Article

Exploring Education-Induced Bargaining Power of Women on Household Welfare in Sub-Saharan Africa

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Abstract: Women's education and empowerment have engaged the interest of policymakers and academics for many years. We employ individual-level data from Ghana and Uganda in this paper to offer a comparative analysis of the impact of women's education and empowerment on six household welfare indicators: child labor, child school enrollment, female labor force participation, fertility rate, household food expenditure, and nutrition intake. Comparing the two countries is insightful due to their distinct socio-economic structures and cultural contexts, which might influence the dynamics of women's empowerment differently. The study utilizes the Ordinary Least Squares (OLS) and Instrumental Variables (IV) regressions and provides a battery of robustness tests. The empirical results show that in a household, the woman's and man's education levels are significant determinants of household welfare. However, contrary to common assumptions, the woman's education does not have a stronger effect than the man's, and her relative bargaining position has negligible effects on the welfare indicators studied, at least for the cases of Ghana and Uganda. Further sensitivity checks support these findings, suggesting that female education can improve household welfare, but its impact may not necessarily operate through enhanced bargaining power within the household.

Keywords: women empowerment; intra-household bargaining; household welfare; Ghana; Uganda

JEL Classification: I2; J13; J16

1. Introduction

The importance of women's empowerment in intra-household decision-making and its impact on household and child welfare has been a central theme in the global development discourse (see, for example, Balaj et al. 2021; Davis 2024; Duflo 2012; Grown et al. 2005; Malhotra and Schuler 2005). The topic also features in the Sustainable Development Goals, reflecting its critical role in achieving broader development objectives. Indeed, the United Nations has long regarded it not only as a goal in itself but also as a means to achieve sustainable development (see, for example, UNFPA 1994; UNGA 2015; Warth and Koparanova 2012). The Copenhagen Consensus Center (2015) estimates a substantial monetary benefit from women's empowerment. As a result, global initiatives like the World Bank's Gender Action Plan have sought to establish a link between economic growth and women's empowerment in the economic and political spheres.

Women's empowerment influences resource allocation, particularly regarding child welfare (see, for example, Doepke and Tertt 2014; Tavananezhad et al. 2022; Thomas 1990; Yusof and Duasa 2010). Therefore, policymakers are interested in identifying effective strategies to empower women to achieve the desired improvements in household welfare (Sundaram et al. 2014). Education has emerged as a powerful tool for this purpose, as it is usually positively associated with women's empowerment and improved household welfare (see, for example, McCracken et al. 2015; UNGEI 2014; Wild and Stadelmann

2024). The association between women's education, empowerment, and household welfare suggests that education can impact welfare through two main channels: a direct education effect and an indirect effect via empowerment.

We contribute to the literature by analyzing the direct effects of education and its bargaining power implications (indirect effect) on household welfare with survey data for Ghana and Uganda. The paper measures female bargaining power as a woman's relative years of schooling compared to her husband's education. Similar measures have been widely adopted in the literature (see, for example, Doss 2013; Handa 1996; Imai et al. 2014; Özer et al. 2023; Thomas 1994). First, educational attainment is usually achieved before marriage, making it exogenous to the current intra-household bargaining dynamics. Second, an educated woman has a better chance of securing economic and social independence outside the marriage, strengthening her bargaining position within the household (Doss 2013). Third, there are comparatively reliable data on education levels in developing countries.

This study assesses the effects of male and female education on household welfare, with a focus on whether the differences in their educational attainment lead to any *additional* impact through enhanced bargaining power. We measure bargaining power by differences in education levels of women and men. Rather than concentrating solely on the direct effects of education, we investigate the potential influence of an increase in female education relative to male education within the household. Our analysis draws on data from two developing countries—Uganda and Ghana. Each country provides a distinct context for examining these dynamics. The comparison between Uganda and Ghana is particularly interesting because, despite having similar policies for free universal basic education emphasizing girls' education, the countries differ significantly in cultural norms, social structures, and economic settings that influence women's roles and empowerment. While both countries are considered developing, Ghana has a substantially higher per capita GDP than Uganda. This makes comparing these two cases in Sub-Saharan Africa insightful. The differences between the countries provide an opportunity to observe whether the effects of education and bargaining power on household welfare are consistent across diverse contexts.

We measure household welfare using six indicators: child labor and school enrollment (child's welfare); female labor participation and fertility rate (woman's welfare); and household food expenditure and nutrition intake (household welfare) (see, for example, Aromolaran 2004; Been et al. 2024; Breierova and Duflo 2004; Glick and Sahn 2000; Thiele and Weiss 2003; Wild and Stadelmann 2022). Our empirical strategy employs the Ordinary Least Squares (OLS) and Instrumental Variables (IV) regressions to account for potential endogeneity problems. We further validate our findings by using alternative measures of women empowerment based on cultural traits (using the traditional inheritance system) in Ghana as a robustness check. Finally, we apply Oster's (2019) technique to investigate the potential effect of omitted variables on the results. Consistent with the literature, the empirical results show that education levels significantly enhance household welfare. However, the relative bargaining position of women, as proxied by educational differences, has a marginal effect on some of the welfare indicators. These findings are consistent across Uganda and Ghana, suggesting that socio-economic or cultural differences are not the primary drivers of the observed coefficients. Based on the results of the IV estimation and the robustness tests, we are confident that the observed effects of bargaining power are not due to omitted variable bias or endogeneity. Thus, while female and male education positively affect household welfare, the woman having more schooling than the man does not confer a sizeable additional welfare effect.

The remainder of the paper is structured as follows. Section 2 reviews some existing literature on women's empowerment and economic development. Section 3 describes the data and methodology used to measure the main variables. Section 4 presents the empirical results and evaluates their robustness. Section 5 provides a discussion and Section 6 concludes with policy implications.

2. Literature Review

Women's education and empowerment are key to economic progress (see, for example, Davis 2024; Doepke et al. 2012; Duflo 2012), thus it has been extensively studied together with other variables like political participation (see, for example, Dollar et al. 2001; Keneck-Massil et al. 2024; Walters et al. 2024). This paper contributes to understanding the role of female education in women's empowerment and the potential welfare effects of women's relative education compared to men. Focusing specifically on the effects of relative differences in education between men and women is relevant, as the general importance of education in enhancing women's productivity and labor force participation has been well-documented. It has been shown to contribute to economic development (see, for example, Hl and King 1993, 1995; Klasen 2002; Wild and Stadelmann 2024). Past studies have expanded these themes by examining how innovative technologies and operations can alleviate poverty by empowering women (Tang 2022). More broadly, women's empowerment can be understood as a fundamental structural element of sustainable economic development (for a recent discussion on sustainable development, see Klarin 2018; Manioudis and Meramveliotakis 2022). Notably, women's education and empowerment are closely linked to the advancement of the Sustainable Development Goals (SDGs), particularly in fostering gender equality and contributing to the eradication of poverty. Despite these overall positive effects of female education on welfare, there is some mixed evidence too. For example, Ahmed and Hyndman-Rizk (2020) discusses the paradoxical nature of higher education in Bangladesh, where despite increased access, women's empowerment and labor force participation has not risen proportionally due to structural and cultural barriers. Mukhopadhyay (2023) provided a review on inequalities in female labor force participation in South Asia and Latin America.

One way education empowers women is by increasing their productivity, labor force, and political participation. According to the literature, the relationship between education and labor force participation depends on the impact of education on the reservation wage of women relative to the market wage rate (see, for example, Becker 1985; Caliendo et al. 2017; Goldin 2014; Lam and Duryea 1999; Lincove 2008; Schultz 1960). If education increases the productivity of women at home rather than in the labor market, the opportunity cost of working outside the home is higher, and female labor force participation may not increase. Moreover, economic participation may vary significantly based on local contexts as shown by different studies (see, for example, Abou-Shouk et al. 2021; Anderson et al. 2021; Klasen et al. 2021). A study by Wei et al. (2021) emphasized the multifaceted nature of empowerment, showing that in rural Bangladesh, education, health, and living standards are all significantly influenced by women's empowerment.

Education can have a profound impact on female empowerment by providing women with access to resources and secured property rights (for a detailed discussion, see Wamboye 2023). In sub-Saharan Africa, where agriculture serves as the primary source of livelihood for many women, their lack of secured property rights often results in the under-utilization of farmlands owned by women (see, for instance, Doss et al. 2018; Goldstein and Udry 2008; Joireman 2008; Udry 1996; Wamboye 2023). In the context of Ghana, Goldstein and Udry (2008) illustrated that in regions where arable land is under the control of community leaders or chiefs, women tend to shorten the fallow period due to the fear of losing their land.

Other studies have established that women's education correlates positively with a reduction in child labor and improvements in children's schooling and health outcomes (see, for example, Breierova and Duflo 2004; Cygan-Rehm and Maeder 2013; Glick and Sahn 2000; Güneş 2015; Imai et al. 2014; for a recent survey, see Abdullah et al. 2022). Frempong and Stadelmann (2021) emphasized the role of a mother's risk aversion in explaining child labor in Ghana. While these findings suggest that the quality of a child's human capital improves when the mother is better educated, it is important to recognize that the observed correlation may suffer from biases due to systematic differences between educated and uneducated women (Duflo 2012), as well as assortative mating. Thus, the observed effects cannot be attributed solely to the amount of education a woman has received. In this

context, this study contributes by jointly analyzing the education levels of both parents and assessing the potential effect of female empowerment on household welfare.

Some recent research has explored the potential endogeneity between women's bargaining power and various welfare indicators (Doss 2013). Several studies have used proxies such as women's ownership of non-labor income, including remittances, pension benefits, and interest on capital, to capture their bargaining power (see, for example, Dong 2022; Schultz 1990; Thomas 1993). However, since non-labor income could be the outcome of past labor decisions, these measures may also suffer from endogeneity (Doss 2013). However, the scarcity of suitable data on empowerment has necessitated using education and its correlates as alternative measures of women's bargaining power within the household (see, for instance, Güneş 2015; Handa 1996; Imai et al. 2014).

The use of education as a proxy for bargaining power is derived from the evidence that women's education correlates with their participation in household decision-making (Becker et al. 2006; Boateng et al. 2012; Gupta and Yesudian 2006; Headey and Fan 2008). Furthermore, educated women are more likely to meet their livelihood needs independently outside the marriage, which provides them with a credible threat in the intra-household decision-making game. Thus, education is a robust indicator of a woman's bargaining power (Chiappori 1997). Nevertheless, as highlighted by Laszlo et al. (2020), measuring women's economic empowerment, particularly within households, presents significant methodological challenges. Our study contributes to this literature by employing various approaches to empirically evaluate female bargaining power, such as examining differences between matrilineal and patrilineal ethnic groups in Ghana.

3. Materials and Methods

We study the role of women's bargaining power and education on household welfare in Ghana and Uganda with six different indicators: child labor and school enrollment, household nutritional intake and expenditure on education, female labor force participation, and fertility. We chose the two countries because of data availability. Additionally, this case selection allowed us to examine a comparatively poorer Sub-Saharan African country (Uganda) alongside a relatively more advanced one (Ghana). Both countries have been politically stable, which minimizes the likelihood that major changes in the political environment would affect our results.

The study primarily analyzes the fifth and sixth rounds of the Ghana Living Standards Survey (GLSS-5 and GLSS-6) and the Uganda National Panel Survey (UNPS) for the periods 2009/2010, 2010/2011, and 2011/2012. Both datasets are nationally representative and are collected using the World Bank's Living Standards Measurement Survey framework, providing comprehensive information on the social and economic characteristics of individuals, households, and communities. This study aims to explore the effects of female education relative to male education, focusing on a general relationship rather than restricting the analysis to a specific period. In recent years, particularly after around 2010, the significance of education in enhancing female bargaining power has been increasingly discussed in policy circles, leading to potential interventions specifically targeting women through educational initiatives in the two countries. The use of non-recent data in this context may have advantages, as it reduces the likelihood of bias that could arise from more recent policies aimed at improving intra-household bargaining and welfare. However, we acknowledge that independent progress in female education and household welfare has also occurred, suggesting that analyzing a more recent survey might offer additional insights. Future research could therefore extend the time frame and incorporate more recent data to assess whether the relationships identified in this study truly hold over time.

Regarding the six welfare indicators, i.e., the dependent variables, (1) *child labor* was measured as a binary variable with outcomes zero and one. A child is assigned one if he had worked for pay, profit, family gain or produced anything for batter or family use; otherwise, zero is assigned. (2) *School enrollment* was measured for children between the ages of 6 and 15 years. A child within this age range is considered enrolled if she has ever attended school.

(3) The *fertility* of a woman was measured with the total number of births. (4) *Female labor force participation* a binary variable which takes one if she was engaged in any economic activity outside domestic chores and household farm work, and zero if otherwise. (5) *Household total expenditure on food* measures of household food consumption expenditure. Two different but closely related, variables are used to measure (6) *nutrition intake* for the two countries. For Ghana, we measure nutrient intake with dietary diversity and use household per capita caloric intake for Uganda. We measure the household per capita caloric intake as the total calories consumed by the household divided by the household size (Benson et al. 2008).

The years of schooling for the man and woman are derived from the individual's highest grade completed variable in the datasets. To obtain the bargaining power proxy, we select a sub-sample of households where there is a husband and at least one wife. When the outcome variable is measured at the household level and there are more wives in the household, we used the education of the wife with the highest level of education to construct our measure for bargaining power. The variable that measures education-induced bargaining power is then derived as a ratio of the woman's years of schooling to the sum of her years of schooling and that of the husband.

In the empirical analysis, we include relevant control variables including the child's age and gender, household size, measures of household wealth, a dummy for whether the household is engaged in farming, distance to the nearest school, an indicator variable for when both the man and woman have zero years of schooling. Descriptive statistics for these variables are presented in Table A3. We also take account of regional and time-fixed effects in all the analyzes.

Our baseline empirical model for each of the six welfare indicators uses the following reduced form model:

$$y_{ij} = \alpha + \gamma_1 Bargain_i + \gamma_2 Schoolingwoman_i + \gamma_3 Schoolingman_i + \mathbf{X}'_i \boldsymbol{\beta} + \epsilon_i \qquad (1)$$

where j = (child labor, child school enrollment, female labor force participation, fertility rate, food expenditure, nutrition intake). The three coefficients of interest are γ_1, γ_2, and γ_3. While γ_2 and γ_3 capture the effect of an increase in the level of education for women and men on household welfare (direct effect of education), γ_1 measures the bargaining effect (indirect effect through female empowerment). $\mathbf{X}$ and $\boldsymbol{\beta}$ contain the control variables their respective coefficients in the model, including region-fixed effects, and ϵ is the error term. We start by estimating the above equation using OLS and then IV estimates, utilizing a suitable instrument for education-induced female bargaining power.

4. Results

4.1. Baseline Results

The results of Equation (1) for school enrollment and child labor (child welfare) are presented in Table 1. Table 2 presents results for female labor participation and fertility (female welfare), and further results for household welfare are presented in Table 3. For every indicator, we present four specifications. Specification 1, in columns 1 and 5, shows the estimates of regressions with only the bargaining power measure as the main variable, and regional fixed effects as the only additional controls. In columns 2 and 6, only the levels of education of both the man and woman are entered. In specifications 3 and 7 we include both the levels and the bargaining power measure and finally, the full models with additional controls and fixed-effects are presented in columns 4 and 8. In Tables 1–3 we pool the various datasets from the various years for the respective countries[1]. Tables A2 and A4 and the Mean VIF of the models show that multicollinearity may not be a large problem to affect our findings.

In Panel A of Table 1, we observe that a woman's relative bargaining position has no significant effect on the child's probability of school enrollment once the years of schooling of the mother and father are controlled. The years of schooling of both parents, however, have positive and statistically significant effects on the child's school enrollment. These effects remain for Ghana but not Uganda if additional variables are controlled for. In Panel B, the effect of the mother's bargaining power on child labor also becomes insignificant

when additional controls are included in the models. In columns 4 and 8, we found that while a father's education matters in reducing child labour in Ghana, that of the mother is significant in Uganda. An additional year of education for the father is associated with about a 0.011 lower probability of child labor in Ghana, and the mother's education is associated with about a 0.006 lower probability of child labor in Uganda. We also do not find evidence of a significant effect from the woman's bargaining power when measured as the relative education of women in comparison to men.

Table 1. Women's bargaining power and child welfare in Ghana and Uganda.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ghana				**Uganda**			
	Panel A: Women's bargaining power and school enrollment (Marginal Effects)							
Woman's bargaining power	−0.043 ***		0.016	0.032	−0.038 **		−0.022	−0.002
	(0.009)		(0.018)	(0.021)	(0.015)		(0.024)	(0.028)
Woman's sch. yrs.		0.008 ***	0.007 ***	0.004 *		0.002 *	0.004 *	0.001
		(0.001)	(0.002)	(0.002)		(0.001)	(0.002)	(0.002)
Man's sch. yrs.		0.009 ***	0.010 ***	0.008 ***		0.008 ***	0.007 ***	0.002
		(0.001)	(0.001)	(0.001)		(0.001)	(0.002)	(0.002)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	12716	12716	12716	12716	7265	7265	7265	7265
McFadd. R^2	0.193	0.251	0.251	0.276	0.009	0.026	0.026	0.272
Man-Woman		0.001	0.003	0.004		0.006	0.003	0.002
		[0.456]	[0.263]	[0.164]		[0.003]	[0.405]	[0.647]
Mean VIF				2.310				1.810
	Panel B: Women's bargaining power and child labor (Marginal Effects)							
Woman's bargaining power	0.028 *		−0.062 **	−0.026	−0.059 ***		0.028	0.036
	(0.016)		(0.030)	(0.029)	(0.023)		(0.041)	(0.036)
Woman's sch. yrs.		−0.007 ***	−0.003	−0.001		−0.011 ***	−0.013 ***	−0.006 **
		(0.001)	(0.002)	(0.002)		(0.002)	(0.003)	(0.003)
Man's sch. yrs.		−0.011 ***	−0.014 ***	−0.011 ***		−0.003 *	−0.001	0.001
		(0.001)	(0.002)	(0.002)		(0.002)	(0.003)	(0.002)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	11779	11779	11779	11779	7410	7410	7410	7410
McFadd. R^2	0.063	0.085	0.085	0.177	0.006	0.012	0.012	0.221
Man-Woman		−0.004	−0.010	−0.010		0.008	0.012	0.007
		[0.029]	[0.004]	[0.002]		[0.005]	[0.038]	[0.165]
Mean VIF				2.120				1.760

Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Man-Woman is the difference between man's years of schooling and that of the woman. The control variables in Panel A are child's age and gender, household size, a dummy for whether the household is engaged in farming, distance to the nearest school (hours), an indicator variable for when both the man and woman have zero years of schooling, two dummies for whether the father or mother is engaged in any paid job, a measure of household wealth, number of children 17 years of age or younger, and a set of dummies for region-fixed effects, year, and urban residence. The control variables in Panel B are child's age and gender, a dummy for school attendance, household size, a dummy for whether the household is engaged in farming, whether the child leaves with the father, two dummies for whether the father or mother are engaged in any paid job, an indicator variable for when both the man and woman have zero years of schooling, a measure of household wealth, and a set of dummies for region-fixed effects, year, and urban residence.

Table 2 contains the effects of women's bargaining power on female labor force participation and fertility rates in Panels A and B. In Panel A, the coefficient for women's bargaining power is not statistically significant in all our specifications. However, we estimate statistically significant effects of the man and women's education on female labour force participation. Panel B although columns 1 and 5 indicate a negative relationship between women's bargaining power and fertility, this effect disappears when the levels of education are included. In the full specification, we find a positive effect of bargaining power on fertility. This is counter-intuitive, but a possible explanation is that childbirth in

itself can be a source of bargaining power in some cases (see Schultz (1990)). The results also indicate that the years of schooling for both men and women generally have a fertility-reducing effect. Moreover, in Panel B, the impact of the woman's education on fertility is consistently stronger than that of the man in all specifications. This finding suggests that a woman's educational attainment has a more pronounced influence on fertility decisions than that of her husband. However, this effect can be attributed to the direct influence of education rather than the indirect effect mediated through relative bargaining power.

Table 2. Women's bargaining power and female welfare in Ghana and Uganda.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Ghana				**Uganda**	
	Panel A: Women's bargaining power and female labor force participation (marginal effects)							
Woman's bargaining power	−0.135		0.124	0.001	0.361		−1.113	−1.030
	(0.217)		(0.441)	(0.438)	(0.422)		(0.892)	(0.798)
Woman's sch. yrs.		0.011 ***	0.012 ***	0.007 ***		0.003	−0.002	−0.009 *
		(0.001)	(0.002)	(0.002)		(0.003)	(0.005)	(0.005)
Man's sch. yrs.		0.007 ***	0.007 ***	0.005 **		0.012 ***	0.018 ***	0.013 **
		(0.001)	(0.003)	(0.003)		(0.003)	(0.006)	(0.006)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	9283	9283	9283	9283	1956	1956	1956	1956
McFadd. R^2	0.053	0.069	0.072	0.105	0.027	0.034	0.034	0.090
Man-Woman		0.004	0.005	0.001		−0.008	−0.020	−0.023
		[0.061]	[0.308]	[0.755]		[0.122]	[0.061]	[0.023]
Mean VIF				2.230				2.050
	Panel B: Women's bargaining power and fertility—Poisson (incident rate ratio)							
Woman's bargaining power	−1.653 ***		1.866 ***	1.601 ***	−3.350 ***		0.389	1.289 **
	(0.284)		(0.544)	(0.418)	(0.433)		(0.737)	(0.569)
Woman's sch. yrs.		−0.035 ***	−0.045 ***	−0.030 ***		−0.047 ***	−0.049 ***	−0.033 ***
		(0.002)	(0.003)	(0.003)		(0.003)	(0.006)	(0.004)
Man's sch. yrs.		−0.011 ***	−0.003	−0.006 **		−0.001	0.001	−0.001
		(0.002)	(0.003)	(0.002)		(0.003)	(0.005)	(0.004)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	9133	9133	9133	9133	3208	3208	3208	3208
McFadd. R^2	0.011	0.035	0.035	0.156	0.015	0.015	0.033	0.173
Man-Woman		0.023	0.042	0.024		0.045	0.050	0.032
		[0.000]	[0.000]	[0.000]		[0.000]	[0.000]	[0.000]
Mean VIF				2.670				2.570

Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Man-Woman is the difference between man's years of schooling and that of the woman. The control variables in the labor force model are age of the woman, a dummy for pregnant woman, the number of household members who are 17 years of age or younger, a dummy for a polygamous household, a dummy for farm households, a dummy for husband being in a paid job, a measure of household wealth, and a set of dummies for region-fixed effects, year, and urban residence. The control variables in the fertility model are age of the woman, a measure of household wealth, whether the woman or her husband have used contraceptive, a dummy for a polygamous household, an indicator variable for when both the man and woman have zero years of schooling, the square term, the age of the woman, the number of males and female in the household, whether the woman has used contraceptive before, and a set of dummies for region-fixed effects, year, and urban residence.

Table 3 presents the results for household food expenditure in Panel A and nutrition intake in Panel B. The impact of women's education-induced bargaining power is statistically significant only in specification (5) for food expenditure in Uganda. However, the years of schooling for both men and women exhibit significant effects across several specifications, albeit with varying signs depending on the country context. For instance, in the case of Ghana, the estimated coefficients for years of schooling are negative for household food expenditure, whereas in Uganda, they are positive. This divergence highlights the context-specific relationship between education and household spending patterns. Overall, the behaviour of the bargaining power variable is consistent with the patterns observed in

Tables 1 and 2. Regarding the impact of schooling for men and women, the estimates in both Panels of Table 3 further show that the effects of male and female education on food expenditure and nutrition intake are not significantly different from another.

In general, the findings in Tables 1–3 suggest that the education levels of both women and men are important predictors of the six welfare indicators. However, the potential influence of education-induced women's bargaining power on these indicators is neither systematically nor statistically significant once the absolute levels of education for both men and women are considered. This evidence points to a direct link between education and household welfare outcomes yet provides little support for an indirect effect operating through the bargaining power of the woman.

Table 3. Bargaining power and household nutrition in Ghana and Uganda.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Ghana				Uganda	
			Panel A: Women's bargaining power and food expenditure					
Woman's bargaining power	0.156		−0.581	−0.253	1.048 **		−0.582	−0.561
	(0.262)		(0.539)	(0.314)	(0.406)		(0.756)	(0.706)
Woman's sch. yrs.		0.018 ***	0.021 ***	−0.007 ***		0.036 ***	0.039 ***	0.023 ***
		(0.002)	(0.003)	(0.002)		(0.003)	(0.006)	(0.005)
Man sch. yrs.		0.016 ***	0.014 ***	−0.013 ***		0.031 ***	0.028 ***	0.009 *
		(0.001)	(0.003)	(0.002)		(0.003)	(0.005)	(0.004)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	10934	10934	10934	10934	4609	4609	4609	4609
R^2	0.517	0.537	0.537	0.839	0.098	0.185	0.185	0.330
Man-Woman		−0.001	−0.007	−0.006		−0.005	−0.011	−0.015
		[0.644]	[0.236]	[0.101]		[0.358]	[0.264]	[0.106]
Mean VIF				2.450				3.570
			Panel B: Women's bargaining power and household nutrition intake					
Woman's bargaining power	0.055		0.147	0.077	−0.795		−1.624	−0.463
	(0.046)		(0.095)	(0.091)	(0.477)		(0.894)	(0.885)
Woman's sch. yrs.		−0.001 ***	−0.002 **	−0.000		0.005	0.015 *	0.005
		(0.000)	(0.001)	(0.001)		(0.004)	(0.007)	(0.007)
Man sch. yrs.		−0.001 ***	−0.001	−0.000		0.015 ***	0.007	0.000
		(0.000)	(0.000)	(0.000)		(0.004)	(0.005)	(0.006)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	No	No	No	Yes	No	No	No	Yes
N	11098	11098	11098	11098	4063	4063	4063	4063
R^2	0.801	0.803	0.803	0.823	0.110	0.117	0.118	0.161
Man-Woman		−0.000	0.001	0.000		0.010	−0.008	−0.005
		[0.331]	[0.326]	[0.934]		[0.121]	[0.466]	[0.672]
Mean VIF				3.590				4.180

Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Man-Woman is the difference between man's years of schooling and that of the woman. The control variables in the labor force model are age of the woman, a dummy for a pregnant woman, the number of household members who are 17 years, a dummy for a polygamous household, a dummy for farm households, a dummy for husband in a paid work, a measure of household wealth, and a set of dummies for region-fixed effects, year, and urban residence. The control variables in the fertility model are age of the woman, a measure of household wealth, whether the woman or her husband used contraceptive, a dummy for a polygamous household, an indicator variable for when both the man and woman have zero years of schooling, the square term, age of the woman, number of males and female in the household, whether the woman has used contraceptive before, and a set of dummies for region-fixed effects, year, and urban residence.

4.2. Further Specification and Sensitivity Tests

4.2.1. Female Lineage and Bargaining Power

We conduct several specification and sensitivity tests to validate our baseline results. First, we draw on insights from the anthropology literature, which suggests that women from matrilineal societies tend to exhibit greater autonomy and empowerment compared

to their counterparts from patrilineal societies (Dyson and Moore 1983). Traditional inheritance systems are still practiced in some African countries, including Ghana (Kutsoati and Morck 2014). In general, among matrilineal tribes in Ghana, children trace their lineage through their mothers, meaning that a child is considered the "property of the woman". Conversely, in patrilineal societies, children are considered to "belong" to their fathers.

To further explore the role of lineage and inheritance systems in shaping household welfare, we analyze the variation between matrilineal and patrilineal societies in Ghana. Given the traditional norms, we expect women from matrilineal societies to have higher levels of autonomy and, consequently, a stronger influence on household welfare outcomes compared to women from patrilineal backgrounds (Dyson and Moore 1983; Harari 2019). Table 4 presents the results of the impact of female lineage on welfare outcomes in Ghana. Apart from household food expenditure, there is no statistically significant difference in welfare outcomes between matrilineal and patrilineal women.

The results in Table 4 are consistent with the findings in Tables 1–3, particularly regarding the limited role of women's bargaining power in influencing welfare outcomes compared to the direct effects of male and female educational attainment. This evidence suggests that lineage-based autonomy may not translate into substantial differences in welfare outcomes across different ethnic groups.[2]

Table 4. Female lineage and household welfare in Ghana.

	(1)	(2)	(3)	(4)	(5)	(6)
	Child Labour	School Enrollment	Fem. lab. Participation	No. of Children	Dietary Diversity	Log Food Expenditure
Woman from a matrilineal society	0.021	0.209	0.088	0.023	0.002	−0.034 ***
	(0.074)	(0.163)	(0.064)	(0.014)	(0.002)	(0.010)
Woman's sch. yrs.	−0.017 *	0.100 ***	0.023 ***	−0.022 ***	−0.000	−0.008 ***
	(0.008)	(0.019)	(0.007)	(0.001)	(0.000)	(0.001)
Man's sch.yrs.	−0.070 ***	0.106 ***	0.030 ***	−0.012 ***	−0.001 **	−0.011 ***
	(0.008)	(0.015)	(0.006)	(0.001)	(0.000)	(0.001)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	11,774	12,716	9283	9133	11,020	10,860
R^2	0.183	0.275	0.105	0.156	0.823	0.838

Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Woman from a matrilineal group is an indicator variable = 1 if the woman is from one the matrilineal ethnic groups in Ghana and 0 if otherwise. The same controls in Tables 1–3 are used in these estimations.

4.2.2. An Alternate Measure for Bargaining Power

Next, we investigate whether the non-significance of women's bargaining power could be attributed to non-linearity in the relationship. To address potential non-linearity, the the bargaining proxy is re-specified as a categorical variable with three categories: (i) the woman has fewer years of schooling than the man, (ii) the woman has more years of schooling than the man, and (iii) she has the same years of schooling as the man. In Table 5, we compare the welfare outcomes of households where the wife has more years of schooling than her husband to those where the wife has fewer years of schooling.

The results are broadly consistent with our earlier findings. Panel A of Table 5 provides evidence that in Ghana, women with more years of schooling than their husbands tend to have fewer children, lower household food expenditure, and their children are less likely to engage in child labor. However, for Uganda, as shown in Panel B, this alternative specification of bargaining power does not yield any significant effects on the welfare outcomes. Overall, we do not observe substantial differences between the results obtained using the categorical measure of bargaining power in Table 5 and those obtained using the continuous measure in Tables 1–3. This suggests that non-linearity in the bargaining power variable is unlikely to be the reason for the lack of significant associations with the dependent variables.

Table 5. Woman's bargaining power and household welfare—categories of bargaining power.

	(1)	(2)	(3)	(4)	(5)	(6)
	School Enrollment	Child Labour	Fem. lab. Participation	No. of Children	Dietary Diversity	Log Food Expenditure
			Panel A: Ghana			
Woman's sch.> Man's sch.	−0.005	−0.050 ***	−0.013	−0.057 **	0.003	−0.031 *
	(0.015)	(0.018)	(0.023)	(0.024)	(0.005)	(0.017)
Woman's sch. = Man's sch.	−0.019	0.008	−0.010	−0.062 ***	−0.001	−0.024 *
	(0.017)	(0.016)	(0.015)	(0.019)	(0.003)	(0.014)
Woman's sch. yrs.	0.007 ***	−0.001	0.006 ***	−0.017 ***	−0.000	−0.006 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.001)
Man's sch. yrs.	0.006 ***	−0.014 ***	0.006 ***	−0.016 ***	−0.001	−0.014 ***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.000)	(0.002)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	11940	12965	9282	9301	11095	11108
R^2	0.179	0.274	0.105	0.156	0.823	0.835
Man-Woman	−0.001	−0.013	−0.001	0.001	−0.000	−0.007
	[0.783]	[0.000]	[0.891]	[0.749]	[0.543]	[0.005]
			Panel B: Uganda			
Woman's sch.> Man's sch.	−0.019	0.003	−0.016	−0.023	0.051	0.035
	(0.013)	(0.019)	(0.039)	(0.033)	(0.043)	(0.034)
Woman's sch. = Man's sch.	−0.010	0.024	0.036	0.037	0.074 **	0.015
	(0.012)	(0.017)	(0.030)	(0.027)	(0.037)	(0.031)
Woman's sch. yrs.	0.002	−0.006 **	0.008 *	−0.038 ***	−0.003	0.017 ***
	(0.002)	(0.002)	(0.005)	(0.004)	(0.006)	(0.004)
Man's sch. yrs.	0.001	−0.002	−0.005	−0.010 **	0.007	0.014 ***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.005)	(0.004)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	7265	7397	1956	3209	4063	4609
R^2	0.272	0.219	0.090	0.122	0.161	0.330
Man-Woman	−0.002	0.004	−0.013	0.028	0.010	−0.002
	[0.624]	[0.346]	[0.122]	[0.000]	[0.324]	[0.747]

Note: Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Man-Woman is the difference between the man's years of schooling and that of the woman. The same controls in Tables 1–3 are used for these estimations.

4.2.3. Instrumental Variables Estimations

As an additional specification test, we address the potential endogeneity between the years of schooling and the outcome variables. Endogeneity may arise due to measurement errors in the schooling variable or omitted variables resulting from unobserved correlates. To mitigate this issue, we employ an IV. The identification strategy and implementation of IV require a valid instrument that satisfies two conditions: (i) the instrument must be correlated with our bargaining index, and (ii) it must satisfy the exclusion restriction, meaning it should not directly influence the outcome variables other than through its effect on the bargaining index.

Using data from the National Population Census of the respective countries, we calculate the average years of schooling for cohorts of individuals based on their region and year of birth. Each individual in our sample is then matched to the average years of schooling of their respective cohort in the census data. This average schooling variable serves as an instrument for the individual's years of schooling. We then construct an instrument for the bargaining index by dividing the average years of schooling of the woman by the sum of the averages for both the man and the woman from the population census. The rationale behind this instrument is that individuals born within the same year and region are likely to have similar educational attainment, making the average years of schooling a suitable predictor of individual education levels. At the same time, average education levels should not directly influence individual household welfare, except through

their effect on individual education. This type of instrument is inspired by previous studies (Breierova and Duflo 2004; Chou et al. 2010; Correa et al. 2016; Fisman and Svensson 2007; Winters and Winters 2014). Nonetheless, we cannot completely rule out direct or indirect influences of our instrument on the dependent variables. Therefore, we interpret the IV estimations as an additional robustness check and investigate whether our main results remain consistent.

　　　　Table 6 presents the results of the IV estimates. The findings indicate that the relative bargaining position and the level of education do not have a significant effect on the selected welfare indicators. However, diagnostic tests on the IV estimates reveal that the instruments are weak. Consequently, we exercise caution in interpreting the IV results in Table 6.

Table 6. Woman's bargaining power and household welfare—instrumental variable estimates (linear probabilities).

	(1)	(2)	(3)	(4)	(5)	(6)
	School Enrollment	Child Labour	Fem. lab. Participation	No. of Children	Dietary Diversity	Log Food Expenditure
Panel A: Ghana						
Woman's bargaining power	1.423	−1.001	1.301	−16.697	−1.401	−0.390
	(1.059)	(2.036)	(2.315)	(12.129)	(1.730)	(3.211)
Woman's sch. yrs.	−0.100	0.034	−0.049	0.965	0.092	0.026
	(0.066)	(0.130)	(0.136)	(0.719)	(0.103)	(0.189)
Man's sch. yrs.	0.107 *	−0.050	0.072	−1.161 *	−0.078	−0.060
	(0.063)	(0.127)	(0.127)	(0.698)	(0.094)	(0.161)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	12,366	11,528	9017	8872	10,792	10,634
Under ID. LM Statistic	10.104	3.413	3.337	3.857	1.040	1.434
	[0.001]	[0.065]	[0.068]	[0.050]	[0.308]	[0.231]
Weak ID. F statistic	3.364	1.137	1.108	1.283	0.345	0.476
Panel B: Uganda						
Woman's bargaining power	12.420	4.357	−61.749	−21.675	6.209	−0.561
	(12.356)	(3.528)	(482.330)	(19.989)	(4.173)	(2.120)
Woman's sch. yrs.	−0.988	−0.339	4.946	0.724	−0.486	0.065
	(0.978)	(0.286)	(38.540)	(1.544)	(0.299)	(0.151)
Man's sch. yrs.	0.837	0.291	−4.432	−1.420	0.460 *	−0.011
	(0.798)	(0.229)	(34.427)	(1.423)	(0.276)	(0.143)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed dummies	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	5507	5539	1350	2220	3011	3255
Under ID. LM Statistic	1.108	1.913	0.016	1.733	3.858	3.654
	[0.293]	[0.167]	[0.898]	[0.188]	[0.050]	[0.056]
Weak ID. F statistic	0.364	0.629	0.005	0.557	1.253	1.190

Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The same controls in Tables 1–3 are used for these estimations.

4.2.4. Bias from Unobservables

　　　　As a final sensitivity test, we explore potential bias from unobservables (Oster 2019). This test relies on the movement of the coefficient to conclude on the possible bias that may arise due to the omission of unobservables. By successively including control variables with explanatory power in a model, the R^2 of the model is expected to increase; however, if the increase in R^2 leaves the coefficient mostly unchanged, then it can be concluded that the inclusion of the unobservables will most likely not significantly change the coefficient (Oster 2019).[3]. The coefficient of education-induced bargaining power generally becomes statistically insignificant when additional control variables are included in the model. Therefore, we apply a variant of the method to test the influence of unobservable factors. By examining the so-called delta (*δ*) bound, we can assess how influential the

unobserved variables would need to be, relative to the observed variables, to reduce the estimated coefficient to zero. A higher δ value indicates that unobservable factors must be considerably larger relative to the observable ones to render the estimated coefficient insignificant. Consequently, a larger δ is indicative of a robust coefficient, as it suggests that the most relevant controls have already been incorporated into the model. Following the methodology proposed by Oster (2019), the δ associated with a coefficient of zero is calculated using the following formula:

$$\delta = \frac{\widetilde{\beta}(\widetilde{R^2} - \dot{R}^2)}{(\widetilde{\beta} - \dot{\beta})(R_{max}^2 - \widetilde{R^2})}$$

where $\widetilde{\beta}$ is the coefficient from the full model, $\dot{\beta}$ the coefficient from the parsimonious model, and $\widetilde{R^2}$ and R_{max}^2 are the R^2 from the full model and the maximum obtainable R^2 if all possible control variables were to be included. $\dot{R}^2$ is the R^2 from the parsimonious model whilst δ is the coefficient of proportionality. It must be noted that since the test is appropriate for only linear models, linear probability models were run for cases where the dependent variables are dichotomous.

Panels A and B of Table 7 present the estimates for Ghana and Uganda, respectively. The results indicate that, in most cases, the unobservables would need to have minimal influence to reduce the coefficient of the bargaining measure to zero (as reflected by the small δ values, which are below unity). In some cases, the inclusion of additional observable variables already overturns the results obtained without considering unobservables, leading to negative δ values. This suggests a lack of robustness for any education-induced bargaining effect. Overall, the results in Table 7 support the interpretation that female bargaining power, as captured by the education-induced measure, has no significant effect on the various indicators of household welfare analyzed in this study.

Table 7. Proportional selection test (delta bounding).

	(1) Child Labour	(2) School Enrollment	(3) Fem. lab. Participation	(4) No. of Children	(5) Dietary Diversity/ Caloric Intake	(6) Log Food Expend.
			Ghana			
$\dot{R}^2$	0.070	0.096	0.111	0.123	0.028	0.313
$\widetilde{R^2}$	0.170	0.174	0.142	0.490	0.823	0.839
$\dot{\beta}$	−0.055	−0.024	0.010	0.129	0.018	−0.389
$\widetilde{\beta}$	−0.028	0.043	0.003	0.468	0.008	−0.025
δ	0.132	−0.044	0.017	−0.879	3.305	0.228
			Uganda			
$\dot{R}^2$	0.056	0.097	0.068	0.123	0.020	0.311
$\widetilde{R^2}$	0.235	0.144	0.118	0.402	0.161	0.330
$\dot{\beta}$	−0.023	−0.029	0.047	0.129	−1.543	−0.413
$\widetilde{\beta}$	0.031	0.017	−0.109	0.091	−0.463	−0.056
δ	−0.148	−0.020	−0.023	1.360	0.111	0.006

5. Discussion

Our findings contribute to the extensive body of literature examining the link between education, women's empowerment, and household welfare in developing contexts (see, for example, Davis 2024; Doepke et al. 2012; Duflo 2012). The results presented in Tables 1–3 and the additional tests indicate that the education levels of both women and men are usually significant predictors of the six welfare indicators analyzed in this study. Thus, our results support the relatively broad consensus that both male and female education levels are crucial determinants of household welfare outcomes. However, we find limited evidence for the indirect effects of education through women's bargaining power measured as the relative education of women in comparison to men. This outcome contrasts with the

view that female empowerment could improve welfare outcomes at the individual level (see, for example, Ahmed and Hyndman-Rizk 2020; Mukhopadhyay 2023). One possible explanation for this discrepancy is the socio-economic and cultural context of Ghana and Uganda, which may affect how bargaining power operates within households. Alternatively, our findings might suggest that the general levels of female and male education are of primary importance, with intra-household bargaining power playing a relatively minor role in influencing household welfare.

Indeed, the evidence indicates a direct link between education and household welfare outcomes, providing little support for an indirect effect through enhanced bargaining power of women. In many cases, we also observe that the effect of the woman's education is not significantly different from that of the man. Thus, from a positive perspective, our findings confirm the traditional view on the importance of education. However, the welfare-enhancing impact of education does not appear to extend beyond its direct effects. Consequently, while education remains a crucial determinant of household welfare, its influence may not necessarily translate into greater bargaining power for women within the household.

From a theoretical standpoint, the non-significance of bargaining power, as measured by the relative education of women, suggests that the direct effects of education on welfare outcomes may overshadow its indirect effects through empowerment (see, for example, Chiappori 1997). This finding is relevant to current policy debates on whether interventions should prioritize educational attainment alone or consider a broader set of socio-economic measures to enhance women's empowerment and welfare outcomes.

Although our analysis focuses on Ghana and Uganda, two distinct countries in Sub-Saharan Africa, the results may still be context-specific. External factors such as climate conditions (see, for example, Meierrieks and Stadelmann 2024) could influence economic opportunities, with women being potentially particularly vulnerable to adverse climatic shocks. Similarly, rising price levels can disproportionately impact households in developing countries (Frempong and Stadelmann 2019), potentially undermining the positive welfare effects of education.

6. Conclusions

This study investigates the role of education in women's empowerment and its impact on household welfare by employing both OLS regressions and IV regressions to account for potential endogeneity. Using data from Ghana and Uganda, we provide a comparative analysis of how male and female education levels influence various household welfare indicators, including child labor, school enrollment, female labor force participation, fertility rates, household food expenditure, and nutrition intake.

The findings support the view in the literature that both male and female education levels contribute to household welfare. However, we do not find strong evidence that the relative bargaining power of women, as proxied by educational differences with their husbands, provides additional welfare effects beyond the direct impact of education. This suggests that while education is a critical tool for improving household welfare, its impact does not necessarily operate through increased bargaining power within the household. These results are robust across different model specifications and hold for various alternative measures of empowerment and cultural controls.

A relevant limitation of our study is the reliance on cross-sectional data, which restricts our ability to fully capture the dynamic aspects of bargaining power and its long-term effects. Moreover, we classify the results as exploratory evidence regarding the potential of education-induced bargaining power. While we account for various control variables, some of our estimates tend to be statistically insignificant, and adding additional controls can affect the stability of the estimated coefficients. In other words, as with most observational studies, causal claims must be made cautiously based on the results of our investigation. Furthermore, the findings may not fully account for unobserved factors such as local labor market conditions and shifts in gender norms over time. In particular, we did

not investigate recent education initiatives specifically targeting women to increase their bargaining power. Future research could therefore extend the time frame, incorporate more recent data, and analyze these recent initiatives in greater detail to determine whether the relationships identified in this study hold over longer time horizons. This might be particularly relevant given events such as the recent pandemic, which may have had its own impact on the relative bargaining power of women.

Our results offer practical policy insights. Both male and female education potentially play a crucial role in improving household welfare in developing countries. While promoting female education is important, our findings suggest that a relative increase in female educational attainment compared to male education does not automatically guarantee enhanced bargaining power or potential other associated benefits. From a policy perspective, our results advocate for continued investment in education for both men and women, given its positive correlation with improved welfare outcomes. However, our analysis indicates that education-focused empowerment policies may need to be complemented by labor market opportunities and legal rights to further strengthen women's bargaining power.

Appendix A. Panel Models for Uganda

Table A1. Random and fixed-effect models for Uganda.

	(1)	(2)	(3)	(4)	(5)	(6)
	Child Labour	**School Enrollment**	**Fem. lab. Participation**	**No. of Children**	**Dietary Diversity**	**Log Food Expenditure**
			Panel A: Random Effects			
Woman's bargaining power	0.346	−0.413	0.114	−0.630	−0.107	−0.061
	(0.282)	(0.617)	(0.074)	(0.544)	(0.990)	(0.071)
Woman's sch. yrs.	−0.061 **	0.056	−0.029 ***	0.130 **	0.004	0.023 ***
	(0.024)	(0.055)	(0.006)	(0.041)	(0.008)	(0.006)
Man's sch. yrs.	−0.000	0.047	0.000	−0.072 *	0.008	0.008
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	7441	7265	3208	3194	4063	4609
			Panel B: Fixed Effects			
Woman's bargaining power	−0.017	−3.181 *	0.125	0.047	−1.031	−0.077
	(0.557)	(1.282)	(1.086)	(0.137)	(1.821)	(0.115)
Woman's sch. yrs.	0.031	0.265	0.182	0.001	0.012	0.014
	(0.055)	(0.163)	(0.115)	(0.014)	(0.016)	(0.010)
Man's sch. yrs.	0.057	−0.149	−0.010	0.001	−0.002	0.007
	(0.052)	(0.139)	(0.080)	(0.011)	(0.014)	(0.009)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	2417	718	919	2718	4063	4609

Note: Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The same controls in Tables 1–3 are used in these estimations.

Table A2. Women's bargaining power and household welfare using average schooling of the man and woman.

	School Enrollment	Child Labour	Fem. lab. Participation	No. of Children	Dietary Diversity	Log Food Expenditure
			Panel A: Ghana			
Woman's bargaining power	0.007	0.050 ***	−0.012	−0.036 *	0.008 *	0.021
	(0.011)	(0.014)	(0.021)	(0.021)	(0.005)	(0.015)
Average schooling	0.013 ***	−0.014 ***	0.012 ***	−0.033 ***	−0.001 ***	−0.020 ***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	12,716	11,774	9283	9133	11,095	10,934
			Panel B: Uganda			
Woman's bargaining power	−0.013	−0.007	0.053	−0.183 ***	−0.014	0.038
	(0.014)	(0.020)	(0.041)	(0.037)	(0.048)	(0.038)
Average schooling	0.003 **	−0.007 ***	0.002	−0.044 ***	0.005	0.030 ***
	(0.001)	(0.002)	(0.004)	(0.003)	(0.005)	(0.003)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	7265	7397	1956	3209	4063	4609

Note: Note: Standard errors are in parenthesis. *p*-values of test statistics are in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Average schooling = average years of schooling for the man and woman. The same controls in Tables 1–3 are used in these estimations.

Table A3. Summary statistics of the main variables.

	Ghana			Uganda		
Variable Definition	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Bargaining power	10,934	0.406	0.236	4609	0.399	0.248
Years of schooling of the man	10,934	6.888	5.386	4609	6.204	3.774
Years of schooling of the woman	10,934	4.737	4.806	4609	4.515	3.645
Both woman and man have no schooling	10,934	0.244	0.430	4609	0.066	0.248
Household size	10,934	5.220	2.278	4609	7.567	3.224
Number of children between 6 and 17 years	10,934	1.624	1.522	4609	2.599	1.893
Number of males in household	10,934	2.654	1.483	4609	3.773	2.024
Number of females in household	10,934	2.566	1.439	4609	3.794	1.996
Age of household head	10,934	45.14	14.13	4609	44.88	13.93
Polygamous households	10,934	0.021	0.144	4609	0.032	0.176
Urban residence	10,934	0.462	0.499	4609	0.189	0.392
Woman does paid work	10,934	0.487	0.500	4609	0.284	0.451
Man does paid work	10,934	0.732	0.443	4609	0.517	0.500
Hours from household to nearest school	8101	0.625	1.766	3547	37.03	27.19

Table A4. Correlation of the three independent variables in the different models for Ghana and Uganda.

Model	Ghana			Uganda		
	Man–Woman	**Man–Bargain**	**Woman–Bargain**	**Man–Woman**	**Man–Bargain**	**Woman–Bargain**
School enrollment	0.617	−0.385	0.382	0.472	−0.298	0.679
Child labour	0.614	−0.384	0.385	0.632	−0.309	0.566
Fem. lab. part.	0.637	−0.333	0.413	0.463	−0.309	0.566
Female fertility	0.635	−0.337	0.412	0.441	−0.353	0.554
Dietary diversity	0.633	−0.350	0.409	0.489	−0.286	0.563
Food expenditure	0.626	−0.343	0.408	0.559	−0.289	0.490

Man–Woman = correlation between the years of schooling of the man and the woman. Man–Bargain = correlation between years of schooling of the man and the bargaining index. Woman–Bargain = correlation between years of schooling of the woman and the bargaining index.

Notes

[1]   The Ghana Living Standards Survey consists of repeated cross-sections. The Uganda National Panel Survey allows us to present panel estimates with fixed-effects which we present in Table A1 in Appendix A.

[2]   Our findings on fertility are partially consistent with Harbison et al. (1989), who argue that the considerable autonomy enjoyed by Garo women of Bangladesh has a limited impact on fertility decisions among women of that tribe.

[3]   Arnold et al. (2015) and Birthal et al. (2015) provide applications.

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