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Abstract

The rural households in Bangladesh are vulnerable to several adverse shocks, whose impacts might depend on the socio-economic status, and other regional and physical factors. In this paper, utilizing microeconometric techniques and a rich dataset, the Bangladesh Integrated Household Survey (BIHS) 2015, we investigate how adverse shocks impact female labor force participation in rural areas of Bangladesh. Results obtained from the analyses show households with larger household size, outstanding loans, less education, assets, productive lands, and income, are more vulnerable. Econometrically estimated results suggest that the female household members are significantly more likely to participate in the labor force if the household is adversely affected by a hazard, and such impact is the largest for natural shocks; additionally, the likelihood of female labor force participation declines with household-heads' employment. This paper contributes to a better understanding of the linkages between adverse shocks and female labor force participation in rural Bangladesh. Results obtained in this paper have important implications for improving shock resilience and poverty alleviation of the vulnerable rural population in Bangladesh.

Keywords: Labor force participation, Coping strategies, Shocks, Probit model,

JEL code: J22, Q54

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1. Introduction

Bangladesh has made spectacular strides forward in its economic and social development in recent years. Between 2010 and 2017, the annual average growth rate of GDP has been 6.5 percent, which reached at a stellar rate of 7.9 percent in 2018[‡]. The headcount poverty incidence declined from 48.9 percent in 2000 to only 24.3 percent in 2016.[§] Despite these impressive achievements, close to 40 million people in Bangladesh still live under the poverty line and another 30 million are considered "vulnerable" given the risks they face in slipping back to poverty due to a modest loss of income from any sudden negative economic, social, and natural or climactic shock[**]. According to the most recent Household Income and Expenditure Survey (HIES) 2016, about 43 percent of the population in Bangladesh is considered as poor and vulnerable. In addition, the poverty rate in rural Bangladesh is much higher at 26.4 percent compared to the national headcount incidence of poverty of 24.3 percent. However, the rural population is much more vulnerable to any adverse shocks compared to their urban counterparts.

A plethora of economic, social, and natural shocks contribute to the poverty incidence of rural households in Bangladesh. While most improvements in terms of graduation from poverty in rural areas happen slowly, declines induced by negative shocks are often more sudden. Not only these stresses cause immediate hardship but also, they have serious long term consequences. The short-run and long-term impacts of these shocks on rural households depend on myriad types of economic, geographical, social, and demographic factors. Both the nature of shocks and the resilience of households against stresses play a crucial role in shaping the dynamics of rural poverty and vulnerability. In this paper, *"Vulnerability"* of the rural population is characterized as the reduced ability of an individual or a group to forecast, cope with, resist, and recover from the adverse effects of natural or man-made hazards[††]. The *"shocks"* in this research refer to an actual event that may result in income and non-income losses for households and associated with uninsured risk.

Poverty and coping capacity of households are intertwined. While poverty might be induced from a sudden shock faced by the households, the coping capacity of such hazards is also dictated by the level of household poverty. Hence, one crucial aspect of shocks is that its adverse impacts do not affect different groups of population in the same way. Secure livelihoods and higher incomes increase resilience and enable people to recover more quickly from a hazard. In the absence of sufficient productive assets and financial resources, labor is often the major and only endowment of poor and vulnerable rural households in Bangladesh. Besides, poorer households are usually characterized by a higher dependency ratio, meaning a smaller number of working-age people compared to the more affluent households. The scenario is even worse for the rural households in Bangladesh, as most of them depend on on-farm agricultural activities, which is more vulnerable to climactic and natural shocks. In this context, being labor the primary resource of impoverished households, often female members of adversely affected households participate in the labor force or increase their labor supply. Hence, for these households in addition to many other coping mechanisms to weather man-made or natural hazards, female labor force participation contributes to recovery from shocks and improved households-resilience. Female labor force participation also leads to women's empowerment, which is one of the key factors for rural households in graduating from persistent poverty (Ahmed and Tauseef, 2019). Hence, in addition to its role as a coping mechanism against adverse shocks, understanding the impacts of several hazards on women's labor force participation hold promise for sustained poverty reduction in Bangladesh.

Several types of research have been conducted to explore the impact of shocks on the practice of coping mechanisms adopted by vulnerable rural households. While most of the papers in this area are qualitative in nature, a few research tried to answer these aspects quantitatively. However, no rich dataset and robust econometric techniques have been utilized in such research yet. In this paper, we explore how a wide range of economic, social, and natural hazards affect rural households in Bangladesh. Also, we analytically investigate the effects of different types of shocks on the female-labor force participation in rural Bangladesh. The main contribution of this paper is an econometric analysis of female labor force participation utilizing a very rich rural representative dataset the Bangladesh Integrated Household Survey (BIHS 2015)[‡‡], in the context of increasing resilience against and recovering from shocks for the rural households in Bangladesh. Such a dataset has never been econometrically used in the literature under this context. Hence, the originality of this work lies in its nature and the policy implications of the Government of Bangladesh in terms of supporting poor and vulnerable rural populations by increasing their resilience against shocks, which will ultimately help them recover from shock-induced poverty.

Objective and research questions:

Different types of adverse shocks are prevalent, which affects the poor and vulnerable[§§] population of Bangladesh in many ways. In this paper, we classify a wide range of shocks in three categories: economic shocks, social shocks, and natural shocks. The shocks are defined as sudden negative events causing a significant adverse impact on the local community or on a household that may result in income and non-income losses (Besser et al. 2008). This research tries to answer the following research questions;

- How do economic impacts of different types of adverse shocks differ for households with different income levels, demography?
- How do different negative shocks affect female-participation in the labor force?
- Do the female-labor force participation impacts differ across different types of shocks experienced by households?

In order to answer the research question mentioned above, in this paper we have attempted to achieve the following key objectives.

a. Explore the socio-economic background of the households who are subject to vulnerability and experiences adverse shocks
b. Better understand the nature and types of shocks as well as how these impacts the households from different socio-economic backgrounds
c. Investigate if several shocks faced by households increases the likelihood of female labor force participation (FLFP) and estimate the impacts
d. Policy recommendations based on the empirical findings obtained in this paper in order to improve the resilience of the impoverished and vulnerable-female population.

To achieve the objectives mentioned above, this paper has made use of empirical approaches that include undertaking a comprehensive review and analysis of existing studies and data from secondary sources. To obtain an in-depth understanding of the research questions, quantitative and econometric analyses have been conducted in this paper utilizing a representative credible dataset, the Bangladesh Integrated Household Survey (BIHS 2015), administered by the International Food Policy Research Institute (IFPRI).

The paper is structured as follows. After this introduction, section 2 presents an in-depth review of the literature on different types of shocks and their impact on the poverty afflicted population in developing countries. We have also discussed the impacts of shocks and different coping mechanisms adopted by the poor people in Bangladesh, focusing on the female population. This section is followed by a discussion on the methodology in section 3. Section 3 discusses the methodologies followed in this paper, including a description of the BIHS 2015 dataset, the survey methods followed in collecting the dataset, and the econometric techniques utilized in this paper. This section also includes an economic model showing the linkage between female labor force participation and negative household-specific shock proposed in Haurin (1989) and corresponding implications for our paper. Section 4 presents the descriptive statistics of the dataset at hand as well as provides results obtained from the econometric analysis conducted to estimate the effects of adverse socio-economic and natural shocks on the household choice of female labor force participation. Lastly, section 5 presents concluding remarks, which are followed by some recommendations.

2. Literature review

In this paper, we have reviewed the relevant existing literature on household-specific negative shocks, coping mechanisms of vulnerable households, and the subsequent impacts on female labor force participation (FLFP) from several perspectives. Linkages between negative shocks and transitioning from poverty, a coping mechanism of poor and vulnerable households in the face of such shocks to improve resilience against man-made and natural hazards, or recovery from the induced damages of shocks have been carefully investigated from the literature. In addition to these, how women respond to several economic, societal, and natural shock and how their participation in the labor force, as well as the labor supply, is affected by such shocks are also investigated in detail from the existing research papers and reports.

Several studies identify the key factors contributing to households' poverty persistence and their movements into and out of poverty. Among many other socio-economic, demographic, and regional factors, negative shocks are considered as one of the vital proponents of causing poverty. While improvements in livelihoods and graduation from poverty occur gradually, decline into poverty can happen abruptly due to a wide range of hazards, among which one of the most important is the sudden sickness of the main income earner (Davis and Baulch 2011). Other important negative shocks for the rural households in Bangladesh that are studied in the literature include sudden medical expenses due to illness, loss of livestock, a major loss to crop or productive assets due to natural disaster, cost of wedding or dowry, etc. Vulnerable households can fall back under the poverty line with a significant reduction in the family income if they are exposed to natural shocks such a flooding, storms, or economic shock resulting from ill-health or death of the main earning member of the household (Sen 2003). Similar results can also be found in Nargis and Hossain (2006) and Hossain and Bayes (2009). Additionally, the frequency and intensity of natural disasters associated with climate change disproportionally reduces the ability of the poor compared to the non-poor to cope with disasters because of their more vulnerability to climate shocks, lack of finance and alternative livelihoods, limited access to social safety nets and technologies to help them adapt natural shocks (Chaudhury 2017).

Ahmed and Tauseef (2019) explore important factors that can improve the resilience of the vulnerable population in rural Bangladesh. Their results suggest that women's empowerment is one of the key factors in escaping chronic poverty incidence. Other factors they found to important in alleviating poverty, preventing poor people from sliding back to poverty, and improving the resilience of marginal households against negative shocks, including savings, education, off-farm activities, and access to social safety net programs. Sen (2003) also analyzes factors that can help poor population escape poverty and indicate poverty afflicted households can graduate from poverty by pursuing several strategies such as crop intensification meaning increasing the number of crops in the same land per year, diversification of agricultural production, engaging in more off-farm activities, and livelihood migration. The coping strategies may also include borrowing, sale of assets, remittances, adjustment of food intake, and drawing of savings if available. Impacts from shocks also may depend on the educational status of household head, household size, per capita income, shock type, and coping strategies undertaken by affected households (Olalekan et al. 2011).

The coping strategies adopted by the adversely affected households depend crucially on the types of negative shocks and availability of coping options. Households with higher education level can have greater access to stable and more income sources, hence are more likely to adopt effective coping methods. On the other hand, households with more assets tend to divest assets or vie for loans in the face of shock-induced negative effects (Rashid et al. 2006). Osmani et al. 2015 find that the lower level of education is usually associated with a higher level of poverty in rural areas of Bangladesh. In addition, the more educated household can weather a negative shock in a better way compared to the less educated counterpart, due to the higher productivity in their activities. Another interesting finding obtained in the Osmani et al. (2015) is that the poor households are not necessarily more prone to shocks than the non-poor in rural Bangladesh. As found in other studies, they conclude engaging in off-farm activities substantially reduces households' vulnerability to shocks. Whereas, microcredit borrowers and participants in social safety nets are more vulnerable than the non-borrowers and non-participants. However, the impacts of a large aggregate shock or a macro-economic shock differ from the household-specific negative shocks. The adjustment mechanisms such as household structure, fertility, household labor supply, inter and intra-household transfers used by the households to cope with the negative household-specific shocks are found to be not as effective for an aggregate shock (Mckenzie 2003).

Several studies found evidence showing evidence that poor households often consider female labor supply as an insurance or recovery mechanism against idiosyncratic shocks and earning risks (Coile 2004). Attanasio et al. 2005 show that additional uncertainty regarding household earning increases female participation rates, and this increase is even larger for households with limited ability to borrow. This paper also shows household welfare is greater when households are able to adjust the female labor supply.

According to the neo-classical theory, the supply of labor and participation in the labor force depends on the labor-leisure choice. Later the role of household works was emphasized by several economists (Mincer 1962, Becker 1965). In addition to these, a wide range of factors contributes to the female labor force participation decisions in Bangladesh. In the face of sudden negative shocks, opportunity costs of women for not being in the labor force, hence, not contributing to the household earning is very high. Therefore, economic, societal, or natural negative shocks reducing household income might act as supply-side factors affecting the female labor force participation. One of the early research that theoretically explores the effect of household-specific negative

shocks on the female labor force participation is Haurin (1989). This paper investigates the impact of a change in the husband's earning on women's labor force response. In the case of an unexpected loss in family income resulting from the death of the main earning member, unexpected unemployment of husband or sudden health shock induces an increase in the likelihood of female labor market participation. Similar results are also found in Cullen and Gruber (2000); however, these labor supply change does not occur in the same way when negative shocks induced a reduction in wage is permanent and transitory. Response in labor supply is larger when the shocks are permanent compared to transitory shocks (Zhang 2008).

Even though a wide range of studies discuss the linkages between economic shocks and their impacts on women labor supply, the vulnerability of rural households in Bangladesh, and their coping mechanisms, both qualitatively and quantitatively, almost no paper econometrically explore such linkage's implications for female labor force participation in rural Bangladesh. In this paper, utilizing the BIHS 2015, impacts of negative shocks will be investigated under different types of hazards.

3. Methodology

This paper has utilized several quantitative and econometric techniques to deal with the research questions and achieve research objectives. An economic model showing the linkage between female labor force participation and negative household-specific shock proposed in Haurin (1989) has been used to come up with a hypothesis and its implications for this research. Additionally, a detailed review, which has been discussed in the literature review section, has been completed of the available literature that includes relevant documents, academic papers, research reports, and cross-country analysis.

The empirical analysis part of the paper heavily uses the Bangladesh Integrated Household Survey (BIHS 2015), a rich dataset that is publicly available at the Harvard Dataverse website.[***] The BIHS-2015 survey was conducted on 6,500 households in 325 villages across seven divisions and the Feed the Future (FTF) Zone of Influence[†††] in Bangladesh. In the survey, data were collected on plot-level agricultural production and practices, dietary intake of individual household members, anthropometric measurements (height and weight) of all household members, and women's empowerment measurement in agriculture index (WEAI). A community survey supplements the BIHS data to provide information on area-specific contextual factors.

BIHS (2015) dataset entails detailed information on shocks for all surveyed households covering 33 different types of negative shocks. Utilizing available information from this module, shocks have been classified under three broad categories, based on their economic, social, environmental impacts. While social and environmental impacts are discussed in detail through descriptive statistics, the focus of the research has been on the negative economic shocks. Another novelty of this dataset is, it also collects information on the frequency and the length of shocks, which has also been utilized to explore how impacts on households' changes with exposure to a different frequency of shocks.

Several descriptive and econometric techniques (Probit regression model under several set-ups) have been used to analyze BIHS (2015) in order to investigate the research questions. The descriptive statistics provide detailed information on the nature and types of economic shocks

experienced by rural households. We also discuss the socio-economic background and characteristics of the vulnerable and shock-affected population. Additionally, the impacts of economic shocks and their effects on the behavioral decisions of household members (both male and female) in terms of labor force participation of women in order to generate more income have been carefully estimated by statistical and econometric techniques such as Probit regression models. In order to ensure unbiasedness and consistency of our estimation, we control for a wide range of important factors that might affect the likelihood of female labor force participation, which include types of occupation, age, gender, education, religion, economic background provide by asset ownership, etc. Based on findings obtained from this paper, specific policy recommendations will be laid out to increase female labor force participation as well as improve shock-induced vulnerability-resilience of marginalized and vulnerable rural households of Bangladesh.

Economic Model:

The theoretical implication of negative shocks on female labor force participation has been derived in this paper based on an economic model developed by Haurin (1989). Household members in this model make ex-ante savings decisions and ex-post labor supply decisions. This model provides a framework to examine how household members make female labor supply decision in response to sudden negative shocks that reduce family income.

To analyze this question a two-period model has been presented in this paper, where the utility of the household is a function of the consumption of a composite good q and the leisure time of males m and females f. The measures of leisure time are normalized between 0 and 1. The wealth of the household is defined as W, the rate of interest is i, and ρ is the rate of time preference. Female wages and male wages are indicated by v and w respectively. There are two time periods in this model indicated by $t \in \{1,2\}$ and are shown as subscripts. The household-specific negative shock in this model is incorporated through the future or second time period employment prospects of the male household members are uncertain with density function $\varphi(m_2)$. In this setup, the optimization problem of the household is as follows,

$$(i)\ \max_{f_1, m_1, W_1} E\left(U^*\right) = U_1[f_1, m_1, q_1] + E\left(U_2^*\right) \Big/ (1+\rho) \quad \text{where,} \quad E\left(U_2^*\right) = \int_0^1 U_2^* \varphi(m_2)\, dm_2 \quad \textit{and} \quad U_2^* = \max_{f_2} U[f_2, m_2, q_2]$$

Subject to;

$$(ii)\ \ q_1 = W_0(1+i) + v_1(1-f_1) + w_1(1-m_1) - W_1$$

$$(iii)\ q_2 = W_1(1+i) + v_2(1-f_2) + w_2(1-m_2)$$

Equation *(i)* says that the household maximizes the lifetime (two-periods) discounted expected utility (second period expected utility is measured with respect to the probability of shock-induced leisure level in the second period) recognizing that the first period choices depend on the probability of occurrence of future negative shocks and the resultant level of utility. The intertemporal budget constraint has been used to derive consumption constraints for the first and second periods in equations *(ii)* and *(iii)*.

Solving this optimization problem, we have the following result,

$$(iv)\ \ln f_2 = \ln f_1 + (\ln B_2 - \ln B_2) - (\ln v_2 - \ln v_1) + \ln(1+i)/(1+\rho) - w_2(\bar{m}_2 - E(m_2))/\psi \quad \text{where,} \quad \psi = v_2 + W_1(1+i)$$

Equation *(iv)* indicates, if due to a negative shock in the second period, male labor supply declines meaning actual leisure of males $\bar{m}_2$ is larger than the expected leisure time $E(m_2)$, then the female labor supply will increase (percentage change in female leisure in *t=2* is negative). Additionally, if the negative shock on the household causes a reduction in the household wealth accumulated at the end of *t=1* (that is, W_1 reduces), female labor supply in the household will also increase.

Utilizing results obtained from this economic model, we can hypothesize that a household experiencing any negative shock, which results in a decline in wealth or reduction of male earning, will optimally increase the female labor market participation in order to weather or recover the adverse impacts of hazards. In our paper, this also implies that a negative shock can increase the likelihood of female labor market participation for the affected households.

Data description

This part of the paper provides an overall picture of different types of shocks that are experienced by rural households in Bangladesh. We also obtain the soci0-economic background of the affected and non-affected groups of households utilizing the Bangladesh Integrated Household Survey (2015) dataset. According to the BIHS 2015, out of 6,569 households surveyed, 2653 experienced at least one shock since 2011. BIHS 2015 collected information on 33 different types of shocks that have negative impacts on households. We classify all these 33 shocks under three broad categories: economics, societal, and natural shocks. The current scenario of shocks and characteristics and backgrounds of households experiencing them are presented in Table 1.

According to table 1, 2653 households (39.22% of the sample) were exposed to at least one type of shock during the years 2011-2014, whereas 3916 (60.78% of the sample) households did not face any shock during the same period. Most households that are exposed to shocks faces economic hazards (60.2%). However, out of the three, on average, the societal shocks cause the largest amount of damages (81,394 takas), which is followed by economic and natural shocks (53,759 takas and 41,972 takas respectively). Many asset shocks may also involve loss of income. However, we do not state these as income shock as in the literature, income shocks are defined only as those shocks that do not necessarily flow from the loss of some assets. The average duration of shocks is also the highest for societal shocks (119 days), followed by economic and natural shocks (95 and 74 days, respectively).

From Table 1, we can also see that more than two-thirds (69.1%) of the households exposed to negative shocks suffered losses that made their condition worse than their pre-shock scenario. On average, households experiencing negative economic, social, or natural shocks are characterized by a significantly larger amount of both outstanding and total amount of loans, the bigger size of household, and more access to social security programs. On the other hand, such shock-induced families own less amount of assets, have lower per-capita income, and own less amount of land.

Another interesting finding gleaned from the dataset is that a significantly large portion, 2079 (81% of shock-experienced) of households allowed females to work because of financial reasons

after the adverse effects induced by any type of distress. This portion is lower (76.7%) and statistically significant for the households that did not face any negative shock during their past five years. Additionally, our findings suggest that negative shock-induced households own a significantly lower amount of land (92.28 decimals against 108.60 decimals) compared to the families that did not experience any distress. This fact, along with the lower amount of asset (asset value was 62574.23 taka for shock-facing households, and that for families with no shock was 67216.45 taka), more outstanding loans (52920.24 takas in the face of 38580.74 takas), and many other factors indicate a severe vulnerability of the affected families. The total amount of loans for shock-incurring households and families facing no shock was 64860.67 taka and 46432 takas respectively, also provide similar results.

Furthermore, a larger percentage (41% against 30.6%) of households that went through negative shocks are comprised of disabled members compared to the unaffected population. Also, the families experiencing shocks are slightly larger (5.09 against 4.96 number of members). The average yearly income per capita of households experiencing no negative shocks was 8278.88 taka, whereas it was only 6241.22 taka for families facing shocks. However, we can see more percentage (45.4% against 40.6%) of the households have access to some social protection program (SPP) from the government when negative shocks are concerned. This is because, indeed, the households receive SSP assistance are more prone to shocks. The findings obtained here are both economically and statistically significant (based on p-value) and can help explain why women's labor force participation rate is higher for the negative shock-induced groups of households.

Table 1: Scenario of households with and without shock			
Particulars	**Households without shocks**	**Households with shocks**	**p-value**
Number of households	**3916**	**2653** Economic shock: 60.2% Social shock: 20.2% Natural shock: 12.3% Others: 7.3%	
Average loss induced by shocks (in taka)		Economic shock: 53,759.83 Social shock: 81,394.47 Natural shock: 41,972 Others: 94,667.19	
Shocks duration (in days)		Economic shock: 95 Social shock: 119 Natural shock: 74 Others: 101	
Condition after shock		Worse than before: 2165 (69.1%) Same as before: 819 (26.2%) Better than before: 147 (4.7%)	
Households with working female (in percentage)	65.7%	77.3%	<0.001
Husbands/ households allowed female work because of financial reason	N=2079 (76.7%)	N=1887 (81.5%)	<0.001
Land ownership (in decimals)	108.60	92.28	<0.001
Households with disable member	1197 (30.6%)	1281 (41.0%)	<0.001
Average household size	4.96	5.09	0.005
Average yearly income per cap of household (in taka)	8278.88	6241.22	<0.001
Household asset (in taka)	67216.45	62574.23	0.036
Total amount of loan (in taka)	46432.43	64860.67	<0.001
Total outstanding loan (in taka)	38580.74	52920.24	<0.001
SSP access	40.6%	45.4%	<0.001

Source: Calculated by authors using BIHS 2015 dataset

Table 2: Number of households with negative exposure

Number of negative-shock exposure	Number of Households
1	2,202
2	294
3	93
> 3	64
Total exposure	2653
Total non-exposure	3916

Source: Calculated by authors using BIHS 2015 dataset

From Table 2, we can see, out of 2653 exposed-to-shocks households, 2202 (83%) experienced only one negative shock, 294 (11%) faced these shocks twice, and only about 6% of households were exposed to more than two shocks during 2011-2014.

Table 3: Number of households with working females

	HH without working female	HH with working female
HH not exposed to shocks	N=1,098	N=2,814
HH exposed to shocks	N=583	N=1,941

Source: Calculated by authors using BIHS 2015 dataset

In table 3, an important finding is observed for the shock-induced households' female labor-force participation. Females were engaged in income generation activities in 77.3% (583 out of 1,941) of households that were exposed to different types of distresses, while this percentage was only 65.7% (1,098 out of 2,814) for families that did not experience any hazard. This result implies that households experiencing negative shocks, among other mechanisms, use female labor force participation as a coping mechanism. In other words, designing policies that improve female income-generating capacities can eventually make rural households more resilient in the face of negative shocks.

Table 4: Worst type of shocks by household ranking

Type of shocks	Ranked as worst by number of households (N)	Households (%)
Economic (1)	1,609	63
Social (2)	441	17
Natural (3)	285	11
Others (4)	183	7.2
Total	2518	100

Source: Calculated by authors using BIHS 2015 dataset

Table 5: Worst 10 shocks by household ranking

Type of Shocks	Ranked as worst by number of HH
Medical expenses due to illness or injury	909
Loss of income due to illness or injury	236
Loss of livestock due to death	154
Other costs of wedding	135
Death of main earner	119
Major loss of crops due to flood	105
Dowry payment	95
Major loss of crops due to other reason	87
Failure or bankruptcy of business	78
Losses due to court case	78
Total	**1996**

Source: Calculated by authors using BIHS 2015 dataset

In table 4 and 5, our descriptive statistics from the dataset show, in terms of damages caused, out of 2518 households, most households (1609 and 63%) rank economic shocks as the worst type of shock, followed by societal (441 and 17%) and natural shocks (285 and 11%). The top 5 shocks ranked by the affected households were medical expenses due to illness or injury, loss of income due to injury or illness, loss of livestock due to death, cost of a wedding, and death of the main earner of the family. Out of these five, four can be classified as an economic shock. From Table 6,

we can see no matter whether the group is of the extreme poor, poor, or vulnerable households, in all the cases, most are affected by the economic shocks, followed by societal and natural shocks.

Table 6: Distribution of affected households according to their poverty level

Extreme poor households (N=1384)			**Poor households (N=2023)**			**Vulnerable households (N=3059)**		
Economic shocks	(N=364)	26.30%	Economic shocks	(N=532)	26.30%	Economic shocks	(N=803)	26.25%
Societal shocks	(N=76)	5.49%	Societal shocks	(N=117)	5.78%	Societal shocks	(N=186)	6.08%
Natural shocks	(N=55)	3.97%	Natural shocks	(N=85)	4.20%	Natural shocks	(N=132)	4.32%
Others	(N=41)	2.96%	Others	(N=57)	2.82%	Others (77)	(N=77)	2.52%

Source: Calculated by authors using BIHS 2015 dataset

Table 7: Socio-Economic background of households

	Households with shocks	**Households without shock**	**Households facing economic shocks**	**Households facing societal shocks**	**Households facing natural shocks**
Average years of schooling	3.49	3.57	3.48	3.34	3.11
Average age (in years)	46.08	45.54	45.53	48.18	46.60
Average per capita income (in taka)	6,403.66	8,286.37	6,562.83	7,028.50	4,677

Source: Calculated by authors using BIHS 2015 dataset

Table 8: Occupation of household heads (in %)

	Households with shocks	Households without shock	Households facing economic shocks	Households facing societal shocks	Households facing natural shocks
Household head's occupation is farming	40.06%	36.63%	36.70%	42.47%	58.54%
Household head's occupation is off-farm salaried worker	4.68%	4.98%	4.71%	5.94%	2.70%
Household head's occupation is off-farm self-employment	11.53%	13.04%	11.41%	12.79%	8.45%

Source: Calculated by authors using BIHS 2015 dataset

Table 7 and Table 8 portrays average education, age, per-capita income, and occupation of household-heads. Here it is shown that the average years of schooling of the household head facing shocks is lower than that of household head's experiencing no hazard. This also supports the findings from the literature that, households are more resilient to shocks with a higher level of education. The same is true for the average per capita income of the household, which also supports the result of increasing resilience with more household income. In addition to these from table 8, we can observe, the households exposed to negative shocks are more engaged with farming activities, in line with the finding of off-farm activities that make households less vulnerable to hazards.

VI. Econometric analysis

In the econometric analysis, our main interest is to estimate the household choice of female labor force participation affected by negative socio-economic and natural shocks. However, Such decisions also depend on many other individuals and household characteristics. To assess the choice of household female's participation in the labor force, we have used the neoclassical random utility model for discrete choice decision-making (Greene 2003). In order to estimate the discrete choice of households, we have used a Probit Binary Response regression model of the form,

$$\text{Prob}\left(y_i = 1 \mid X_i\right) = \text{Prob}\left(y_i^* \mid X_i > 0\right) = CDF_{normal}\left(\beta X_i\right)$$

$$y_i^* = \left[\beta X_i + \varepsilon_i\right] \begin{cases} if \ > 0, \ y_i = 1 \\ if \ < 0, \ y_i = 0 \end{cases}$$

where y_i indicate if the *i*-th household chooses female labor force participation (1 for yes and 0 for no). y_i^* is the latent variable indicating the random utility of *i*-th household from a wide range of factors affecting the utility of labor force participation, that lead to decide on female labor force participation. $CDF_{normal}(.)$ represents the normal cumulative distribution function; X_i is a vector of covariates (presented in the following Table 9) affecting the likelihood of female participation in the labor force, and β contains a vector of parameters to be estimated. ε_i indicates the stochastic effects of unobserved factors affecting the household utility from the female labor force participation decision. If $y_i^* > 0$ meaning random utility of household is positive, females decide to engage in earning activities. Our variable of interest in this analysis is a dummy variable indicating if the household experienced shock during 2011-2014. Other covariates are included in the models to control for omitted variable biases and endogeneity. Summary statistics of variables used in the analysis are presented in Table 9.

We have estimated the Probit regression model using three different set-ups, each of which has its own importance and provides us a better understanding of the linkages between hazard and female engagement with earning activities. The first set-up uses the whole dataset to find out the impacts of sock-exposure on the FLFP. In the second set-up, we focus only on the vulnerable group of population in the sample and compare if the vulnerable groups FLFP response is different from that of the overall sample. Finally, we investigate which type out of economic, societal, and natural shocks have the largest impact on the FLFP.

Table 9: Summary statistics of variables used for analysis

Variable	Obs	Mean	Std.Dev.	Min	Max
Household with female labor force participation (1=yes, 0=no)	6708	.364	.481	0	1
Age of working age female	6708	35.787	12.988	17	64
Marital status (1=yes, 0=no)	6708	2.062	.582	1	5
Female's education (in school years)	6708	4.157	4.006	0	16
Passed primary schooling (1=yes, 0=no)	6708	.375	.484	0	1
Exposed to shocks during (2011-2014) (1=yes, 0=no)	5945	.386	.487	0	1
Total loss from shocks (in taka)	5945	30366.89	113000	0	2300000
Has children below 2 years age (1=yes, 0=no)	5945	.197	.398	0	1
Number of children below 6 years age	4435	.564	.706	0	4
Age of household head (HH) (in years)	6708	46.281	13.578	17	92
Education of household head (in school year)	6708	3.484	3.958	0	18
Interaction variable between female and HH's education	6708	21.369	34.782	0	288
Household head employed (1=yes, 0=no)	6708	.77	.421	0	1
Household has disable member (1=yes, 0=no)	5947	.377	.485	0	1
Household size	6708	5.386	2.272	1	21
Percapita yearly household income (in taka)	5947	9307.823	28684.84	0	527000
Total outstanding loan (in taka)	5947	53670.46	167000	0	3820000
Has access to social security program (1=yes, 0=no)	6708	.36	.48	0	1
Total amount of land (in decimals)	5947	101.343	165.191	0	3092
Value of household asset (in taka)	5947	81496.74	120000	80	2830000
Monthly expenditure of household (in taka)	5947	3819.809	2637.377	447.1	39172.1
Household is vulnerable (1=yes, 0=no)	5947	.398	.49	0	1
Total loss of vulnerable households (in taka)	5945	8123.43	49426.11	0	1520000

Source: Calculated by authors using BIHS 2015 dataset

Table 10: Results from the Probit regression model under different model set-up

	For all households (Model-1)	**For vulnerable households (Model-2)**	**For shock experiencing households (Model-3)**
Age (in years)	-0.003*	-0.004*	-0.001
Marital status (1= yes, 0=no)	0.044*	0.068*	0.04
Education (in school years)	-0.059***	-0.084***	-0.054***
Passed primary schooling (1= yes, 0=no)	0.028	0.018	-0.009
Experienced shock during (2011-2014)	**0.031****	**0.037***	
Household (HH) has children below 2 years old (1= yes, 0=no)	-0.027	-0.029	-0.047
Number of children below 6 years old	-0.025*	-0.017	-0.016
HH head's age (in years)	-0.001	-0.002	-0.003
HH head's education	-0.013***	-0.019**	-0.020***
Interaction variable of female and HH head's education	0.002***	0.004***	0.003**
HH head is employed (1=yes, 0=no)	0.011	0.088*	-0.101**
HH has disabled member (1=yes, 0=no)	0.069***	0.081**	0.074**
HH size	-0.021***	-0.014	-0.017*
Households percapita income (in taka)	-0.000**	-0.000**	-0.000*
Total outstanding loans (in taka)	-0.000**	-0.000*	0
Access to SSP (1=yes, 0=no)	0.051***	0.036	0.042
HH is vulnerable (1=yes, 0=no)	-0.006		0.019
Interaction variable of age and education	0.001***	0.002***	0.001***
Faced economic shock (1=yes, 0=no)			**-0.021**
Faced natural shock (1=yes, 0=no)			**0.059***
Household is extreme poor (1=yes, 0=no)			-0.004
Household is poor (1=yes, 0=no)			-0.027

Source: Estimated by authors using the BIHS 2015 dataset
Marginal effects in the rows
***p<0.01, **p<0.05, *p<0.1

Table 11: Division specific effects on labor force participation (Dhaka as the base division):

	Model-1	Model-2	Model-3
Chittagong	-0.087***	-0.123***	-0.105**
	-0.02	-0.03	-0.03
Khulna	0.031	0.098	0.095
	-0.06	-0.09	-0.1
Rajshahi	-0.079**	-0.095**	-0.034
	-0.02	-0.04	-0.04
Rangpur	-0.053*	-0.066	0.016
	-0.02	-0.04	-0.04
Sylhet	-0.163***	-0.085	-0.159***
	-0.02	-0.06	-0.04
	0.07	0.032	0.035
	-0.06	-0.08	-0.08

Source: Estimated by authors using the BIHS 2015 dataset
Marginal effects in first and Standard errors in second rows.
***p<0.01, **p<0.05, *p<0.1

Discussion:

The Table 9 shows summary statistics of all the variables used in the econometric analysis in this paper. Whereas, Table 10 and Table 11 presents the marginal effects of a wide range of socio-economic, demographic, and regional factors on the likelihood of a household's female labor force participation. We can see in all of the three model setups, exposure to negative shocks induces household females to engage in income generation activities for families. On average, experiencing a negative shock (economic, societal, or natural) in the last 4 years between 2011 and 2014, a household is about 3% more likely to have female labor force participation. However, this effect is larger for the vulnerable groups of the population being about 4%. For the group of households that face some type of negative shock in the past 4 years, having a household head with employment reduces the FLFP by 10%. While all different types of negative shocks increase FLFP's likelihood, natural hazards cause the largest increase by about 6% more than the societal shocks.

This result has an important implication in terms of the policy. Results suggest that females from the vulnerable groups of the population in rural Bangladesh are engaging more with the income generation activities compared to the poor and extreme poor households. Hence, the government of Bangladesh should focus more on the poor and extreme poor rural household to encourage and help improve female labor force participation

Other factors that are included in the model to control for omitted variable bias and endogeneity are also significant. Marital status, passing primary school education, experiencing shocks, having a disabled member in the household have positive impacts on the female labor force participation. Whereas, age, education, having children below two years old, the number of children below six years old, household head's age, household head's employment status when facing shocks,

household size, and household head's education negatively affect the likelihood of female labor force participation. One interesting result derived from the analysis is that in all three model setups, the variable "Interaction variable of female and HH head's education" is significant. Hence, we can say incremental education of females increases their likelihood of engaging in income generation activities when household heads are more education. We have also estimated regional impacts of FLFP, treating the Dhaka division as the baseline. Our results suggest Dhaka has the highest regional impact on FLFP, while the lowest regional impact is observed in Sylhet.

VII. Concluding remarks:

Based on the study, it can be concluded that there is a significant absence of sufficient productive assets and financial resources faced by the vulnerable rural households in Bangladesh. Additionally, they are characterized by a higher dependency ratio and more reliance on farming activities that are vulnerable to adverse shocks. In this context, labor is the primary recourse of impoverished households. Hence, increasing women's participation in the labor force and generating income can substantially improve the resilience of the rural poor and vulnerable households in Bangladesh. The increased female labor force participation not only acts as an effective coping mechanism against adverse shocks but also will contribute to alleviating poverty situation in rural Bangladesh. The resilience of the vulnerable households in rural Bangladesh can also be revamped by increasing the level of education, awareness regarding coping mechanisms, generating more employment through off-farm activities, and crop intensification as well as diversification of agricultural production of the households related to farming activities.

One limitation of this paper is due to the nature of the dataset. The results obtained here cannot be generalized for shock-induced households in urban area. This is because the BIHS 2015 is a representative dataset of rural Bangladesh. However, because of the rapid rate of urbanization in Bangladesh, the vulnerability, resilience, and impacts of shock on urban population warrants significant importance. In our future work, we will try to incorporate information on shocks and their impacts on urban households, possibly using the Household Income and Expenditure (HIES 2016) dataset. While findings obtained from this paper are of crucial importance, in order to better understand the dynamics of various types of shocks and how those are mitigated through women's labor force participation, we plan to use several other econometric techniques in our future work, including panel data models. This will allow us to explore how different types of shocks have affected the rural population in Bangladesh over time.

Recommendations:

In Bangladesh, like most South Asia countries, the policy approaches to improve women's employment has been mostly through anti-poverty programs, safety-nets, social protection initiatives, small livelihoods programs, and micro-credit programs. Based on the analysis in this paper, we argue policies should incorporate the perspective of female labor force participation as an essential tool to improve the resilience of vulnerable households rather than merely advocating it as an anti-poverty agenda. Our results also suggest that the likelihood of female labor force participation has important regional effects. Region-specific interventions can be undertaken with a clear understanding of the geographical patterns of female labor force participation.

The government can increase its focus on enhancing women's participation in public employment programs. Since a large portion of rural women is employed in agriculture or agriculture-based occupations, the policy also needs to address issues that would enhance women's productivity in the agricultural sector. The policies are also needed to be based on a better understanding of the way large public employment programs benefit women and what the barriers to greater participation are.

The government needs to create incentives and support systems to encourage married women to enter or stay in the labor force. The high odds of married women staying out of the labor force also have to do with reproductive responsibilities. Our results in this paper also suggest having kids less than six years old significantly reduces the likelihood of female labor force participation. Facilitating mechanisms like access to information about jobs and spreading awareness regarding the benefits of females engaging in income generation activities may also go a long way in attracting them into the labor force.

Vulnerable Group Development (VGD) is one of the largest safety-net programs assisted by the World Food Programme (WFP). It is targeted at poor and vulnerable women in Bangladesh. The ultimate goal of the program is to bring sustainable improvement to the lives of ultra-poor households by helping women participate in the labor force. The government can improve the resilience of vulnerable rural households by improving such kind of programs.

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‡ Source: The World Bank dataset (accessed on December 12, 2019)
§ Source: Household Income and Expenditure Survey (HIES) 2016.
** According to the national Social Security Strategy (NSSS) of Bangladesh, 2015 vulnerability is defined by the 1.25*upper poverty line.
†† Source: International Foundation of Red Cross and Red Crescent Societies (IFRC)
‡‡ Bangladesh Integrated Household Survey (2015) is conducted by International Food Policy Research Institute covering 6,500 rural households.
§§ Vulnerability is defined as 1.25 times the upper poverty limit according to the National Social Security Strategy 2015.
*** BIHS 2015 dataset is collected from the following link: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/BXSYEL
††† Feed the Future (FTF) initiative is led by U.S. Agency for International Development (USAID) seeking to reduce poverty and under-nutrition in Bangladesh. Geographic areas targeted by FTF interventions are known as the Future Zones of Influence (ZOI) and include rural areas of 20 districts in the Southern Delta region of Bangladesh with a population of 28 million (IFPRI, 2017).

References:

Ahmed, A. and Tauseef, S., 2019. *Climbing up the ladder and watching out for the fall: Poverty dynamics in rural Bangladesh* (Vol. 1791). International Food Policy Research Institute

Ahmed, A.U. and Melormi, S., 2018. *Vulnerability of Women, Adolescent Girls and Children to Climate Change in Urban Areas of Bangladesh. Dhaka, CARE Bangladesh, pp.61*

Attanasio, O., Low, H. and Sánchez-Marcos, V., 2005. Female labor supply as insurance against idiosyncratic risk. *Journal of the European Economic Association*, *3*(2-3), pp.755-764.

Becker, G.S., 1965. A Theory of the Allocation of Time. *The economic journal*, pp.493-517.

Chaudhury, M., 2017. Strategies for reducing vulnerability and building resilience to environmental and natural disasters in developing countries. In *Expert Group Meeting on Strategies for Eradicating Poverty to Achieve Sustainable Development for All., New York*.

Coile, C.C., 2004. *Health shocks and couples' labor supply decisions* (No. w10810). National Bureau of Economic Research.

Cullen, J.B. and Gruber, J., 2000. Does unemployment insurance crowd out spousal labor supply?. *Journal of labor Economics*, *18*(3), pp.546-572.

Davis, P. and Baulch, B., 2011. Parallel realities: Exploring poverty dynamics using mixed methods in rural Bangladesh. *The Journal of Development Studies*, *47*(1), pp.118-142.

Green, W.H. ,2003. Econometric Analysis. Prentice Hall International Editions, New Jersey.

Haurin, D.R., 1989. Women's labor market reactions to family disruptions. *The review of economics and statistics*, pp.54-61.

Hossain, M. and A. Bayes. 2009. *Rural Economy and Livelihoods: Insights from Bangladesh.* AH Development Publishing House, Dhaka, Bangladesh.

International Food Policy Research Institute (IFPRI), 2016, "Bangladesh Integrated Household Survey (BIHS) 2015", Source: https://doi.org/10.7910/DVN/BXSYEL, Harvard Dataverse, V2, UNF:6:/HCrB4FtVE4GWh8oQ1dhEQ== [fileUNF]

McKenzie, D.J., 2003. How do households cope with aggregate shocks? Evidence from the Mexican peso crisis. *World Development*, *31*(7), pp.1179-1199.

Mincer, J., 1962. Labor force participation of married women: A study of labor supply. In *Aspects of labor economics* (pp. 63-105). Princeton University Press.

Nargis, N. and Hossain, M., 2006. Income dynamics and pathways out of rural poverty in Bangladesh, 1988–2004. *Agricultural Economics*, *35*, pp.425-435.

National Social Security Strategy (NSSS) of Bangladesh, 2015

Olalekan, O.S., Olapade-Ogunwole, F. and Raufu, M.O., 2011. Shocks and Coping Strategies of Rural Households: Evidence from Ogo-Oluwa Local Government, Oyo State, Nigeria. *International Journal of Agricultural Management and Development (IJAMAD)*, *1*(1047-2016-85438), pp.259-266

Osmani, S.R., Ahmed, M., Latif, M. and Sen, B., 2015. *Poverty and Vulnerability in Rural Bangladesh*.

Preliminary Report on Household Income and Expenditure Survey, Bangladesh 2016

Rashid, D.A., Langworthy, M. and Aradhyula, S.V., 2006. *Livelihood shocks and coping strategies: an empirical study of Bangladesh households* Selected Paper Prepared for Presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California (No. 379-2016-21620).

Sen, B., 2003. Drivers of escape and descent: changing household fortunes in rural Bangladesh. *World development*, *31*(3), pp.513-534.

Zhang, S., 2008. How Do Wage Shocks Affect the Labor Supplies of Married Couples?-Evidence from the Collective Model.