Fertility shock and schooling

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Abstract: This paper uses Demographic and Health Surveys data from about 30 sub-Saharan African countries to investigate the link between the birth of an "unintended child" and schooling decisions of children (dropout and entry). After controlling for local unobserved heterogeneity, we show that, the birth of an "unintended child" hinders child schooling. It reduces the probability of current school enrolment. As for school dynamics, it increases the probability that a child aged 6 to 18 years drops out of school and it decreases the probability that a child aged 6 to 9 years starts schooling. This result suggests that, the unexpected birth of a child strengthens household's resources constraints and reduces human capital investments. The results also highlight the importance of the timing of the unexpected birth and the heterogeneity of the effect according to child characteristics.

Key words: unwanted fertility, education school dropout, school enrollment

JEL Classification: J13, I20, O12

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1. Introduction

During their life course, households are exposed to different type of shocks, collateral shocks as well as idiosyncratic ones. One important source of idiosyncratic shocks stems from demographics phenomena (such as fertility and mortality) that occur within the household. In more developed societies, fertility is effectively controlled so that pregnancy and child bearing cannot be considered as a shock. But in many developing countries, fertility remains high and a non negligible part of child bearing is inopportune. In sub-Sahara-Africa, the total fertility exceeds desired fertility by almost 0.5 to 1 child per women and unmet need for contraception use is quite high (between 10 à 25%)[4]. In such specific context, child bearing can be view as a shock, in particular when the pregnancy was unwanted. Therefore, it is interesting to study to what extent fertility shocks affect household outcomes.

A fertility chock might affect various households' outcomes including: household living conditions, child health and mortality, children education. Regarding education, the arrival of an unexpected birth in the household can be particularly damaging for other children already at school. Indeed, an unexpected pregnancy leads to a birth that induces an unplanned increase in the family size. Thus the consequences of fertility shocks on children education can be studied within the general framework of the Quantity-Quality model (Becker and Lewis, 1973). This model presumes that households allocate resources to each child to improve its quality. A direct implication of this model is a trade-off between per child investment (quality) and the number of children in the family (quantity).

From an empirical perspective, the literature on the relation between quality and quantity of children is huge and diverse. The papers covert different regions in the world including the following countries: US (Blake, 1981, Downey, 1995), France (Goux and Maurin, 2005), Thailand (Knodel et al., 1990, Knodel and Wongsith, 1991), Kenya (Gomes, 1984), Botswana (Chernichovsky, 1985), Ghana and Cote d'Ivoire (Montgomery et al., 1995), Malaysia (Sudha, 1997), China (Lu and Treiman, 2008), Hungary (Van Eijck and De Graaf, 1995) and Cameroon (Eloundou-Enyegue and Williams, 2006). In the developed countries, the literature displays a consistent negative relationship between the number of sibling and the schooling (Becker and Lewis, 1973, Becker and Tomes, 1986, Sewell and Shah, 1968, Blake, 1981). However, in developing countries, the literature shows mixed conclusions. In some context a negative relationship is found (Cote d'Ivoire, Ghana) while in other a positive relationship is observed (Kenya, Botswana). These results raised the possibility of systematic variation of the relation across societies as noted by Eloundou-Enyegue and Williams (2006).

The empirical literature treats the family size either as given or exogenous or uses various sets of variables to instrument for its endogeneity. In the first case, the exogeneity hypothesis is debatable and in the second the validity and consistency of the instruments are also questionable. Moreover, when accessing the link between fertility or family size and education outcome, most studies in developing countries use a static approach: neither the timing of changes in family size nor that of its effect on school outcomes is explicitly taken into account. A more dynamic approach consists to both dating fertility changes and its impact on school outcomes.

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[4] www.measuredhs.com

This paper focuses on changes in fertility originating from unintended pregnancies. Children born out of an unintended pregnancy can be treated as an unexpected shock on family size. This approach provides the possibility to consistently examine the effects of an exogenous family size variation on household decision making. It is not common in the literature and to our knowledge; it has only been used by Mongomery and Lloyd (1999). Using DHS data, these authors analyze the impact of excess fertility and unwanted fertility on children school attainment in four countries (Dominican Republic, Egypt, Kenya and Philippines). Their analyses show a significant negative effect of unwanted fertility and excess fertility on school attainment in Dominican Republic and Philippines. No effect is found in the other two countries. But it is important to mention that their outcome variable, the number of completed school grades is a variable resulting from a cumulative process. And on the other side, unexpected pregnancy is a one-off event[5]. So these authors investigate the effect of a one-off event (unwanted pregnancy) which occurs on a specific moment on the overall school outcome. In particular, in their set up, the timing of the unwanted fertility change in the schooling process of a child is not given special attention.

The contribution of this paper is twofold. First, it investigates the short run effect of having an unintended child on contemporaneous school dynamics: dropout and entry of school-age children. Regarding dropout, we intend to investigate whether the presence of an unintended child pushes children already at school out of school. With school entry, we check whether the presence of an unintended child delays school entry. In studying entry, the sample is restricted to young children who have never been at school. Second, the paper uses data from about 20 countries, all located in sub-Saharan Africa where the propensity of having and unintended child is relatively higher.

The reminder of this paper is organized as follows. The next section suggests a conceptual framework to understand the way that an unintended birth affects household behaviors. Section 3 presents the data and our empirical strategy. The results, discussion and conclusion are respectively in sections 4 and 5.

2. Conceptual framework

Let's suppose a household utility function that depends on two types of "goods": children school achievement "S" and other goods "C". We also suppose that "C" is homogeneous but that "S", is not. The contribution of child schooling to household utility varies with child types: girls, boys, son or daughter and fostered children..

U=$U_0\left(C, S_{1,} S_2, S_3;..., S_t\right)$

Where t is the number of type of children considered

[5] A least as measure in the DHS surveys

Let's suppose that the price of the consumption good is normalized to one, the fertility is given[6] in the sense that the household only make its choice between consumption and schooling. We also suppose a quasi concave and twice differentiable utility.

The household maximization program is:

$$\underset{C,S_1\ldots S_t}{Max} : U_0(C, S_1, S_2, S_3;\ldots, S_t)$$
$$s.t.\ \ C + \sum_{i=1}^{t} p_i S_i \leq R_0$$

The p_i represents the direct and indirect cost of the education. We allow this price to vary according to child types. One important source of variation of p_i is the indirect or the opportunity cost of education. R_0 represents the household's income.

At the optimum under the hypothesis of fixed number of children and saturated budget constraint, we have that $U'_{0S_i}/p_i = U'_{0S_j}/p_j = \ldots = U'_{0S_t}/p_t = U'_{0c}$ Where i ≠ j ≠ t and i, j, t represent a "type" of child.

So, the household consumes $(C_0^*, S_{01}^*, \ldots, S_{0t}^*)$.

When a shock or an unintended pregnancy occurs and leads to an "unanticipated" birth. The new birth changes the economic environment of the household and leads to an additional fixed costs (k) that decreases the available resources for the household. We have $R_1 = R_0 - k < R_0$. So, the budget constraint is tightened, leading to a new utility level $U_1(.)$.How are consumption and schooling adjusted so that the household minimize the loose in utility due to the new budget constraint? In general, household will adjust both consumption and schooling in such a way that it minimizes the loose of utility due to the new budget constraint. However, in some cases, households (mainly the poorest) cannot fall beyond a minimum level of consumption. For a household at subsistence consumption level that is almost incompressible, when an adverse shock occurs, it will only adjust on children schooling. .

When household need to adjust its schooling demand, this adjustment will be done according to its preferences and the schooling costs. Let's suppose that the household has only two types of children: those with higher (U'_{0S_h}) marginal utility of schooling (U'_{0S_h}) and those with lower marginal utility of schooling(U'_{0S_l})

Because the household takes a higher marginal satisfaction from additional investment in the schooling of thechild.of type h,

At the optimum, we have ($U'_{S_h^*}/P_h = U'_{S_l^*}/P_l$). If schooling prices were equals, parents would less

[6] This hypothesis is plausible since we only consider exogenous fertility. So we can consider change in number of children as given.

reduce the investments in the education of children with higher marginal utility. If marginal utilities are held fixed and equal, children with higher education cost will suffer more. Actually, children with higher cost (especially opportunity cost) for schooling are the same with lower marginal utility. These children can be girls, foster children or the others who are neither daughters nor sons of household's head, the aged children and so forth.

Girls generally have higher cost of schooling compare to boys. Indeed, Mason and Khander (1996), Lavy (1996) show that indirect costs of schooling are higher for girls than for boys in Tanzania and Ghana, respectively. Alderman and Gertler (1997) note that girls' education is more sensitive to prices and incomes than that of boys; while Alderman and King (1998) reveal that gender bias in education is most important in poor households. According to Glick and Sahn (2000), the higher the household wealth, the higher girls' participation in school and the lower their dropout rate, whereas no effect was found on boys' education.

On the other hand, the difference may occur from the preference for the new born. Up to now, we have supposed that in case of fertility shock, the reduction of household resources is the same regardless of characteristics of the new unexpected born. Actually as for the schooling demand, the amount of resources allocated to a new born could vary according to its characteristics. So it can also appear heterogeneity among these unexpected births that lead to heterogeneity in the magnitude of the shock. i.e $R_1 = R_0 - k_t$. where t is the "type of new born".

The heterogeneity may occur from the expected benefits of educational investment, especially expected remittances. Since parents expect remittances from children, they may favor first the schooling of their own children and then the schooling of the most "lucrative" ones. Empirical studies also show that remittances are an important component of household income in developing countries (Selden and Wasylenko, 1992, Knowles and Anker, 1981). However, analyses suggest that transfers received from the girls are lower than that of boys (Knowles and Anker, 1981 for Kenya).

3. Empirical strategy

Data and descriptive analysis

This paper uses data from Demographic and Health Surveys (DHS) to investigate the link between the kind of the last birth (wanted then, wanted later, not wanted) and the schooling decision (dropout, entry). The DHS program was originally developed by the U.S. Agency for International Development (USAID). Since 1984, DHS have collected, have analyzed, and have disseminated accurate and representative data for more than 200 surveys in more than 75 countries. DHS data are collected with the support of ICF Macro, based in the United States. DHS samples are representative at national and sub national levels.[7] DHS survey methodologies and questionnaires are standardized. DHS data are comparable across countries. The surveys offer detailed information on various subjects, including education, health, as well as detailed information on women's fertility, activities and participation in the decision-making process. DHS also provides interesting information for our analysis of the impact of recent fertility on schooling behaviors.

[7] http://www.measuredhs.com/

We about 30 country-year DHS data sets: Benin (2001), Benin (2006) Burkina Faso (2003), Cameroon (2004), Congo Brazza. (2005), Congo Rep. (2007), Ethiopia (2000), Ethiopia (2005), Ghana (2003), Ghana (2008), Guinea (2005), Kenya (2003), Kenya (2008-2009), Lesotho (2004), Liberia (2007), Madagascar (2003-04), Madagascar (2008-09), Malawi (2000), Malawi (2004), Mali (2001), Mali (2006), Mozambique (2003), Namibia (2000), Namibia (2006-07), Niger (2006), Nigeria (2003), Nigeria (2008), Senegal (2005), Tanzania (2004-05).

Measurement

The fertility shock measurement

During DHS surveys, all female who had given birth during the 5 years prior to the survey date were asked specific questions. For any of those births, they were asked to say whether they would have liked to have the child then, to have the child later or whether they did not intend to have that child at all. Women who said they would have liked to have the child later were additionally asked to indicate the appropriate date.

Our measure of fertility shock is defined as follows: all households hosting a woman who gave birth to an unintended child are considered to have experienced an exogenous fertility shock. Fertility shock is measured as a dummy variable: equals 0 if no unintended birth was reported in the household and equals 1 otherwise. As indicated in figures 1 and 2, all births are dated.

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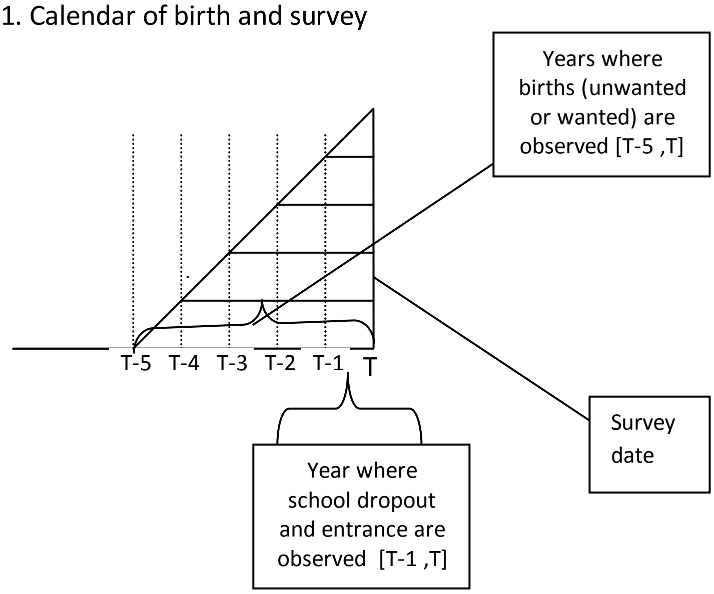
The schooling dynamic measurement

DHS surveys have a well documented module on education of children aged 6 to 18 years. This paper uses two measurements of schooling dynamics. The first is whether or not a child (between 6-18 years old) who attends school the year prior to the survey was currently attending school (**dropout**); the second dependant variable indicates whether or not a child (between 6-9 years old) who was not enrolled at school during the previous year, joins the schooling system during the survey year (**entry**).

Figure 1. Calendar of birth and survey



Wealth. A household wealth index is computed by adding up the number of durables good owned by the household. The maximum value is 11. From the index, the dummy variable Poor indicates whether the household owned 2 items or less.

The sample consists of all 574,414 children aged 6 to 18 in the countries listed. Almost half of them are female and the average age is 11 years. Among them, 63% were enrolled at school the year before the survey. They constitute the group of children at stake in studying drop out.

Regarding entrance, we are interested in first entry. The actual question is whether the presence in one household of a child born out of an unintended pregnancy delays school entry. The sample contains 37% of young children, under the age of 10. The table 1 presents the descriptive statistics of the mains variables.

Table 1: Descriptive statistics of main variables

	Without unintended child		With unintended child		All sample	
	Mean	sd	Mean	sd	Mean	sd
Unintended child					0.10	0.30
At school the year of the survey	0.63	0.69	0.67	0.69	0.63	0.69
Female	0.49	0.50	0.50	0.50	0.49	0.50
Age	11.27	3.65	11.28	3.65	11.27	3.65
Young (aged 6 to 9 years)	0.37	0.48	0.37	0.48	0.37	0.48
Son or Daughter of head	0.70	0.46	0.77	0.42	0.71	0.45
Wealth	2.27	2.15	2.06	2.02	2.25	2.13
Dummy poor	0.44	0.50	0.48	0.50	0.45	0.50
Household size	7.66	4.14	9.23	4.32	7.81	4.19
Head age	47.91	13.60	46.41	12.03	47.77	13.46
Head Female	0.23	0.42	0.24	0.43	0.23	0.42
Head Education	4.01	4.73	4.45	4.36	4.05	4.70
Observation	518538		55465		574414	

The proportion of children living in a household with an unintended child is 10%. This percentage accounts of all unintended child irrespective of their age. Figure 2 shows the percentage of children living in household with unintended child of given age. It shows that, about 3% of children live in a household where the unintended child was born the year of the survey and that the proportion decrease with age. This decreasing pattern may be due to two factors: (1) the fact that, as children grow, parents become less likely to declare that they were born out of an unwanted pregnancy, (2) excess mortality of children born out of unintended pregnancy.

Figure 2: Percentage of children living in a household with an unintended child of a given age

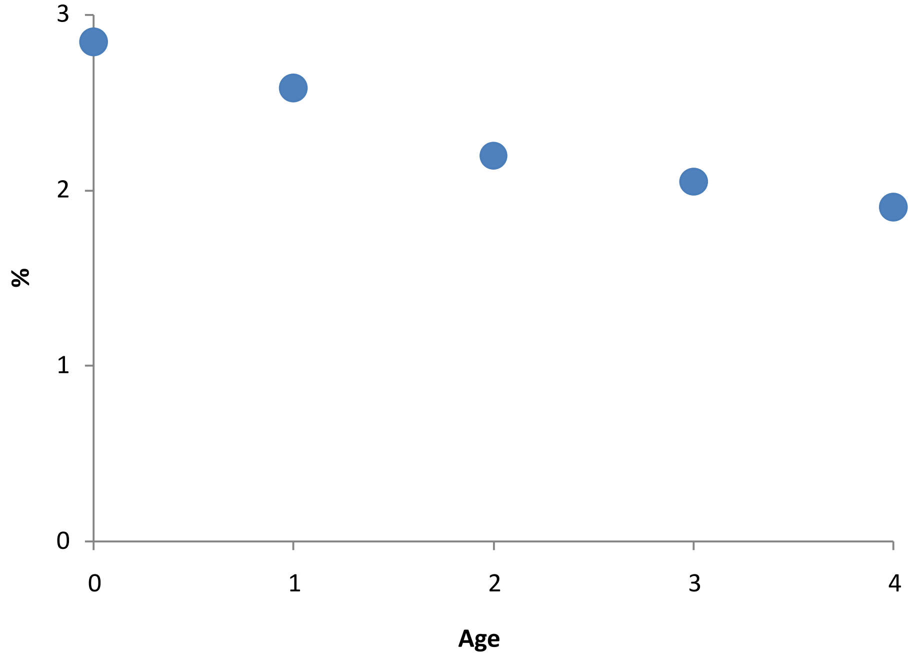


Table 2 shows the comparison of dropout rate and entry rate among children living in household with and without an unintended child. To compute dropout rate, we restrict the sample to children who were enrolled at school the year before the survey. Similarly, to compute entry rate, the sample is restricted to young children who were not enrolled the year of the survey[8]. The outcome of the comparison test is striking. Children living in household hosting an unintended child have significantly higher probability to dropout and lower probability to start schooling. This is the main message of the paper. In the next section, with a regression model, we will investigate whether this message still holds when we factor out the potential effect of other factors on dropout and entry rates.

Table 2: Comparison of dropout and entrance rates

	Dropout rate (%)	Entrance rate (%)
With Unintended birth	4	25
Without Unintended birth	3	30
P value	0.00	0.00

[8] The outcome of the comparison test remains if the whole sample is used instead.

A linear probability model of schooling

We consider a child who was enrolled at school the year prior to the survey. We define the binary dependant variable Y_{ijk} for a child i of the household j in cluster k by:

$$Y_{i,j,k} = \begin{cases} 1 & if\ child\ i\ of\ household\ j\ is\ enrolled\ at\ school \\ 0 & if\ child\ i\ of\ household\ j\ \text{not enrolled}\ at\ school \end{cases}$$

The linear probability model (LPM) is defined by

$$P\left(Y_{ijk} = 1 \middle| X\right) = X'_{i,j,k}\,\beta + \delta F_{ij} + H'_{j,k}\ \gamma + u_k + \varepsilon_{i,j}$$

Where X_{ijk} the vector of child specific covariates, H_{jk} are household's characteristics (proxy for household's wealth, head of household's education, household size) and u_j represents the strata fixed effect, and $\varepsilon_{i,j}$ is the unobserved error term.

The variable F_{jk} indicates whether and unintended birth occurred in household j in cluster k over the past four years prior to the survey date.

The vector of covariates X_{ij} includes child characteristics (gender, age). The strata fixed effect captures all strata observed and unobserved characteristics and in particular, the supply side of education and price of labor. The model is estimated by ordinary least squares (OLS). Estimated standard errors and t statistics are heteroskedasticity-robust. Theoretically, unless the range of X is severely restricted, this model can lead to negative probabilities or to probability that are higher than one. However, it turns out that the LPM often seems to give good estimates of the partial effects on the response probability near the center of the distribution of covariates (Wooldridge, 2002, chap. 15).

4. Results

The main impact of the unintended fertility on school dynamics (dropout and entry)

Table 1A shows the estimated coefficients of the regression model on dropout. The dependant variable dropout takes the value 1 when the child is not enrolled at school the current schooling year but was enrolled the year before. The results indicate that the presence of a child (under five) born out of an unintended pregnancy in one household increases the probability that a child (aged 6 to 18) who was enrolled at school drops out. So, an unexpected increase in the number of children increases dropout rate of schooling children aged 6 to 18 years. The effect is significant and its magnitude is around 1%. The magnitude can be considered relatively low but it is important to underline that it an annual rate. Medium term cumulative effect might turn out to be very important.

Table 2A shows the estimated coefficients of the regression model on school entry. The dependant variable school entry takes the value 1 when the child is enrolled the current schooling year but was not enrolled the year before. The school entry rate of children aged 6-

9 years old is also significantly lower for children living in household with an unintended child (table 2A). Actually, the entry rate falls by 1.3% when household faces a fertility shock. Thus, the presence of a child born out of an unintended pregnancy has a negative impact on schooling, in particular it at best delays first school entry. It is important to stress the fact that we have controlled for supply side factors through cluster fixed effects and then our results reflect the intrinsic constraints faced by households.

Is there any long lasting effect?

Figure 1 shows that whereas we can only observe school dynamic (dropout or entry) between the previous year and the year of survey, DHS data record all the births status (wanted/unwanted) that occurred during the last five years before each survey. It's then possible to disentangle the impact of fertility shock according to the age of the unintended child (within the five years interval preceding the survey) and then to dissert about the transitory or the permanent nature of the link between of the two processes.

The results (table 3A in annex) show that the effect of fertility shock on school entry and dropout seems to be transitory. Indeed, the effect of the presence of an unintended child on dropout decline overtime, from 1.34% the year of the birth to 0.74% one year after the fertility shock. Beyond the second year the coefficients becomes very low and not statistically significant. As school entry is concerned, the impact of presence of an unintended child is restricted to the year of birth. An unintended birth reduces entry rate by 2.7% the birth year, and no effect at all after.

But the immediate link between unexpected birth and school entry or exit should not attenuate its damaging effect. Giving that childbearing spans a longer period of time, the consequences of an unintended can have long term effect on the total number schooling grades a child would accumulate throughout his schooling course.

Household wealth effect

The second source of heterogeneity of the fertility shock effect is household position on the wealth distribution. If the household belongs to the poorest group, then in case of exogenous adverse fertility shock, given that it cannot reduce its consumption of other good, the only adjustment mechanism would be through reducing schooling expenditures. Investment in education would be sacrificed. The analysis confirms this assertion, but with a nuance according to the school dynamic considered (exit or entry). In case of fertility shock, dropping children out from school is a strategy used by almost all the households whatever their position on wealth distribution (table 1A). This result reflects the burden of a fertility shock. Even non poor households need to adjust their behavior to cope with.

Regarding school entry (table 2A), the presence of an unintended child seems to negatively affect school entry only among the poor. The effect is significant and its magnitude is of about 1. 3%. Unlike the poor, the presence of an unintended child has no effect on child school entry among non poor households.

The fact that, adjustment via dropout is similar along the wealth distribution while adjustment via entry is essentially used by the poor households could be interpreted as follows: in case of exogenous shock, dropping some children from school is sufficient to reached another acceptable equilibrium for wealthier households while poorer ones need and additional severe adjustment which passes through reducing school enrollment of 6-9 years children.

Fertility shock and gender of the schooling child

Before discussing the interaction of gender with fertility shock, let cast a glance on its marginal effect. Everything being equal, girls face higher risk of not being enrolled in school and of dropping out than boys (table 1A and 2A). This is very often observed in developing countries. The interaction term reveals that when a household experiences a fertility shock, the schooling situation of girls worsens as dropout rate almost doubles. At least two mechanisms can be put forward to explain this configuration. The first may be the fact that girls' education is less valued than boys' in the household. So when household faces adverse shock on it resources, the "optimal" adjustment is to reduce investment in girls' quality rather than in boys'. We can call this a "preference" mechanism. The second one is more specific to child bearing shock: a new baby needs care and rearing. These activities are traditionally devoted to women and girls, a sort of specialization in housework. So a birth, especially an unexpected one, increases the opportunity cost of girls schooling. The school dropping out could reflect, for some girls, this increase. When considering school entry, girls do not face additional disadvantage due the arrival of a new baby. But it is important to stress on the fact that school entrance concerns young children

Fertility shock and the relationship to household head of the schooling child

In the African context, child fostering is a widespread practice and is very often described as reflecting some form of familial solidarity. Yet it's unclear whether fostered children receive equivalent investment in human capital as that of household's head own children. Some studies conclude that fostered children are discriminated whereas others come out with opposite results (Pilon M. 2003 provides a literature review). In this study, it appears that fostered children face higher dropout rates. The probability of dropping out is 1.4% higher for fostered children. Children of household's head are also more likely to start schooling (2.3%) compare to fostered children. When an unexpected birth occurs in a given household, fostered kids probability of dropping out of school is 1.25% compared to 0.45% for the household head own children. So this result tends to suggest that in case of adverse shocks, consequences are transferred on fostered children even though they are already initially disadvantaged. Regarding school entry, there is no additional disadvantage due to fertility shock.

The newborn characteristics (relationship to the household's head) also matter.

As stated in the conceptual framework, the importance given to each new born may depends on it relationship to the household decider or on it gender, and so the resource devoted to it. Giving that in this study we suppose that the effect of an unexpected child bearing passes through a reduction of available resource, we should expect the impact of child bearing on school outcome to vary according to the relationship to the head of the household. In table

4A, we investigate the potential effect the unintended birth form spouse of the household head or not.

. Estimations show that child bearing from household head impact positively school dropout and negatively impact school entry. But when the additional baby belongs to a secondary household member, it hardly influences children education.

The effect of unintended fertility on current school enrolment

Finally, we look at the average effect of living in a household with an unintended child on school enrolment. Table 7A shows the estimated coefficients of the regression model school enrolment. The dependant variable takes the value 1 when the child was enrolled at school the year of the survey. The model is estimated on all children aged 6 to 18 year. The table shows that, on average, living one household that host a child born out of an unintended pregnancy hinders school enrolment in general.

Robustness checks

Horrace and Oaxaca (2006) stress the bias and inconsistency of OLS on the linear probability model and suggest that a ‘’trimmed estimator’’ may reduce OLS bias. We implement the “trimmed estimator” proposed by restricting the sample size to observations that the predicted probabilities are between 0 and 1. The trimmed sample represents 86% of the initial sample on dropout. In the case of school entry, all predicted values are between 0 and 1. The results from the estimated “trimmed estimator” (table 5A) are qualitatively similar.

The alternative to the LPM would be a fixed effect Logit model. The condition fixed effect Logit model is not suitable in this case because only cluster that display some heterogeneity in the outcome variable are taken into account in estimating the model. The requirement is very binding in this set up because in many clusters in our sample, even if when children characteristics are different, the outcome variable takes only either the value one or the value zéro. Namely, all children in those clusters are either in or out of school. Discarding them would be ignoring important variations in the whole schooling process. However, Table 6A shows estimated coefficients of conditional fixed effect logit. It also shows the reduction in sample sizes. For school dropout, the sample is reduced by 50%. Regarding school entry, the sample is reduced by 22%. It striking to observe that, event on these sub samples, the patterns of our results remain.

Finally, we restricted the sample used to estimate dropout, entry and school enrolment to household that have witness a new born over the five years prior to the survey data. The restriction allows identifying to effect of having an unintended birth to that of having a child born out of a wanted pregnancy. The results are shown on table 8A. The coefficient of the variable unintended birth suggests compare to intended birth, unintended still have damaging effect on schooling and schooling dynamics.

5. Conclusion

When family planning is widespread, fertility is totally under control and births due to unexpected pregnancies are very scarce. In such context, families with given preferences (observable and unobservable) and constraints, first desire a kid and then give birth after. On the contrary, in many developing countries, and especially in African context, effective contraceptive methods, even when available are seldom used. Some children are born out of an unintended pregnancy. The birth of unintended child is unexpected and can be viewed as a shock that households should cope with. In this study we focus on impacts of theses shocks on household schooling investments. More specifically, we are interested in changes in school entry and dropout following a birth of an unintended child. We use data from DHS surveys from more than twenty sub-Saharan African countries. All surveys were conducted after the year 2000. The surveys make it possible to capture recent school dynamics one the one hand and, on the other, to identify children born out of an unintended pregnancy among births that occurred within five years interval prior to the survey. To measure the effect of this unexpected child bearing on schooling, we use linear probability model (LPM) and control for unobservable heterogeneity with fixed effect. The results show that fertility shocks lead to an underinvestment in young children education. Namely, when an unexpected birth occurs in a given household, all else equal, it reduces the probability of first school entry of children aged 6 to 9 years and increases the dropout rate of children aged 6 to 18 years already in school. This paper also investigates the whether the heterogeneity of fertility shocks is relevant for schooling. Do the gender and the relationship to the household head of the unintended child affect differently schooling? In parallel, are some children more effect by the fertility shock? The results suggest that, unintended birth that occurs the current academic year are more damaging for current school enrolment than those that occurred 2 to 4 years before. It addition, household’s head unintended child have more damaging effect than other household’s member unintended child.

Regarding schooling children characteristics, the results suggest household’s head children are less affect by the presence of an unintended child in the household compare to other children living in the household. Male and female children are equally affected by the presence of an unintended child in the household. Overall, the results of this paper suggest, the presence of child born out of an unintended pregnancy in a household affect negatively current schooling. Such effect could have long lasting consequences on human capital accumulation. Pushing for affective use of contraception should then remain in the policy agenda of African policy makers.

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Annex

Table 1A: LPM of recent fertility shock on current school drop out of children aged 6-18 years

VARIABLES	(1) All_	(2) Poorer	(3) Richer	(4) Male	(5) Female	(6) Son/daughter of hh head	(7) Other children
Unintended birth	0.0057***	0.0064***	0.0050***	0.0012	0.0102***	0.0041***	0.0122***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)
Son or daughter of the head	-0.0121***	-0.0073***	-0.0155***	-0.0084***	-0.0160***		
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)		
Female	0.0064***	0.0074***	0.0060***			0.0043***	0.0108***
	(0.001)	(0.001)	(0.001)			(0.001)	(0.001)
Age	0.0097***	0.0103***	0.0091***	0.0088***	0.0108***	0.0085***	0.0115***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wealth proxy	-0.0025***	-0.0039***	-0.0018***	-0.0022***	-0.0029***	-0.0026***	-0.0026***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Schooling dalay	0.0021***	0.0012**	0.0023***	0.0027***	0.0017***	0.0023***	0.0015***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household size	-0.0004***	-0.0007***	-0.0004***	-0.0005***	-0.0003**	-0.0004**	-0.0004*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head of household age	-0.0001***	-0.0001**	-0.0002***	-0.0001**	-0.0002***	0.0002***	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female headed household	-0.0043***	-0.0036**	-0.0060***	-0.0047***	-0.0043***	0.0002	-0.0071***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Head of household education	-0.0007***	-0.0015***	-0.0005***	-0.0007***	-0.0007***	-0.0007***	-0.0010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.0511***	-0.0577***	-0.0457***	-0.0444***	-0.0539***	-0.0642***	-0.0724***
	(0.003)	(0.006)	(0.004)	(0.004)	(0.004)	(0.003)	(0.006)
Observations	341,235	127,815	213,420	178,016	163,219	240,651	100,584
R-squared	0.025	0.024	0.027	0.020	0.032	0.021	0.031
Number of strata	13,194	10,620	11,900	13,102	12,841	13,137	12,037
aR-squared	0.0254	0.0242	0.0274	0.0202	0.0321	0.0215	0.0313

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2A: LPM of recent fertility shock on current school entry of children aged 6-9 years

	(1) All_	(2) Poorer	(3) Richer	(4) Male	(5) Female	(6) Son/daughter of hh head	(7) Other children
Unintended birth	-0.0116**	-0.0127**	-0.0059	-0.0052	-0.0088	-0.0078	-0.0063
	(0.005)	(0.006)	(0.009)	(0.007)	(0.007)	(0.005)	(0.013)
Son or daughter of the head	0.0240***	0.0148***	0.0368***	0.0153***	0.0283***		
	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)		
female	-0.0072***	-0.0041	-0.0131***			-0.0086***	0.0039
	(0.002)	(0.003)	(0.004)			(0.003)	(0.006)
age	0.0429***	0.0480***	0.0370***	0.0479***	0.0382***	0.0469***	0.0391***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)
Wealth proxy	0.0292***	0.0298***	0.0280***	0.0294***	0.0287***	0.0303***	0.0287***
	(0.001)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Household size	-0.0024***	-0.0031***	-0.0016***	-0.0034***	-0.0017***	-0.0026***	-0.0012
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Head of household age	-0.0001	-0.0001	-0.0003	-0.0000	-0.0002	-0.0010***	0.0009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female headed household	0.0167***	0.0135***	0.0268***	0.0110*	0.0237***	0.0009	0.0304***
	(0.004)	(0.005)	(0.008)	(0.006)	(0.006)	(0.005)	(0.008)
Head of household education	0.0106***	0.0102***	0.0099***	0.0109***	0.0106***	0.0116***	0.0086***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.1133***	-0.1324***	-0.0777***	-0.1333***	-0.0926***	-0.0913***	-0.1060***
	(0.011)	(0.015)	(0.019)	(0.016)	(0.015)	(0.012)	(0.026)
Observations	115,404	64,706	50,698	58,181	57,223	87,785	27,619
R-squared	0.028	0.026	0.024	0.031	0.027	0.033	0.022
Number of strata	12,141	9,480	9,728	11,160	11,060	11,446	9,417
aR-squared	0.0284	0.0259	0.0243	0.0310	0.0268	0.0333	0.0215

Robust standard errors in parentheses

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

Table 3A LPM of recent fertility shock on current school entry and dropout: timing of the unexpected birth

	(1)	(2)
VARIABLES	dropout	entrance
Unintended birth year survey	0.0152***	-0.0288***
	(0.002)	(0.008)
Unintended birth one year after survey	0.0083***	-0.0003
	(0.002)	(0.009)
Unintended birth two years after survey	0.0024	-0.0157*
	(0.002)	(0.010)
Unintended birth three years after survey	0.0001	-0.0005
	(0.002)	(0.009)
Unintended birth four years after survey	-0.0036	-0.0114
	(0.002)	(0.010)
Poorer	0.0084***	-0.0539***
	(0.001)	(0.003)
Head's child	-0.0169***	0.0227***
	(0.001)	(0.003)
Female	0.0083***	-0.0070***
	(0.001)	(0.002)
Age	0.0103***	0.0429***
	(0.000)	(0.001)
schooling delay	0.0020***	
	(0.000)	
Household size	-0.0017***	-0.0027***
	(0.000)	(0.001)
Household size squared	0.0000***	0.0000*
	(0.000)	(0.000)
Head's Age	-0.0003***	-0.0001
	(0.000)	(0.000)
Female Head	-0.0079***	0.0125***
	(0.001)	(0.004)
Head education	-0.0010***	0.0118***
	(0.000)	(0.001)
Constant	-0.0449***	-0.0381***
	(0.003)	(0.012)
Observations	335,413	113,371
R-squared	0.030	0.025
Number of pays_grap	12,843	11,847
aR-squared	0.0297	0.0252

Robust standard errors in parentheses

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

Table 4A LPM of a spouse fertility shock on current school entry and dropout

recent fertility schok on current school drop out

VARIABLES	(2) Current school entry	(4) Current school drop out
Unwanted head's child	-0.0136***	0.0045***
	(0.0036)	(0.0010)
Unwanted non head's child	0.0009	-0.0016
	(0.0092)	(0.0014)
Poorer	-0.0533***	0.0064***
	(0.0033)	(0.0009)
Head's child	0.0240***	-0.0064***
	(0.0032)	(0.0007)
Female	-0.0092***	0.0013**
	(0.0023)	(0.0005)
Age	0.0393***	0.0026***
	(0.0012)	(0.0002)
Household size	-0.0025***	-0.0004**
	(0.0007)	(0.0002)
Household size squared	0.0000*	0.0000
	(0.0000)	(0.0000)
Head's Age	-0.0001	-0.0001*
	(0.0001)	(0.0000)
Female Head	0.0134***	-0.0027***
	(0.0038)	(0.0008)
Head education	0.0114***	-0.0008***
	(0.0005)	(0.0001)
Schooling delay		0.0002
		(0.0002)
Constant	0.0123	0.0031
	(0.0111)	(0.0026)
Observations	125387	267962
R-squared	0.023	0.004
Number of pays_grap	12729	13649
aR-squared	0.0233	0.00364

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5A: Estimated LPM on a trimmed sample (Horrace and Oaxaca procedure)

VARIABLES	(1) dropout	(2) entry
Unintended child	0.0076***	-0.0116**
	(0.001)	(0.005)
Son or daughter of the head	-0.0160***	0.0240***
	(0.001)	(0.003)
Female	0.0095***	-0.0072***
	(0.001)	(0.002)
Age	0.0129***	0.0429***
	(0.000)	(0.001)
Wealth proxy	-0.0036***	0.0292***
	(0.000)	(0.001)
Schooling delay	0.0031***	
	(0.000)	
Household size	-0.0006***	-0.0024***
	(0.000)	(0.000)
Head of household age	-0.0002***	-0.0001
	(0.000)	(0.000)
Female headed household	-0.0057***	0.0167***
	(0.001)	(0.004)
Head of household education	-0.0011***	0.0106***
	(0.000)	(0.001)
Constant	-0.0840***	-0.1133***
	(0.004)	(0.011)
Observations	294,609	115,404
R-squared	0.029	0.028
Number of strata	13,187	12,141
aR-squared	0.0286	0.0284

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6A : Conditional fixed effect logit model and LPM of school dropout (same sample for clogit and LPM)

	(1) Clogit	(2) LPM
The dependant variable is dropout		
Unintended child	0.1928***	0.0101***
	(0.036)	(0.002)
Son or daughter of the head	-0.3997***	-0.0227***
	(0.024)	(0.002)
Female	0.2623***	0.0119***
	(0.022)	(0.001)
Age	0.3886***	0.0186***
	(0.006)	(0.000)
Wealth proxy	-0.1106***	-0.0051***
	(0.009)	(0.000)
Schooling delay	0.0855***	0.0038***
	(0.006)	(0.000)
Household size	-0.0143***	-0.0008***
	(0.004)	(0.000)
Head of household age	-0.0030***	-0.0002***
	(0.001)	(0.000)
Female headed household	-0.1474***	-0.0083***
	(0.027)	(0.002)
Head of household education	-0.0357***	-0.0015***
	(0.003)	(0.000)
Constant		-0.1000***
		(0.006)
Observations	170,727	170,727
R-squared		0.050
Number of strata		5,798
aR-squared		0.0497

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

Table 6A : Conditional fixed effect logit model and LPM of school entry (same sample for clogit and LPM)

	(1) clogit	(2) LPM
The dependant variable is school entry		
Unintended child	-0.0794**	-0.0149**
	(0.032)	(0.006)
Son or daughter of the head	0.1753***	0.0314***
	(0.024)	(0.004)
Female	-0.0524***	-0.0098***
	(0.018)	(0.003)
Age	0.3378***	0.0587***
	(0.009)	(0.002)
Wealth proxy	0.1951***	0.0373***
	(0.009)	(0.002)
Household size	-0.0176***	-0.0031***
	(0.003)	(0.001)
Head of household age	-0.0007	-0.0001
	(0.001)	(0.000)
Female headed household	0.1309***	0.0235***
	(0.026)	(0.005)
Head of household education	0.0618***	0.0128***
	(0.003)	(0.001)
Constant		-0.1863***
		(0.015)
Observations	85,233	85,233
R-squared		0.037
Number of strata		8,153
aR-squared		0.0369

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7A: LPM of recent fertility shock on current school enrolment of children aged 6-18 years

	(1) All_	(2) Poorer	(3) Richer	(4) Male	(5) Female	(6) Son/daughter of hh head	(7) Other children
The dependant variable is current school enrolment							
Unintended birth	-0.0157***	-0.0200***	-0.0102***	-0.0044	-0.0264***	-0.0132***	-0.0226***
	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Son or daughter of the head	0.0782***	0.0465***	0.1018***	0.0598***	0.0926***		
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)		
female	-0.0382***	-0.0320***	-0.0422***			-0.0322***	-0.0453***
	(0.001)	(0.002)	(0.002)			(0.001)	(0.002)
age	-0.0039***	0.0012***	-0.0075***	0.0002	-0.0083***	0.0028***	-0.0129***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wealth proxy	0.0219***	0.0388***	0.0166***	0.0221***	0.0215***	0.0261***	0.0142***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household size	-0.0001	-0.0005	0.0000	-0.0004	0.0003	0.0000	-0.0003
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Head of household age	0.0009***	0.0009***	0.0009***	0.0008***	0.0011***	-0.0009***	0.0011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female headed household	0.0340***	0.0306***	0.0438***	0.0345***	0.0344***	0.0067***	0.0456***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Head of household education	0.0090***	0.0133***	0.0075***	0.0094***	0.0088***	0.0105***	0.0072***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.5136***	0.4277***	0.5922***	0.4840***	0.5126***	0.5684***	0.6860***
	(0.005)	(0.008)	(0.006)	(0.006)	(0.006)	(0.005)	(0.008)
Observations	574,407	256,317	318,090	293,974	280,433	407,706	166,701
R-squared	0.023	0.012	0.031	0.018	0.028	0.022	0.022
Number of strata	13,484	11,505	12,304	13,473	13,468	13,468	13,310
aR-squared	0.0233	0.0122	0.0311	0.0176	0.0279	0.0222	0.0224

Robust standard errors in parentheses

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

Table 8A: LPM of recent fertility shock on dropout, entry and current school enrolment of children (sample restricted to households with new born)

	Dropout (6-18 year)	Entry (6-9 years)	enrolment(6-18 year)
Unintended birth	0.0036**	-0.0078	-0.0052**
	(0.001)	(0.005)	(0.003)
Son or daughter of the head	-0.0150***	0.0377***	0.0960***
	(0.001)	(0.004)	(0.002)
Female	0.0085***	-0.0081***	-0.0506***
	(0.001)	(0.003)	(0.002)
Age	0.0087***	0.0458***	-0.0002
	(0.000)	(0.001)	(0.000)
Wealth proxy	-0.0028***	0.0288***	0.0244***
	(0.000)	(0.002)	(0.001)
Schooling delay	0.0014***		
	(0.000)		
Household size	-0.0007***	-0.0019***	0.0012***
	(0.000)	(0.000)	(0.000)
Head of household age	-0.0000	-0.0003**	0.0004***
	(0.000)	(0.000)	(0.000)
Female headed household	-0.0017	0.0093*	0.0280***
	(0.001)	(0.005)	(0.003)
Head of household education	-0.0008***	0.0108***	0.0106***
	(0.000)	(0.001)	(0.000)
Constant	-0.0400***	-0.1483***	0.4310***
	(0.004)	(0.014)	(0.006)
Observations	178,593	80,527	328,404
R-squared	0.025	0.032	0.027
Number of strata	12,912	11,142	13,378
aR-squared	0.0251	0.0320	0.0270

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1