



Do Natural Disasters Decrease the Gender Gap in Schooling?

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Summary. — Rapidly decreasing gender gaps in schooling in some developing countries can be partly explained by a gendered division of child farm labor as a coping response to natural disasters. This paper makes a case for this conjecture by analyzing original household survey data from rural Fiji. Boys, not girls, contribute to farming only among cyclone victims with dwelling damage, independent of housing-aid receipt. Boys' school enrollment is significantly lower than girls' only among victims who did not receive aid early enough. Boys with no elder brother and an educated father are particularly vulnerable in their progression to higher level schools.
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1. INTRODUCTION

Eliminating gender disparity in education is crucial to promote gender equality and empower women.¹ Although the gender gap in education—measured by the difference in school enrollments or educational attainments between men and women—is still significant, especially in South Asia and Sub-Saharan Africa, in most developing countries women's schooling has been increasing relative to men's (Orazem & King, 2008; World Bank, 2011). In particular, in about one third of developing countries (45), girls outnumbered boys in secondary education in 2008 (World Bank, 2011, p. 61). World Development Report 2012 (World Bank, 2011) attributes this remarkable progress to household responses to market and institutional changes—improved returns to education for females and reduced cost of schooling—fueled by government policies, such as school construction, free primary education, conditional cash transfer, and so forth. This paper proposes an alternative mechanism underlying the relative progress in women's education that has received virtually no attention in the policy dialog on what factors narrow the gender gap—a gendered division of child farm labor as a coping response to natural disasters.

Consider a case where men are more active in farming than women, because of their distinct labor productivities across activities (including home work),² labor-market conditions, and/or social norms, as seen in many developing areas (FAO, 2011). Suppose that poor farmers rely on child farm labor to cope with adverse shocks. Then, boys at the secondary-school age with physical maturity are more likely to drop out of school for farming than girls. When overall secondary-school enrollment is low, this does not lead to a significant gender gap in schooling; as secondary schooling becomes more and more common, however, it can have such an effect. Then, as market and institutional changes promote schooling, the gender gap in education can decrease as a result of a household coping response that is independent of those changes. This alternative mechanism can be more significant in the developing countries that have been experiencing rapid education development without a comparable transformation in the agricultural economy than in others (and developed countries) that have experienced (much) slower education development. The recent progress of education also coincides with increased natural disasters, especially hydro-meteorological ones, such as floods, cyclones, and droughts

(e.g., Cavallo & Noy, 2009; Sawada, 2007; Strömberg, 2007), to which peasant farmers are particularly vulnerable. Natural disasters may be a driving force to decrease the gender gap in schooling, especially in rural developing areas.

After 1970 independence Fiji has been experiencing rapid education development and girls' secondary enrollments have been higher than boys' since the 1980s. To my knowledge, no systematic research has been conducted to explain the remarkable progress of women's education in Fiji. I collected household survey data in rural Fiji more than two years after a tropical cyclone swept over the region in January 2003. I first show that the reversal of the gender gap in adults' secondary education is unlikely to be explained solely by changes in labor markets. I examine youths' farm labor and schooling in response to household dwelling damage and the corresponding provision of housing construction materials, which were a dominant type of aid in the reconstruction phase when the survey was conducted.³ The analysis reveals that (1) boys, not girls, contribute to farming, not non-farm activities, among cyclone *victims* (households with dwelling damage), but not *non-victims*, and (2) boys' school enrollment is significantly lower than girls' among victims, but not non-victims. Although the time horizon of my data is not long enough to conclude that boys' school dropout against cyclone damage was non-temporary, these findings support my conjecture that the relative progress in women's education in Fiji can be partly explained by the gendered coping response to natural disasters.

I explore two critically important questions for policy. First, does disaster aid mitigate school dropout and child labor

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among disaster victims? I show that housing aid mitigates boys' school dropout, if the provision occurs early enough (in two years' time), but not their labor use. In particular, although boys' farm labor is independent of aid, a significant gender gap in schooling exists only among aid *non-recipients*, but not *recipients*. [de Janvry, Finan, Sadoulet, and Vakis \(2006\)](#) show that conditional cash transfers (Progresa) mitigate school dropout, but not child labor, against various shocks, on which transfers are not conditional. My new finding means that public transfers targeted toward victims, unconditional on schooling, have similar mitigating effects.

Next, which boys are particularly vulnerable among non-recipient victims? I examine four hypotheses: (1) Boys who enter higher level schools at the same time as disasters and aid are more vulnerable; (2) The oldest brothers are the most vulnerable (because of their physical maturity for farming, [Fafchamps & Quisumbing, 1999](#))⁴; (3) Boys in poorer households with limited coping capability are more vulnerable (as found in previous works cited shortly); and, (4) Maternal education decreases boys' vulnerability. I find strong evidence for the school-progression and birth-order effects, but not for the wealth and maternal effects.

The gender-risk nexus in schooling and child labor is related to two lines of literature. On one hand, economists extensively study how gender disparity in schooling can be explained by distinct returns to education and opportunity costs of schooling between boys and girls (e.g., [Schultz, 1987, 2001, 2002](#)). Opportunity costs of schooling are mainly determined by returns to child labor, which can significantly vary in the gender sphere depending on activities, including home work ([Edmonds, 2008](#)). In rural Ethiopia, for example, child farm labor is more common among boys than girls ([Guarcello, Lyon, & Rosati, 2006](#)). On the other hand, many studies address the potential role of school dropout and child labor as self-insurance. Forgone human capital development for short-run coping responses can have a wide range of adverse consequences in the long run. Supporting empirical evidence has been found in various locales (e.g., [Beegle, Dehejia, & Gatti, 2006](#); [Duryea, Lam, & Levinson, 2007](#); [Jacoby & Skoufias, 1997](#); [Thomas et al., 2004](#)).

Empirical findings of distinct insurance roles between boys and girls are mixed. Whereas [Jensen \(2000\)](#) finds no gender gap in schooling after rainfall shocks in Côte d'Ivoire, [Cameron and Worswick \(2001\)](#), [Chaudhuri, Christiaensen, and Asadullah \(2006\)](#), and [Skoufias and Parker \(2006\)](#), respectively, show bias against girls' schooling corresponding to crop loss in Indonesia and Ethiopia and unemployment in Mexico; [Duryea et al. \(2007\)](#) report similar bias in child labor against unemployment in urban Brazil. In rural Mexico, [de Janvry et al. \(2006\)](#) find bias against boys in schooling and labor use in response to unemployment and health shocks, respectively, and bias against girls' schooling following natural disasters. It is noted that these studies find bias against girls' schooling, which is opposite to my conjecture, in locales where secondary schooling is less common than in Fiji.

The rest of the paper is organized as follows. Section 2 describes the study area, livelihoods, and gender gaps in education attainment and employment among adults. Section 3 describes cyclone damage, aid, rehabilitation, and gender gap in schooling among youths; evidence for boys' farm labor and school dropout against the damage is offered. Section 4 presents the econometric specification to test the alternative mechanism and the questions discussed above, which is followed by the estimation results in Section 5. The last section summarizes major findings and offers implications for research and policy.

2. STUDY AREA, LIVELIHOODS, EDUCATION, AND EMPLOYMENT

(a) *Study area and livelihoods*

In June–September 2005, I conducted a livelihood survey among 906 randomly selected households in 43 native Fijian villages in Cakaudrove Province in the northern region of the country, which significantly lags behind the main island Viti Levu, where the state capital, two international airports, and most tourism businesses are situated. (Fiji is divided almost equally between native Fijians and Indo-Fijians, and my study focuses on the former.) Virtually all households in the sample employ traditional farming practices, using no mechanized equipment or animal traction to produce taro, cassava, coconut, and kava plants. Rural land is communally owned by clan (within-village kin group) and is privately used, and by law it cannot be sold. Most households also engage in artisanal fishing and handicraft making. Whereas farming and fishing are conducted by both men and women (Fijian women are active fisherwomen, [Chapman, 1987](#)), handicrafts are made exclusively by women ([Turner, 1987](#)). Farming, fishing, and handicraft making, respectively, account for 66%, 11%, and 10% of income earned by sample households in the past one month (the mean total income is F\$1,583; F\$1 = US \$0.60).

(b) *Working-age adults' education and employment*

Fiji's educational system consists of eight-year primary (Class 1–8; Class 1 begins at age 6), which became compulsory in 1997, and four-year secondary (Form 3–6);⁵ standardized examinations are at the end of Class 8, Form 4, and Form 6 ([Tavola, 1992](#)). Although girls were much less educated than boys during the British colonial period, girls' secondary enrollments quickly increased after 1970 independence and outnumbered boys' by 1981; this reversed gender gap has been persistent since that time ([Ministry of Finance & National Planning, 2004](#); [Tavola, 1992](#)).

The relative progress of women's education is confirmed among 2,115 working-age adults (age 20–59, excluding a small number of adults still in school) in the sample (see [Table 1](#)). Education attainments greatly improved over time. The largest *gender gap*—the simple difference in education attainments between women and men—exists in secondary complete or above, and it reversed over time: Although men's education was higher than women's among old adults (age 40–59) (4% gap), women surpassed men among young adults (age 20–39) (12% gap). Although the gender gap in secondary education was not significant among old adults, it became more common among young adults, and a 10% gender gap emerged.⁶

Fijian society is male dominant (e.g., [Aucoin, 1990](#)), and women's employment opportunities, especially in rural areas, are weaker than men's. Indeed, permanent employment is strongly biased against women in the sample: 6.5% of working-age adults had been employed in the past one year and men's employment is almost three times women's. In contrast to the reversed gender gap in schooling, the gender gap in employment is persistent, though it decreases from near 10% among old adults to less than 4% among young adults. Adults with higher education are much more likely to be employed.⁷ As such, the rapid progress of women's education has not been accompanied with a comparable expansion of their labor-market opportunities. The reversal of the gender gap in adults' secondary education is unlikely to be explained solely by market changes.

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