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ARE BOYS AND GIRLS AFFECTED DIFFERENTLY WHEN THE HOUSEHOLD HEAD LEAVES FOR GOOD? EVIDENCE FROM SCHOOL AND WORK CHOICES IN COLOMBIA

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This paper investigates how the permanent departure of the head from the household, mainly due to death or divorce, affects children's school enrolment and work participation in rural Colombia. In our empirical specification we use household-level fixed effects to deal with the fact that households that experience the departure of the head are likely to differ in unobserved ways from those that do not, and we also address the issue of non-random attrition from the panel. We find remarkably different effects for boys and girls. For boys, the adverse event reduces school participation and increases participation in paid work, whereas for girls we find evidence of the adverse event having a beneficial impact on schooling. To explain these differences, we provide evidence for boys consistent with the head's departure having an important effect through the income reduction associated with it, whereas for girls, changes in the household decision-maker appear to play an important role.

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1 Introduction

A major disruption to family life can have serious consequences for children. A particularly traumatic event is the permanent departure of the head, or main decision-maker, from the household. There are at least three different channels through which this can affect children's human capital accumulation, and in particular their school and work participation (more discussion of the following points is to be found in Case et al, 2004 and Gertler et al, 2004). First, it is likely to involve a substantial income loss, particularly if the head is a working male, and this may be important for school choices in the presence of credit and insurance market failures. Second, the balance of decision-making power within the household may change, with the preferences of remaining adults gaining increased importance, which may have important consequences for children. Third, it is likely that the head is a parent, the loss of whom can have significant emotional and psychological consequences for children. The importance of the first and third channels were highlighted in a recent World Bank Development Outreach report (Bell et al, 2006)

'if parents sicken and die while their children are still young, then all the means needed to raise the children so that they can become productive and capable citizens will be greatly reduced. The affected families' lifetime income will shrink, and hence also the means to finance the children's education, whether in the form of school fees or taxes. On a parent's death, moreover, the children will lose the love, knowledge and guidance which complement formal education.'

Some countries, particularly in Africa, have put in place policies to provide education and health support to children who have lost one or both parents. These policies appear to be a

response to the increase in HIV-associated mortality, which has resulted in millions of children losing parents to AIDS. Yet loss of a parent due to death or divorce whilst a child is still young is a pervasive phenomenon. Despite this, there is surprisingly little evidence on how children are affected by the loss of one or more parents (recent exceptions are referred to below). In this paper we investigate how the permanent departure of the head from the household affects children's school enrolment and work participation. We consider mainly losses that are due to death or divorce, and that can thus be reasonably considered to be adverse events. We are interested in school and work participation because it is well-known that they affect the human capital accumulation of children (though we measure only short-term impacts in this paper); moreover child work also affects family income and therefore current poverty.

In the econometric analysis, we use household-level fixed effects to deal with the fact that households that experience the departure of the household head are likely to differ in unobserved ways from those that do not. Our results are robust to the presence of non-random attrition from the panel, which is important to take into account if there are common unobserved factors explaining the decision to send children to school/work and attrition. We find remarkably different effects for boys and girls. For boys, the adverse event reduces school participation and increases participation in paid work, whereas for girls we find evidence of the adverse event having a beneficial impact on schooling.

Our findings suggest that the mechanisms explaining the consequences of adverse events on schooling and child labour decisions are complex and different for boys and girls. For boys, we provide a number of pieces of evidence consistent with the departure having an important effect through the income reduction associated with it. First, our findings are observed mainly

in remote areas in which borrowing constraints and insurance market failures are likely to be more acute (Becker and Tomes, 1986). Second, the effects vary in the expected way with household wealth (measured before the adverse event). Third, we observe a similar pattern of findings when we use a crop loss as a proxy for a negative income loss (see Beegle et al, 2006a).

In contrast, we find no evidence to suggest that the income loss associated with the departure affects adversely the school participation of girls (note we do not consider paid work for girls due to low rates of female participation in this activity). In fact, we find that girls' school participation increases after the adverse event. We provide evidence to suggest that the change in the household decision-maker is a potentially important factor behind this effect. Using relative age and education levels of the former and new heads as proxies for relative bargaining power, we show that the change in bargaining power associated with a change in head from male to female is beneficial for girls. This finding is consistent with the presence of differential intra-household preferences, with mothers preferring to devote resources to improving the well-being of daughters as opposed to sons, in line with findings by Thomas (1990).

Our work first fits into the growing literature in developing countries on parental deaths and children's education. This literature investigates the importance of different channels in explaining the observed impacts (Beegle et al, 2006b, Case et al, 2004; Gertler et al, 2004; Yamano and Jayne, 2005; Evans and Miguel, 2007). In short, it generally finds adverse effects on education, particularly on primary school participation, and the findings tend not to be entirely explained by the income loss associated with the death. A novelty of our work is that we also consider the effects on child labour (though for boys only due to data

constraints), which, to our knowledge, has not been considered in this literature, and yet which is an important economic activity amongst children in developing countries and one which may be particularly responsive to an adverse event that induces an income reduction.

Our work also fits into the strand of the literature that considers the relationship between other negative income shocks, such as crop losses, and children's work participation (Jacoby et al., 1997; Beegle et al, 2006a; Dehejia and Gatti, 2005; Duryea et al, 2007; Dammert, 2007; Guarcello et al.2003). In line with this literature, our results for boys - increases in child labour following sudden reductions in family income - are consistent with the presence of credit and insurance market failures in Colombia.

There is also some existing evidence that impacts of income shocks may be different for boys and girls. If parents "prefer" investing in boys than in girls (for example, because returns to resources are greater if invested in boys than in girls), then liquidity constrained households may withdraw more resources from girls than from boys when resources shrink. The evidence on this points to the schooling of girls suffering more than that of boys after income losses (Sawada, 2003; Parker and Skoufias, 2006). Our finding that the schooling of girls may increase after the departure of the household head stands in contrast to these findings. We argue that, among the very poor households in rural Colombia represented in our sample, the departure of the head may be less detrimental to the schooling of girls than that of boys, because it tends to result in females taking over from males as household heads, thus potentially increasing the decision-making power of females. To our knowledge, only Gertler et al. (2004) used a related argument in their theoretical discussion on the fact that death of a mother may be more detrimental for the schooling of daughters than death of father, if mothers favour daughters.

The remainder of the paper proceeds as follows. In section 2 we describe the data that we use in this research. After presenting the empirical methodology in section 3, we discuss the results for boys and girls in section 4, and go on to conclude in Section 5.

2   Data

2.1   Background

We use three years of panel data from a survey of households and individuals in rural Colombia. These data have been collected to evaluate a large scale welfare programme *Familias en Acción* (FeA from hereon), which has been in place in rural areas of Colombia since 2002, and which has since expanded to cover urban areas. The programme aims at alleviating poverty by fostering human capital accumulation among the poorest households through conditional subsidies for investments into education, nutrition and health. Attanasio et al (2009) contains a more complete description of the programme and an evaluation of its impacts on children's schooling and work.

The first wave of data collection for the evaluation of this programme took place in 2002, and around 11,500 households were interviewed. We refer to this as the first survey. A year later, a second wave of data was collected, with a third wave collected in 2006, which we refer to as the second and third surveys respectively. In this work, we use data from all three rounds, though we only consider the effects of the adverse event on children's outcomes in the second and third surveys (note, both of these are post-programme). This is because the adverse event that we are considering is the permanent departure of the head since the previous wave, which is thus not defined for the first wave.

The data are rich, reflecting interviews that lasted on average 3.5 hours. They contain information on household socio-demographic structure, dwelling characteristics, use of healthcare services, anthropometric indicators, household consumption and assets, individual education and labour supply, income and transfers.

2.2 Descriptive statistics

The sample we use comes from surveys that were conducted in 122 municipalities in rural Colombia, with each municipality containing less than 100,000 inhabitants. Municipalities contain both a rural and a relatively more urbanised district, which we refer to as 'rural' and 'urban' areas respectively. The 'urban' part contains the 'cabecera municipal', which is the centre of government of the municipality. It is also expected to have at least 3,000 inhabitants and various public facilities including a city hall, a school and a health centre. The 'rural' part includes the other, more remote parts of the municipality.

2.2.1 Outcomes

The outcome variables we consider are discrete indicators for children's school and paid work participation, though we consider the latter outcome for boys only as, as we will see, very few girls participate in paid work. School participation relates to whether the individual is enrolled in school at the time of the survey. Work participation is measured using information from a module specific to paid work, and includes having spent the majority of the week prior to the survey engaged in paid work or actively looking for a job. Thus this category captures "full-time" paid workers.[1]

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[1] Amongst the sample of boys in paid work, just under 11% of them are also enrolled in school, and amongst those enrolled in school just 2% of them report being in paid work as well.

In Table 1, we show the proportions of our sample enrolled in school and participating in paid work, by age, separately for males and females. We see that school enrolment rates are high amongst children aged 7-11, corresponding to primary school.[2] The first substantial drop in enrolment is observed at age 12, at the transition from primary to secondary school. Another point worth noting is that school enrolment of females is higher than that of males. Engagement in paid work is considerably higher for males than for females, and is very low for both before the age of 12 (we do not observe participation in paid work for individuals below age 10). These trends lead us to confine our main analysis to children aged 12 through 17. Moreover, we consider paid work as an outcome for boys only, given how low it is for girls, at around 5.2% on average.

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[2] The school system in Colombia operates as follows. Compulsory education is free and lasts for nine years, and consists of basic primary (five years, ages 7 through 11) and basic secondary (educación básica secundaria, four years, ages 12 through 15). The secondary school system also includes the middle secondary cycle (educación media, two years, ages 16 and 17). Successful completion of studies leads to the Bachillerato. Students must pass an entrance examination/test for access to universities.

Table 1: School and paid work participation, by age and gender

	Boys		Girls	
Age	**School enrolment %**	**Paid work %**	**School enrolment %**	**Paid work %**
7	92.8	-	94.0	-
8	94.6	-	96.3	-
9	95.9	-	96.8	-
10	95.3	0.5	96.3	0.2
11	92.9	0.8	95.6	0.2
12	88.9	2.3	91.8	0.7
13	82.2	5.2	87.7	1.8
14	75.3	10.4	83.0	2.9
15	67.0	16.3	78.0	5.4
16	58.2	23.9	66.7	11.3
17	44.4	35.2	56.0	13.1
12-17	70.5	14.6	78.9	5.2
N	*21,503*	*15,875*	*19,262*	*14,008*

NOTES:- Based on *FeA* surveys 2 and 3. Urban and rural areas pooled.

2.2.2 Adverse Event

In order to capture a potentially very important disruption to family life, we restrict attention to the permanent departure of the household head since the previous survey.[3] We define this to have occurred if the head died, got divorced, or left along with his partner since the previous wave (hence precluding the use of children's outcomes at the first survey from the analysis). Throughout the text we refer to this as an 'adverse event'. The percentage of our sample of households (i.e. those with at least one 12 to 17 year old, at either the second or third surveys) in which the head departed permanently since the previous wave is 4.4%. Of these, around 20% are due to death, 60% are due to divorce or separation and, in the 20% of

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[3] The household head is defined in our survey as the person whom all other household members perceive as such. Our interpretation is that this perception is likely to be very closely tied to his/her earnings capacity and decision-making power.

remaining cases, the spouse left along with the head.[4] The average age of heads who departed is around 44.

Despite the reasonably low occurrence of this adverse event, it is likely to be a very significant event in a child's life. One reason for this is that it results in a substantial income reduction. To have a cleaner measure of this, we define the adverse event as departures of heads who were previously working and thus contributing to household income. This is approximately 78% of heads that departed. To get an idea as to the extent of the income loss associated with the adverse event, we compare total household earnings of adults (aged 18+) in households which did and did not experience this adverse event in the previous period. Table 2 shows the coefficients from a regression of the log of total household earnings on the adverse event.[5] In households in which the head departed, total household adult earnings are lower by around 25% compared with households in which the head did not depart (conditional on the variables listed in the note to the table).

Note that in an additional 4% of households the head departed the household since the previous survey for some other unknown reason (so it is difficult to know to what extent it is

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[4] We assume that heads who left with their spouse are unlikely to return to the household, and thus consider it to be a permanent departure from the household. As their proportion in the sample is very low, it was not possible to test for heterogeneous impacts of adverse events in such households.

[5] Note that this regression gives a lower bound of the magnitude of the adverse event in terms of total household adult earnings, as it includes labour supply responses to it, which are likely to mitigate the potential adverse effects on income. We exclude earnings from children to mitigate this problem.

an adverse event, or whether the departure is likely to be permanent), or departed due to death/divorce but was not working beforehand (so it may not capture an income loss). We see from Table 2 that departure of the head for other reasons is also negatively correlated with current household earnings, though the magnitude is considerably lower (row 2). As the concern with this is that it may include heads who have left temporarily to earn money elsewhere, we do not use it as a proxy for an adverse event (though we control for it throughout the analysis).

Table 2 Marginal effects, OLS regression of log current household earnings on the adverse event

Dependent variable household earnings	
Adverse event = Permanent departure of head	-0.250 (0.038)**
Other departure of head	-0.084 (0.044)[+]
N	14,471

NOTES:- Control for household earnings at time t-1, time effects, adult composition of the household, sex, age quadratic and education level of the head, crop loss. Robust standard errors clustered at municipality level in parentheses. N is the number of households with non-zero earnings in waves 2 and 3. [+]significant at 10%; *significant at 5%; **significant at 1%.

Whether such adverse events are fully anticipatable or not, it is unlikely that the very poor households in our sample have ways to fully insure against the income losses they entail, in particular in the most remote (rural) parts of the municipalities where credit and insurance markets are thin (Edmonds, 2006). In these conditions, we expect them to affect household decisions to send their children to school/work.

In addition to income losses, the adverse event is likely to have a number of other important repercussions. First, the household head is likely to be one of the key decision-makers in the household, so such a departure may bring about important changes in bargaining power and decision-making within the household, which may affect children's education and work.

Second, the household head is usually a parent, which is an important figure head for children. Indeed, amongst households that experienced this adverse event, 80% of the time it is a father that departs.[6] In the empirical analysis, we will address these different channels.

A concern with using such a proxy for an adverse event is that it may not be exogenous to the outcomes of interest, child labour and schooling. For example, couples may split up due to having different preferences over investment in children. Though we have no reason to believe this to be the case in our context, we can get some informal indication as to whether it is a potential issue, by considering whether these households are different in their decision-making *before* divorcing. To do this, we use data from a module on decision-making administered to women at the first survey, before the divorce. We consider two measures relating to decision-making between partners. The first is whether the mother reports that it is she who makes decisions about taking the child to the doctor, school attendance, and purchasing children's clothes. The second is whether the mother reports that she alone can decide on how to spend any extra money she may receive. We do not find any statistical differences in decision-making amongst households in which the head subsequently left due to divorce, versus households in which the head left for some other reason, as shown in Table

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[6] We do not consider departures other than of the household head because the surveys allow us to observe the child's relationship to the head only, not to any other household members. Though we can sometimes infer relationships between people based on their relationships to the head, this is not always the case. So if anyone else in the household left, we do not know with certainty the child's relationship to him/her. In any case we are most interested in the head, who is likely to be the most important person when it comes to the household economy and decision-making.

3. Though this is just one aspect of decision-making, this evidence nonetheless alleviates concerns that divorce is more driven by a decision-making imbalance than death. Note, moreover, that in our empirical analysis we will control for potential related endogeneity problems, which we return to below.

Table 3 Comparison of decision-making amongst couples who subsequently got divorced and couples who split up due to death/other reasons

Decision-making at first survey ↓	Adverse Event= Divorce	Adverse Event= Death/Other	*p-value difference*
Mother makes decisions relating to children's human capital (%)	18.31 (2.72)	19.79 (4.08)	*0.762*
Female has full power to decide how to spend money (%)	49.5 (3.52)	41.48 (5.10)	*0.200*
Number of households	218	140	

NOTES:- Data from the first survey.

More generally, departure of the household head may not be a random event even when it is due to death. If this is the case, failure to control for it would result in biased estimates of the effect of the adverse event on outcomes. To investigate this, we compare observable characteristics of households in which the head did and did not subsequently depart, in Table 4 below. Note that the characteristics in the table pertain to the first survey (i.e. *before* the departure happened). Households that did and did not experience this adverse event generally share similar characteristics, such as family composition, income levels, and area characteristics. However, there are some differences, though they are of low magnitudes: households that went on to experience the adverse event have slightly younger, more educated (conditional on having some education) heads at the first survey, contain more 7-11 year old girls and live closer to a school.

Table 4 Comparison of pre-adverse event household and municipality characteristics across households that do and do not experience an adverse event

Characteristic, wave 1 ↓	Departure of household head (D)		
	D=1	**D=0**	*P-value*
Age of household head	44.04	46.25	***0.001***
Age of spouse	39.72	42.33	***0.000***
Education of head			
None	0.276	0.276	*0.989*
Incomplete primary	0.504	0.591	***0.001***
>= Complete primary	0.180	0.114	***0.0001***
Education of spouse			
None	0.236	0.237	*0.978*
Incomplete primary	0.593	0.639	*0.082*
>= Complete primary	0.171	0.124	***0.011***
Household composition			
Ave # of kids 0-6	0.413	0.415	*0.898*
Ave # of boys 7-11	0.668	0.648	*0.622*
Ave # of girls 7-11	0.748	0.592	***0.0001***
Ave # of boys 12-17	0.702	0.709	*0.870*
Ave # of girls 12-17	0.625	0.634	*0.807*
Ave # of female adults	1.440	1.429	*0.797*
Ave # of male adults	1.402	1.376	*0.603*
School enrolment rate of 7-17 year olds in household	0.843	0.820	*0.180*
Programme area	0.590	0.586	*0.870*
Altitude	568.07	595.70	*0.475*
Distance to school	11.07	13.18	***0.001***
Household consumption at time of first survey	74946.6	74533.5	*0.716*
# households	*356*	*7,840*	

NOTES:- The sample consists of households in which there is at least one 12-17 year old in either the second or third survey. Characteristics in the table pertain to the first survey.

Whilst we can control for all of these variables in the analysis, this does not mitigate concerns that the two household types may also differ along unobserved dimensions that are correlated with the outcomes of interest. If this is the case, then failure to control for this would result in biased estimates of the effect of the adverse event on outcomes. We discuss how we deal with this econometrically in section 3.

2.3 *Attrition*

One concern that must be addressed is non-random attrition from the survey. This is important because results may be biased if the reason for leaving the sample is related to the behaviour being modelled, as might be the case if the adverse event affects decisions to leave the municipality of residence. Recall that we carry out the analysis using outcomes of 12-17 year old children from the second and third surveys. In order to capture who *should* be in our sample at the second survey, we take the sample of children aged 11-16 at the first survey who should be 12-17 at the second survey, one year later, and thus in our sample. If they are not observed at the second survey, they are taken to have attrited. We pool them with the sample of children aged 10-15 at the second survey who should be 12-17 at the third survey, two years later, and thus in our sample. Overall, around 16% of individuals have left the sample in either of the two surveys.

Although we do not know why individuals left the sample, we can compare the baseline characteristics of those that did and did not subsequently leave the sample. This comparison is shown in Table 5. The main difference between children who did and did not leave the sample is that those who left are more likely to be from households in which the head and spouse are relatively older, and from relatively less educated households, though differences are very small. Nonetheless, this does not alleviate concerns that they may be different along unobservable dimensions, so potential selection biases in the data cannot be ruled out, which we need to account for in our empirical work. We return to this in section 3, though it is worth noting, in advance of our results, that it makes little difference to the effects we estimate.

Table 5 Comparison of characteristics across children that leave the sample at any time after the first survey and those that do not

Survey 1 characteristics ↓	Did not attrit	Did attrit	*P-value difference*
Age of head	45.691	46.661	*0.000*
Age of spouse	41.652	42.736	*0.000*

Head no education	0.276	0.313	*0.001*
Spouse no education	0.237	0.274	*0.000*
Head some education	0.597	0.571	*0.028*
Spouse some education	0.643	0.625	*0.082*
Head high education	0.111	0.096	*0.017*
Spouse high education	0.12	0.101	*0.007*
# female adults in household	1.403	1.376	*0.069*
# male adults in household	1.369	1.326	*0.031*
Treated area	0.584	0.577	*0.651*
Altitude	572.611	584.504	*0.666*
Crop loss at first survey	0.129	0.129	*0.967*
Owns house	0.976	0.972	*0.209*
# individuals	21,806	4,147	

NOTES:- The sample consists of individuals at the first (second) survey who would have been aged 12-17 by the time of the second (third) survey, see text.

3   Empirical Methodology

To estimate the effects of the departure of the head on children's school and work participation, we estimate the following model

$$y_{ijt} = \alpha_1 + \alpha_2 V_{jt} + X'_{ijt}\alpha_3 + W'_{h't}\alpha_4 + f_j + \delta_t + u_{ijt} \qquad (1)$$

where i denotes child, j denotes household and t denotes time, y_{ijt} is a discrete indicator for participation in school or work, V_{jt} is an indicator that takes the value 1 if the head has left the household permanently since the previous wave (due to death, divorce, or with partner – see section 2.2.2), and 0 otherwise, X_{ijt} is a vector of observed time-variant characteristics including age of the child, number of siblings and quadratics, $W_{h't}$ includes observed characteristics of the head at the time of the survey (gender, education level, relationship to the child) and the composition of adults in the household at the time of the survey, all of which are likely to change between surveys for households in which the head has departed, f_j includes unobserved time-invariant household characteristics, δ_t is a survey round dummy,

and u_{ijt} is an error term that we assume to be *iid*. The coefficient of interest is α_2, the effect of departure of the head on the outcome of interest.

We estimate equation (1) using a linear probability model (LPM) and cluster the standard errors at the municipality level to adjust for possible correlations of household decisions within the same municipalities. Although the dependent variable is discrete, in our case the main advantage of the linear model over discrete choice models is that it is considerably easier to incorporate fixed effects. Another point to note is that in our application most of the explanatory variables are discrete and take on only a few values, strengthening the case for the LPM (Wooldridge, 2003). A drawback of the LPM is that the assumptions of normality of the error term are likely to be violated, in particular when the mean of the dependent variable is close to zero or one. However, this is not such a concern in our sample, where the school enrolment rate is around 75%, and the work participation rate amongst boys is around 15%.[7] Another potential limitation of the LPM is that it can yield predicted probabilities outside the unit interval, though in our case it is not a big concern as at most 3% of predictions lie outside the unit interval.

Note also that we checked for robustness of our results to this linear specification, by estimating a fixed effects logit model (Honoré, 2002). The estimates, though less precisely estimated as they are based on the subset of children who changed their activity over time,

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[7] Paid work participation for girls is only around 5%, so we do not consider this outcome.

point to the same patterns of coefficients as are discussed in the main text on the basis of LPMs.[8]

As discussed above, an important issue in considering the effects of this adverse event on child activities is that it may be correlated with unobserved household characteristics that have a direct effect on child schooling and work. If these unobserved characteristics are fixed over time, we can use a fixed effects model to control for spurious correlations between the adverse event and children's outcomes.[9]

Another issue that arises in estimating equation (1), discussed in section 2.3, is that non random attrition, if present, will yield inconsistent parameter estimates. To investigate this potential problem, we use a standard correction in a two-step sample selection model (Heckman, 1979). The probability that the individual does not leave the survey, shown in equation (2), is estimated using a Probit

$$\Pr(S_{ijt} = 1) = \beta_1 + \beta_2 Z_{jt-1} + X'_{ijt}\beta_3 + \beta_4 t + \eta_j + v_{ijt} \qquad (2)$$

where S_{ijt} takes the value one if individual i from household j does not leave the survey in wave t, and zero otherwise, Z_{jt-1} are the instruments used for identification, discussed below, X_{ijt} are individual and household characteristics at wave t, t is a time dummy variable, and η_j is a household-level fixed effect, which may be correlated with f_j in equation (1).

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[8] The number of observations drops considerably when using this method, as only around 30% (22%) of our sample of boys changed their schooling (work) behaviour over time for example. The main estimates are shown in Table A1 of the appendix.

[9] A Hausman test rejected the validity of random effects in favour of fixed effects at less than the 1% level.

The instrument set Z_{jt-1} includes the interview date and whether the respondent is the head or spouse, both measured in the previous survey. Both may affect the overall experience of the interview and thus willingness to be re-interviewed. We believe that the identifying assumption that they have no independent effects on the outcomes of interest is plausible, particularly as they relate to the previous wave, so they are unlikely to affect the current activities of children.

The estimates from equation (2) are shown in Table A2 in the appendix. The instruments are jointly significant at the 1 per cent level. We use these estimates to construct the inverse mills ratio, which is appended to the set of control variables in equation (1). The selection correction term turns out to be in most cases not significant at convention levels, and the parameters change very little when it is included in equation (1). As this selection correction term does not change our results, we do not correct for it in the rest of the analysis.

4   Results

4.1   Boys

We first show the results for boys, in Table 6 below. We see from column 1 that the departure of the head has a significant negative effect on boys' school enrolment, of around 10 percentage points, and from column 2 we see that it increases significantly their participation in paid work, again by around 10 percentage points. Note that these results, and all that follow, are robust to including a variety of other background characteristics in the regression, which are listed in the note to the table.

As discussed in section 2, there are several reasons why these negative effects on schooling and positive effects on work may be expected. One important channel that was discussed was

the fact that households whose heads left due to death or divorce incur a substantial reduction in income.[10] We thus investigate the extent to which the income loss associated with the departure of the head explains the estimated impacts. We investigate this in a number of ways. First, we look at whether the effects are larger for households that are more likely to face credit constraints and insurance market failures - those living in more remote 'rural' areas and those with relatively low levels of pre-adverse event wealth - for whom ways to mitigate the impacts of such income losses are more limited, at least in the short run. We do this for both schooling and paid work, as shown in columns 3 and 4 of Table 6 and in Table 7. Second, we investigate whether we obtain similar findings when we consider a different type of income shock, a crop loss, shown in Table 8.

Results for the specification in which we interact the adverse event with a dummy variable that takes the value one for the less urbanised (more remote) areas of rural municipalities, areas in which credit and insurance markets are more likely to be thin, are shown in columns 3 and 4. We see in column 3 that the negative impacts on school participation are entirely driven by relatively more remote 'rural' areas. In column 4 we find that the increase in paid work participation that occurs as a result of the adverse event is observed in such 'rural' areas only. Though this result could also be due to more flexibility on the labour market in such rural areas, where children can more easily obtain informal work to cope with the adverse event, we probe further the income loss channel in what follows.

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[10] Recall we restrict the variable of interest to departures of those that previously worked and thus contributed to household income, though we also control for other departures.

Table 6 Marginal effects of the adverse event on the schooling and paid work of boys, all areas.

	(1)	(2)	(3)	(4)
	school	paid work	school	paid work
Adverse event[1]	-0.105*	0.093**	-0.017	0.048
	(0.048)	(0.035)	(0.061)	(0.042)
Adverse event * rural[2]			-0.184*	0.094+
			(0.072)	(0.052)
Observations	11593	11604	11593	11604
Number of households	5756	5758	5756	5758
P-value test of joint significance			0.001	0.002

NOTES:- Marginal effects from a fixed effects linear probability model reported (see equation (1)). Also control for departure of non-working heads/departure of heads for unknown reason, time dummy, age dummies, sibling composition, number of adults, female adult composition, and current head's age, sex and education level. Robust standard errors clustered at municipality level in parentheses. [+] significant at 10%; *significant at 5%; ** significant at 1%.
[2] Marginal effect of the adverse effect in rural areas is the sum of [1] and [2]. P-value for its significance is in the last row of the table.

We next investigate whether within rural areas, the effects are larger for relatively poorer households, who are likely to face the more binding liquidity constraints. We use household total consumption measured in the first survey (i.e. *before* the adverse event happened) as a proxy for household wealth.[11] We see from column 1 of Table 7 that the negative effect of the departure of the head on school participation in rural areas is mitigated significantly by (pre-

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[11] This comprises consumption of food items, both bought and self-produced (auto-consumption of food items has been measured using detailed information on quantities of different food items consumed and prices in the municipality (see Attanasio and Mesnard, 2006), as well as expenditures of other items such as heating, shoes, cloths and so on. All of these are measured at the first survey, i.e. before the shock occurred. This measure is of better quality in our surveys than household income, and is arguably more exogenous to household decisions, providing us with a good proxy for household wealth.

departure) household wealth. This is again consistent with credit and insurance market constraints being important for these households. A parallel result holds for paid work participation, which increases after the adverse event for relatively poor households only, as shown in column 2 of the table. As these coefficients are difficult to interpret, Figure 1 shows the total impacts of the adverse event plus its interaction with wealth at different wealth levels for school and paid work participation. It shows that for richer households, the adverse event has no impact on participation in school or paid work.

Table 7 Marginal effects of the adverse event and its interaction with wealth on the schooling and paid work of boys, rural areas

	(1)	(2)
	school	**paid work**
Adverse event[1]	-5.446*	4.844**
	(2.138)	(1.288)
Adverse event * wealth	0.465*	-0.421**
	(0.192)	(0.115)
Observations	5977	5984
Number of households	2911	2912
P-value test of joint significance	0.012	0.001

NOTES:- Marginal effects from a fixed effects linear probability model reported (see equation (1)). Also control for variables listed in note to Table 6. Robust standard errors clustered at municipality level in parentheses. [+] significant at 10%; *significant at 5%; ** significant at 1%.

Figure 1 Impact of the adverse wealth on school and work participation,

by household wealth levels (measured at the first survey)
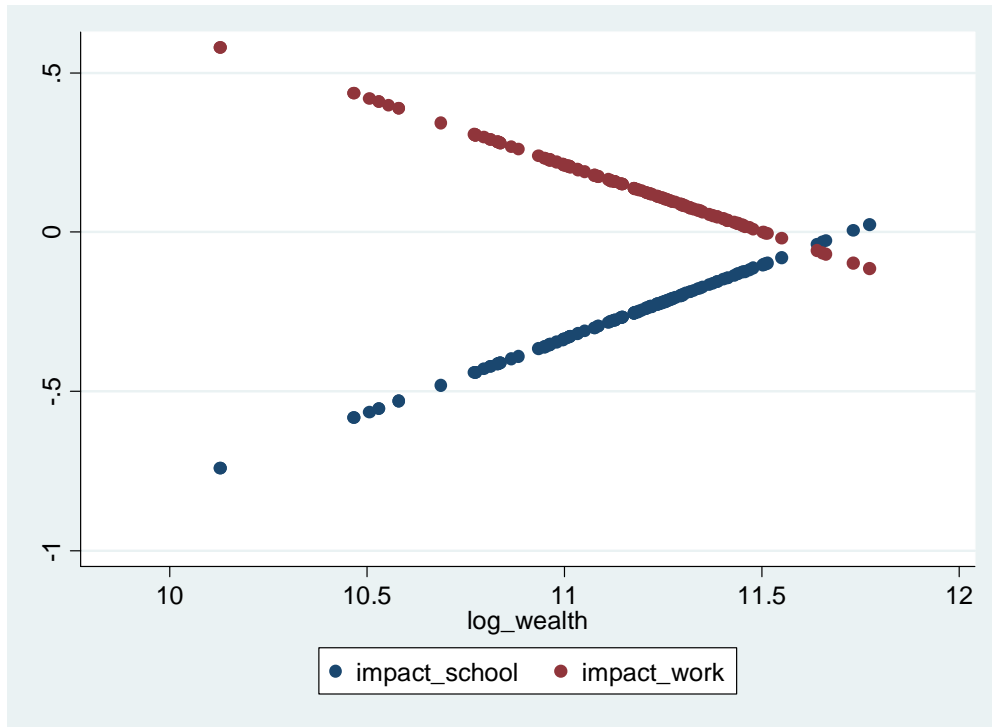
To further investigate the income loss channel, we next consider whether children's activities are affected by a crop loss.[12] The reason for this is that it is also likely to pick up a substantial income loss - indeed household income is around 19% lower in households that had a crop loss[13] - but is less likely to affect within-household decision-making and does not involve the loss of a parent. Though it may have other implications - it may affect the outside options of children in the labour market for example - finding similar results with this event would suggest that the income loss, common to both, is an important channel behind the effects.

The impacts of the crop loss on school and work participation in rural areas are shown in Table 8. We observe no significant effects on 12 to 17 year olds overall (columns 1 and 2). We then allow for heterogeneous effects of the crop loss for boys aged 12 to 13 (columns 3 and 5), and for those aged 14 to 17 (columns 4 and 6). We find that the reductions in school participation and the increases in paid work participation observed in Table 6 for the adverse event are here confined to the older age group. Moreover, the school participation of 12 to 13 year olds increases significantly after the crop loss (column 3). A possible explanation for this is that opportunities for non-remunerated work on the farm may decrease, and boys, mainly older ones, may turn instead to paid work, whereas younger boys go more to school.[14]

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[12] The variable crop loss takes the value one if the household reports having been affected by a crop loss in either of the two years prior to the survey. Unlike Beegle et al (2006a), we unfortunately do not know the magnitude of the crop loss.

[13] This is estimated from the same regression as in Table 2.

[14] In contrast, we find no significant impacts on schooling for boys in urban areas, where job opportunities are less affected by crop losses, and paid work of 14-17 year olds increases by only around 3.5%, which is significant only at the 14 % level.

Table 8 Marginal effects of crop loss on the schooling and paid work of boys, rural areas

	(1) school, 12-17	(2) paid work, 12-17	(3) school, 12-13	(4) school, 14-17	(5) paid work, 12-13	(6) paid work, 14-17
Crop loss	-0.012	0.007	0.193**	-0.068+	-0.022	0.064*
	(0.026)	(0.024)	(0.064)	(0.036)	(0.046)	(0.030)
Observations	6084	6091	2220	3864	2220	3871
Number of households	2959	2960	1822	2368	1822	2370

NOTES:- Marginal effects from a fixed effects linear probability model reported (see equation (1)). Also control for variables listed in note to Table 6. Robust standard errors clustered at municipality level in parentheses. [+] significant at 10%; *significant at 5%; ** significant at 1%.

Taken together, the pattern of results points towards the existence of capital and insurance market imperfections, with adverse implications for the human capital accumulation of boys aged 12 and over, who appear to play a potentially important role in cushioning the household against negative income shocks. Whilst one cannot rule out the psychological impacts of a parent departing playing a role too, we believe they are of secondary importance to the income loss channel. First, we have no reason to believe that psychological impacts would be stronger in remote rural areas, or would vary with wealth levels. Second, we tested whether the effects are driven by households in which it was the father who departed (80% of households): they are not. Third, we estimated the effects of the adverse event on 7-11 year olds and found no evidence of any effects, which again would be hard to reconcile with the psychological impacts being important. Another channel discussed in section 2 was a change in bargaining power. We should note that using two measures of bargaining power (explained in detail in the next section), we did not find any evidence that changes in bargaining power within the household explain the findings for boys.

4.2 *Girls*

We now go on to consider the impacts of the adverse event on the schooling of girls, shown in Table 10.[15] We see from the first column that there is a significant *increase* in school enrolment after the adverse event, of just under 10 percentage points. We first investigate whether this finding masks heterogeneous effects across different subgroups. Column 2 of the table tests for heterogeneous effects by rural/urban area, and finds no evidence of any - the positive impacts holds in both. We then test for heterogeneous effects by household wealth (measured before the adverse event – see footnote 11). We do this in urban and rural areas together (column 3), as well as in rural areas only (column 4), where we expect credit and insurance market failures to be relatively more acute. The lack of heterogeneous impacts along these dimensions and the absence of any significant impact of crop losses (shown in column 5)[16], provide no evidence that the income loss associated with the adverse event adversely affects the schooling of girls.

One potential factor behind the positive impacts is that if death of the head was preceded by illness, girls may have been more likely to stay out of school to take care of him and then returned to school upon the death. Whilst we cannot observe to what extent this is going on, if it is a factor, then the positive impact should be driven by households in which the head left due to death. However when we interact the adverse event with an indicator variable for whether death was the reason for departure, we

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[15] We do not consider paid work for girls, as participation is close to 5%, which raises concerns about the use of a linear probability model, as discussed in section 3.

[16] As for boys, we tested for heterogeneous impacts of the crop loss for young and old girls, and found no evidence of any.

find no evidence that the positive impact is driven by households in which the head died (column 6 of Table 10).

Of the three channels discussed in section 2 through which departure of the head may affect schooling - income loss, loss of a parent and change in bargaining power - the one which could be potentially beneficial for schooling is the change in bargaining power. There is ample evidence in the literature that the sex of the head matters for decision-making, with income controlled by women more likely to translate into higher household food expenditures and calorie intake and expenditures on health, education, and household services, than income controlled by men (Hoddinott and Haddad 1995; Haddad, Hoddinott, and Alderman 1997; Thomas 1990).

In 96% of households that suffer the adverse event, it is a male head that leaves and a female that becomes the new head, so increased female empowerment may be a potentially important factor behind the observed impacts. To test this further, we consider two proxies for increased bargaining power of the new head, and test for heterogeneous effects of the adverse event along these dimensions. They are (1) the new head has a lower level of education than the previous head (2) the new head is younger than the previous head. For new heads that were already of a similar or higher education level or age as the previous head, we assume that they do not see an important increase in decision-making power.

In order to investigate whether these proxies are in fact correlated with decision-making, we use a module administered specifically to married women containing a

series of questions on decisions related to the household.[17] We use this information from the first survey, i.e. *before* any adverse event happened. Women are asked whether, when they receive extra money, they (a) decide how to spend it themselves, (b) are obliged to give it to their husband, (c) decide with husband, or (d) have to consult other household members. Around 42% of respondents respond (a) and 53% respond (c). We assume that women who respond (a) have relatively more decision-making power than the others. In Table 9 we correlate this with our two proxies for bargaining power - relative education levels and age. We see that wives with lower education than their husbands appear to have lower power in decision-making; the same is also true for younger wives: though the differences are not large, they are significant at the 10% level or lower. This gives us more confidence in these measures.

Table 9 Bargaining power proxies correlated with reported decision-making power

	Spouse has full power to decide how to spend money (%)	p-value difference
Spouse has lower education than partner	40.34	
Spouse has higher education than partner	42.89	0.087
Spouse is younger than partner	41.30	
Spouse is older than partner	44.25	0.025

NOTES:- Data from first survey.

We thus proceed to investigate whether the adverse event has different impacts depending on whether the new head has "increased bargaining power", measured as discussed already by (1) the new head has a lower level of education than the previous

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[17] We do not have this information for those who are not married, and so we lose around 25% of our sample in this part of the analysis.

head (2) the new head is younger than the previous head. Results are shown in columns 7 and 8 of Table 10. We find some evidence that the increase in schooling amongst girls that occurs after the adverse event is mainly driven by households in which the head sees an increase in bargaining power. Such effects are significant at the 10% level or less.

Table 10 Marginal effects of the adverse event on schooling of girls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Adverse event[1]	0.119*	0.104+	-0.245	-3.070		0.109+	0.042	0.044
	(0.054)	(0.061)	(1.607)	(2.447)		(0.057)	(0.066)	(0.077)
Adverse event * rural[2]		0.036						
		(0.080)						
Adverse event * wealth			0.033	0.288				
			(0.144)	(0.222)				
Crop loss					0.016			
					(0.024)			
Adverse event * death[3]						0.041		
						(0.085)		
Adverse event * increased bargaining (education proxy)[4]							0.129	
							(0.087)	
Adverse event * increased bargaining (age proxy)[5]								0.105
								(0.076)
Observations	10012	10012	9723	4895	4996	10012	7909	8060
Number of households	5341	5341	5181	2608	2662	5341	4181	4264
p-value test joint significance		0.062	0.885	0.214		0.076	0.089	0.060

NOTES:- Marginal effects from a fixed effects linear probability model reported (see equation (1)). Also control for variables listed in note to Table 6. Columns (4) and (5) estimated in rural areas only. Robust standard errors clustered at municipality level in parentheses.
[+] significant at 10%; * significant at 5%; ** significant at 1%.
[2] Marginal effect of the adverse effect in rural areas is the sum of [1] and [2]. P-value for its significance is in the last row of the table.
[3] Marginal effect of the adverse event death is the sum of [1] and [4]. P-value for its significance is in the last row of the table.
[4, (5)] Marginal effect of the adverse event for those with increased bargaining power (proxied as described in text) is the sum of [1] and [4 (5)]. P-value for its significance is in the last row of the table.

Whilst these findings for girls are in contrast to previous work which points to the schooling of girls suffering more than that of boys after income losses (Sawada, 2003;

Parker and Skoufias, 2006), the important difference with our work is that the adverse event we consider is also likely to induce an important change in bargaining power within the household. We see our findings as suggesting that this channel is an important factor in decisions over human capital accumulation, and one that warrants greater attention in future such studies.

4.3 Further Analysis

Finally, we take a look *within* the household and test whether there is any evidence that the adverse event increases competition amongst siblings: if girls are favoured by the new head after the adverse event, we would expect boys (girls) who have sisters (brothers) amongst their siblings to be relatively worse (better) off in terms of human capital investments, which would stand in contrast to the findings of Garg and Morduch (1998) and Sawada (2003).

We show the results of this exercise in Table 11 below, for both boys and girls. Interestingly, we find that it is only boys that have at least one sister who suffer after the adverse event (their schooling decreases, paid work increases). Similarly, it is girls with at least one brother who benefit in terms of schooling after the adverse event.

Table 11 Marginal effects of the adverse event on activities of boys and girls, by whether of not they have siblings of opposite sex

	(1)	(2)	(3)	(4)	(5)	(6)
	school	**school**	**paid work**	**paid work**	**school**	**school**
	Boys				**Girls**	
	At least 1 sister	No sisters	At least 1 sister	No sisters	At least 1 brother	No brothers
Adverse Event	-0.180**	0.056	0.119*	0.045	0.157*	0.048
	(0.067)	(0.079)	(0.049)	(0.053)	(0.068)	(0.102)
Observations	7230	4363	7235	4369	6525	3487
Number of households	3877	2388	3877	2391	3745	2005

These findings suggest that parental preferences over the activities of children of different sexes may differ, implying that there are important within-household tradeoffs between siblings of different sexes, at least in terms of investment of household resources in human capital.

5 Conclusions

This paper has investigated the link between the permanent departure of the household head from the household and the school enrolment and work participation of children between the ages of 12 and 17 in rural Colombia. We find strikingly different effects for boys and girls. For boys, we argue that the reduction in school participation and increase in participation in paid work following the adverse event is due mainly to the income reduction associated with it. For girls on the other hand, there is evidence to suggest that the beneficial impact of the event on schooling is at least partly attributable to the change in the household decision-maker and associated increase in bargaining power of females within the household. All of our results are robust to controlling for a range of household and individual characteristics, to household level fixed effects, and to potential non-random attrition from the surveys.

Our results have a number of important policy implications. First, they suggest that credit and insurance market failures are potentially important in the context of rural Colombia, and can contribute to lower human capital accumulation of children. Second, an adverse event such as the permanent departure of household heads has

potentially important consequences on the schooling and work of children and this could be taken into account in the design of safety nets and their targeting. Third, empowering women may have mixed impacts, benefiting girls but being detrimental to boys when resources become scarcer, as is the case after a permanent departure of the household head. This finding is the first of this kind, and offers an important agenda for future work. An important question is whether this finding also holds for other types of investments than schooling (such as health and nutrition of children) and in other contexts and environments. Moreover, due to data limitations, this paper considers only the short-term effects on schooling and work of children, though longer-term impacts are also important to consider in future work.

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7 Appendix

7.1 *Robustness*

7.1.1 Non-linear specification

Table A1. Robustness of main results to non-linear specification

	Boys		Girls
	school	paid work	school
Adverse event	-1.171**	1.905**	0.896
	(0.401)	(0.513)	(0.695)
Observations	3439	2517	3439

NOTES:- Coefficients from a fixed effects conditional logit model.
Also control for variables listed in note to Table 6.
Robust standard errors clustered at municipality level in parentheses.
+ significant at 10%; *significant at 5%; ** significant at 1%.

7.1.2 Modelling attrition

Table A2. Probability of not leaving the sample, marginal effects

	Dep vble=probability of not leaving the sample
female	-0.024**
	(0.004)
dummy variable survey 3	-0.079**
	(0.007)
house	0.020
	(0.018)
urban	0.024**
	(0.007)
number of children in household at 1st survey	0.004*
	(0.002)
_Idate_2	-0.004
	(0.016)
_Idate_3	-0.003
	(0.019)
_Idate_4	0.018
	(0.017)
_Idate_5	0.034*
	(0.016)
_Idate_6	0.002
	(0.019)
_Idate_7	0.024
	(0.016)
_Idate_8	0.002
	(0.018)
_Idate_9	-0.012
	(0.020)
_Idate_10	0.025
	(0.017)
_Idate_11	0.012
	(0.019)
_Idate_12	-0.005
	(0.023)
_Idate_13	0.004
	(0.022)
_Idate_14	-0.004
	(0.020)
_Idate_15	0.003
	(0.020)
_Idate_16	-0.021
	(0.022)

_Idate_17	0.024
	(0.021)
_Idate_18	0.031+
	(0.018)
_Idate_19	0.013
	(0.021)
_Idate_20	-0.006
	(0.026)
_Idate_21	0.029
	(0.019)
_Idate_22	0.028
	(0.018)
_Idate_23	0.012
	(0.022)
_Idate_24	-0.001
	(0.018)
_Idate_25	0.023
	(0.021)
_Idate_26	0.008
	(0.020)
_Idate_27	0.009
	(0.017)
_Idate_28	0.030+
	(0.017)
_Idate_29	0.012
	(0.020)
_Idate_30	0.026+
	(0.015)
_Idate_31	0.013
	(0.023)
respondent_head	-0.015
	(0.013)
respondent_spouse	0.030*
	(0.012)
Observations	25897
p-value test of joint significance of instruments	0.0000
Robust standard errors in parentheses	
** p<0.01, * p<0.05, + p<0.1	

NOTES:- Marginal effects from a probit model (see equation (2) in text). Robust standard errors clustered at municipality level in parentheses. $^{+}$ significant at 10%; *significant at 5%; ** significant at 1%.