Mothers' Non-Farm Entrepreneurship and Child Secondary Education in Rural Ghana

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Abstract

While an important share of the rural population in Sub-Saharan Africa owns a non-farm enterprise (NFE), it is unclear how these businesses, especially among female owners, contribute to rural development. This study investigates the missing link between rural NFEs and children's education in developing countries. Using nationally representative data for Ghana and instrumental variable regressions that pass weak and overidentification restrictions, we estimate the impact of mothers' non-farm entrepreneurship on the propensity of child secondary school enrollment. We find a strong significant positive effect of 10.6% points, corresponding to a relative increase of more than 25%. We find a positive effect on Junior High School enrollment but not on Senior High School enrollment, which relates to lower expenses and a better spread in payment for Junior High School education. The school-improving effect of mothers' non-farm entrepreneurship is equally strong for boys and girls and for high- and low-educated mothers, and stronger for poorer households. While most of NFEs are small-scale and informal, our results show that even these businesses result in increased investments in child schooling and directly contribute to development. The results imply that NFEs entail the potential to stimulate child schooling among children of low-educated and poor mothers and thereby reduce inequality in rural education.

Key Words: non-farm enterprise, employment, schooling, rural development, Ghana

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1 Introduction

While agriculture still dominates the economy in rural Sub-Saharan Africa (SSA), an important share of households diversifies their income through non-farm enterprises (NFEs) (Nagler & Naudé, 2017). Review papers on household income-generating activities confirm the critical and growing role of rural NFEs in income growth and poverty reduction (Davis, Di Giuseppe, & Zezza, 2017; Haggblade, Hazell, & Reardon, 2010). Other studies highlight the positive effects on food security (Ali & Peerlings, 2012; Owusu, Abdulai, & Abdul-Rahman, 2011; Tsiboe, Zereyesus, & Osei, 2016) and investment linkages with the agricultural sector (Adjognon, Liverpool-Tasie, & Reardon, 2017). However, NFEs in rural SSA are also characterized by low survival and productivity rates, especially among female owners (Rijkers and Costa, 2012; Nix et al., 2015). Due to a lack of empirical evidence it is unclear whether female-owned NFEs can contribute to rural development in SSA.

We address this gap in the literature by investigating how mothers' non-farm entrepreneurship influences child secondary education. Theoretically this impact occurs through three channels: 1) a positive income effect, 2) a negative labour substitution effect, and 3) a bargaining effect of which the sign is *a priori* not clear (Maertens & Verhofstadt, 2013). If mothers' non-farm entrepreneurship increases household income, then child's education will improve. On the other hand, mothers' non-farm entrepreneurship may lead to substitution of child labour for female labour in the farm-household and thereby reduce child schooling. Additionally, if non-farm entrepreneurship increases women's intra-household bargaining power and women have a higher preference for child education than men, mothers' non-farm entrepreneurship improves child education. The overall effect of mothers' non-farm entrepreneurship on child education cannot be theoretically derived and needs to be tested empirically.

The scarce existing literature on female non-farm employment and child schooling in developing countries finds indeed opposite effects. Some studies find a positive link (Afridi, Mukhopadhyay, & Sahoo, 2013; Luke & Munshi, 2011; Maertens & Verhofstadt, 2013) while others find that an increase in women's labour market opportunities is associated with a decrease in child schooling, especially for girls

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(Lokshin, Glinskaya, & Garcia, 2000; Skoufias, 1993). There are some limitations to these studies. First, they focus on particular and confined case-studies where employment opportunities for women suddenly increased, e.g. due to an export boom or government employment schemes. Drawing general conclusions from these studies could lead to an overestimation of the importance of non-farm employment in more remote areas. Second, they only consider non-farm wage employment and most analyse the impact on primary schooling or on primary and secondary schooling combined. Effects might be different for non-farm self-employment and for secondary schooling. First, the income effect might differ for primary and secondary schooling due to a higher cost and a lump-sum payment structure of secondary education. In addition, earnings from NFEs might be higher or lower and less or more smooth throughout the year compared to earnings from non-farm wage employment, which may lead to different income effects. Second, the substitution effect will likely be larger for secondary schooling since adolescents are more likely to replace their mothers on the farm or in the household than younger primary school-aged children. Third, the bargaining effect can be different as NFEs and wage employment may empower women differently. If NFEs take place inside the farm-household and do not result in broader social contact, the bargaining effect might be lower (Anderson & Eswaran, 2009). In addition, gendered differences in preferences for child schooling might be less or more pronounced for secondary education.

In this paper we empirically analyse the impact of mothers' non-farm entrepreneurship on child secondary school enrollment in rural Ghana. We use nationally representative quantitative data from the sixth round of the Ghana Living Standard Survey (GLSS) and qualitative data from focus group discussions throughout rural Ghana. We apply instrumental variable estimation techniques with instruments that pass weak and overidentification tests. We test interaction effects between mothers' non-farm entrepreneurship and other important determinants of child schooling. We use qualitative data to support our quantitative findings.

Ghana is a relevant country to study the impact of NFEs on secondary school enrollment for two reasons. First, the importance of NFEs as an income-generating activity has increased in the past decades and the sector is mainly dominated by women (Ackah, 2013; International Monetary Fund, 2012; Lambrecht, Schuster, Asare, & Pelleriaux, 2017). Ghana's Poverty Reduction Strategy Paper for 2010-2013 sets out various strategies to improve the performance of micro, small and medium enterprises

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run by women, as they are regarded to be crucial for Ghana's growth, employment generation and poverty reduction (International Monetary Fund, 2012). Second, the adjusted net enrollment rate in primary school is 89%, while the net enrollment rate in secondary school is only 51% (2014 figures)[1] (UNESCO Institute for Statistics, 2017a, 2017b). While secondary education has received less attention than primary education in the 2000-2015 development agenda (e.g. the Millennium Development Goals focus only on primary education), it is high on the international policy agenda for 2015-2030 with a specific target on universal lower secondary education in the Sustainable Development Goals. Given the progress in universal primary education in the last decades, improvements in secondary education have become more important for poverty reduction, health behaviour, fertility rates, gender equality, technology adoption and civic awareness (Duflo, Dupas, & Kremer, 2012, 2017).

The structure of the paper is the following. In section 2 the data collection and sample construction are explained. In section 3 we describe NFEs and the educational landscape in rural Ghana. Section 4 contains the econometric analysis and section 5 a discussion of the econometric results. In section 6, we summarize our findings and set out policy and research implications.

2   Data

We use quantitative data to analyse the impact of mothers' non-farm entrepreneurship on child secondary education and qualitative data to support the findings from the quantitative analysis. We use nationally representative quantitative data from the sixth round of the Ghana Living Standard Survey (GLSS6), which was conducted by the Ghana Statistical Service (GSS) in 2012–2013 (GSS, 2014). GLSS6 relies on a two-stage stratified sampling design with the ten administrative regions divided into rural and urban regions as strata. In the first stage, 1,200 enumeration areas (EAs) were selected as primary sampling units (PSUs). More EAs were selected in regions with smaller populations (e.g. Upper West and Upper East Ghana). In the second stage, 15 households were randomly selected in each EA, resulting in a sample of 18,000

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[1] Adjusted net enrollment rate in primary school is the number of children of primary school-age enrolled in primary or secondary school expressed in percentage of the total population of that age cohort. Net enrollment rate in secondary school is the total number of students of the theoretical age group for secondary school expressed as a percentage of the total population in that age cohort. For Ghana this encompasses the percentage of 12-17 year olds that are enrolled in secondary school (UNESCO Institute for Statistics, 2017a, 2017b).

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households. We adjust for the sampling procedure and response rate by applying sampling weights.

GLSS6 uses a quantitative, structured household questionnaire with individual-level modules on demographic characteristics, education and employment (including NFEs), and household-level modules on living standards, assets, income sources (including agricultural production), expenditures, and access to savings and credit. From a community survey accompanying the household survey, community-level data is available on infrastructure and institutions for each enumeration area.

To complement the quantitative survey data, we collected qualitative data through focus group discussions (FGDs) in rural communities throughout Ghana. We organised gender-separated FGDs with 28 groups of eight to fourteen participants in four different regions in Ghana (Eastern Region, Central Region, Ashanti Region and Northern Region). The FGD covered two main topics. First, we asked about prevalence of NFEs in the community, motivations and constraints to start NFEs, profitability of NFEs and how revenues are spent, and the influence of NFEs on intra-household bargaining power. Next, we asked about preferences for child education, constraints to secondary school enrollment and child labour. If it was not mentioned by participants, we explicitly asked about the influence of mothers' NFEs on children's secondary education.

In our analysis we focus on rural households and only use survey data from the rural strata in GLSS6. The analysis is partially a household level analysis and partially an analysis at the individual child level. For the latter, we use three different samples depending on the level of secondary education. We only consider children whose mother is present in the household and exclude boys and girls who already have children. To focus on secondary schooling in general, the first sample includes all children aged 12-21 who did not finish secondary school. The lower cut-off age of 12 corresponds to the official age of entry into secondary education. Analogous to Pickbourn (2015), we choose 21 as the upper cut-off age because it is common in rural Ghana to still find 21-year-olds in secondary school; this is four years above the official graduation age. We drop children who have completed secondary school from the sample in order to avoid confounding drop-out and graduation. To focus on junior high school (JHS) enrollment (corresponding to lower secondary education), we restrict the sample to children aged 12-18. Similar to the first sample we extend the official graduation age with four years and drop those who have completed JHS. In the same

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logic and to focus on senior high school (SHS) enrollment (corresponding to higher secondary education) we restrict the sample to children aged 15-21, excluding those who have already completed SHS. The respective samples consist of 6,161 children aged 12-21; 4,608 children aged 12-18; and 3,674 children aged 15-21.

3 Descriptive results

3.1 Non-farm enterprises in rural Ghana

Non-farm entrepreneurship is common in rural Ghana, particularly among women; 36.8% of rural households run an NFE of which 69.1% are operated by women (GSS, 2014)[2]. Most NFEs operate on a micro or small scale, mainly in the informal economy in different sectors (services, trading, manufacturing and agro-processing). According to the FGDs, there are typical female NFEs (e.g. retail, food vending, selling second hand clothes, selling pure water), typical male NFEs (e.g. corn milling, taxi driver, mechanic, brick making, palm wine tapper or distiller) and NFEs that can be done by both (e.g. oil palm processing, processing cassava, running a cold store or provision shop). Most people who run an NFE combine this with farming.

The most common motives to start an NFE raised during the FGDs are smoothing of household consumption during the low-productive agricultural season, and supplementing household income in case farm income is insufficient to cover expenditures in general and school-related expenses in particular. Multiple studies indeed show that non-farm income significantly increases income and improves food security of rural households in Ghana (Ackah, 2013; Owusu et al., 2011; Tsiboe et al., 2016; Zereyesus, Embaye, Tsiboe, & Amanor-Boadu, 2017). Table 1 compares households in rural Ghana with and without a female HH member that owns an NFE. These statistics show that for households where at least one female member runs an NFE, the total household income per capita and the educational expenses for basic education are significantly higher.

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[2] Non-farm wage employment, on the other hand, is far less common in rural areas; 12.9% of men and only 4.5% of women are wage employed (GSS, 2014).

Table 1 Average household income, wealth, size and educational expenses in rural Ghana across female non-farm entrepreneurship. *Source: own calculations from GLSS6 data.*

	HH without female NFE	HH with female NFE	
Total HH income (GHC/year)	6684.83	8177.67	***
Total HH income per capita (GHC/year.capita)	1277.21	1712.04	***
HH Asset Index	1.68	2.08	***
Size land (acres)	6.23	4.80	***
Number of Children (up to 17 years)	2.81	2.74	
Number of Adults	3.07	2.73	***
Educational expenses for basic education (primary school and JHS)	305.93	404.70	***
Educational expenses for higher secondary education	205.51	205.09	

NFE: Non-farm enterprise. The household asset index is constructed using a principal component analysis and includes information on the type of house, the material of the floor, wall and roof, and ownership of furniture, vehicles and electronic devices. All statistics are nationally representative. Comparisons are made between households with and without a female member owning NFE using a two-sided *t*-test. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Exchange rate: US \$1 = 1.91 GHC in 2012.

Women who are responsible for child welfare (usually the spouse of the household head) are more likely to start an NFE than younger or older women (Ackah, 2013). Furthermore, educational level, access to credit and electricity, and distance to the nearest market are important determinants of NFE ownership in rural Ghana (Newman & Canagarajah, 2000; Senadza, 2012).

In the FGDs it was often stated that women need permission from their husband before they can start up an NFE. In some cases men do not want their wife to run an NFE because she will earn more money and will not respect her husband anymore. Yet, in most cases men allow their wives to start an NFE because the household simply needs the extra income. Regarding the decision of starting an NFE, one woman in Bosome Freho, Ashanti region said: *"It is the women's own choice to start the NFE. They start it because you need extra money to provide for the household, the chop money from the husband is not enough. Men are not able to cater for all household expenses alone. They cannot stop their wives from running an NFE because they would then need to provide for everything themselves".*

3.2 Secondary education in Ghana

The educational system in Ghana comprises six years of primary education (official entrance age at 6 years), three years of lower secondary education in a Junior High School (JHS) (starting at 12), three years of higher secondary education in a Senior

High School (SHS) (starting at 15) and a minimum of four years of tertiary education (GSS, 2014; UNESCO, 2016)[3]. From GLSS6 data we reveal that during the academic year 2012/2013, 38.3% of children aged 12-21 in rural Ghana were enrolled in secondary school (Table 2). JHS enrollment rate among children aged 12-18 is 33.5% while SHS enrollment rate among children aged 15-21 is only 17%. Girls (36.9%) are more likely to be enrolled than boys (30.8%) in JHS but this difference almost disappears for SHS enrollment (17.3% compared to 16.7%). Among the 21 year olds in rural Ghana 59.9% obtained a JHS degree and 18.6% a SHS degree.

These enrollment rates are far below the target that was set by the Free Compulsory Universal Basic Education (FCUBE) programme in 1995, which aimed at improving basic education (including primary and junior secondary education) by providing among others free tuition and better infrastructure (Akyeampong, 2009). However, education in Ghana is still not free nor universal. Parents still need to pay for uniforms, transportation, lunches and in some cases indirect levies introduced by the school to replace the abolished tuition fees (Krauss, 2013; Osei, Owusu, Asem, & Afutu-Kotey, 2009). In rural Ghana, average school expenses are 127.7 Ghana Cedis (GHC) for primary school, 193.8 GHC for JHS and 463.1 GHC for SHS per year (calculated from GLSS6 data). Parents who do not send their children to school for the full duration of basic education, often do not face any action (Krauss, 2013).

While primary and JHS education is in theory open to everyone, SHS enrollment has been historically very selective in Ghana (Duflo et al., 2017). There are 700 SHSs in the country for which each year about 350,000 students graduating from more than 9,000 JHSs compete for admission. SHS candidates have to submit a ranked list of six SHS choices and take the Basic Education Certificate Exam (BECE). Only 60% of the BECE candidates successfully pass the examination (Ghana Education Service, 2014). A centralized application system then allocates students who pass the entrance exam to the different SHSs based on their test scores and ranking choices (Ajayi, 2013). Students' choice of school is based on cost and proximity (Ajayi, 2013) and children admitted to SHS might still drop out because of financial difficulties (Duflo et al., 2012).

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[3] Most Ghanaian children do not enroll at the appropriate age for their grade and late enrollment and repetition are common (Akyeampong, 2009).

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Table 2 compares secondary school enrollment rates between children whose mother has an NFE and children whose mother does not. Children of mothers who are non-farm entrepreneurs are more likely to be enrolled in school, whether for JHS (41.6% compared to 29.7%) or SHS (21.4% compared to 14.6%), and whether they are boys or girls. The differences can even amount up to 9.9% points for boys and 14.2% points for girls.

Table 2. Average secondary school enrollment rates for children in rural Ghana across mothers' non-farm entrepreneurship. *Source: own calculations from GLSS6 data.*

	All children	Children of mothers without NFE	Children of mothers with NFE	
JHS and SHS enrollment (aged 12-21)				
Total	38.29%	34.26%	46.17%	***
Boys	36.58%	33.15%	43.60%	***
Girls	40.47%	35.73%	49.24%	***
JHS enrollment (aged 12-18)				
Total	33.53%	29.66%	41.61%	***
Boys	30.78%	27.61%	37.55%	***
Girls	36.93%	32.23%	46.43%	***
SHS enrollment (aged 15-21)				
Total	16.95%	14.58%	21.43%	***
Boys	16.70%	14.20%	21.91%	***
Girls	17.28%	15.11%	20.88%	**

JHS: Junior High School; SHS: Senior High School; NFE: Non-farm enterprise. All statistics are nationally representative. Comparisons are made between children of mothers with and without NFE using a two-sided *t*-test. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

4   Econometric analysis

4.1   Model

We analyse the propensity of a child to be enrolled in secondary school using the following linear probability model (LPM)[4]:

$$P\big(Y_{ijk} = 1 \big| X_{ijk}\big) = \beta_0 + \beta_1 (NFE_m)_{ijk} + \beta_2 C_{ijk} + \beta_3 P_{ijk} + \beta_4 H_{jk} + \beta_5 M_k$$

for child i in household j in community k. We use three different specifications for the dependent variable (Y): 1) current enrollment in JHS or SHS for children aged 12-21; 2) current enrollment in JHS for children aged 12-18; and 3) current enrollment in SHS for children aged 15-21. The main variable of interest is mothers' non-farm

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[4] We use an LPM rather than a binary probit model. Both models lead to similar results, but an LPM is expected to be more consistent, since a logit or probit model is only consistent when the underlying model is exactly correct (Angrist, 2001). Moreover, an LPM is easier to interpret and allows for a comparison with IV estimation and the use of interaction effects with the endogenous variable.

entrepreneurship (NFE_m) with β_1 measuring the effect of mothers' NFE on the propensity of child school enrollment. We additionally control for child, parent, household and community characteristics, with control variables that are chosen based on the literature and insights from the FGDs on determinants of school enrollment. Child characteristics (C) include gender, age and its square, a dummy indicating if the child was ever married, number of siblings younger and older than five years and a birth order index. This index divides the child's birth order by the average birth order among all siblings and hence purges the family size effect from the birth order effect (Booth & Kee, 2009). Parental characteristics (P) include mothers' and father's age and education level. Because female and male NFE ownership is correlated, a dummy for the father's non-farm entrepreneurship is added as a control variable. As household characteristics (H), we include a household asset index, size of land owned by the household, a dummy for polygamous status of household, a dummy for being a female headed household, and ethnicity and religion dummies. The household asset index is constructed using a principal component analysis and represents the living conditions of a household (Filmer & Pritchett, 1999)(Filmer & Pritchett, 1999)(Filmer & Pritchett, 1999)(Filmer & Pritchett, 1999). It can be interpreted as a proxy for the wealth status of the household and includes information on the type of house, the material of the floor, wall and roof, and ownership of furniture, vehicles and electronic devices. As community characteristics (M) we include distance to motorable road, presence of primary school, presence of a JHS, distance to nearest SHS and region dummies. All the control variables are summarized in appendix (Table A 1).

We first estimate the model using an ordinary least squares (OLS) model. As this model does not control for potential unobserved heterogeneity in child, household or community characteristics that affect both mothers' non-farm entrepreneurship and child school enrollment, we additionally use an instrumental variable two-stage least squares (IV-2SLS) estimation to reduce this bias. We use a linear IV model because both the dependent and endogenous variable are binary (Chiburis, Das, & Lokshin, 2012). In the first stage the propensity of non-farm entrepreneurship is estimated using a set of instruments Z and the same set of control variables X as in the OLS model. These regression results are presented in the appendix (Table A 2). In the second stage the estimated $\widehat{NFE_m}$ is used as an instrumented covariate in the above equation. Because we use a linear IV model with a sample size below 10,000, we estimate the

confidence intervals through bootstrapping (Chiburis et al., 2012). To correct for weighting we use heteroscedasticity-robust standard errors in both the OLS and IV model[5] (Solon, Haider, & Wooldridge, 2015).

We include the following two instruments for NFE_m: 1) a dummy indicating whether the mother of the mother was engaged in agricultural ($z_1 = 1$) or non-agricultural work ($z_1 = 0$); and 2) the percentage of women in the community who own an NFE (z_2). The rationale behind the first instrument is a trans-generational influence on the likelihood to be an entrepreneur (Rijkers & Costa, 2012). Findings from the FGDs reveal that in rural Ghana this generational influence occurs from mother to daughter. The second instrument is related to the fact that clustering of NFEs in the same community leads to an increased likelihood of farm households to start their own NFE (Ali & Peerlings, 2012). The IVs are strongly correlated with mothers' non-farm entrepreneurship ($\rho_{z1} = -0.158^{***}$; $\rho_{z2} = 0.447^{***}$). Table A 2 reports various test statistics for the IV estimation. Both the Stock-Yogo test and underidentification test reject the weak IV hypothesis, indicating that the IVs are highly relevant. They have no partial effect on child school enrollment when included in the main regression, suggesting that the exclusion restriction holds. The Hansen J statistic of the overidentification test fails to reject the null hypothesis[6], which indicates that the IVs are plausibly exogenous.

To estimate heterogeneous effects among different subgroups of women with an NFE, we use a two-stage residual inclusion regression (IV-2SRI). Rather than including the estimated $\widehat{NFE_m}$ as covariate in the second state, the residual of the first stage regression, which captures unobserved heterogeneity in mothers' NFE ownership, is included. This technique allows for the inclusion of interaction terms with an endogenous variable, unlike the IV-2SLS approach (Terza, Basu, & Rathouz, 2008). We test interactions between NFE_m and gender of the child, education of the mother, number of younger siblings and household wealth.

Our method has a specific limitation. The data only allow to estimate the impact of current NFE ownership on current school enrollment (and not achieved educational degree or schooling efficiency). Since there is no recall data on non-farm entrepreneurship for women who currently do not own an NFE, it is not possible to

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[5] Similar results were obtained when standard errors were clustered at mother level.
[6] It is rejected at 10% significance level in the regression of JHS enrollment.

reconstruct a panel database in which we can link previous non-farm entrepreneurship to overall child education. If only NFEs that are successful at raising enrollment continue to exist, we will overestimate the impact of NFE on school enrollment. On the other hand, an underestimation of the positive impact will occur if the positive impact of NFE on enrollment persists for mothers that discontinue their NFE. The ultimate direction of bias (if any) is thus unclear.

4.2 Results

Table 3 shows the OLS and IV regression results for secondary school enrollment of children. The propensity to be enrolled in JHS or SHS is estimated for children aged 12-21, in JHS for children aged 12-18 and in SHS for children aged 15-21. The effect of mothers' non-farm entrepreneurship is significantly positive in the OLS and IV models for JHS and SHS combined enrollment, and JHS sole enrollment. For SHS enrollment the effect becomes insignificant in both OLS and IV models. The estimated coefficients in the IV models are twice as large as in the OLS models, indicating a downward bias when endogeneity of mothers' non-farm entrepreneurship is not taken into account. This underestimation is likely due to the fact that women whose husband cannot provide for their children's education are more likely to start an NFE. Other studies on the effect of mothers' employment on child schooling find a similar underestimation (Afridi et al., 2013; Maertens & Verhofstadt, 2013; Ural Marchand, Rees, & Riezman, 2013).

Table 3. IV and OLS regressions of the determinants of secondary school enrollment. *Source: own calculations from GLSS6 data.*

	Secondary school enrollment (12 -21 years)						JHS enrollment (12 - 18 years)						SHS enrollment (15 - 21 years)					
	OLS			IV			OLS			IV			OLS			IV		
	coefficient	se		coefficient	se		coefficient	se		coefficient	se		coefficient	se		coefficient	se	
Mothers' ownership of NFE	0.050	0.019	***	0.106	0.055	*	0.047	0.022	**	0.090	0.050	*	0.026	0.016		0.050	0.049	
Gender child: girl	0.042	0.016	***	0.041	0.015	***	0.064	0.019	***	0.064	0.019	***	0.017	0.015		0.016	0.015	
Age child	0.539	0.036	***	0.536	0.036	***	0.662	0.079	***	0.657	0.080	***	0.318	0.088	***	0.317	0.088	***
Age child squared	-0.015	0.001	***	-0.015	0.001	***	-0.019	0.003	***	-0.019	0.003	***	-0.007	0.003	***	-0.007	0.003	***
Never married	0.331	0.068	***	0.328	0.068	***	0.360	0.103	***	0.353	0.100	***	0.106	0.072		0.104	0.073	
Birth order index	-0.040	0.020	**	-0.039	0.020	**	-0.025	0.021		-0.025	0.021		-0.036	0.020	*	-0.035	0.020	*
# siblings under 5	-0.027	0.008	***	-0.026	0.008	***	-0.024	0.009	***	-0.024	0.009	***	-0.014	0.009		-0.013	0.009	
# siblings over 5	-0.012	0.007	*	-0.012	0.007	*	-0.017	0.006	***	-0.017	0.006	***	-0.011	0.008		-0.011	0.008	
Age mother	0.001	0.001		0.001	0.001		0.002	0.001		0.002	0.001		0.001	0.001		0.001	0.001	
Age father	-0.000	0.001		-0.000	0.001		0.000	0.001		0.000	0.001		-0.000	0.001		-0.000	0.001	
Primary degree mother	0.001	0.028		-0.005	0.029		-0.003	0.031		-0.006	0.032		0.029	0.033		0.026	0.033	
Secondary degree mother	0.064	0.021	***	0.060	0.021	***	0.063	0.024	***	0.060	0.024	**	0.068	0.031	**	0.066	0.031	**
Primary degree father	0.007	0.033		0.009	0.034		0.004	0.031		0.006	0.031		0.009	0.032		0.009	0.032	
Secondary degree father	0.065	0.021	***	0.066	0.022	***	0.055	0.025	**	0.055	0.025	**	0.056	0.021	***	0.057	0.021	***
Father's ownership of NFE	0.029	0.027		0.022	0.028		0.016	0.030		0.012	0.030		-0.007	0.028		-0.012	0.028	
Household asset index	0.034	0.011	***	0.031	0.012	**	0.041	0.010	***	0.038	0.011	***	0.044	0.009	***	0.043	0.009	***
Landholdings	0.001	0.001		0.001	0.001		0.001	0.001		0.001	0.001		-0.000	0.000		-0.000	0.000	
Polygamous household	-0.024	0.021		-0.024	0.022		-0.037	0.022	*	-0.037	0.022	*	-0.047	0.023	**	-0.047	0.023	**
Female household head	-0.027	0.022		-0.028	0.022		-0.005	0.023		-0.006	0.023		-0.030	0.019		-0.030	0.019	
Distance road	-0.004	0.002	*	-0.004	0.002		-0.004	0.003	*	-0.004	0.003		-0.002	0.002		-0.002	0.002	
Presence primary school	-0.022	0.022		-0.020	0.022		-0.023	0.023		-0.021	0.023		0.000	0.021		0.001	0.021	
Presence JHS	0.031	0.021		0.024	0.022		0.044	0.026	*	0.038	0.026		0.016	0.020		0.013	0.021	
Distance SHS	-0.002	0.001	**	-0.001	0.001	**	-0.002	0.001	***	-0.002	0.001	***	0.000	0.001		0.000	0.001	
Constant	-4.596	0.270	***	-4.586	0.270	***	-5.587	0.567	***	-5.548	0.570	***	-3.303	0.769	***	-3.307	0.766	***
N	6,161			6,161			4,608			4,608			3,674			3,674		
Wald chi^2	2,942			3,053			2,043			2,022			656			634		
Prob > chi^2	0.0000			0.0000			0.0000			0.0000			0.0000			0.0000		
R squared	0.2103			0.2076			0.2506			0.2490			0.1557			0.1548		

JHS: Junior High School; SHS: Senior High School; NFE: Non-farm enterprise. Bootstrapped standard errors (100 repetitions) between parentheses. All regressions control for sampling weights and include ethnicity, religion and region fixed effects. All variables are defined and summarized in Table A1. Significant effects: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 4 presents a summary of the interaction effects between mothers' non-farm entrepreneurship and gender of the child, education (primary or secondary) of the mother and household wealth based on the IV models for JHS enrollment[9]. The effect of mothers' non-farm entrepreneurship remains robust across the four models and positively influences JHS enrollment. Being a girl, having an educated mother and living in a wealthier household increase the likelihood for a child to be enrolled in JHS. The interaction effects for child's gender and mothers' education are not significant, while the interactions with household wealth and number of siblings younger than 5 years old are significantly negative.

Table 4. Interaction effects of mothers' non-farm entrepreneurship with gender of child, education level of mother and household's assets for JHS enrollment. *Source: own calculations from GLSS6 data.*

	Model 1		Model 2		Model 3		Model 4	
Mothers' NFE	0.099	*	0.102	**	0.140	**	0.123	**
	(0.052)		(0.052)		(0.055)		(0.051)	
Gender child: girl	0.069	***	0.064	***	0.065	***	0.064	***
	(0.026)		(0.02)		(0.02)		(0.020)	
Primary or secondary degree mother	0.033	*	0.046	*	0.033	*	0.032	
	(0.024)		(0.025)		(0.024)		(0.020)	
Household asset index	0.04	***	0.04	***	0.056	***	0.039	***
	(0.01)		(0.01)		(0.013)		(0.010)	
# Siblings younger than 5	-0.025	***	-0.025	***	-0.025	***	-0.016	
	(0.009)		(0.009)		(0.009)		(0.011)	
NFE * girl	-0.014							
	(0.039)							
NFE * education mother			-0.034					
			(0.042)					
NFE * assets					-0.032	**		
					(0.016)			
NFE * young siblings							-0.029	*
							(0.015)	
Other variables	Included		Included		Included		Included	

These are summary results from full two-stage residual inclusion models with Junior High School enrollment as dependent variable and same covariates as in Table 3. Bootstrapped standard errors (100 repetitions) between parentheses. Significant effects: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Other important drivers of secondary school enrollment include child, parental and community characteristics (Table 3). Child age has a positive but decreasing effect with a turning point at 16.4 years in case of JHS and 22.6 years in case of SHS. Birth order

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[9] We do this only for JHS enrollment because there is a positive effect of a mothers' NFE ownership on JHS enrollment, but not on SHS enrollment (table 3).

and number of siblings reduce the likelihood of secondary school enrollment, with the effect of siblings younger than or equal to five years being twice as large as the effect of having older siblings. Child schooling increases with both mothers' and father's education while being part of a polygamous household decreases the likelihood. We do not find a significant correlation between father's non-farm entrepreneurship and school enrollment. Presence of a primary school or JHS in the community does not matter while distance to a SHS reduces the likelihood of secondary school enrollment.

5   Discussion

We find that mothers' non-farm entrepreneurship in rural Ghana increases the likelihood of a child aged 12-21 to be enrolled in secondary school with 10.6% points. Given the mean secondary school enrollment rate of 38.9%, this is a substantial increase of 27.2%. When separating JHS and SHS enrollment, we only find a positive effect of mothers' non-farm entrepreneurship for JHS enrollment and not for SHS enrollment. This can be explained through the different expense rates and timing of payment for JHS and SHS. School expenses for SHS (e.g. admission fee, supplies) are more than twice as high as for JHS and need to be paid all at once at the beginning of each trimester while for JHS the expenses can be paid more evenly across the year. An NFE typically gains small amounts of money on a daily basis, which makes it a suitable income source to pay for JHS. Saving is required to be able to use NFE revenues for SHS expenditures, but saving is often hard for rural households in poor countries (Daidone et al., 2015) and respondents indicated during the FGDs that most NFE revenues are immediately spent on daily household needs.

We find that household wealth is an important determinant of secondary school enrollment, which is in line with previous findings in the literature (Glick & Sahn, 2000; Grimm, 2011; Tansel, 1997). The school-improving effect of mothers' non-farm entrepreneurship is even stronger for asset-poor households, which suggests that the effect partially comes from a positive income effect. This was also confirmed during the FGDs, where it was stated that the responsibility for educational expenses first and foremost lies with the father but that the mother supports her husband by paying for smaller expenses (e.g. uniform, feeding fee). If the father does not have enough money, she also contributes to the admission fee.

We find that girls have a 6.4% points higher likelihood to be enrolled in JHS than boys. This contradicts the common trend in the gender literature of girls having lower

education opportunities than boys in developing countries (Glick & Sahn, 2000; Maertens & Verhofstadt, 2013) but it is in line with results from the FGD in rural Ghana. When parents cannot send all their children to school due to limited household resources, they decide first and foremost based on child intelligence, obedience and birth rank (the eldest child is given priority, which is also reflected in the regressions). During the FGDs parents furthermore indicated a preference towards schooling of their daughters to avoid them becoming pregnant and because boys are expected to contribute more to farm work and are therefore considered more useful when they stay away from school. The school-improving effect of mothers' non-farm entrepreneurship is equally strong for boys and girls so it does not exacerbate the gap.

Also in line with the literature is the positive effect of parental education on secondary school enrollment (Tansel, 1997). However, obtaining a primary degree is insufficient; only a secondary degree is conducive for own child secondary schooling. We find that the school-improving effect of mothers' non-farm entrepreneurship is as strong for educated and non-educated mothers. Given that only 19.7% of mothers in rural Ghana have a secondary degree, this means that rural NFEs can turn around the intergenerational immobility in secondary schooling and entail the potential to stimulate child schooling among low-educated mothers.

Finally, we find that having more siblings reduces the propensity of secondary school enrollment and that having more young siblings lowers the positive effect of mothers' NFE on JHS enrollment. These results suggest lower schooling in larger families and an increased demand for older children's time in childcare or other household tasks. Running an NFE might further reduce mothers' availability for reproductive activities, causing her children to take over, which could lower their school performance and probability to go to school. However, respondents in the FGDs indicated that children indeed often help their parents in the NFE or on the farm, but that this work never interferes with their education. Children whose mother has an NFE are significantly more likely to be enrolled in school and at the same time to be working (48.8% for mother with NFE compared to 43.2% for mother without NFE) and less likely to be out of school to work (14.1% for mother with NFE compared to 20.3% for mother without NFE). This is in line with a study in rural Brazil by Parikh and Sadoulet (2005), who find that children from self-employed mothers are more likely to work but not less likely to go to school.

6 Conclusion

This study contributes to the knowledge gap in the literature on the link between rural NFEs and children's education in developing countries. Using nationally representative data for Ghana, we empirically analyse the impact of mothers' non-farm entrepreneurship on the propensity of child secondary school enrollment. We find a significant and strong effect of 10.6% points, corresponding to a relative increase of more than 25%. The results are driven by an increase in enrollment rates in JHS but not in SHS, due to higher expenses and a less spread payment timing. Nevertheless, while most of the female-owned NFEs are small-scale and take place in the informal economy, our results show that even these businesses can contribute to long-term improvements in child welfare. The school-improving effect of mothers' non-farm entrepreneurship is equally strong for boys and girls and for high- and low-educated mothers, and stronger for poorer households. This shows that NFEs entail the potential to stimulate child schooling among low-educated mothers and to reduce inequality in rural child schooling.

Our results have important policy implications. They reveal how female owned NFEs can contribute to reaching the fourth Sustainable Development Goal; i.e. ensuring inclusive and quality education. We find that promoting NFEs among women in rural Ghana is an inclusive policy to increase JHS enrollment. Our results suggest that for SHS enrollment to increase, a reduction of school fees and expenses or a more evenly spread of payments over the year are required. Also policies can be installed to render NFEs more profitable and to facilitate saving schemes so NFE revenues can contribute to the payment of SHS expenditures.

Our findings are nationally representative for Ghana and have wider implications for other rural areas in (West-)Africa where female owned NFEs are common and secondary school enrollment rates are low. As our findings might not hold in other settings, we encourage further research to investigate the potential of NFEs to improve child schooling or other aspects related to rural development. Preferably such studies use data from multiple panel rounds to be able to investigate long-term effects and educational achievements, and to reduce endogeneity bias.

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Appendix

Table A 1. Definition and descriptive statistics of control variables used in the regressions. *Source: GLSS6 data.*

Variable	Definition	All Children		Mother without NFE		Mother with NFE		
		Mean	*se*	*Mean*	*se*	*Mean*	*se*	
Gender child	Dummy variable indicating if the child is female (1) or male (0)	0.43		0.43		0.46		
Age child	Age of the child in years	15.56	0.04	15.52	0.04	15.64	0.07	
Child never married	Dummy indicating if the child is married, separated, divorced, widowed (0) or has never been married (1)	0.99		0.99		0.99		
Birth Order Index	Birth order of the child divided by the average birth order	1.14	0.01	1.13	0.01	1.15	0.01	
Number siblings < 5 y.	Number of siblings younger than 5 years	0.84	0.03	0.89	0.04	0.73	0.04	
Number siblings > 5 y.	Number of siblings older than 5 years	2.31	0.06	2.34	0.07	2.25	0.07	
Age mother	Age of the mother in years	43.67	0.20	43.66	0.25	43.71	0.3	
Age father	Age of the father in years	51.62	0.26	51.83	0.32	51.2	0.39	
Education mother, primary	Dummy variable indicating if the highest qualification of the mother is primary school (1) or not (0)	0.12		0.1		0.16		
Education mother, sec.	Dummy variable indicating if the highest qualification of the mother is junior high school or higher (1) or not (0)	0.20		0.16		0.26		
Education father, primary	Dummy variable indicating if the highest qualification of the father is primary school (1) or not (0)	0.08		0.08		0.08		
Education father, sec.	Dummy variable indicating if the highest qualification of the mother is junior high school or higher (1) or not (0)	0.42		0.39		0.50		
NFE Father	Dummy variable indicating whether the father owns an NFE (1) or not (0)	0.10		0.07		0.14		***
Household Asset Index	Index of living conditions	1.68	0.04	1.52	0.04	1.99	0.06	***
Size land	Size of land owned by the household (acres)	6.78	0.50	7.16	0.58	6.03	0.74	
Polygamous HH	Dummy variable indicating if the household is polygamous (1) or not (0)	0.14		0.16		0.11		***
Female household head	Dummy variable indicating if the household head is female	0.24		0.23		0.26		
Distance motor. Road	Distance from the community to the closest motorable road (km)	0.82	0.14	1.07	0.2	0.33	0.07	***
Primary school	Dummy indicating if there is a primary school in the community (1) or not (0)	0.78		0.75		0.82		**
JHS	Dummy indicating if there is a junior high school in the community (1) or not (0)	0.56		0.48		0.70		***
Distance nearest SHS	Distance from the community to the nearest senior high school (km)	14.41	0.82	15.9	1.06	11.48	0.73	***
N		6,161		4,120		2,041		

Comparisons are made between children of whom the mother owns an NFE and children of whom the mother does not using a two-sided t-test. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table A 2. First stage regression results of determinants of mothers' non-farm entrepreneurship. *Source: own calculations from GLSS6 data.*

	NFE mother (Children aged 12 – 21)			NFE mother (Children aged 12 – 18)			NFE mother (Children aged 15 – 21)		
	coefficient	*se*		*coefficient*	*se*		*coefficient*	*se*	
Percentage NFE	0.935	0.075	***	0.942	0.061	***	0.970	0.055	***
Agricultural work mother of mother	-0.111	0.035	***	-0.118	0.035	***	-0.107	0.030	***
Gender child: girl	0.019	0.013		0.010	0.017		0.039	0.020	**
Age child	0.028	0.027		0.109	0.063	*	-0.013	0.079	
Age child squared	-0.001	0.001		-0.004	0.002	*	0.000	0.002	
Never married	0.064	0.062		0.197	0.064	***	0.071	0.063	
Birth order index	-0.000	0.020		0.015	0.021		-0.016	0.025	
# siblings under 5	-0.017	0.011		-0.005	0.012		-0.030	0.014	**
# siblings over 5	0.006	0.010		0.006	0.009		0.002	0.011	
Age mother	0.001	0.001		0.002	0.002		-0.000	0.002	
Age father	-0.001	0.001		-0.002	0.001		-0.001	0.001	
Primary degree mother	0.065	0.031	**	0.064	0.045		0.052	0.036	
Secondary degree mother	-0.038	0.051		0.070	0.033	**	-0.023	0.056	
Primary degree father	-0.013	0.029		-0.057	0.047		-0.014	0.034	
Secondary degree father	0.059	0.043		-0.008	0.029		0.119	0.052	**
Father's ownership of NFE	0.043	0.014	***	0.036	0.042		0.040	0.014	***
Household asset index	-0.000	0.001		0.053	0.014	***	0.000	0.001	
Landholdings	0.000	0.027		-0.000	0.001		0.003	0.034	
Polygamous household	-0.022	0.028		-0.003	0.029		-0.019	0.029	
Female household head	0.095	0.043	**	-0.026	0.029		0.109	0.049	**
Distance road	-0.001	0.002		-0.002	0.002		-0.001	0.002	
Presence primary school	-0.002	0.027		-0.018	0.026		0.010	0.028	
Presence JHS	0.030	0.026		0.029	0.026		0.024	0.025	
Distance SHS	-0.001	0.001		-0.001	0.001		-0.001	0.001	*
N	6161			4608			3674		
Wald chi squared	1397.45		***	1218.96		***	1428.24		***
R squared	0.209			0.249			0.222		
Kleibergen-Paap rk LM (underidentification)	442.004		***	354.938			300.061		***
Kleibergen-Paap rk Wald F statistic[1] (weak identification)	285.970		*	237.258		*	197.785		*
Hansen J statistic (overidentification)	0.915			3.955		*	0.096		

Robust standard errors in brackets. The F statistic measures the joint significance of the two excluded instruments. All regressions control for ethnicity, religion and regional dummies. Significant effects: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. [1] The critical value of 10% maximal IV size of Stock-Yogo weak ID test is 19.93.