

**THE IMPACT OF BRAC'S FOOD FOR TRAINING AND INCOME
GENERATION PROGRAM IN SOUTH SUDAN ON BOYS' AND
GIRLS' EDUCATION OUTCOMES**

Master of Arts in Law and Diplomacy Capstone Project

Submitted by Leah Meadows

April 2014

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Leah Meadows

Thesis Spring 2014

The Fletcher School of Law and Diplomacy

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EXECUTIVE SUMMARY

This paper presents the results of an impact evaluation of BRAC's Food for Training and Income Generation (FFTIG) program, which took place in South Sudan in 2008. BRAC's original evaluation of the program found significant effects on girls' educational enrollment as a result of the program. My analysis further explores the gendered effects of the program on educational outcomes. It also examines whether different social and economic characteristics of households caused some households to increase their investment in education over others.

I find evidence that BRAC's program did not have a statistically significant effect on girls' or boys' enrollment. Instead, more money was spent on girls who were already in school, as opposed to allowing more girls to enroll in school. There was no impact on boys' education spending. Households who were IDPs experienced a lower treatment effect, as opposed to households who were not IDPs. Other household socio-economic characteristics (including literacy of a household head, social networks, and aspirations for sons) did not change the impact of the program for households. These findings provide an important area of research for future programming.

This paper is divided into three sections. First, a background of education in South Sudan and an overview of the program and theory of change, as well as the research questions, balance tests, and models. The next section presents my findings of treatment effects and heterogeneous effects on education outcomes. The last section includes the discussion and possible threats to validity.

1. INTRODUCTION

1.1 Background of Education in South Sudan

Education is vitally important to South Sudan's development and success as Africa's newest nation. With low primary school completion rates and high gender, geographic, and wealth disparities in education outcomes, South Sudan's education system remains one of the worst in the world. Girls in South Sudan are more likely to die in pregnancy or childbirth than to graduate from primary school.¹ Both male and female literacy rates are astoundingly low: Only 16% of adult females and 27% of adult males over the age of 15 can read and write. Literacy in urban areas is much higher than rural areas, however (53% and 27%, respectively).²

The educational opportunities available to South Sudan's young people will shape the country's future. An overwhelming proportion of its population is young: More than 70% of its population is under the age of 30, 51% under the age of 18, and 32% under the age of 10.³ Education -- combined with employment opportunities -- is essential for Sudan's stability and development.

There are several barriers to education and quality of learning in South Sudan. Violence, lack of infrastructure and latrines, school fees, large distances to school, and domestic responsibilities all impede girls and boys' enrollment and attendance. Although South Sudan has a policy of free primary education, parents pay enrollment fees and the salaries of 'volunteer teachers', who are not provided by the government of South Sudan.⁴ In a National Bureau of Statistics Survey, one state reported charging SDG 10 (USD\$2) for a child to be registered in primary school and SDG 35 (USD\$6) for secondary school.^{5 6}

Some children manage to attend school. The gross enrollment rate in 2009 was 65% for primary school and 22% for secondary school.⁷ Although boys and girls enter the first grade at a similar rate, girls are falling out of the school system much faster and earlier than boys. The gender parity index (calculated by dividing the gross attendance rate for females by the gross attendance rate for males) in primary education was 0.7 and in secondary education was 0.4.⁸ For those children who manage to enroll and attend school, their level of learning is low. In 2009, there were 129 students per classroom in primary schools, on average. The

¹ Brown, Gordon. *Education in South Sudan: Investing in a Better Future*. 2012 <http://gordonandsarahbrown.com/wp-content/uploads/2012/03/Education-in-South-Sudan-investing-in-a-better-future.pdf>

² National Bureau of Statistics (NBS) National Baseline Household Survey 2009: Report for South Sudan <http://ssnbs.org/storage/NBHS%20Final%20website.pdf>

³ Unicef Children and Youth Consultation Report, 2011

http://www.unicef.org/southsudan/UNICEF_children_youth_consultation_report.pdf

⁴ World Bank. 2012. *Education in the Republic of South Sudan: Status and Challenges for a New System*. Washington, D.C.: World Bank. (8)

⁵ World Bank. 2012. *Education in the Republic of South Sudan: Status and Challenges for a New System*. Washington, D.C.: World Bank. (107)

⁶ Although the currency of South Sudan is the South Sudanese Pound (SSP), introduced 18 July 2011, these figures are stated in Sudanese Pound (SDG)

⁷ National Bureau of Statistics (NBS) National Baseline Household Survey 2009: Report for South Sudan <http://ssnbs.org/storage/NBHS%20Final%20website.pdf>

⁸ *ibid*

average pupil-textbook ratio was 3:1; two-thirds of students did not have paper to write on; and one-fifth did not have a writing instrument.⁹

Education is vitally important to South Sudan's development. Education has the powerful potential to raise incomes, improve health and lower HIV/AIDS, promote gender equality, mitigate climate change, and reduce poverty. To achieve these results, however, children must enroll and attend quality schools, and have the opportunity of gainful employment upon their completion.

1.2 Overview of BRAC's Food-for-Training Project

Sudan's most recent 21-year civil war left its residents with an acute shortage of basic services and limited employment opportunities in its wake. In an attempt to address some of their needs, BRAC, in association with the World Food Program, designed and delivered the Food for Training and Income Generation (FFTIG) program in 2008.¹⁰ FFTIG advocated for the dual goals of protection and promotion by providing food aid in conjunction with livelihood training and access to credit and savings services. Targeted households were provided with a monthly food package for nine months. In addition, one adult female from each household was eligible to receive training on an income generating activity. Participants could choose from programs in vegetable cultivation, setting up a nursery, tailoring, petty trade, and cattle rearing, with approximately eighty percent choosing vegetable cultivation. BRAC also offered credit and savings services to these households. The food transfer was made regardless of whether the household used the other components of the program.¹¹

The program targeted ultra-poor households in six branches of Central Equatoria province, surrounding the capital Juba. BRAC used a two-pronged targeting strategy, which included eligibility scoring and community identification. Eligibility scores were calculated based on the characteristics of having a female household head, living in a house made of hay or sticks, not owning the house, and having at least three dependents per income-earner. Communities were asked to identify which households they considered to be the poorest, and a BRAC staff member then visited each household to measure their eligibility on the aforementioned criteria.¹² At the end of the identification process, 1,058 households were identified as potential beneficiaries, and ultimately, 474 were randomly assigned to the treatment group and 520 were assigned to the control group.¹³ A baseline survey was conducted in March 2008, and the endline survey was conducted in March 2009.

There was considerable contamination across groups; 14% of the control group received the program, while 12% of the treatment group did not receive it.¹⁴ The contamination was primarily attributed to confusion of participants' names and larger distance of the most

⁹ World Bank. 2012. *Education in the Republic of South Sudan: Status and Challenges for a New System*. Washington, D.C.: World Bank. (6)

¹⁰ BRAC, "Baseline Report on Food Distribution, Skill Development, and Financial Services: An Evaluation of BRAC South Sudan's FFTIG Program," December 2008, p.2.

¹¹ Munshi Sulaiman, "Incentive and Crowding Out Effects of Food Assistance: Evidence from Randomized Evaluation of a Food-for-Training Project in South Sudan," BRAC, December 2011, p. 3.

¹² Sulaiman, "Incentive and Crowding Out Effects of Food Assistance," p.5.

¹³ BRAC, "FFTIG Baseline Report," p.2.

¹⁴ Sulaiman, "Incentive and Crowding Out Effects of Food Assistance," p.6.

contaminated branches from the program manager, which suggests that it is plausibly exogenous.

1.3 Intended Theory of Change

The three components of the program (food transfer, skills training, and credit and savings services) were intended to bring about simultaneous improvements in health status, work capacity, job skills, and financial resources.

The food transfer component was designed not only to improve health and nutrition but also to free up income that would otherwise have been spent on food. This transfer was expected to increase household utility by increasing consumption, savings, or assets. Household preferences determine how this extra money will be spent, whether by consuming durable goods, sending additional children to school, or saving the money. The food aid component, therefore, was designed to both improve health among recipients and contribute to their overall livelihoods.

The program also offered training on income generating activities for women in recipient households. The training would provide the women with skills they could use to earn additional income. Lastly, the program offered savings and credit services, presumably based on the belief that participants would use loans to buy assets needed to start a business using the skills learned during training, and then put the money they earned from the business in a savings account. The theory of change indicates that the different components of the program were designed to work together to help households increase their capacity and develop a new source of income and an asset base, which would help them to better cope with shocks.

Resulting Changes

BRAC's original evaluation found that most participants reported not using the skills on which they were trained and that only 6% of households in the treatment group took up the financial services. Thus, it appears that the expected skills and resource changes did not occur as anticipated, and the program did not lead to all the desired effects on participants' livelihoods. It is likely that any changes brought about by the program were primarily the result of the food aid component. However, this cannot rule out the possibility that simply receiving the training or being offered the financial services had an impact as well.

1.4 Research Question

Education was not an explicit goal or outcome of the FFTIG program. This paper examines how the FFTIG program affected girls and boys' education, however, to determine how and if the extra household income as a result of FFTIG was spent on schooling.

The different ways household income can affect education relates to the extensive and intensive margins of income to education outcomes. The extensive margin corresponds to the increase in the probability of a student being enrolled from the household. The intensive margin, on the other hand, corresponds to the intensity that a resource is used. In education,

this could mean spending more money on fees or consumption items for the children currently in school, or increasing the number of children enrolled in school.

To examine the extensive and intensive margins, this paper examines how the FFTIG program affected girls and boys' education outcomes through the following outcome variables:

- *Girls' enrollment (0/1)*: a binary variable equal to one if the household has at least one girl enrolled in school and zero otherwise;
- *Boys' enrollment (0/1)*: a binary variable equal to one if the household has at least one boy enrolled in school and zero others;
- *Girls' enrollment*: the total number of girls enrolled in school per household;
- *Boys' enrollment*: the total number of boys enrolled in school per household;
- *Girls' education spending*: total per household spending on girls' education in Sudanese Pounds
- *Boys' education spending*: total per household spending on boys' education in Sudanese Pounds
- *Household school fees*: Total household school fees in Sudanese Pounds, not disaggregated by gender

Household school fees and expenditure on schooling items represent two different types of investments in education, in order to examine whether households were sending more children to school or investing more in auxiliary investments for education, such as books and uniforms. The former would manifest itself as a spike in education fees, whereas the latter would be captured by education costs. Enrollment is analyzed using two variables (a binary for the likelihood of having a child enrolled in school and the number of children enrolled), because there was a drastic increase in household sizes from the baseline to endline data. "Girls" and "boys" are defined as females and males ages 6 to 14 years old at the time of baseline.

Heterogeneous Effects

In addition to measuring the treatment effect for each of the outcomes listed above, this paper examines whether the program affected households differently depending on socioeconomic characteristics. To measure differential effects, this analysis examines the outcomes of interest for four heterogeneous effects (all measured using baseline data):

- *Social networks*: A binary variable equal to one if the amount of money the respondent believes their household could collect from friends and relatives in an emergency is above the mean of values reported and zero if it is below the mean. The hypothesis behind this heterogeneous effect is that recipients with strong social networks would be more likely to make long-term investments in education, as they are better equipped to smooth consumption in the event of an emergency.¹⁵

¹⁵ This definition of social networks is based on: Marcel Fafchamps and Flore Gubert, "The formation of risk sharing networks." *Journal of Development Economics* 83, no. 2 (2007): 326-350.

- *IDP status*: A binary variable equal to one if the respondent reported having moved to their current residence because of security reasons and zero if they moved for another reason or never moved. The hypothesis behind this heterogeneous effect is that IDP households may be less likely to send their children to school or spend money on schooling, because they may not be planning to stay in the area permanently.
- *Literacy of the household head*: A binary variable equal to one if the household head reports being able to read and write a letter and zero if not. Households in which the head is literate may be more likely to invest in their children's education.
- *Parents' aspirations for their eldest son*: A binary variable equal to one if the respondent reported having high professional aspirations for their eldest son still living the household.¹⁶ Parents with higher professional aspirations for their children may be more likely to invest in their education.

1.5 Balance Tests: Did Randomization Work?

To examine whether the treatment and control groups were similar at baseline in 2008 in observable characteristics, a t-test on household socioeconomic characteristics and on the outcome variables of interest was done at baseline. Overall, randomization of assignment to treatment was successful. The treatment and control groups are not significantly different from each other at baseline, except for five variables: the household head's years of education, ownership of a cow, whether the household experienced the death of a household member in the previous year, whether the household experienced any shock in the previous year, and monthly per capita income.

Socioeconomic Characteristics

Table 1 below shows baseline balance tests for household socioeconomic characteristics. Treatment group household heads had an average of 0.729 more years of education than control group household heads, significant at the 1% level. The treatment group was 3.1 percentage points more likely to own a cow than the control group, statistically significant at the 1% level. Also, the treatment group households were, on average, 7.6 percentage points more likely than the control group to have experienced the death of a household member in the past year, a difference significant at the 5% level, and were 11 percentage points more likely to have any shock in the past year, significant at the 10% level. A baseline difference in per capita monthly household income was significant at the 10% level: control households had slightly higher incomes, as they were 7.6 percentage points less likely than the treatment group to be below the national poverty line.

¹⁶ High aspirations for the eldest son is a binary variable if parents believe their child will pursue a career that requires greater training or education, such as owning a business, being a community worker, a professional (doctor/engineer/nurse), private, government, or NGO employee, and selling real estate. Lower aspirations include house cleaning, wage agricultural labor, rickshaw drivers, or being unemployed and unable to work.

Table 1: Baseline Balance Tests of Socioeconomic Characteristics

Household Characteristics	Assigned to Treatment Mean	Assigned to Control Mean	Difference (Treatment - Control)	p-value	Sample size
Number of household members	5.277	5.348	-0.071	0.635	990
Number of females	2.843	2.970	-0.127	0.180	990
Number of males	2.413	2.354	0.058	0.571	990
Number of girls	0.636	0.643	-0.008	0.885	990
Number of boys	0.647	0.627	0.021	0.702	990
Girl to boy ratio	0.658	0.599	0.059	0.393	438
Number of old people	0.099	0.078	0.021	0.300	990
Household head sex	0.033	0.027	0.006	0.613	990
Household head years of education	2.155	1.426	0.729	0.001***	990
Number of household members with any disability	0.151	0.127	0.025	0.347	990
Number of household members participating in other NGO programs	0.047	0.055	-0.008	0.550	990
Tribe: Baari	0.335	0.329	0.006	0.837	990
Tribe: Pojulo	0.083	0.091	-0.007	0.681	990
Tribe: Muru	0.087	0.074	0.013	0.441	990
Tribe: Catholic	0.612	0.593	0.020	0.530	990
Tribe: Protestant	0.324	0.352	-0.029	0.341	990
Respondent planning to move	0.268	0.236	0.031	0.267	954
Owns cow	0.050	0.019	0.031	0.007***	990
Shock: Any shock in last year	1.269	1.157	0.113	0.062*	846
Shock: Death of household member	0.390	0.314	0.076	0.013**	986
Shock: Theft/robbery	0.179	0.144	0.035	0.142	985
Shock: Death of livestock	0.041	0.032	0.009	0.448	986
Monthly household income per capita above poverty line	0.314	0.390	-0.076	0.012**	990
In case of shock, could raise money from friends and relatives	0.211	0.251	-0.040	0.137	990
Respondent moved for security (IDP Status)	0.192	0.184	0.008	0.738	990

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2 shows the balance tests for the education outcomes at baseline. The treatment and control groups do not have statistically different education outcomes at baseline, except for girls education spending. The treatment group spent on average 11 SDG less on girls education than the control group at baseline, statistically significant at the 5% level. This statistical difference will be incorporated into the regression using ANCOVA (explained below in regression 4).

Table 2: Baseline Balance Tests for Education Outcomes

Outcome Variables	Mean Treatment	Mean Control	Difference	p-value	Sample Size
Girl Enrollment (0/1)	0.200	0.213	-0.013	0.601	990
Boy Enrollment (0/1)	0.203	0.222	-0.018	0.489	990
Girl Enrollment	0.254	0.287	-0.033	0.372	990
Boy Enrollment	0.277	0.289	-0.012	0.759	990
Girls Education Spending	23.672	35.108	-11.435	0.048**	990
Boys Education Spending	23.698	26.428	-2.731	0.528	990
Household Education Fees	351.508	449.473	-97.965	0.393	990

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

The household sizes of treatment and control both increased from baseline to endline. This could be because of measurement error or systematic misreporting. After doing a balance test of growth in household size, however, the growth between treatment and control households was not statistically different at conventional levels.

1.6 Models for Estimation of Treatment Effects

Intention to Treat (ITT) was used to estimate the treatment effects for FFTIG on the education outcomes outlined above. This measures the effect of the program on those who were assigned to the FFTIG program at baseline. The first regression used is

$$(1) \quad Y_i = b_0 + b_1Z_i + u_i$$

In this case, $Z_i=1$ if the household was assigned to receive the FFTIG program and $Z_i=0$ if it was assigned to the control group. Y_i are the potential outcomes for education. This regression was used for continuous independent variables, such as spending and fees.

For the binary independent variables (girls' and boys' enrollment), dprobit was used using the following regression equation:

$$(2) \quad Pr(Y=1|Z=1, X) - Pr(Y=1|Z=0, X)$$

The same ITT regression as regression (1) was then estimated, but controlling for unbalanced baseline characteristics (household head's years of education, having experienced the death of a household member in the past year, monthly per capita income, and owning a cow), represented here by "X." The death of a household member in the past year was used instead of both a shock death variable and a variable for experiencing any shock (which was statistically significant at the 10%) because these are highly correlated and experiencing a death of a household member was more statistically significant.

$$(3) \quad Y_i = b_0 + b_1Z_i + X_{0i} + u_i$$

For measuring girls' education outcomes using ANCOVA¹⁷, because the treatment and control groups were not balanced at baseline in girls' education spending, regression 4 includes a control for the baseline level of girls' education spending (the variable G_{0i}).

$$(4) \quad Y_i = b_0 + b_1Z_i + G_{0i} + u_i$$

Finally, the ITT is estimated with heterogeneous effects for the baseline characteristics discussed earlier (social networks, IDP status, household head literacy, and parents' aspirations for eldest children), represented here by "H."

$$(5) \quad Y_i = b_0 + b_1Z_i + b_2H_{0i} + b_3Z_i * H_{0i} + u_i$$

2. FINDINGS

The FFTIG program had a statistically significant and positive impact on girls' education spending within households, but no impact on fees or girls' enrollment. Being assigned to receive FFTIG increased household's expenditures on girls' education by 11.44 Sudanese Pounds (SDP) on average, relative to the control group. This is statistically significant at the 10% level. The program had no impact on boys' education outcomes. This proves that the program affected the intensive margins of education for girls: More money was spent on girls who were already in school, as opposed to allowing more girls to enroll in school.

Households with IDP status experienced less of a treatment effect on girls' education spending and were less likely to have a boy enrolled in school, both statistically significant at the 10% level. There were no other statistically significant heterogeneous effects on boys and girls' education outcomes (based on social networks, literacy of the household head, or parents' aspirations for their eldest son).

2.1 Girls' and Boys' Enrollment

Being assigned to receive FFTIG did not increase boys' or girls' enrollment in school in a statistically significant way (at conventional levels). The binary variable of enrollment represents the likelihood that a household has one girl/boy enrolled in school. The mean of the control group at the endline for girls' enrollment was .1996 (20%). In the dprobit analysis of the binary variable of girls' enrollment (Table 5), evaluated at the mean, being assigned to receive the FFTIG program increases the likelihood that a household has a girl enrolled in school by 4.7 percentage points. This is not statistically significant at conventional levels. The mean of the control group at endline for boys' enrollment was .2035. At the mean, being assigned to receive the FFTIG program increased the likelihood that a household had a boy enrolled in school by 6.2 percentage points. This is not statistically significant at conventional levels. When controlling for baseline characteristics and the number of girls or boys in the household, the treatment effect on girls' enrollment increases to 6.6 percentage points, and the treatment effect on boys' enrollment increases to 11.8 percentage points, but neither of these is statistically significant at conventional levels. When controlling for the

¹⁷ McKenzie, D. 2012. "Beyond Baseline and Follow-Up: The Case for More T Experiments." *The Journal of Development Economics* 99 (2): 210-221.

girl-to-boy-ratio within a household (which is equal to the number of girls divided by the number of boys per household), the treatment effect becomes lower, but the statistical power of these calculations does as well (because the sample size drops in half).

The OLS estimates for girls and boys' enrollment shows a similar story (Table 6). Control group households had 2.5 girls enrolled in school and 2.8 boys enrolled in school at the endline, on average. Being assigned to receive the FFTIG program increased the number of girls in school by 3.3 and the number of boys in school by 1.2. These treatment effects are not statistically significant at conventional levels, however.

Table 3: Girls and Boys' Enrollment (0/1) (dprobit)

	Girl Enrollment (0/1) (dprobit)					Boy Enrollment (0/1) (dprobit)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Assigned to Treatment	0.0472 (0.0903)	0.0760 (0.0998)	0.0660 (0.101)	0.0361 (0.141)	0.0204 (0.146)	0.0622 (0.0897)	0.0962 (0.0980)	0.118 (0.0998)	0.0558 (0.121)	0.0723 (0.124)
Girls in HH		0.778*** (0.0601)	0.788*** (0.0617)							
HHEducation			0.0304** (0.0129)		0.0388** (0.0174)			0.0289** (0.0128)		0.0261 (0.0165)
Owns Cow			-1.027** (0.433)					-0.698* (0.362)		- 0.799** (0.368)
Shock: Death			0.0448 (0.104)		-0.0501 (0.150)			0.0637 (0.103)		0.0933 (0.128)
Below PovLine			0.160 (0.105)		-0.124 (0.162)			-0.155 (0.108)		-0.165 (0.135)
Girl:Boy Ratio				0.812*** (0.0977)	0.845*** (0.102)				- 0.00231 (0.0841)	- 0.00890 (0.0846)
Boys in HH							0.715*** (0.0593)	0.713*** (0.0594)		
_cons	-0.843*** (0.0630)	-1.516*** (0.0787)	- 1.627*** (0.107)	- 1.329*** (0.117)	- 1.334*** (0.151)	- 0.829*** (0.0627)	- 1.436*** (0.0805)	- 1.456*** (0.104)	- 0.215** (0.100)	- -0.229* (0.126)
N	990	990	986	438	419	990	990	986	438	436

Standard errors in parentheses; ***p<0.01, **p<0.05, *p<0.1

Table 4. Girls and Boys Enrollment (OLS)

	Girls Enrollment (OLS)					Boys Enrollment (OLS)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Assigned to Treatment	0.0330 (0.0372)	0.0303 (0.0320)	0.0352 (0.0321)	0.0280 (0.0507)	0.0381 (0.0525)	0.0119 (0.0387)	0.0192 (0.0336)	0.0236 (0.0335)	-0.00849 (0.0741)	0.00332 (0.0745)
Girls in HH		0.351*** (0.0299)	0.350*** (0.0296)							
Boys in HH						0.354*** (0.0336)	0.351*** (0.0335)			
HHEducation			0.0130** (0.00530)		0.0195*** (0.00745)		0.00940* (0.00497)			0.0145 (0.0104)
Owns Cow			-0.168** (0.0704)		-0.322*** (0.0737)		- 0.184*** (0.0704)		- 0.383*** (0.138)	
Shock: Death			0.0377 (0.0334)		0.0165 (0.0534)		0.0139 (0.0355)			0.0309 (0.0776)
Below PovLine			0.0452 (0.0333)		-0.0397 (0.0536)		-0.0349 (0.0343)			-0.112 (0.0772)
Girl:Boy Ratio				0.401*** (0.0518)	0.398*** (0.0500)				-0.0828* (0.0433)	0.0864** (0.0426)
_cons	0.254*** (0.0247)	0.0305* (0.0181)	-0.0169 (0.0259)	0.0446 (0.0322)	0.0224 (0.0449)	0.277*** (0.0273)	0.0477** (0.0196)	0.0443 (0.0276)	0.632*** (0.0665)	0.638*** (0.0842)
N	990	990	986	438	436	990	990	986	438	436

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

2.2 Girls' and Boys' Education Spending

Being assigned to the FFTIG program had a positive and significant impact on girls' education spending (Table 4). Being assigned to receive FFTIG increased household's expenditures on girls' education items by 11.44 Sudanese Pounds (SDP), relative to the control group. This is statistically significant at the 10% level. Because the treatment and control groups spent statistically different amounts on girls' education at the baseline (treatment spent 11 SDP less than the control group, on average), girls' education spending at baseline was added as a control. When this is added, the treatment effect is still positive and statistically significant (9.53 SDP at the 10% level). When adding in additional controls for characteristics that were different between treatment and control at baseline, this increases to 9.83 SDP, statistically significant at the 10% level.

In order to determine if adding in the baseline level of girls' education spending is correlated with the endline girls' education spending, this paper includes a *pwcorr* analysis of girls' education spending at baseline, girls' education spending at endline, and being assigned to treatment. There is not a high correlation between the three, as demonstrated in Table 3, below.

Table 5. Correlation of Girls Education Spending Baseline, Endline, and Treatment Assignment

	Girls Education Spending Baseline (2008)	Girls Education Spending Endline (2009)	Assigned to Treatment
Girls Ed Spending Baseline (2008)	1.0000		
Girls Ed Spending Endline (2009)	0.2575	1.0000	
Assigned to Treatment	0.0409	0.0628	1.0000

Being assigned to the FFTIG program did not impact boys' education spending in a statistically significant way. Being assigned to FFTIG increased households' expenditures on boys' education items by 2.7 SDP, and by 3.5 SDP *ceteris paribus*. Neither of these treatment effects is statistically significant at conventional levels.

There is a statistically significant difference between boys' and girls' education spending within households. When running a regression with an interaction term for treatment and gender, the term on treatment and gender was found to be statistically significant at the 1% level.

It is interesting to note that the control group spent the same amount on boys' and girls' education at the end of the project (23.7 SDP), but that the treatment group spent significantly more on girls' education items as a result of the project.

Table 6. Girls' and Boys' Education Spending (OLS, in SDP)

(Standard errors in parentheses, ***p<0.01, **p<0.05, *p<0.1)

	Girls Education Spending (OLS) (Sudanese Pounds)						Boys Education Spending (OLS) (Sudanese Pounds)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Assigned to Treatment	11.44* (5.866)	9.534* (5.761)	11.16** (5.566)	9.829* (5.442)	18.72** (8.155)	19.91** (8.223)	2.731 (4.345)	3.336 (4.049)	3.481 (3.945)	6.586 (8.974)	6.989 (8.690)
Girls Ed Spending Baseline		0.201*** (0.0397)		0.103*** (0.0383)		0.0316 (0.0342)					
Girls in HH			34.82*** (4.588)	28.25*** (4.890)							
HHEducation				1.247* (0.733)		1.938* (1.054)		0.428 (0.566)		0.282 (1.138)	
Owns Cow				-16.37** (7.178)		29.61*** (7.504)		-8.125 (10.76)		-18.04 (21.76)	
Shock: Death				-2.307 (5.233)		-11.69 (7.889)		-2.089 (4.159)		-7.421 (8.834)	
Below PovLine				10.84* (6.212)		-11.43 (8.428)		-5.183 (4.048)		-10.91 (9.445)	
Girl:Boy Ratio					38.11*** (5.710)	36.01*** (6.194)				-6.298 (5.476)	-6.210 (5.445)
Boys in HH							29.25*** (3.511)	28.91*** (3.537)			
_cons	23.67*** (3.281)	16.29*** (2.946)	1.537 (2.649)	-2.442 (3.823)	0.0599 (4.425)	4.498 (6.434)	23.70*** (2.873)	4.765* (2.537)	6.924* (3.628)	52.81*** (7.800)	58.71*** (10.40)
N	990	990	990	986	438	436	990	990	986	438	436

2.3 Household Education Fees

Being assigned to the FFTIG program did not have a statistically significant impact on household school fees. Without controls, being assigned to the FFTIG program increased household education fees by 98 SDP, but this is not statistically significant at conventional levels. This treatment effect of 98 SDP is almost one-third the amount of the mean of the control group, 352 SDP, which is economically significant. When controlling for the number of girls or boys in the household with additional controls of baseline characteristics that were unbalanced, this effect drops more than half to about 35 SDP. Although this treatment effect is still not statistically significant at conventional levels, it is more than 10% of the mean of the control group. The standard errors are too large for any statistically significant effect.

Table 7. Household Education Fees

	Dependent Variable: Household Education Spending/Fees (Total) (OLS) (in Sudanese Pounds)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Assigned to Treatment	97.96 (117.6)	98.19 (117.9)	97.09 (118.0)	36.24 (79.76)	35.88 (79.42)	245.8 (206.5)	84.50 (75.68)
Girls in HH		-28.46 (61.10)		13.56 (46.22)			
Boys in HH			-42.07 (42.28)		-66.35* (35.88)		
HHEducation				-15.69* (8.963)	-14.94* (8.950)		-8.339 (7.642)
Owns Cow				-31.83 (148.3)	-35.09 (150.2)		269.9 (276.5)
Shock: Death				405.1*** (109.5)	402.2*** (109.1)		220.2** (89.79)
Below Povline				-128.1* (68.65)	-138.6** (69.87)		- 146.8*** (53.40)
Girl:Boy Ratio						-56.38 (130.3)	49.80 (62.81)
_cons	351.5*** (50.75)	369.6*** (61.97)	378.7*** (66.69)	261.2*** (55.39)	315.9*** (61.26)	298.5*** (92.60)	185.3*** (61.74)
N	990	990	990	986	986	438	436

Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1

2.4 Heterogeneous Effects

IDP Status (a binary variable equal to one if the respondent reported having moved to their current residence because of security reasons) is the only heterogeneous effect that has a statistically significant effect on education outcomes. Households with IDP status experienced less of a treatment effect on girls' education spending, and experienced a decreased likelihood of having a boy enrolled in school. Among non-IDP households, being assigned to receive FFTIG increased girls' education expenditures by 16.55 SDP. This effect is 27% lower for IDP households as compared with non-IDP households, statistically significant at the 10% level. Among non-IDP households, being assigned to receive FFTIG decreased the likelihood of having a boy enrolled in school by 1.4 percentage points. This effect is 41 percent greater in IDP households than non-IDP households, which means that IDP households are even less likely to have a boy enrolled in school and spend less on girls' education, as compared with non-IDP households after being assigned to the FFTIG program. This confirms the hypothesis that IDP households may be less likely to send their children to school or spend money on schooling.

Table 8. Heterogeneous Effects: IDP Status on Education Outcomes

	Girls Ed Spending	Boys Ed Spending	Girl Enrollment (0/1)	Girl Enrollment	Boy Enrollment (0/1)	Boy Enrollment	HH Education Fees
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treat_Assign	16.55** (6.547)	3.516 (4.910)	-0.0165 (0.100)	0.00790 (0.0419)	-0.0135 (0.0994)	-0.0159 (0.0433)	107.7 (139.9)
IDP Status	15.70 (11.30)	-3.638 (7.950)	-0.128 (0.164)	-0.0767 (0.0529)	-0.244 (0.168)	-0.0929 (0.0635)	-110.0 (104.9)
Treat*IDP	-27.17* (14.41)	-4.446 (10.33)	0.334 (0.231)	0.134 (0.0903)	0.414* (0.233)	0.147 (0.0968)	-57.98 (210.1)
_cons	20.66*** (3.124)	24.40*** (3.104)	-0.820*** (0.0695)	0.269*** (0.0286)	-0.786*** (0.0688)	0.295*** (0.0310)	372.6*** (59.37)
N	990	990	990	990	990	990	990

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Social Networks (measured as a binary variable equal to one if the amount of money the respondent believes their household could collect from friends and relatives in an emergency is above the mean of values reported) do not reveal a statistically significant heterogeneous effect (Table 9, below). It is interesting, however, that households with high social networks experienced a lower treatment effect on girls education spending. They also experience a higher treatment effect for household education fees in general. None of these findings are statistically significant at conventional levels, however.

Table 9. Heterogeneous Effects: Social Networks on Education Outcomes

	Girls Ed Spending (1)	Boys Ed Spending (2)	Girl Enrollment (0/1) (3)	Girl Enrollment (4)	Boy Enrollment (0/1) (5)	Boy Enrollment (6)	HH Ed Fees (7)
Treat_Assign	15.30** (7.086)	-1.419 (4.549)	0.0493 (0.104)	0.0370 (0.0405)	0.0624 (0.103)	0.00441 (0.0445)	98.10 (154.5)
Social Networks	7.848 (9.159)	-1.082 (6.567)	0.170 (0.150)	0.0969 (0.0689)	0.0736 (0.152)	-0.0140 (0.0642)	-222.0*** (67.50)
Treat*Social Networks	-16.63 (12.60)	16.70 (11.57)	-0.0327 (0.210)	-0.0311 (0.0971)	-0.0124 (0.211)	0.0321 (0.0905)	34.67 (163.9)
_cons	22.01*** (3.487)	23.93*** (3.314)	-0.881*** (0.0718)	0.233*** (0.0262)	-0.845*** (0.0709)	0.280*** (0.0311)	398.4*** (63.95)
N	990	990	990	990	990	990	990

Standard errors in parentheses
 ***p<0.01, **p<0.05, *p<0.1

Literate Household Head: One hypothesis of this paper was that households who have a literate head will be more likely to invest in their children’s education than households without a literate head, as a result of being assigned to the FFTIG program. Table 10, below, describes the heterogeneous effects of household head literacy (measured as a binary variable equal to one if the household head reports being able to read and write a letter). There is an increased treatment effect of being assigned to the FFTIG program for households with a literate head in regards to girls’ and boys’ educational spending and enrollment, although these findings are not statistically significant at conventional levels.

Among households without a literate head, being assigned to receive FFTIG increased girls’ education expenditures by 8.38 SDP. Households with a literate head experience a 16% increase in this treatment effect, which is a large magnitude even though it is statistically insignificant. Households without a literate head only increased boys’ educational spending by 0.83 SDP as a result of being assigned to FFTIG. Households with a literate head experienced a 10% increase in the treatment effect on boys’ educational spending, although the overall magnitude is less than girls’ educational spending. Households with a literate head experienced less than 1% increase in the treatment effect for enrollment for boys and girls (although still positive), relative to households without literate heads. These findings are not statistically significant.

Among households without a literate head, being assigned to receive FFTIG increased overall household education fees by 113 SDP. This treatment effect was 92% lower for households with a literate head, which is large in magnitude, but not statistically significant.

Table 10. Heterogeneous Effects: Literacy of Household Head on Education Outcomes

	Girls Ed Spending (1)	Boys Ed Spending (2)	Girl Enrollment (0/1) (3)	Girl Enrollment (4)	Boy Enrollment (0/1) (5)	Boy Enrollment (6)	HH Ed Fees (7)
Treat_Assign	8.381 (6.601)	0.837 (5.018)	-0.0197 (0.105)	0.00717 (0.0389)	0.0386 (0.104)	0.0000810 (0.0422)	113.0 (147.2)
HHH Read	7.614 (7.954)	2.809 (6.256)	0.164 (0.144)	0.0937 (0.0650)	0.285** (0.142)	0.106 (0.0681)	-115.6 (91.50)
Treat*HHHRead	16.18 (14.25)	9.718 (9.990)	0.299 (0.209)	0.142 (0.104)	0.139 (0.207)	0.0752 (0.101)	-92.40 (167.6)
_cons	21.86*** (3.702)	23.03*** (3.398)	-0.884*** (0.0731)	0.232*** (0.0265)	-0.903*** (0.0736)	0.252*** (0.0302)	379.1*** (63.36)
N	990	990	990	990	990	990	990

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Parents' High Aspirations for Eldest Son: Another hypothesis of this paper was that parents who have high aspirations for their son (measured as a binary variable equal to one if the respondent reported having high professional aspirations for their eldest son still living the household) will be more likely to invest in boys' educational spending and enrollment than parents who have low aspirations. It is interesting that parents with high aspirations experience about 10% less of a treatment effect on both boys and girls educational spending than parents with low aspirations, although this is not statistically significant at conventional levels. They also experience the same treatment effect for enrollment as parents with low aspirations, but this is also not statistically significant. Although parents may state they expect their sons to work in professional employment, this does not translate to investments in education in the household.

Table 11. Heterogeneous Effects: Parents' High Aspirations for Eldest Son

	Girls Ed Spending (1)	Boys Ed Spending (2)	Girl Enrollment (0/1) (3)	Girl Enrollment (4)	Boy Enrollment (0/1) (5)	Boy Enrollment (6)	HH Ed Fees (7)
Treat_Assign	17.00* (9.618)	7.630 (6.101)	-0.0289 (0.129)	-0.00198 (0.0554)	-0.0687 (0.131)	-0.0191 (0.0477)	-24.10 (147.1)
Son Aspirations	1.032 (6.650)	10.93* (5.849)	-0.0920 (0.126)	-0.0599 (0.0490)	-0.00718 (0.125)	0.0664 (0.0552)	-286.2*** (98.00)
Treat*Son Aspirations	-10.54 (12.06)	-10.31 (8.851)	0.153 (0.181)	0.0718 (0.0743)	0.237 (0.181)	0.0512 (0.0773)	258.2 (228.9)
_cons	23.18*** (3.916)	18.46*** (2.950)	-0.800*** (0.0860)	0.283*** (0.0370)	-0.826*** (0.0867)	0.245*** (0.0320)	488.5*** (89.38)
N	990	990	990	990	990	990	990

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

3. DISCUSSION

3.1 Discussion

In BRAC’s final program evaluation document for FFTIG, BRAC states that the FFTIG program led to a 10 percentage point increase in girls’ enrollment.¹⁸ In BRAC’s analysis, they drop 235 households (lowering their sample size from 1049 households to 814 households) due to ‘contamination’ in the Jabel Kujur Branch, which had the lowest compliance for treatment and control. Among households in the panel, 14% of the control group wrongly received the intervention and 12% of the treatment group did not receive the food transfers. Because the Jabel Kujur Branch had the lowest level of compliance, BRAC removed these observations from their analysis.

My findings differ from BRAC’s because I did not drop any observations, but instead chose to analyze the effect of the FFTIG program on all participants, regardless of compliance (through Intention-to-Treat). I find that the BRAC program did not have a statistically significant effect on girls’ or boys’ enrollment. Interestingly, the program affected the intensive margins of education for girls: More money was spent on girls who were already in school, as opposed to allowing more girls to enroll in school, as a result of the program. Of the 636 school-aged girls at baseline, 235 of them were not in school. The

¹⁸ Sulaiman, “Incentive and Crowding Out Effects of Food Assistance,” p.2.

FFTIG program did not help these girls who were not enrolled in school, but rather increased household's spending on books, uniforms, or school fees for the 401 girls already enrolled.

Boys had similar numbers of enrollment rates as girls at baseline. Of the 640 school-aged boys at baseline, 251 were not enrolled in school. At the endline, the control group spent the same amount of Sudanese Pounds on girls' and boys' education. This means that the treatment effect caused households to spend more money on girl's education than boys by 9-11 SDP.

If the control group had spent less on girls' than boys' education, the treatment effect could be explained through girls' education being a 'more strongly normal good' than boys'.¹⁹ This assumes a unitary household model that treats the household as a single actor that seeks to maximize a single utility function. If girls' education is a more strongly normal good, then girls receive less educational spending when income is low, but as a household's consumption rises, girls' educational spending rises enough to equal boys' educational spending when incomes are higher. Thus a rising income may reduce a gender gap in girls' and boys' educational spending. This is not the case, however, because boys' and girls' educational spending is similar for the control group, but the treatment group chose to put more money towards girls' education.

There are several hypotheses as to why households would spend more money on girls' education than boys', particularly given that girls drop out of school in South Sudan at higher rates than boys. One could be a spillover effect from other development programs in the Juba area. Although only 50 households reported being involved in other NGO programs, there could be spillovers from the abundant number of girls' education programs in Juba from the World Bank, CARE, UNICEF, and many others, which would influence households' decision-making to prioritize girls' education. Because there was not an explicit component of the program design to target girls' education, it is difficult to ascertain the root cause of household's prioritizing girls' educational spending over boys.

My findings go further than BRAC's to analyze the heterogeneous effects of the FFTIG program. As could be expected, households who moved within the last year for security reasons experience less of a treatment effect on girls' education spending and were less likely to have a boy enrolled in school, both statistically significant at the 10% level. This could be because IDP households do not feel secure in their current residence and feel they may move again, or their lack of stability. Other heterogeneous effects such as income, the literacy of a household head, or high aspirations for sons did not cause a change in the treatment effect of the FFTIG program.

3.2 Threats to validity

There are several possible threats to internal validity that could affect the above analysis:

- *Spillover*: There is a strong possibility of spillover effects, as randomization was at the household level, rather than the village level. Additionally, treatment and control groups were not necessarily separated from each other geographically, which could also cause spillover effects.

¹⁹ Schaffner, Julie. *Development Economics: Theory, Empirical Research and Policy Analysis.* (Forthcoming). Pg. 23

- *Attrition*: Attrition was 4.2% in the treatment group and 5.8% in the control group. Even though these levels are low, it is important to address attrition, in order to ensure unbiased estimates. An Inverse Mills Ratio (to check that attrition had no effect on the validity of the estimates) confirmed that attrition did not have a significant effect on the above results.
- *Imperfect randomization*: Overall, randomization worked well and, as discussed earlier, unbalanced characteristics are identified and controlled for in the regressions.
- *Sample size*: Though sample size was not a major concern for the validity of the findings, working with a larger sample would be helpful to explore the treatment and heterogeneous effects with greater confidence. Regressions that used the girl to boy ratio had too few observations, and lost statistical power.
- *Data quality*: Data quality issues are a concern. The survey length may have caused participant fatigue and resulted in inaccurate responses. For example, there were 60 girls and 58 boys who were not in school, but whose families reported as having spent more than 0 SDP on their education.

3.3 Conclusion

In conclusion, the FFTIG program was not effective in increasing enrollment rates of boys and girls, but did improve the well-being of girls already enrolled in school in a post-conflict setting. Not all households experienced the same treatment effect, however: Households with IDP status experienced a lower treatment effect on girls' and boys' education. It is important to research further how IDP households use food transfer programs to increase their household utility, because South Sudan has become increasingly volatile in the past few months. If BRAC wants to impact girls' and boys' educational outcomes in South Sudan, it should explore other programs that offer educational components, instead of food transfers, to have the greatest impact possible.