

# Women's employment and natural shocks

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## Abstract

We employ georeferenced data and longitudinal household panel survey data to investigate the impact of the dramatic flood that hit Bangladesh in August-September 2014 on women's employment and bargaining power. Development economics models suggest that household labour supply increases after an idiosyncratic shock as coping strategy to avoid a heavy reduction in consumption. Our difference-in-difference estimates confirm these assumptions: women's employment probability raises by around 18 percentage points and the probability for non-employed women to enter employment increases by around 22 percentage points after the flood. Correcting for the selection bias due to the initial employment status of women, we also find a significant rise in their probability to engage in autonomous wage-earning activities and in their average monthly income. Finally, we show that the greater involvement in the labour market - instrumented by the intensity of the flooding in villages where women live - contributes to raising their bargaining power within the household as measured by the Women's Empowerment in Agriculture Index.

**Keywords:** Bangladesh; Flood; Shock-coping strategy; Women's employment; Intra-household bargaining

**JEL Classification:** F66; J16; Q12; Q54.

# 1 Introduction

A number of studies have investigated the impact of idiosyncratic shocks on households in developing countries, showing that labour supply would increase to absorb their consequences on household income and to prevent from a strong reduction in consumption. Some of these studies evaluate the consequences of earning shocks due to political crisis and wars (Smith & Ward, 1985; Acemoglu, Autor, & Lyle, 2004; Goldin & Olivetti, 2013), while others focus on coping strategies developed by households after natural shocks (Mueller & Quisumbing, 2011).

For women labour supply, previous research has seek to explain the determinants of female labour force participation focusing on education, fertility, social norms, etc. (Eckstein & Wolpin, 1989; Cullen & Gruber, 2000; Gaddis & Klasen, 2014). Klasen (2018) reviews the literature on the reasons for women's choice to work, comprehending both supply and demand side factors of the labour market.

Goldin (1994) and other authors conduct a macro-level analysis and hypothesize that female labour force participation has a U-shaped relationship with economic growth, and that it would drop at early stages of development and increase when the society shifts to a more industrialised and richer economy. This hypothesis has been tested by many studies, finding heterogeneous trends in female labor force participation according to countries, urban and rural sectors, policies and macroeconomic conditions (Luci, 2009; Tam, 2011; Gaddis & Klasen, 2014; Lahoti & Swaminathan, 2016). For the relation with economic development and households' wellbeing, Sarkar, Sahoo, and Klasen (2019) find that an increasing local economic development and a higher income of other members of the household would lead to a lower probability for women to work.

Among the drivers of female labor force participation rate (LFPR), natural shocks may lead to increasing women's participation rates as a coping strategy to reduce the uncertainty in earnings, as shown by Attanasio, Low, and Sánchez-Marcos (2005). Bhalotra and Umana-Aponte (2010) in their multi-country analysis for the developing world find evidence of raising LFPR in contexts of higher income volatility.

In addition, also women's bargaining power in the household would be affected by idiosyncratic income shocks. Anderson and Eswaran (2009) find that women induced to work by economic hardship experience an increase their bargaining power, but only in case of employment outside their husbands' farms. Women's outside option, meaning the payoff they would get if they left their marriage, would be in fact higher, enhancing their decision power (Blumberg & Coleman, 1989; Rahman & Rao,

2004; Majlesi, 2016). Our paper is therefore related to the strands of literature that investigate the effects of women's ownership of production assets (Agarwal & Bina, 1994), access to credit programs (Hashemi, Schuler, & Riley, 1996; Anderson & Baland, 2002) and participation in wage-earning activities (Kelkar, Nathan, & Jahan, 2003) on their autonomy. According to these studies, new earning opportunities for women have significant implications for their decision making power, as well as for their education, health status, fertility and investments in their children (Atkin, 2009; Jensen, 2012; Heath & Mobarak, 2015).

We study the case of Bangladesh. Data from the World Bank show how the progressive economic growth started in the 90's has been accompanied by an increase in female labour force participation rate from 23 to 33 percent in 2017 (Figure 1). This rise has been explained by numerous factors: the increase of agricultural yields brought by the *Green Revolution* that starting from the 60's, thanks to the introduction of new fertilizers, pesticides and modern irrigation equipments, brought to an increase in the harvest by around 150 percent (Headey & Hoddinott, 2016); the rapid decline of fertility rate from 4.4 in 1990 to 2.1 in 2016 (World Bank, 2018); and the diffusion of the garment industry that from the 90's has grown at a rate of 17 percent per year and where around 80 percent of the 4 million people employed in the sector are women. In addition, the rise in female education and in the enrolment rate that went from being half the rate of boys in 1970 to overcome it in recent years, contributed to boost women labour force participation. However, as shown in Figure 2, Bangladeshi women participation rate still remains far below the global average of 50 percent. According to World Bank data, male labour force participation rate was around 80 percent in 2017, a proportion considerably higher compared to the 33 percent of females.

As in the majority of South Asian countries, in Bangladesh flood phenomena are quite common during the monsoon seasons. The flood that hit Bangladesh starting from mid-August 2014 was particularly dramatic and affected over 3 million people until the end of September. The flood inundated large rural fields, especially in the northeastern part of the country where it severely damaged crops and in particular cultivations of paddy covering approximately 77 percent of the total crop area in Bangladesh.

Following the *new climate-economy literature* we combine data on flooding obtained from high-resolution satellite imagery with survey data for panel households drawn from the *Bangladesh Inte-*

*grated Household Survey* for the period before and after the shock to examine its impact on female labor supply. While previous research on the effects of the great 1998 floods in Bangladesh has mainly employed self-reported information from household surveys on damages caused by natural calamities (Alvi & Dendir, 2011), we use georeferenced data from NASA satellites that measure the impact of the flood as the share of inundated areas for each sampled village where households reside, following the methodology employed by Gröger and Zylberberg (2016).

Using a difference-in-difference approach we estimate the effect of this continuous treatment on different outcomes for our sample of rural households: we investigate the impact on women’s employment and on the probability of non-employed women to enter the labour force; for women that are employed at baseline, correcting for selection into the labour force, we evaluate how the flood affects their weekly hours of work and their monthly income; finally, with a double-selection approach, we estimate how the probability for women working in the family business to engage in an independent wage-earning activities changes after the shock.

In the second part of the analysis we investigate whether the expected rise in women’s employment and, in particular, their employment in independent wage-earning activities - instrumented by the shock - would help to increase women’s bargaining power within the households. Women’s decision making power is measured by the Women’s Empowerment in Agriculture Index (WEAI) (Alkire et al., 2013), a survey-based index that employs individual-level data collected from the two primary male and female respondent adults of the household on the decision making process in different aspects of family life.

Note that we do not extend the investigation on the impact of the shock also to male labour supply. While we do acknowledge that an analysis comprehending also men’s employment, in the rural context under analysis we find that the large majority of men are employed at baseline (around 91 percent of men over 15 years old) and we do not find significant changes in the share of men working outside the household farm between the two waves of the survey <sup>1</sup>. In addition, our estimations on women’s bargaining power, as will be outlined later, required a comparison with the male one in order to evaluate whether there have been improvements in women’s autonomy.

Our empirical findings show that female labour force participation increases by around 18 percentage points after the flood and that the probability for unemployed women at baseline to enter into

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<sup>1</sup>The share of males not working on the household farm and working in the market is 42 percent in 2012 and 41 percent in 2015

employment raises by 22 percentage points. After correcting for selection bias due to initial employment status, we also find an increase in average monthly income by around \$24 PPP due to the shock, while we do not observe any significant change in working hours per week. Weekly working hours are referred to the 7 days before the survey and, since the questionnaires were administered in two different cultivation seasons in 2012 and 2015, results might be biased by the seasonality of agricultural activities.

Interestingly, the probability for women working in the family business to engage in independent wage-earning activities outside the partner's farm increases after the flood by around 28 percentage points.

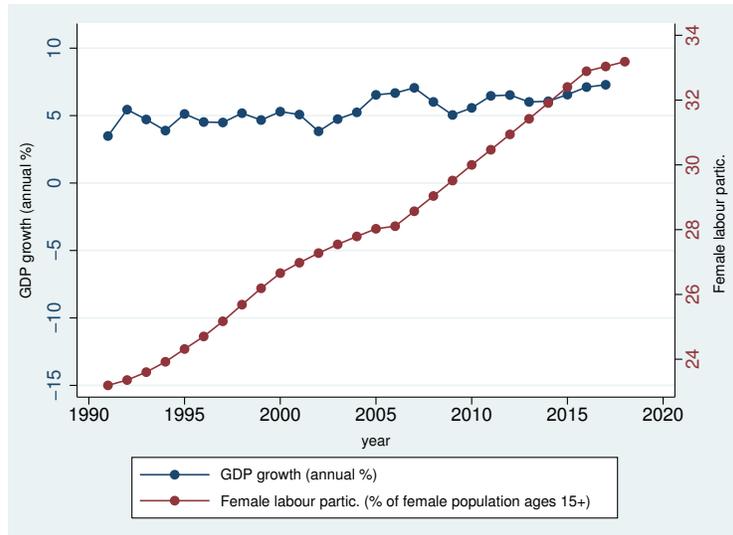
Finally, we find that the increase in female labour force participation, if instrumented by the severity of the flood shock that women faced, contributes to raise their bargaining power within the household by around 57 percentage points, even if this result is significant only in case of women working outside the household farm.

This paper contributes to the existing literature on the determinants of female autonomy (Sell & Minot, 2018), relating it to the strand of research on the impact of natural shocks on labour supply. Female labour force participation is a potentially endogenous explanatory factor for women's bargaining power, therefore we instrument it using the intensity of the flood that sampled women faced as an instrument.

Differently from Anderson and Eswaran (2009), we employ fixed effect and difference-in-difference estimations to control for time invariant unobserved individual and household heterogeneity, and to show how not only women's labour force participation but also their monthly earnings and their probability to work outside the partner's farm are affected by this natural shock. In the second part of the empirical estimation, we employ a comprehensive measure of women's bargaining power, the Women's Empowerment in Agriculture Index, and we test the hypothesis that only working for an independent income contributes to increase women's autonomy.

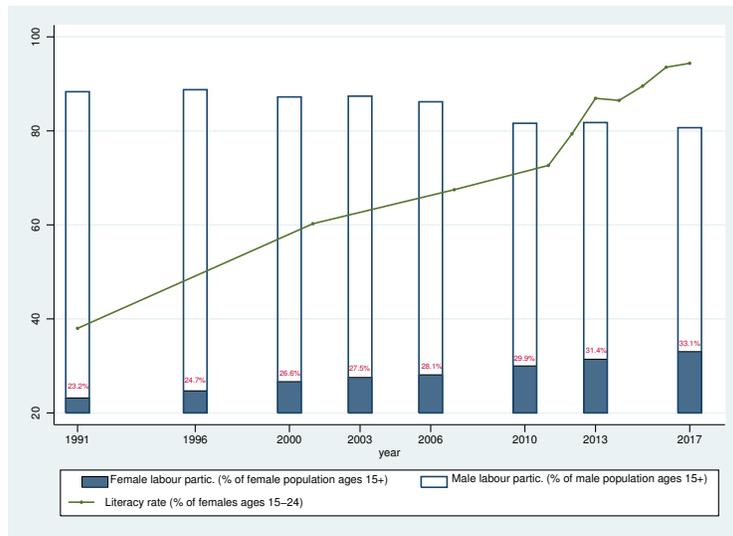
The structure of the paper is as follows. After illustrating a simple theoretical model (Section 2), we describe the georeferenced satellite data and the household survey employed for the analysis (Section 3). We then explain our research strategy and the robustness checks implemented (Section 4). We finally present our results (Section 5) and concluding remarks (Section 6).

Figure 1 GDP per capita growth and female labour force participation rate



Note: Source: World Bank.

Figure 2 Labour force participation rate by gender



Note: Source: World Bank.

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