



Intra-Household Resource Allocation under Negative Income Shock: A Natural Experiment

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Summary. — Using households from coastal districts in Bangladesh, as a case, and applying the difference-in-difference estimation method, this paper demonstrates a gender-differentiated outcome of negative income shocks for education expenditures of households. The cyclonic disaster that reduced crop income substantially increased the demand for labor as well as wages for rebuilding damaged farms. This in turn increased the opportunity costs of boys' schooling, as reconstruction is a male-friendly sector. Consequently, parents withdrew their sons from school and engaged them in their households' repair work and/or in wage-earning activities. However, girls' schooling expenditure was unchanged in the affected farm and non-farm households.

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1. INTRODUCTION

There is a growing concern among development economists and policymakers on whether negative income shocks can generate gender-differentiated impacts on intra-household resource allocation to health and education (World Bank, 2012). A clear understanding of household choices relating to gender-conditional expenditure on health and education under negative income shocks is critical not only to ensure household welfare but also to attain gender parity as per the Millennium Development Goals (MDG) of the United Nations. A question arises: If there are gender-differentiated impacts on intra-household resource allocation, particularly to health and education, what is the direction of the bias? More specifically, if households need to reduce health and education expenditures in the face of negative income shocks, do they reduce expenditures more for females or males?

Unfortunately, only a few empirical studies address this issue (e.g., Cameron & Worswick, 2001; Rose & Al-Samarrai, 2001; Tansel, 2002). These studies do not reach a consensus as to whether a negative income shock has a greater impact on males or females. For example, in response to a reduction in household budget in Turkey (e.g., Tansel, 2002) and to crop failure in Indonesia (e.g., Cameron & Worswick, 2001), it was mostly girls who were pulled out of school. By contrast, it was mostly boys who were pulled out of school in Ethiopia in the face of the economic crisis (Rose & Al-Samarrai, 2001) and, in Côte d'Ivoire, boys' school enrollment fell more than girls' in response to drought (Jensen, 2000). There are also a few contrasting findings that demonstrate that, if economic shocks lower the opportunity costs of schooling, this can actually bring students of both genders back to school. For example, a reduction in coffee price in Nicaragua (Maluccio, 2005) and a financial crisis in Argentina (López Bóo, 2010) led to an increase in school participation of boys from rural areas. These examples point to the fact that the nature, location, and duration of the shock, as well as the tradition and sociocultural factors of a country (World Bank, 2012), determine whether negative income shocks adversely impact males or females.

This indicates the necessity of undertaking more country-specific empirical studies with well-defined variables and new datasets to clearly understand whether the intra-household resource allocation to health and education under negative income shocks conditional on gender is warranted. This paper attempts to fill that gap by examining the intra-household resource allocation behavior of both farm and non-farm households to health and education in the face of negative income shocks caused by natural disasters. This particular case involved tropical cyclone "Aila," which hit the coastal region of Bangladesh on May 25–27, 2009. By matching this natural disaster with the government's Household Income and Expenditure Survey (HIES) data (HIES 2005 and HIES 2010) and applying the "difference-in-difference" estimation approach in a natural experimental setting, this article examines both farm and non-farm households' expenditure behavior separately for their male and female family members on food, health and education, and participation in non-farm income activities that particularly boomed because of the reconstruction of houses and farms after the cyclone. This article shows that "Aila" caused enormous losses in crop income for farm households located in the affected areas and forced them to reallocate resources within the household to cope with the loss in crop income. Because of the loss of the rice crop, farm households had to allocate more resources to ensure food security by spending more on food. Although health-related expenditures did not reveal any bias, this article confirms that the cyclone-affected households with at least one male child in high school and above reduced their expenditures on boys' schooling, while girls' schooling expenditures were unchanged in the affected farm and non-farm households compared with the unaffected households. This article also confirms that, as the cyclone increased the demand for male labor in post-disaster mitigation and recovery construction relative to female labor, farm households allocated more male members to non-farm income-generating activities. This factor actually

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explained the lower education expenditure on boys than on girls in the cyclone-affected areas.

The novelty of the study is threefold. First, the study highlights the impact of income shock on the income of households engaged in both farm and non-farm sectors in Bangladesh. Note that, in Bangladesh, agriculture is the principal source of livelihood of its burgeoning population, where more than 45% of the total 54.1 million economically active labor force is directly engaged in agriculture (GOB, 2014). Ironically, as Bangladesh is mostly a low-lying delta with a long coastal area, floods, droughts, and cyclones are recurrent phenomena that generate frequent negative income shocks to farm households (del Ninno, Dorosh, & Smith, 2003; Khandker, 2007; Paul, 1998; Paul & Rashid, 1993; Sarker, Alam, & Gow, 2012). For example, because of seasonal floods alone, the average annual loss in rice production in India and Bangladesh amounts to more than 4 million tons (IRRI, 2010). Unlike developed countries, farm households in Bangladesh do not receive any direct government support that can help them to absorb these shocks. This article thus intends to provide important insights into the gender-differentiated impacts of negative income shocks on health and education expenditures, particularly of the farm households in a developing country, where negative income shocks caused by natural disasters are more frequent.

Second, this study also investigates the impact of a unique female education stipend program in Bangladesh on intra-household resource allocation to health and education. In the four decades since its independence in 1971, Bangladesh has achieved a remarkable improvement in reducing gender differences, particularly as reflected in social, political, cultural, and educational attainments or attitudes. For example, the average number of children per woman has decreased from seven to two; 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 adolescent girls' marriage and motherhood and to increase the school attainment of female students, the government of Bangladesh, jointly with the World Bank and Asian Development Bank, initiated the Female Secondary School Assistance Project (FSSAP) in 1994. Under this program, each girl in grades 6–10 receives tuition-free education, book allowances, a monthly stipend, and free secondary school examination. Although a few studies already examine the impact of the FSSAP on female educational attainment (e.g., Khandker, Pitt, & Fuwa, 2003; Raynor & Wesson, 2006), this study also indirectly assesses the impact of the female stipend program on female education expenditure by a farm household under negative income shocks.

Finally, although this paper focuses on Bangladesh, the circumstances that are examined are closely replicated in millions of households across South Asia and sub-Saharan Africa. Like Bangladesh, most of these developing countries depend on agriculture for their livelihoods, where natural disasters frequently cause negative income shocks to farm households. This juxtaposition of agricultural income volatility caused by natural disasters with households' dependence on agriculture highlights the similarity between Bangladesh and many other agrarian economies. This paper therefore intends to suggest policies based on the case study of farm and non-farm households in Bangladesh that can be applied in many other developing countries.

The rest of the paper is organized as follows. Section 2 describes the study area and the selection of experimental

and control groups. Section 3 presents the sources of data and sampling methods and the characteristics of the sample households. Section 4 discusses the empirical model and presents the estimation results. Section 5 contains the conclusions and policy implications.

2. STUDY AREA, RESEARCH DESIGN, AND EXPERIMENTAL AND CONTROL GROUPS

Bangladesh is one of the countries in the world most prone to natural disasters. Particularly, tropical cyclones are common in Bangladesh from March to November. From 1960 to 2009, a total of 45 major cyclonic storms hit Bangladesh, causing severe damage to human life and property (e.g., BBS, 1999, 2011). For example, on April 29, 1991, the cyclone that hit Chittagong Division severely affected 19 districts and 102 subdistricts, killed 0.14 million and injured 1.39 million people, and damaged 0.13 million acres of cropland (BBS, 2011). Also, the intrusion of saltwater into bodies of fresh water destroyed freshwater fish across the coastal districts. Unfortunately, the majority of the cyclones strike from April to November, during monsoon season, when the sea level in the Bay of Bengal is usually higher than average. This is also when major wet-season rice crops (Aus and Aman) are in the field. Consequently, the strong winds in the coastal area, together with the higher sea level and heavy monsoon rain, increase the severity of cyclones on lives, crops, and property.

On May 25, 2009, Aila, a tropical cyclone, severely hit the coastal divisions of Khulna and Barisal, and a few districts in Chittagong Division. The wind blew at 70 kph minimum and 90 kph maximum, which created a tidal surge as high as 4–6 ft (BBS, 2011). The tidal surge, along with the heavy rain and strong winds, flooded farmlands and smashed embankments, roads, schools, and houses. A total of 190 people were killed almost instantly and several thousand were injured. According to the report of the International Federation of Red Cross and Red Crescent (IFRCRC, 2010), cyclone Aila affected more than 3.9 million people across the coastal districts. The tidal surge and heavy rain caused the heaviest impact, destroying coastal embankments and leading to the intrusion of saline water from the sea into farmlands, which damaged the late Boro rice and Aman rice seedlings and plants and destroyed thousands of households' homes and property in the area (e.g., Schiermeier, 2014). Even five months after the cyclone, nearly 0.20 million people had not regained access to their houses and were still living in temporary shelters.

Table 1 presents the number of people affected (in thousands) by division and district. According to data obtained from the IFRCRC and the Information Technology for Humanitarian Assistance Corporation and Action (ITHACA, 2009), cyclone Aila severely affected the districts of Barguna, Barisal, Bhola, Jhalokathi, Patuakhali, and Pirojpur in Barisal Division; the districts of Bagerhat, Khulna, and Satkhira in Khulna Division; and the district of Noakhali in Chittagong Division, a total of more than 0.1 million people at the minimum (Table 1). In contrast, Comilla, Chandpur, Feni, Laskmipur, Chittagong, and Cox's Bazar districts of Chittagong Division also felt the effects of the cyclone, but only a few thousand households were negatively affected (Figure 1). Using this natural disaster, we classified the sample households from the severely affected districts, where at least 0.1 million households were affected by Aila, as the treatment group and the sample households from the partly affected districts as the control group. It was assumed that the probability

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