AJAE Appendix for "Crop Choice, School Participation and Child Labor in Developing Countries: Cotton Expansion in Burkina Faso"*

Harounan Kazianga Francis Makamu

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A Appendix

A.1 Robustness checks

In this online appendix, we perform three sets of analyses to check the robustness of our findings. The first set of regressions pools the 1998 and 2003 rounds survey to run a DID similar to equation (3) in the text, which is restated below:

$$y_{ijk} = \beta_0 + \beta_1 \left(\text{young1} \times Newcott_i\right) + \beta_3 \text{young1} + \delta_p + \varepsilon_{ijk}, \tag{1}$$

where the sample is restricted to cohorts who were too old to begin schooling in 1995 when the cotton policy reform was implemented. The cotton policy change should not have an effect on the education of these individuals. The cohorts include individuals who were born between 1972 and 1979 (*young1*) and those born between 1959 and 1966 (*old1*) observed in 1998 and 2003. These individuals all had turned 15 by the time the cotton expansion policy was implemented, and could not have started school in response to the 1994 policy reform.

The estimates are reported in table A.1.1 and should be comparable with the results found for younger cohorts in the main text. In particular, the coefficients in Panel A for girls' enrollment (column 3) and years of education completed (column 6) in the cotton expansion areas are not significant in the placebo regressions. In addition, the point estimates are smaller in magnitude in comparison to those reported in the text. These estimates provide some supporting evidence that girls' education in non-cotton regions and new cotton regions followed the same trend before the policy reform.

Second, we re-estimate the effect of the policy reform using the sub-sample of urban households. The specification is similar to equation (2) in the text and is restated below:

$$y_{ijk} = \alpha_1 + \alpha_2 Newcott_i + \alpha_3 \text{postreform} + \beta_1 \left(\text{postreform} \times Newcott_i\right) + \varepsilon_{ijk}. \tag{2}$$

Arguably, most urban households are non-agricultural households and should not have been affected by the policy change. A significant effect of the policy reform on girls' education would suggest that there were other factors affecting girls' education when the policy reform was implemented, hence making our identification strategy questionable.

Estimations of these placebo regressions are shown in table A.1.2 and should be comparable with the results for the cotton adoption when controlling for province fixed effects. None of the point estimates of the DID coefficient in columns 1–6 are significant in Panel A, that is, the new cotton regions. In particular, the DID estimates for girls in columns 3 and 6 are not statistically significant and are in fact negative. Therefore, there is no evidence that the policy reform affected girls' education in urban households. The results in Panel B corroborate those in Panel A. The results for the cotton expansion areas, however, are not statistically significant. Nevertheless, they provide additional confidence in earlier findings. For non-agricultural households, there is no significant effect of the cotton policy change on school participation, only farmers who adopted cotton were more likely to enroll their daughters in school.

Finally, we examine the effect of the policy reform on child labor in urban areas. As we argued above for education outcomes, there is no *a priori* reason for child labor in urban

areas to respond to the policy reform. We report the estimation results in table A.1.3. None of the point estimates for the policy reform are statistically significant at the ten percent level. This holds for both the new cotton region in Panel A and old cotton region in Panel B. In particular, the estimates for girls in columns 3 and 6 in the new cotton region (Panel A) are smaller in magnitude and not statistically different from zero. In sum, the robustness checks suggest that our analysis identifies the effects of the policy reform on education and child labor.

Table A.1.1. Impact of Cotton Adoption on School Enrollment and Years of Education Completed of Younger Cohorts not Affected by the Policy

	Ever enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: New cotton region						
Newcott×Young1	0.006	0.011	0.007	0.045	0.076	0.065
	[0.009]	[0.011]	[0.009]	[0.074]	[0.092]	[0.085]
Young1	-0.001	0.003	-0.004	-0.003	0.029	-0.035
	[0.005]	[0.008]	[0.004]	[0.043]	[0.066]	[0.033]
Girl	-0.008*			-0.064*		
	[0.004]			[0.032]		
Observations	3,698	2,213	1,485	3,698	2,213	1,485
R-squared	0.001	0.000	0.000	0.001	0.000	0.000
Panel B: Old cotton region						
Oldcott×Young1	0.006	0.009	0.005	0.045	0.065	0.036
	[0.007]	[0.009]	[0.008]	[0.061]	[0.069]	[0.071]
Young1	-0.003	-0.004	-0.000	-0.016	-0.028	-0.002
	[0.006]	[0.007]	[0.005]	[0.047]	[0.061]	[0.049]
Girl	-0.010***			-0.083***		
	[0.003]			[0.027]		
Observations	6,325	3,776	2,549	6,325	3,776	2,549
R-squared	0.002	0.000	0.000	0.002	0.000	0.000
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether a child has ever been enrolled in school at the time of the survey. In columns 4-6, the dependent variable is the number of years of education completed.
"Young1" comprises children born between 1972-1979 observed in the 1998 or 2003 survey rounds.
The excluded group regroups children born between 1959-1966 observed in 1998 or 2003 rounds.
None of these cohorts would have been affected by the policy change.
All specifications control for cohort-age dummies, household head's age, education and gender, the month in which the survey was fielded, and province fixed effects.

Table A.1.2. Impact of Cotton Adoption on Child Enrollment and Years of Education in Urban Areas

	Enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: New cotton region						
New×Postreform	0.005	0.033	-0.008	-0.319	-0.016	-0.524
	[0.096]	[0.115]	[0.081]	[0.483]	[0.639]	[0.340]
Postreform	-0.265***	-0.276***	-0.145***	-1.424***	-2.866***	0.665***
	[0.006]	[0.033]	[0.025]	[0.111]	[0.262]	[0.039]
Girl	-0.062***			-0.300***		
	[0.007]			[0.021]		
Observations	6,722	3,309	3,413	6,722	3,309	3,413
R-squared	0.006	0.000	0.000	0.004	0.000	0.001
Panel B: Old cotton region						
Old×Postreform	0.002	-0.022	0.029	-0.078	-0.229	0.077
	[0.029]	[0.033]	[0.030]	[0.236]	[0.208]	[0.274]
Postreform	-0.285***	-0.266***	-0.213***	-1.497***	-2.761***	0.352
	[0.022]	[0.023]	[0.054]	[0.098]	[0.203]	[0.212]
Girl	-0.080***			-0.341***		
	[0.009]			[0.034]		
Observations	10,320	5,154	5,166	10,320	5,154	5,166
R-squared	0.009	0.000	0.000	0.005	0.001	0.000
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether a child is enrolled in school at the time of the survey. In columns 4-6, the dependent variable is the highest grade attained or years of education. The sample consists of households living in urban areas. Additional controls are child age dummies, household head's age, education and gender, survey month dummies and province fixed effects.

Table A.1.3. Impact of Cotton Adoption on Child Work and Farm Labor in Urban Areas

	Child Work			Farm Labor		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: New cotton region						
Newcott×Postreform	0.000	-0.012	0.012	-0.003	-0.021	0.012
	[0.029]	[0.081]	[0.036]	[0.052]	[0.114]	[0.024]
Postreform	0.025	0.120***	-0.071*	-0.021	0.028**	-0.059
	[0.023]	[0.023]	[0.037]	[0.026]	[0.012]	[0.047]
Girl	-0.021***			-0.015*		
	[0.005]			[0.007]		
Observations	6,074	2,994	3,080	6,074	2,994	3,080
R-squared	0.001	0.000	0.000	0.001	0.000	0.000
Panel B: Old cotton region						
Oldcott×Postreform	-0.005	-0.007	-0.009	0.013	0.010	0.012
	[0.031]	[0.045]	[0.030]	[0.019]	[0.024]	[0.025]
Postreform	0.064*	0.128***	-0.004	0.007	0.024	-0.012
	[0.035]	[0.028]	[0.048]	[0.023]	[0.014]	[0.040]
Girl	-0.020***			-0.006		
	[0.006]			[0.007]		
Observations	9,297	4,650	4,647	9,297	4,650	4,647
R-squared	0.001	0.000	0.000	0.000	0.000	0.000
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether a child worked in the week before the survey. In column 4-6, the dependent variable is a binary variable that indicates whether a child worked on the farm. The sample is restricted to urban households. All regressions control for child age, household head's age, education and gender, the month in which the survey was fielded, and province fixed effects.

A.2 Impact of policy reform before 2003

The other potential source of bias would be a national program of school construction known as Basic Education Development Plan (PDDEB) that started in 2002. The program's activities included the construction and restoration of schools and several initiatives to promote education (**?**). Because PDDEB started one year before 2003, it could bias our estimates if PDDEB placement was somehow correlated with cotton regions. We have estimated the effect of the cotton policy reform using the 1994 survey (the baseline) and the 1998 survey, i.e. before PDDEB started. The results reported in table A.2.1 are consistent with our main findings. Hence, it is unlikely that PDDEB is driving our results.

Table A.2.1. Impact of Cotton Policy Reform Before PDDEB

	Enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Newcott×Postreform	0.027	0.012	0.044**	0.049	-0.013	0.123*
	[0.022]	[0.031]	[0.018]	[0.080]	[0.107]	[0.063]
Postreform	0.133**	0.073	0.207***	0.451**	0.262	0.685***
	[0.052]	[0.062]	[0.041]	[0.186]	[0.201]	[0.164]
Girl	-0.106***			-0.378***		
	[0.022]			[0.082]		
Observations	14,207	7,473	6,734	14,207	7,473	6,734
R-squared	0.021	0.000	0.004	0.016	0.000	0.003
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether a child is enrolled in school at the time of the survey. In columns 4-6, the dependent variable is the number of years of education completed. All regressions control for child age, household head's age, education and gender, the month in which the survey was fielded, year of the survey and province fixed effects.

A.3 Robustness using Census 1985 and 1994

We combine data from the 1985 census from Burkina Faso and the 1994 survey to run a difference-in-difference similar to regression 2 where the baseline is 1985 and the follow up is 1994. We choose the provinces from the census to match the non-cotton, the new cotton and the old cotton provinces.

We show the descriptive statistics of the Population Census 1985 in Table A.3.1. Children were more likely to be enrolled in school and to have completed more years of education in the old cotton region than in the new and the non-cotton regions. The differences between the new cotton and the non-cotton regions were, however, negligible. We report the regression results in table A.3.2. The point estimates of the interaction terms in panel A (new cotton region) and panel B (old cotton region) are not statistically different from zero. These point estimates provide some supporting evidence that girls' education evolved in parallel between cotton expansion areas and non-cotton areas before the policy reform.

Table A.3.1. Education Outcomes Statistics (Population Census 1985)

	Old cotton region	New cotton region	Non-cotton region
	(1)	(2)	(3)
Enrolled: Fraction of children attending school at the time of the survey			
Enrolled	0.123	0.089	0.085
Enrolled, Boys	0.177	0.130	0.127
Enrolled, Girls	0.065	0.041	0.041
Grade: Number of years of education completed			
Years of education	0.663	0.474	0.471
Years of education, Boys	0.909	0.717	0.700
Years of education, Girls	0.418	0.214	0.250

Notes: Author's calculations using rural sub-samples of Burkina Faso's 1985 Census.

Table A.3.2. Impact of Cotton Adoption on Child Enrollment and Years of Education using Population Census 1985 and 1994

	Enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: New cotton region						
New×Postreform	0.026	0.011	0.043	0.198	0.070	0.330
	[0.033]	[0.035]	[0.036]	[0.204]	[0.211]	[0.220]
Postreform	0.134***	0.145***	0.124***	0.602***	0.667***	0.537***
	[0.028]	[0.029]	[0.028]	[0.159]	[0.159]	[0.169]
Girl	-0.096***			-0.487***		
	[0.010]			[0.057]		
Observations	11,901	6,254	5,647	11,316	5,850	5,466
R-squared	0.050	0.029	0.039	0.039	0.021	0.029
Panel B: Old cotton region						
Old×Postreform	0.038	0.020	0.058	0.263	0.230	0.304
	[0.063]	[0.072]	[0.056]	[0.365]	[0.410]	[0.328]
Postreform	0.169***	0.185***	0.154***	0.814***	0.885***	0.745***
	[0.038]	[0.042]	[0.034]	[0.231]	[0.237]	[0.228]
Girl	-0.103***			-0.506***		
	[0.008]			[0.037]		
Observations	16,246	8,384	7,862	15,442	7,835	7,607
R-squared	0.069	0.046	0.061	0.055	0.040	0.044
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether the child is enrolled in school at the time of the survey. In columns 4-6, the dependent variable is the number of years of education completed. All regressions control for child age, household head's age, education and gender, survey month dummies, and province fixed effects.

A.4 Effect of household cotton adoption on education outcome: 2SLS estimates

We consider another parameter of interest, that is, the effect of the policy reform on households in the new cotton regions who decided to farm cotton as a result of the policy reform. The policy reform increased the likelihood that households in the new cotton regions would choose to farm cotton, whereas some other households would not. The estimates discussed in the text assess the average effect of the policy reform in the new cotton regions, that is, the effect accounts for households who chose to farm cotton and those who did not. In this appendix, we present the two-stage least squares (2SLS) estimates in table A.4.1 using equation 1 as the first stage. The F-statistics (for cotton) are reported in columns 1 and 5 and are relatively small, except for in column 5 of Panel A (8.01). As a result, we show the 2SLS estimates only for the new cotton regions and control for the province fixed effects. The main assumption is that the policy reform affects a child's education outcomes only through a household's decision to grow cotton. The point estimate (significant at the five percent level) implies that enrollment increased by 36.1 percentage points for girls whose households chose to farm cotton because of the policy reform. These girls gained 1.35 (significant at the ten percent level) additional years of education. Consistent with the DID estimates, there is no significant effect on the pooled sample or boys' sub-sample.

Table A.4.1. Impact of Cotton Adoption on School Enrollment and Years of Education Completed (Two Stage Least Squares)

	Enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Cotton	0.172	0.030	0.361**	0.544	-0.059	1.353*
	[0.185]	[0.249]	[0.169]	[0.800]	[1.033]	[0.686]
Postreform	-0.028	0.046	0.003	-0.115	0.094	-0.033
	[0.029]	[0.050]	[0.023]	[0.124]	[0.145]	[0.092]
Girl	-0.102***			-0.368***		
	[0.020]			[0.070]		
Observations	19,540	10,238	9,302	19,540	10,238	9,302
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a binary variable indicating whether a child is enrolled in school at the time of the survey. In columns 4-6, the dependent variable is the number of years of education completed. The F-statistics for the first stage is reported in column 5 of the table results for the cotton policy impact on crop choice in the main text. The sample is restricted to households in the new cotton region. All regressions control for child age, household head's age, education and gender, the month in which the survey was fielded, and province fixed effects.

A.5 Alternative sample definitions

In Tables A.5.2 and A.5.3 below, we demonstrate that our results are robust to restricting the sample to the period when school is in session (i.e. discarding the data that were collected during the summer months), and to children who have ever enrolled in school.

Table A.5.2. Impact of Cotton Adoption on Child Enrollment and Years of Education, Discarding the School Break Period

	Enrolled			Years of education		
	Boys and girls	Boys	Girls	Boys and girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: New cotton region						
Newcott×Postreform	0.007	-0.021	0.045**	0.013	-0.104	0.171**
	[0.026]	[0.036]	[0.020]	[0.104]	[0.136]	[0.077]
Postreform	0.033	0.009	0.059**	0.134	0.030	0.243**
	[0.027]	[0.036]	[0.021]	[0.096]	[0.123]	[0.085]
Girl	-0.106***			-0.384***		
	[0.025]			[0.094]		
Observations	12,279	6,515	5,764	12,279	6,515	5,764
R-squared	0.020	0.000	0.004	0.017	0.000	0.004
Panel B: Old cotton region						
Oldcott×Postreform	-0.027	-0.037	-0.013	-0.101	-0.159	-0.031
	[0.027]	[0.034]	[0.024]	[0.098]	[0.115]	[0.093]
Postreform	-0.008	-0.034	0.015	-0.036	-0.113	0.007
	[0.032]	[0.037]	[0.030]	[0.115]	[0.133]	[0.112]
Girl	-0.116***			-0.434***		
	[0.017]			[0.064]		
Observations	15,576	8,111	7,465	15,576	8,111	7,465
R-squared	0.024	0.001	0.000	0.019	0.001	0.000
Child age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable in columns 1-3 is a dummy variable indicating whether the child is enrolled when school in session at the time of the survey. In columns 4-6, the dependent variable is the number of years of education completed. All specifications include child age, household head's age, education and gender, survey month dummies, and province fixed effects.

Table A.5.3. Impact of Cotton Adoption on Years of Education Completed for Younger Cohorts Conditional on Being Ever Enrolled

	Years of education		
	Boys and girls	Boys	Girls
	(1)	(2)	(3)
Panel A: New cotton region			
Newcott×Young	1.252**	1.048	1.450*
	[0.516]	[0.724]	[0.707]
Young	0.025	0.485	-7.831***
	[0.516]	[0.731]	[0.228]
Girl	0.052		
	[0.071]		
Observations	2,188	1,346	842
R-squared	0.005	0.005	0.279
Panel B: Old cotton region			
Oldcott×Young	0.976**	1.296**	0.193
	[0.345]	[0.463]	[0.241]
Young	-8.258***	-8.444***	-7.689***
	[0.558]	[0.605]	[0.239]
Girl	-0.047		
	[0.046]		
Observations	3,281	2,092	1,189
R-squared	0.023	0.033	0.348
Cohort dummies	Yes	Yes	Yes
Household head age and education	Yes	Yes	Yes
Survey month dummies	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes

Standard errors in brackets, clustered at the province level.
* significant at 10%; ** significant at 5%, *** significant at 1%.
Notes: The dependent variable is the number of years of education completed. "Young" comprises children born between 1972-1979 observed in the 1998 or 2003 survey rounds. All specifications control for cohort-age dummies, household head's age, education and gender, the month in which the survey was fielded, and province fixed effects.