



What if mothers are entrepreneurs? Non-farm businesses and child schooling 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 using nationally representative data for Ghana. After controlling for observed and (partially for) unobserved heterogeneity, using OLS and instrumental variable regressions with instruments that are highly relevant and plausibly exogenous, we find that secondary schooling is significantly higher among children whose mother engages in non-farm entrepreneurship. We find a significant positive correlation with Junior High School enrolment but not with Senior High School enrolment, which relates to lower expenses and a better spread in payment for Junior High School education. The link of mother's non-farm entrepreneurship with child secondary education 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 findings suggest that even these businesses can contribute to development. The results furthermore 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.

1. Introduction

While agriculture still dominates the economy in rural Sub-Saharan Africa (SSA), an important and increasing share of households diversifies their income through non-farm employment (Yeboah and Jayne, 2018), and non-farm enterprises (NFEs) in particular (Nagler and 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 et al., 2017; Haggblade et al., 2010). Other studies highlight the positive effects on food security (Ali and Peerlings, 2012; Owusu et al., 2011; Tsiboe et al., 2016) and investment linkages with the agricultural sector (Adjognon et al., 2017). However, NFEs in rural SSA are also very heterogeneous (Diao et al., 2018) and characterized by low survival and productivity rates, especially among female owners (Nix et al., 2015; Rijkers and Costa, 2012). Due to a lack of empirical evidence it is unclear how female-owned NFEs can contribute to rural development in SSA.

We address this gap in the literature by investigating how mother's non-farm entrepreneurship influences child 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 and Verhofstadt, 2013). If mother's non-farm entrepreneurship increases household income, then child's education will improve. On the other hand, depending on the nature of the business, mother's non-farm entrepreneurship may or may not 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, mother's non-farm entrepreneurship improves child education. The overall effect of mother's 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 et al., 2013; Luke and Munshi, 2011; Maertens and 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 (Lokshin et al., 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

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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 different 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 and 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 estimate the link between mother's non-farm entrepreneurship and child secondary school enrolment in rural Ghana. We focus on secondary education because, while it 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. Sustainable Development Goals have a specific target on universal lower secondary education. 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 et al., 2012, 2017). 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 and test interaction effects between mother's 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 link between female NFEs and secondary school enrolment 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 et al., 2018). Ghana's Poverty Reduction Strategy Paper for 2010–2013 sets out various strategies to improve the performance of micro, small and medium enterprises 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 enrolment rate in primary school is 89%, while the net enrolment rate in secondary school is only 51% (2014 figures)¹ (UNESCO Institute for Statistics, 2017b, 2017a).

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 and qualitative data for our 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, 1200 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 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 are 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 four regions were purposively selected to offer views from contrasting agro-ecological and socio-economic settings. The selection of communities occurred by a process of two-step random sampling from the list of communities included in the GLSS6 survey. In each region, two districts were randomly selected, except for the Eastern region where only one district was selected. In each of these districts, two communities were then randomly selected. A government agricultural extension agent facilitated access to the communities. In a few cases where the extension officer advised against visiting a certain community, generally due to poor accessibility in the rainy season, a replacement community was selected.

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 enrolment and child labour. If it was not mentioned by participants, we explicitly asked about the influence of mother's NFEs on children's secondary education.

The discussions were held in the local language of the respondents and moderated by the researchers with assistance from a local research assistant. The discussions were transcribed in English based on researchers' notes and recordings. The qualitative data were analysed with narrative analysis. The insights obtained from the FGDs are used to formulate the research questions and hypotheses and to interpret the results from the quantitative analysis.

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

¹ Adjusted net enrolment 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 enrolment 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 (UNESCO Institute for Statistics, 2017b, 2017a).

school from the sample in order to avoid confounding drop-out and graduation. To focus on junior high school (JHS) enrolment (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 logic and to focus on senior high school (SHS) enrolment (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 6161 children aged 12–21; 4608 children aged 12–18; and 3674 children aged 15–21.

3. Background and 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 et al., 2017). In the FGDs it was often stated that women need permission from their husband before they can start 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”*.

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 and Canagarajah, 2000; Senadza, 2012).

Table 1 compares households in rural Ghana with and without a female HH member that owns an NFE. A household member owns a non-farm enterprise when his or her main or secondary employment activity in the past 12 months was self-employment in non-agriculture.³ These statistics show that for households where at least one female

member runs an NFE, the total household income (per capita) and wealth are significantly higher. In such households also educational expenses are significantly higher, and to a sizeable extent, for each schooling level. Female entrepreneurs are more likely to occur in households with male entrepreneurs, but there is no perfect collinearity.

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).⁴ 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 enrolment rate among children aged 12–18 is 33.5% while SHS enrolment 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 enrolment (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 enrolment 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 et al., 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 enrolment 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 9000 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 (Kehinde F. Ajayi and Buessing, 2015). 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).

Table 2 compares secondary school enrolment rates between children whose mother has an NFE and children whose mother does not. 34% of the children between 12 and 21 years old in rural Ghana has a mother that owns a NFE (Table A1). 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 percentage points for boys and 14.2 percentage points for girls.

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).

³ Jointly owned enterprises are uncommon in rural Ghana and therefore the GLSS6 questionnaire requires respondents to assign one unique household member as the owner of each non-farm enterprise. When a household member is helping in the business of another household member, he or she is classified as “contributing family member”. *HH with female NFE* thus indicate HHs where at least one female adult owns an NFE, while in *HH without female NFE* none of the female adult members owns an NFE.

⁴ Most Ghanaian children do not enroll at the appropriate age for their grade and late enrolment and repetition are common (Akyeampong, 2009).

Table 1Average 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)	5775.82	8095.15	***
Total HH income per capita (GHC/year.capita)	1344.70	1750.70	***
HH Asset Index	1.58	2.08	***
Size land (acres)	5.14	4.51	*
Number of Children (up to 17 years)	2.42	2.63	***
Number of Adults	2.44	2.60	***
Educational expenses for primary school	179.94	291.60	***
Educational expenses for lower sec. education	50.19	103.04	***
Educational expenses for higher sec. education	122.40	204.12	***
At least one male adult owns an NFE	0.14	0.23	***
N	5626	2602	

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 for the continuous variables and a *pr*-test for the dummy variable. ****p* < 0.01; ***p* < 0.05; **p* < 0.1. Exchange rate: US \$1 = 1.91 GHC in 2012. To be in line with our regression analysis at child level, we include only rural households where at least one adult female is present (N = 8228).

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

	All children	Children of mothers without NFE	Children of mothers with NFE	
<i>JHS and SHS enrolment (aged 12–21)</i>				
Total	38.29%	34.26%	46.17%	***
Boys	36.58%	33.15%	43.60%	***
Girls	40.47%	35.73%	49.24%	***
<i>JHS enrolment (aged 12–18)</i>				
Total	33.53%	29.66%	41.61%	***
Boys	30.78%	27.61%	37.55%	***
Girls	36.93%	32.23%	46.43%	***
<i>SHS enrolment (aged 15–21)</i>				
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)⁵:

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

for child *i* in household *j* in community *k*. We use three different specifications for the dependent variable (*Y*): 1) current enrolment in JHS or SHS for children aged 12–21; 2) current enrolment in JHS for children aged 12–18; and 3) current enrolment in SHS for children aged 15–21. The main variable of interest is a dummy for mother's non-farm entrepreneurship (*NFE_m*) with β_1 measuring the effect of mother's NFE on the propensity of child school enrolment. 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 enrolment. 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

⁵ We use an LPM rather than a binary probit model because both models lead to similar results and an LPM is easier to interpret and allows for a comparison with IV estimation and interaction effects.

average birth order among all siblings and hence purges the family size effect from the birth order effect (Booth and Kee, 2009). Parental characteristics (*P*) include mother's 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.⁶ The household asset index is constructed using a principal component analysis and represents the living conditions of a household (Filmer and 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 enrolment, 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 et al., 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 *NFE_m* is used as an instrumented covariate in the above equation. To correct for weighting we use heteroscedasticity-robust standard errors in both the OLS and IV model⁷ (Solon et al., 2015).

We include the following two instruments for *NFE_m*: 1) a dummy

⁶ There are other household income sources that are potentially relevant determinants of child education such as wage employment and remittances. Our results are robust to the inclusion of these income sources, that is, these additional control variables are insignificant and do not alter the effect of NFE ownership by the mother. However, as they are likely endogenous and we cannot control for that endogeneity, we do not include them in the main regressions.

⁷ Similar results were obtained when standard errors were clustered at mother level or community level. Furthermore, because we use a linear IV model with a sample size below 10,000, it is advised to estimate the confidence intervals through bootstrapping (Chiburis et al., 2012). Bootstrapping the standard errors (200 repetitions) leads to similar *p* values and a maximum change of 0.013 (33% relative change) in standard errors.

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 and 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 and Peerlings, 2012). The IVs are strongly correlated with mother's 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.

We argue for plausible exogeneity of our IVs but we acknowledge that they might influence child secondary education through other pathways besides through mothers' non-farm employment. In case of the first IV, grandmothers might directly invest in grandchildren's education. However, we do not find evidence for this as survey data shows that for 95% of the children in our sample, the majority of educational expenses are paid by the parents and only for 4% of the children the grandmother lives in the same household. Also in the FGDs, the participants never mentioned a substantive role of grandparents in paying educational expenses. Furthermore, we partially control for indirect channels through which grandmothers' non-farm employment could influence schooling, such as mother's education and household wealth. In case of the second IV, we control for community characteristics that may be related to both NFE ownership and school enrolment, such as remoteness of the community and presence of schools. While this may not completely resolve identification, it likely reduces the exclusion restriction problem (Angrist and Pischke, 2009). The Hansen J statistic of the overidentification test fails to reject the null hypothesis,⁸ which suggests 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 NFE_m as covariate in the second state, the residual of the first stage regression, which captures unobserved heterogeneity in mother's NFE ownership, is included. This technique allows for the inclusion of interaction terms with an endogenous variable, unlike the IV-2SLS approach (Terza et al., 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 us to estimate the link between current NFE ownership and current school enrolment (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 reconstruct a panel database in which we can link previous non-farm entrepreneurship to other child education outcomes such as school completion. If only NFEs that are successful at raising enrolment continue to exist, we will overestimate the effect of NFE on school enrolment. On the other hand, an underestimation of the positive effect will occur if the positive effect of NFE on enrolment 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 enrolment 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 correlation between mother's non-farm entrepreneurship and secondary schooling is

significantly positive in the OLS and IV models for JHS and SHS combined enrolment, and JHS sole enrolment. For SHS enrolment the association becomes insignificant in both OLS and IV models. The results from the IV estimation, in which the bias is reduced, are in line with the OLS results, but with higher point estimates and larger standard errors. These differences relate to two factors. On the one hand, the IV estimation is less efficient than OLS. On the other hand, the IV estimation estimates the Local Average Treatment Effect (LATE), while OLS estimates the Average Treatment Effect (ATE). The LATE can be interpreted as the average treatment effect for the subpopulation that complies with the instrument⁹ (Imbens and Angrist, 1994). Overall, we estimate that children whose mother has an NFE are between 5 and 10.6 percentage points more likely to be enrolled in secondary school than children whose mother does not have an NFE. Given the mean secondary school enrolment rate of 38.9%, this corresponds to an increase of 12.8–27.2 percent.

Table 4 presents a summary of the interaction effects between mother's non-farm entrepreneurship and gender of the child, education (primary or secondary) of the mother, household wealth and number of young siblings based on the IV models for JHS enrolment¹⁰. The positive correlation between mother's non-farm entrepreneurship and child secondary schooling remains robust across the four models. 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 mother's education are not significant, while the interactions with household wealth and number of siblings younger than 5 years old are significantly negative.

Other important drivers of secondary school enrolment 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 and number of siblings reduce the likelihood of secondary school enrolment, 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 mother's 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 enrolment. Presence of a primary school or JHS in the community does not matter while distance to a SHS reduces the likelihood of secondary school enrolment.

5. Discussion

After controlling for observed heterogeneity in child, parent, household and community characteristics, we find that children whose mother has an NFE are more likely to be enrolled in secondary school than children whose mother does not have an NFE. Due to the limitations of cross-sectional data and the exogeneity of instruments, we cannot claim identification or interpret this significant positive association as a true causal impact. When separating JHS and SHS enrolment, we only find a positive correlation between mother's non-farm entrepreneurship and JHS enrolment and not with SHS enrolment. This

⁹ For two instruments the LATE is a weighted average of the instrument-specific LATEs where the weights are a function of the relative strength of each instrument in the first stage (Angrist and Pischke, 2009). As a robustness check we estimate a bivariate probit model, which is an alternative technique for estimating a model with a binary response variable and a binary endogenous variable, but which gives the ATE instead of the LATE (Chiburis et al., 2012). The estimated coefficient for NFE mother is in that case 9.4% (compared to 10.7% for the IV regression), showing that the actual ATE is smaller than the LATE. This is in line with Chiburis et al. (2012) who find a ratio of approximately 1.07 comparing LATE to ATE.

¹⁰ We do this only for JHS enrolment because there is a positive correlation between a mother's NFE ownership and JHS enrolment, but not with SHS enrolment (Table 3).

⁸ It is rejected at 5% significance level in the regression of JHS enrolment.

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

	Secondary school enrolment (12–21 years)						JHS enrolment (12–18 years)						SHS enrolment (15–21 years)					
	OLS			IV			OLS			IV			OLS			IV		
	Coef.	se		Coef.	se		Coef.	se		Coef.	se		Coef.	se		Coef.	se	
Mother's ownership of NFE	0.050	0.017	***	0.107	0.044	**	0.047	0.018	***	0.091	0.048	*	0.026	0.018		0.051	0.045	
Gender child: girl	0.042	0.015	***	0.041	0.015	***	0.065	0.016	***	0.064	0.016	***	0.017	0.016		0.016	0.016	
Age child	0.538	0.033	***	0.536	0.033	***	0.662	0.071	***	0.656	0.071	***	0.318	0.081	***	0.317	0.081	***
Age child squared	−0.015	0.001	***	−0.015	0.001	***	−0.019	0.002	***	−0.019	0.002	***	−0.007	0.002	***	−0.007	0.002	***
Never married	0.332	0.059	***	0.329	0.060	***	0.361	0.095	***	0.354	0.093	***	0.107	0.064	*	0.105	0.064	
Birth order index	−0.042	0.018	**	−0.042	0.018	**	−0.026	0.020		−0.027	0.020		−0.038	0.020	*	−0.037	0.019	*
# siblings under 5	−0.027	0.008	***	−0.026	0.008	***	−0.024	0.008	***	−0.024	0.008	***	−0.014	0.008		−0.013	0.008	
# siblings over 5	−0.012	0.006	**	−0.012	0.006	**	−0.018	0.006	***	−0.018	0.006	***	−0.011	0.006	*	−0.011	0.006	*
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	0.029		−0.005	0.029		−0.003	0.031		−0.006	0.030		0.029	0.031		0.026	0.031	
Secondary degree mother	0.064	0.024	***	0.060	0.024	**	0.063	0.027	**	0.059	0.028	**	0.068	0.026	***	0.066	0.025	***
Primary degree father	0.007	0.030		0.009	0.030		0.004	0.034		0.006	0.034		0.007	0.030		0.008	0.030	
Secondary degree father	0.065	0.020	***	0.066	0.020	***	0.055	0.023	**	0.055	0.023	**	0.055	0.021	***	0.055	0.021	***
Father's ownership of NFE	0.029	0.025		0.022	0.025		0.016	0.027		0.012	0.028		−0.007	0.027		−0.012	0.029	
Household asset index	0.034	0.008	***	0.031	0.009	***	0.041	0.009	***	0.038	0.010	***	0.044	0.009	***	0.043	0.009	***
Landholdings	0.001	0.000		0.001	0.000	*	0.001	0.001	**	0.001	0.001	**	0.000	0.000		0.000	0.000	
Polygamous household	−0.024	0.022		−0.024	0.021		−0.037	0.023		−0.037	0.023		−0.047	0.020	**	−0.047	0.020	**
Female household head	−0.025	0.020		−0.026	0.020		−0.004	0.023		−0.005	0.023		−0.029	0.021		−0.029	0.020	
Distance road	−0.004	0.002	**	−0.004	0.002	*	−0.004	0.002	*	−0.004	0.002	*	−0.002	0.002		−0.002	0.002	
Presence primary school	−0.021	0.019		−0.02	0.019		−0.023	0.021		−0.021	0.021		0.000	0.018		0.001	0.018	
Presence JHS	0.031	0.019	*	0.024	0.019		0.044	0.021	**	0.038	0.021	*	0.015	0.019		0.013	0.019	
Distance SHS	−0.002	0.000	***	−0.001	0.000	***	−0.002	0.000	***	−0.002	0.000	***	0.000	0.000		0.000	0.001	
Constant	−4.591	0.259	***	−4.581	0.258	***	−5.582	0.518	***	−5.543	0.515	***	−3.304	0.706	***	−3.307	0.703	***
N	6161			6161			4608			4608			3674			3674		
F(37, N − 38)	36.439			36.011			33.17			32.658			11.675			11.638		
Prob > F	0.000			0.000			0.000			0.000			0.000			0.000		
R squared	0.210			0.208			0.251			0.249			0.156			0.155		

JHS: Junior High School; SHS: Senior High School; NFE: Non-farm enterprise. Robust standard errors. All regressions control for sampling weights and include ethnicity, religion and region fixed effects. All variables are defined and summarized in Table A1. Significance levels: ***p < 0.01; **p < 0.05; *p < 0.1.

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

	Model 1		Model 2		Model 3		Model 4	
Mother's NFE	0.100	**	0.103	**	0.140	***	0.123	**
	(0.049)		(0.048)		(0.051)		(0.050)	
Gender child: girl	0.069	***	0.064	***	0.066	***	0.064	***
	(0.019)		(0.016)		(0.016)		(0.016)	
Primary or secondary degree mother	0.032		0.046		0.033		0.031	
	(0.024)		(0.029)		(0.024)		(0.024)	
Household asset index	0.040	***	0.040	***	0.056	***	0.039	***
	(0.010)		(0.010)		(0.013)		(0.010)	
# Siblings younger than 5	−0.025	***	−0.025	***	−0.025	***	−0.016	*
	(0.008)		(0.008)		(0.008)		(0.010)	
NFE * girl	−0.014							
	(0.035)							
NFE * education mother			−0.034					
			(0.039)					
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 enrolment as dependent variable and same covariates as in Table 3. Robust standard errors between parentheses. Significance levels: ***p < 0.01; **p < 0.05; *p < 0.1.

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 enrolment, which is in line with previous findings in the literature (Glick and Sahn, 2000; Grimm, 2011; Tansel, 1997). The correlation of mother's non-farm entrepreneurship with secondary education is even stronger for asset-poor households, which suggests that a positive income effect is present. 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 percentage 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 and Sahn, 2000; Maertens and Verhofstadt, 2013) but it is in line with others finding a trend towards gender equality in school enrolment in Ghana (Psaki et al., 2018), and results from the FGDs. 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 or married before they can get educated, 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 mother's 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 enrolment (Tansel, 1997). However, obtaining a primary degree is insufficient; only a secondary degree of parents is conducive for child secondary schooling. We find that the correlation of mother's non-farm entrepreneurship with secondary schooling 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 enrolment and that having more young siblings lowers the positive correlation of mother's NFE and JHS enrolment. These results suggest lower schooling rates 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 economically active (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. Furthermore, recent work by Brandt et al. (2017) in Tanzania finds that parental NFE ownership is related to less child labour.

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 association between mother's non-farm entrepreneurship and the propensity of child secondary school enrolment. While controlling for observed and partially unobserved heterogeneity, we find

that secondary education is significantly higher among children whose mother runs a NFE. The results are driven by an increase in enrolment 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 suggest that even these businesses can contribute to long-term improvements in child welfare. The positive correlation between mother's non-farm entrepreneurship and secondary education 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 even 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 might be an inclusive policy to increase JHS enrolment. Our results suggest that for SHS enrolment 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 enrolment 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.

Declaration of interest

None.

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Appendix

Table A 1

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

Variable	Definition	Children aged 12 - 21					
		All Children		Mother without NFE		Mother with NFE	
		Mean	se	Mean	se	Mean	se
NFE mother	Dummy variable indicating whether the mother owns an NFE (1) or not (0)	0.34	0.02				
Gender child	Dummy variable indicating if the child is female (1) or male (0)	0.44		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	0.05	2.34	0.07	2.25	0.07

(continued on next page)

Table A 1 (continued)

Variable	Definition	Children aged 12 - 21					
		All Children		Mother without NFE		Mother with NFE	
		Mean	se	Mean	se	Mean	se
Age mother	Age of the mother in years	43.67	0.18	43.66	0.25	43.71	0.30
Age father	Age of the father in years	51.62	0.25	51.83	0.32	51.20	0.39
Education mother, primary	Dummy variable indicating if the highest qualification of the mother is primary school (1) or not (0)	0.12		0.10		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		0.38		0.49	***
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	0.48	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	0.20	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	0.86	15.90	1.06	11.48	0.73 ***
N	Number of observations	6161		4120		2041	

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 for the continuous variables and a *pr*-test for the dummy variables. ****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	0.042	***	0.942	0.048	***	0.969	0.055	***
Agricultural work mother of mother	−0.111	0.021	***	−0.118	0.024	***	−0.107	0.026	***
Gender child: girl	0.019	0.014		0.010	0.016		0.039	0.019	**
Age child	0.028	0.034		0.109	0.068		−0.013	0.100	
Age child squared	−0.001	0.001		−0.004	0.002		0.000	0.003	
Never married	0.064	0.064		0.197	0.050	***	0.071	0.066	
Birth order index	−0.001	0.018		0.015	0.021		−0.017	0.025	
# siblings under 5	−0.017	0.008	**	−0.005	0.008		−0.030	0.010	***
# siblings over 5	0.006	0.006		0.006	0.006		0.002	0.008	
Age mother	0.001	0.001		0.002	0.001		0.000	0.001	
Age father	−0.001	0.001	*	−0.002	0.001	*	−0.001	0.001	
Primary degree mother	0.095	0.029	***	0.064	0.033	*	0.109	0.036	***
Secondary degree mother	0.065	0.023	***	0.071	0.027	***	0.052	0.030	*
Primary degree father	−0.037	0.032		−0.058	0.035	*	−0.023	0.042	
Secondary degree father	−0.013	0.020		−0.009	0.023		−0.015	0.026	
Father's ownership of NFE	0.059	0.028	**	0.037	0.032		0.119	0.036	***
Household asset index	0.043	0.008	***	0.053	0.010	***	0.041	0.010	***
Landholdings	0.000	0.000		0.000	0.001		0.000	0.000	
Polygamous household	0.000	0.020		−0.003	0.022		0.003	0.025	
Female household head	−0.022	0.020		−0.026	0.023		−0.020	0.025	
Distance road	−0.001	0.002		−0.002	0.002		−0.001	0.002	
Presence primary school	−0.002	0.018		−0.018	0.020		0.001	0.023	
Presence JHS	0.030	0.018	*	0.029	0.020		0.024	0.023	
Distance SHS	−0.001	0.000	***	−0.001	0.000	*	−0.001	0.001	***
Constant	−0.127	0.278		−0.874	0.504	*	0.263	0.887	
N	6161			4608			3674		
F(38, N-38)	38.836		***	32.218		***	25.973		***
R squared	0.209			0.223			0.222		
Kleibergen-Paap rk LM (underidentification)	441.995		***	344.824		***	281.609		***
Kleibergen-Paap rk Wald F statistic ¹ (weak identification)	285.870		*	228.023		*	179.641		*
Hansen J statistic (overidentification)	0.901			3.985		**	0.084		

Robust standard errors. All regressions control for ethnicity, religion and regional dummies. Significant effects: ****p* < 0.01; ***p* < 0.05; **p* < 0.1.

¹ Only the critical value of 10% maximal IV size of Stock-Yogo weak ID test is available, this is 19.93.

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