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Macro Shocks and Child Grade Attainment in Rural Pakistan

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ABSTRACT

This study attempts to investigate the effects of idiosyncratic and covariate shocks on the educational attainment of rural Pakistani children. For this purpose, we use Pakistan Rural Household Panel Survey (PRHPS-2012, round 1). The empirical evidence is reported for all children, male and female children while using the censored ordered probit model. The results show that covariate shocks are inversely affecting child grade progression for all children and gender. Conversely, the effect of idiosyncratic shocks is insignificant for these children. Covariate shocks adversely affect investment and spending decisions of many households. More importantly, its devastating effect is higher for girl's (grade attainment is almost lower by 10 percent) than that of boys. These results suggest that public support should focus on mitigating the adverse effects of covariate shocks facing by households in rural Pakistani communities. Furthermore, the choice of promoting formal private insurance may not be practical in such circumstances or in the short run.

Keywords: Idiosyncratic and covariate shocks, Child grade attainment

1. INTRODUCTION

Households in developing countries are exposed to various types of idiosyncratic and covariate negative shocks, resulting in income volatility or wealth adversity. Idiosyncratic shocks are much localised for example; crop failure, job loss, death or illness of a household member etc. Whereas, covariate shocks may prevail over the entire community or regionally or over the whole economy. These aggregate shocks usually affect larger groups of households at the same time in the same area for example; market fluctuations, flood or other endemics. So, community-wide informal support networks may not be able to help those negatively affected (Dercon, 2002; Hyder et al. 2015).

Negative idiosyncratic shocks may be better coped with formal insurance or credit, but formal insurance or credit market is either imperfect or absent altogether in developing countries. Hence, households in these countries are more vulnerable and are at greater risk due to negative shocks. The lack of formal insurance markets compels households to adopt different informal risk management strategies to cope with shocks. They may draw down on past savings or may stop sending their children to schools or compromising on the quality of schools their children attend or send their children to market for wages to compensate the fall in income in the short run. Haq (2012) states that majority of people in rural Pakistan are prone to various type of shocks like; floods, droughts (as covariate shocks) and illness, death and job loss (as idiosyncratic shocks). In response to these shocks, they usually sell their assets, take informal loans on higher premiums, draw down their saving or send their children to participate in the labour market.

The previous research focusses on highlighting an ongoing debate about the relative importance of either negative idiosyncratic or covariate shocks in affecting child schooling. For instance, Ferreira and Schady (2009) and Hyder et al. (2015) states that the direction of change in investment in education due to negative covariate shocks is theoretically ambiguous, depending on whether the income effect or substitution effect dominates. For instance, if the negative shocks are covariate, i.e. for the entire community, rather than idiosyncratic, and the other community members provide informal insurance to community members then the community insurance support/function may likely be lowered, and the income effect of the shock may be intensified. Hence, negative covariate shocks result in larger negative (if the income effect dominates) or smaller positive changes (if the substitution effect dominates) in equilibrium schooling investment than negative idiosyncratic shocks. For example, Goldin, 1999; Ferreira and Schady, 2009; Conceição et al. 2010, found positive effect of negative covariate shocks on child schooling, showing that substitution effect dominates the income effect. Besides, Espino and Sanchís, 2009; Vásquez and Bohara, 2010; Debebe, 2010; Hunter and May, 2011; Colmer (2013) found no association between

covariate shocks and child schooling. Whereas, (Skoufias and Parker, 2002; Thai and Falaris, 2014; Hyder et al., 2015; Ge, 2016; Zamand and Hyder 2016), reported adverse impact of negative covariate shocks on child schooling, consistent with the notion that income effect dominates the substitution effect.

In addition, the empirical studies of (Skoufias and Parker, 2006; Escobal et al., 2007; Guarcello et al., 2009; Kim and Prskawetz, 2010), argues that households adopt various risk bearing strategies to better cope with idiosyncratic shocks, as a consequence schooling may not get affected. (Schaffner, 2013) describes that households in developing countries rely on various risk bearing strategies to smooth fluctuation in income and/or consumption which includes seasonal diversification of crops, special diversification of plots of different soil qualities and altitudes, saving up while spending less on current consumption or draw down on past saving, buying or selling durable goods like jewellery, relying on loan from informal or formal sources and might insure themselves informally through participation in mutually assistance agreements with family and friends in the community e.g. gift transfers.

The literature summarises above focused on investigating the effect of negative shocks, either idiosyncratic or covariate and in fact a few focuses on both, on enrolment instead of grade attainment. This study focusses on both idiosyncratic or covariate shocks for rural Pakistan as more research is needed for Pakistan along these lines. The constitution of Pakistan asserts that education is compulsory and basic need of children. But early dropout is annoying for policymakers. Pakistan lagging on human development index than other south Asian countries in the region. Pakistan ranks 134 of 157 countries in the human capital index of the world bank in 2018. Hence, it's important to know about the factors leading to low educational attainment, so this problem is effectively addressed. This study investigates the relative role of idiosyncratic and covariate shocks in grade attainment in rural Pakistan while utilising data from Pakistan Rural Household Panel Survey, 2012.

The paper is organised as; Section 2 reviews the relevant literature. Section 3 discusses data and methodology. Section 4 presents results and findings. Whereas, the last section concludes with policy recommendations and direction for future research.

2. LITERATURE REVIEW

This section reviews relevant literature on negative shocks and child education to help us in conceptualising our study. Education is important for raising wellbeing and development. But, in Pakistan the percentage of children moving to higher grade levels is substantially low. Contemporary research outlines many reasons of low-grade progression for other countries. Negative shock is one of these factors affecting parental schooling decision for their children, which may not permit children to progress to higher grade levels. Shocks can be either idiosyncratic or covariate in nature. The direction of change in investment in education due to negative covariate shocks is theoretically ambiguous, depending on whether the income effect or substitution effect dominates (Ferreira and Schady, 2009; Hyder et al., 2015). Besides, it is argued that that households adopt various risk bearing strategies to better cope with idiosyncratic shocks, as a consequence schooling may not get affected (Skoufias and Parker, 2006; Escobal et al., 2007; Guarcello et al., 2009; Kim and Prskawetz, 2010).

Goldin (1999) pointed that graduation rates and enrolment at high school level get increased at times of great depression (1928–1938) due to better functioning insurance market. (Conceição et al., 2010) investigated the impact of the global financial crisis on human capital development. It is determined that the impact of shock varies in countries defined along the axis of rich, middle- and high-income countries. Education and health enhanced in rich countries but lowered in the poorer countries. This is so as institutional structure in rich countries is better than that of poorer countries. Insurance markets in developed countries are working better than those of poor countries insurance markets. Households in rich countries can buffer shocks in the presence of formal insurance markets, hence their investment in human capital may not get decreased even in the times of shocks. Similar findings are reported by (Fernandez et al., 2010) for five Latin American countries and Ferreira and Schady, 2009, for rich countries like USA and poor countries of South Africa and low-income Asian countries. Kim and Garcia, 2010, referred to economic downturn in Jamaica and its impact on human capital. During slowdown of economic growth in Jamaica enrolment in primary schools get decreased but attendance of children gets increased. Hence, refers to mixed impact of such economic fluctuations.

Besides, (Hunter and May, 2011) study for South African region shows no association between children schooling disruption (drop out from school and grade repetition) and covariate shocks. (Espino and Sanchís, 2009) examined the impact of economic shocks in the form of economic crisis on the social well-being of five Latin American countries i.e. Brazil, Argentina, Jamaica, Mexico and Peru. Economic shock is defined as decline in GDP per capita in these countries. Shocks were irrelevant in some countries and education level increased in other countries as recession result in lower employment opportunities, so parents prefer to send their children to school. (Vásquez and Bohara, 2010) evaluated the effect of aggregate shock i.e. natural disaster on child education in Guatemala. The study uses the to determine the impact on child schooling. The results show no effect of natural disaster on child schooling. (Colmer, 2013) stated that future income shock can be measured while using climate change as a proxy. The study showed that parental income fluctuation due to negative aggregate climatic shocks do not affect child education but increases child working hours. Households increase child labour in farms to minimise the effect of future negative shock on incomes. However, the increase in time spent by children on farm activities affect their performance in schools as less time is available for studies. Similar evidence is reported by Debebe, 2010, for Ethiopia.

Similarly, (Skoufias and Parker, 2002) said that aggregate level shocks negatively affect children time allocation. Mexico peso crisis shocks in the labour market affected the time allocation of adults and children. The shocks increased the probability that children might not be able to attend school in the next year. Gender difference is also found in the results as girls are worse-off. Macroeconomic crisis affects the labour income directly and the indirect way of affecting labour household purchasing powers by the keeping the salaries low and raising the inflation rate. Girls schooling get more affected by these shocks. So economic crisis not only increased the intergenerational poverty level but also the inequality and gender-based preferences. (Frankenberg et al., 1999) found that the economic crisis in Indonesia affected many of their development indicators, one of which was education. During the years of 1997 and 1998 enrolment

rate of children aged from 13-19 years declined. The enrolment rate declined from 33 percent in 1997 to 38 percent in 1998. The two-year crisis also impacts the percentage of child drop out (aged 7-12 years) which got tripled due to Indonesia crisis. The impact of the crisis is larger on the poor children than on rich one. In the similar way the schooling drop-out ratio of children from poor background got more affected more than that of children with better background. (Thai and Falaris, 2014) attempted to investigate the adverse effects of rainfall shock on child school entry and progress in Vietnam. The study shows that regions where families have less consumption smoothing opportunities are adversely affected. Vietnam is a developing country with significant level of poverty and malnourishment. Social institutions in Vietnam are not that much effective to help rural households to survive adverse wealth shocks. The rainfall shocks affect child health which then feeds into lower child schooling. (Hyder et al., 2015) conducted study to check the impact of shocks on child schooling that attendance and child grade attainment in Malawi. They included both idiosyncratic and community level shocks in the study. Their results show significant impact of community level shocks on child schooling as compared to individual level shocks. This shows that community support network, if prevalent, enormously help mitigate idiosyncratic shocks. Besides, investment in female education is affected more than that of male children. (Zamand and Hyder, 2016) states that negative shocks, both idiosyncratic and covariate, disturb human capital development. The took data from Ethiopia, Peru, Vietnam and India. These countries have diverse background. In this context they take human capital as both schooling outcome and health. The study reported the effect of shocks for children ages 14-16 years in these countries. Different types of shocks are considered; socioeconomic shocks such as (death of parents and divorce), economic shock for instance (unemployment and livestock loss) and climatic shocks for instance (floods and droughts). These shocks affect the income of households which result in low welfare of their children in the short run. Hence, affecting child development in critical stages of their development. Another study is of Ge (2016), who investigated the impact of economic reforms for families of State-Owned Enterprises (SOEs) in China in mid-1990s. The reform result in earning gap between the workers of SOEs and non-SOEs. The study compares the difference between the educational attainment of children whose fathers are working in SOEs and whose fathers are not working in SOEs. The children of SOEs workers were less likely to attend high school and college as compared to the children of non-SOEs workers. The difference in the educational attainment of these children is due to the increase in earning gap between SOEs and non- SOEs workers. This evidence supports the presumption that the shock of economic restructuring adversely affects the educational attainment of children.

Besides, (Kim and Prskawetz, 2010) determined the impact of idiosyncratic shocks impact on educational expenditure, fertility and household consumption. Indonesian households use children for consumption smoothing by sending them to labour market and making them to earn in case of parental unemployment. Hence affecting child human capital. (Guarcello et al. 2009) assess the effect of idiosyncratic shocks and credit constraints on child time allocation decisions. Evidence support that schooling decisions and children's work is determinant by credit constraint. Exposure to shock forces parents to send their children to work. But in the presence of insurance schooling increased and the chances of child entering the

market is decreased. African countries witness the tradition of child fostering. Biological parents due to reasons send their children to other families. One of the reasons is living in risky environment. Any kind of idiosyncratic shock will force parents foster their child. Child fostering usually lowers child welfare, including child schooling (Akresh, 2009). The study of Woldehanna and Hagos, 2009, reports the impact of idiosyncratic and covariate shocks on child drop out from primary school. The shocks were crop failure, drought, the death of a livestock or the death of member of a household. Their findings show significant effects of shocks on child drop out of school. (Dillon, 2008) study also supports that child activities like schooling, market and domestic production get affected of idiosyncratic shocks. Children do multiple domestic and market production activities for their households which help household in the improvement of their income. The idiosyncratic shocks faced by households increase hours spent on work which reduce schooling. Escobal et al., 2007, reported from Peru that parents decrease educational expenditure while sending their children to government schools rather than good quality private schools. The government schools are not much efficient in terms of quality than private schools. Chaudhury et al., 2006, found that crop shocks adversely affect the enrolment of females as the enrolment of girls is 12 percent less than that of boys over the period of shocks. During the crises of 1990's in Russia, income and consumption patterns get highly fluctuated. Many households get their wage arrears after the crisis (Mu, 2006). The idiosyncratic shocks in Mexico during the peso crisis do not affect schooling. Job loss of household head does not show any significant impact on schooling of their teenage children. Although some evidence shows higher probability that teenage girl's may not be able to attend school. This is due to the reason that female partners started working as a coping mechanism for such kind of idiosyncratic shocks in Mexico due to which the domestic chores need to be done by teenage females (Skoufias and Parker, 2006). Pakistan has not very effective insurance mechanism system against shocks. Households make their investment decision relying only on their income. Any shock disturbing parental income lead to impacting parental child schooling decision (Burney and Irfan, 1991). Child schooling depends on the parent's capability to invest in child human development. Economic shocks affect parent's capacity to invest in human capital. They found positive association between parental income and child schooling.

The literature cited shows that around the world various studies reported the effect of negative shocks on households' decisions about their children education. The effect of these shocks varies across countries due to context and experience. For instance, developed countries can cope with shocks due to well-structured insurance markets. Studies covering developing countries reported mix results idiosyncratic and covariate shocks. Some reported negative association between shocks education but no relation by others. Most of these studies focused on enrolment/attendance status of child. This study is focusing on child grade attainment, measured by years of schooling completed. The PRHPS survey gives details information on both these variables. The study also incorporates both idiosyncratic and covariate shocks. The literature about child educational attainment decisions in the times of negative economic shocks is not very extensive in case of Pakistan. Hence, this study does the needful to explore more about this issue in Pakistan.

3. METHODOLOGY AND DATA

This section presents the methods and materials we use in the study. Section 3.1 demonstrates the estimation technique; that censored ordered probit model for child grade attainment.

Section 3.2 discusses variables; like child grade attainment, idiosyncratic and covariate shocks and other control variables used in the analysis. Sections 3.3 and 3.4 depicts the data source and descriptive statistics respectively.

3.1. Estimation Strategy

To examine the impact of shocks on child grade attainment we use censored ordered probit model. The dependent variable is years of schooling completed as measure of child grade attainment.

The censored ordered probit model for child grade attainment is given as Eq.1

$$y_{ih} = \alpha_0 + \alpha_1 S_{ih} + \alpha_2 C_{ih} + \alpha_3 H_h + \alpha_4 U_{ih} + \varepsilon_{ih} \quad \dots \quad \dots \quad \dots \quad (1)$$

In Equation 1 y_{ih} is the dependent variable which shows grade attainment of child i , in household h . S_{ih} is the vector of independent variables which include two type of shocks; that idiosyncratic and covariate/aggregate shocks. The vector C_{ih} indicate specific characteristics of the children which includes child's age, age-squared and child's gender. Whereas H_h is the vector of household characteristics i.e. parental education, household head gender and household per capita expenditure; vector U_{ih} representing dummies for provinces and ε_{ih} is the error term.

One of the advantages of using grade attainment instead of school enrolment is that it accounts for the representation of growing investment in child schooling. The second choice concern the use of censored ordered probit model. The censored ordered probit model addresses problems related to the measurement of grade attainment. Censored ordered probit model considered the fact that the grade attainment is representative of ordered discrete choices that whether a child will move to the next grade level or will withdraw from school (Holmes, 1999). Grade attainment is censored at the right. Right censoring occurs for those children who are currently enrolled in school, the final grade attainment of these children is unknown. To treat the grade of currently enrolled children by taking it equal to those who have stopped at some grade level would give biased estimates (Glick and Sahn, 2000). The censored ordered probit model deals with this problem in measuring grade attainment of children, these are the reasons because of which we are using the censored ordered probit model. Other techniques like OLS does not address this issue. This may lead to biased estimates of the impact of shocks on child grade attainment (Mckenzei and Repoport, 2006). As stated, that years of schooling attained is a series of ordered discrete choices. But OLS assume a continuous distribution for dependent variable i.e. years of schooling attained. The continuation to next level of education (i.e. primary to middle) and to continue for an extra year of schooling are two different choices and should be modeled differently.

We have use censored ordered probit to model grade attainment. The censored ordered probit model is an extended form of ordered probit model which was originally developed by King and Lillard, 1987, and later on extensively used in contemporary research e.g. (Glick and Sahn, 2000; Glewwe and Jacoby, 1994; Maitra, 2003; Mckenzei and Repoport, 2006; Zhao and Glewwe, 2010; among others).

Again the model of educational attainment Equation 1

$$y_{ih} = \alpha_0 + \alpha_1 S_{ih} + \alpha_2 C_{ih} + \alpha_3 H_h + \alpha_4 U_{ih} + \varepsilon_{ih}$$

y_{ih} is defined as the variable for completed year of schooling and y^* is defined as the latent desired level of schooling which is dependent on explanatory variable(X) and error (ε).

Now the latent desired level of schooling is given as below:

$$y^* = \beta X + \varepsilon$$

The data we used had no data on the latent desired level of schooling, the survey data have information regarding the years of schooling completed. In practice we do not observe desired level of schooling y^* . For those individuals who have finished schooling, we observe a discrete level of schooling completed y .

$$\begin{aligned} y &= 0 \text{ if } y^* \leq \mu_0 \\ y &= 1 \text{ if } \mu_0 < y^* \leq \mu_1 \\ y &= 2 \text{ if } \mu_1 < y^* \leq \mu_2 \\ &\cdot \\ &\cdot \\ y &= n \text{ if } \mu_{j-1} \leq y^* \end{aligned}$$

Here's μ_i are cut-off points that indicates the transition of education from one level to the other. For example for a probability that a non-enrolled individual observed to have completed two years of schooling ($y = 2$) is the probability that the value of latent schooling attainment function y^* lies between μ_1 and μ_2 . For individuals who have completed their education, we took that lower value of y which falls between two cut-off points. For other individuals who have not been to school y will be normalised to zero. For those Individuals who are currently enrolled will be rightly censored with unknown desired schooling level, and we know that they will at least complete their current level of schooling.

The probability that the values of latent desired level of schooling fall within certain threshold brackets can be written as:

$$\begin{aligned} P(y = 0) &= \Phi(\mu_0 - \beta X) \\ P(y = 1) &= \Phi(\mu_1 - \beta X) - \Phi(\mu_0 - \beta X) \\ P(y = 2) &= \Phi(\mu_2 - \beta X) - \Phi(\mu_1 - \beta X) \\ &\cdot \\ &\cdot \\ P(y = n) &= 1 - \Phi(\mu_{n-1} - \beta X) \end{aligned}$$

3.2. Description of Variables

This section provides a brief discussion of the variables used in our formal analysis.

3.2.1. Dependent Variable

Grade Attainment

In Equation (1), the dependent variable child grade attainment (y_{ih}) is an ordered discrete choice variable. This variable (child educational attainment) is categorised into

six (6) different groups; no schooling, 1-4 years of schooling (below primary), 5 years of schooling (completed primary), 6-7 years (below middle), 8 years (completed middle), 9 years of schooling (below secondary), 10 years of schooling and above (completed secondary or above).

3.2.2. Independent Variables

Vector of Shocks

In Equation (1) the vector of shocks (S_{ih}), include two kinds of shocks in the analysis. The first is idiosyncratic shock at the household level which is a dummy variable taking value of 1 if there exist any shock otherwise 0. The second shock pertains to covariate shocks at the aggregate level which may prevail over an entire community. This is also a dummy variable taking value 1 if there exist any shock otherwise 0. The survey we used include information on shocks prevalent at the household and as well as at the community level.

Vector of Child Characteristics

The vector (C_{ih}) in Equation (1) includes specific characteristics of the children such as child's gender, child's age and age-squared. Gender is an important aspect of child's grade attainment. Research studies either uses dummy or separate equation for male and female children to estimate the effect of child's gender on grade attainment¹. The gender variable takes value 1 if the child is male and 0 if female. Child age is also an important factor in the same way. The effect of age might be positive and quadratic. As the age of the child increases the probability of educational attainment also increases because of low opportunity cost of education; however, after some specific point, the opportunity cost set in increasing along with increase in age due to the increase in labour productivity of the child (Bhalotra, 2003). Hence, to account for these effects, we use age and age-square of the child in the analysis.

Vector of Household Characteristics

In addition to the child level characteristics, household level factors also play an important role in child school attainment. In this study, the vector of household characteristics (H_h) includes parental education, household head gender and household per capita expenditure etc. The effect of parental education on child education is positive as educated parents value schooling and, usually, sees the returns to education. Alternatively, it is argued that educated parents have higher income and, thus, spend more on education. Likewise, we also control for the gender of the household head as households headed by females have lower income due to wage discrimination and lower education (Bhalotra, 2003). We also accounted for per capita household expenditure, to control for the income effect.

Vector of Provincial Level Dummies

In Pakistan there are significant differences between provinces in terms of education and literacy. To control for these differences, our study includes separate dummies for provinces; Punjab, Sindh and Khyber Pakhtunkhwa (KPK).

¹ See for example Bhalotra (2003).

3.3. Data Source

In order to investigate the effect of idiosyncratic and covariate shocks on child grade attainment, we used data from the Pakistan Rural Household Panel Survey (PRHPS-2012) covering 2090 households (total members of 13378) in the rural areas of the three provinces; Punjab, Khyber Pakhtunkhwa (KPK) and Sindh with primary sampling units of 76. The survey contains extensive information on education, migration, assets and savings, participation in social safety nets, time use, sources of income, loans and credit, nature of employment, consumption pattern, shocks and household aspirations etc. The analysis covered a total of 2294 children, ages from 5-15 years.

3.4. Descriptive Statistics

As stated earlier that PRHPS-2012 contains questions on both covariate and idiosyncratic shocks asked from the community leaders/informants and households respectively. Covariate shocks are events like flood, earthquake, and fire may face by a community. The idiosyncratic shocks are events like illness, death, loss of employment or asset etc. by a household.

The community information is collected from total of 76 mouzas in 19 districts of the three provinces. Whereas from each district only four mouzas were selected.

Table 1 reports responses to the types of shocks in each selected mouza. Respondents were asked that “did your village faced any disaster during last 5 years”. Crop insect/disease outbreak is prevalent in 46.1 percent of the mouzas followed by flood/typhoon (45.2 percent. Drought is also quite a problem in some of the communities (about 14.5 percent). From the information on types of shocks, given in Table 1, we calculate that about 72.4 percent of the mouzas face any covariate shock over the last five years as shown in Table 2.

Table 1
Covariate or Aggregate Shocks

Covariate or Aggregate Shocks	Did your Village Face any Disaster during Last 5 Years		Total
	No (percent)	Yes (percent)	
Fire	90	10	76
Flood/Typhoon	56.5	45.2	76
Drought	85.5	14.5	76
Earthquake/Landslide	100	0	76
Famine	100	0	76
Epidemic	94.7	5.2	76
Civil Unrest or Violence	100	0	76
Crop Insect/Disease Outbreak	53.9	46.1	76
Total	518	92	610

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

Table 2

Did your Village Faced any Shock During Last 5 Years

Community Level Shocks	Frequency	Percent
Yes	55	72.4
No	21	27.6
Total	76	100.0

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

Besides covariate shocks, a household may face idiosyncratic shock independent from other households living nearby or in the same village. Among these events the more common are medical expenses due to some injury/illness, house damage, wedding expenses, assets loss, death etc. Table 3 indicates that about 51 percent of the households face idiosyncratic shock in the survey area.

Table 3

Did your Household Face any Negative Shock During Last 5 Years?

Responses	Frequency	Percent
No	712	49.2
Yes	735	50.8
Total	1447	100.0

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

As for as child attendance is concerned, about 87.84 percent of the children are currently attending school in all provinces as shown in table 4. Boy's attendance (current) is higher than girls in all provinces. Sindh leads in lower attendance of girls (33.33 percent) followed by Khyber Pakhtunkhwa (KP) (39.93 percent).

Table 4

Child Schooling by Province and Gender

Child School Status	Punjab		Sindh		KP		All Provinces		Total
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	
Attendance (Ever)	132	78	31	16	14	8	177	102	279
	62.86	37.14	65.96	34.04	63.64	36.36	63.44	36.56	12.16
Current Attendance	613	816	101	202	113	170	827	1188	2015
	42.90	57.10	33.33	66.67	39.93	60.07	41.04	58.96	87.84

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

Furthermore, we divided children's years of schooling completed into five groups; kacchi/pacci, below primary, primary completed, below middle and middle completed (and above) for children ages 5-15 years as given in Table 5. About 22.19 percent children have completed kacchi/pacci class, below primary constitute 48.65 percent of the children and another 12 percent have completed primary level of education. As evident grade progression is quite low and very low proportion of the children are in higher grades. This remain pertinent for both girls and boys. Hence, it is worthy to investigate the factors of such a low-grade attainment in rural Pakistan.

Table 5
Child Years of Schooling Completed by Gender

School Years Completed	Girls	Boys	Total
Kacchi/pacci	228	281	509
	22.71	21.78	22.19
Below primary	498	618	1,116
	49.6	47.91	48.65
Primary completed	118	159	277
	11.75	12.33	12.07
Below middle	95	143	238
	9.46	11.09	10.37
Middle completed and Above	65	89	154
	6.47	6.90	6.71
Total	1,004	1,290	2,294
	100	100	100

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

4. RESULTS AND DISCUSSION

4.1. Introduction

This section presents the findings of our analysis. First, we summarise our important variables. Onwards, we discuss the effect of idiosyncratic and covariate shocks on child grade attainment.

The summary statistics of important variables is given in Table 6. Whereas, the regression results for all children, male and female children are given in Table 7.

Table 6 shows that about 48 percent of the children are exposed to idiosyncratic shocks i.e. at the household level. Whereas the relative proportion for covariate shock is 69 percent. The proportion of idiosyncratic shock is higher in communities who faces a covariate shock. Child grade attainment (for all children, boys and girls) is lower in communities who faces a covariate shock. But the same is not true for idiosyncratic shock. In addition, current attendance is lower in communities and households who faces either idiosyncratic shock or a covariate shock. About 56 percent of the children are male. Paternal and maternal education is also grouped into seven categories. Paternal education is higher than maternal education in the study area. Majority (nearly 99 percent) of the household heads are male. Household expenditure (per capita) is about Rs 23294 in the study area. Besides, household expenditure per capita is lower in communities who faces a covariate shock. We include dummy variables for provinces; Punjab, KPK, and Sindh.

Table 6

Descriptive Statistics

Variables	Total (n=2294)		Idiosyncratic shock=no (n=1187)		Idiosyncratic shock=yes (n=1107)		Covariate shock= no (n=714)		Covariate shock= yes (n=1580)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Shocks										
Idiosyncratic shock (1 if yes)	0.48	0.50	–	–	–	–	0.37	0.48	0.53	0.50
Covariate shock (1 if yes)	0.69	0.46	0.62	0.48	0.76	0.43	–	–	–	–
Child characteristics										
Child age (years)	10.18	2.98	9.47	2.77	10.94	3.00	10.21	3.02	10.17	2.96
Child gender (1 if male)	0.56	0.50	0.55	0.50	0.58	0.49	0.57	0.50	0.56	0.50
Child grade attainment	1.33	1.20	1.14	1.05	1.54	1.32	1.51	1.27	1.25	1.16
Current attendance (1 if yes)	0.88	0.33	0.90	0.29	0.85	0.36	0.89	0.32	0.88	0.33
Child grade attainment (boys only)			1.19	1.09	1.54	1.31	1.51	1.29	1.29	1.17
Current attendance of boys (1 if yes)			0.94	0.24	0.90	0.30	0.93	0.25	0.92	0.28
Child grade attainment (girls only)			1.09	0.99	1.54	1.34	1.51	1.24	1.21	1.15
Current attendance of girls (1 if yes)			0.86	0.34	0.78	0.42	0.82	0.38	0.82	0.38
Household Characteristics										
Father level of education	1.24	1.30	1.29	1.31	1.18	1.28	1.51	1.33	1.12	1.27
Mother level of education	0.34	0.79	0.36	0.83	0.32	0.75	0.39	0.80	0.32	0.79
Head gender (1 if male)	0.99	0.12	0.99	0.09	0.98	0.14	0.98	0.12	0.99	0.11
Per capita Expenditure	23294.08	29792.68	17398.81	16303.56	29615.37	38443.29	23617.51	31122.14	23147.92	29180.97
Provinces										
Punjab	0.71	0.45	0.74	0.44	0.68	0.46	0.68	0.46	0.73	0.45
Sindh	0.15	0.36	0.12	0.33	0.18	0.39	0.10	0.30	0.18	0.38
KP	0.13	0.34	0.13	0.34	0.13	0.34	0.21	0.41	0.10	0.30

Source: Pakistan Rural Household Panel Survey PRHPS (2012).

Table 7

Results of Censored Ordered Probit Model for Child Grade Attainment

	(1)	(2)	(3)
	All Children	Male Children	Female Children
Shocks			
Idiosyncratic shocks	-0.103 [*] (0.0553)	-0.108 (0.0722)	-0.113 (0.0873)
Covariate shocks	-0.309 ^{***} (0.0577)	-0.271 ^{***} (0.0755)	-0.377 ^{***} (0.0911)
Child Characteristics			
Child gender (male)	0.0172 (0.0527)		
Child age (years)	0.335 ^{***} (0.0734)	0.364 ^{***} (0.0948)	0.295 ^{**} (0.117)
Child age square	0.0439 ^{**} (0.0178)	0.00629 (0.00458)	0.0624 ^{**} (0.0286)
Household Characteristics			
Father education	0.0865 ^{***} (0.0215)	0.0561 ^{**} (0.0283)	0.125 ^{***} (0.0332)
Mother education	0.150 ^{***} (0.0348)	0.162 ^{***} (0.0504)	0.143 ^{***} (0.0487)
Head gender (male)	0.0551 (0.233)	-0.0227 (0.337)	0.149 (0.328)
Per capita expenditure	0.00000164 [*] (0.000000956)	0.000000570 (0.00000117)	0.0000394 ^{**} (0.0000175)
Provinces			
Sindh	0.0487 (0.0996)	-0.0190 (0.125)	0.176 (0.167)
Punjab	0.0585 (0.0788)	-0.0245 (0.102)	0.181 (0.125)
Wald chi2	1437.4	819.1	605.2
p	1.04e-301	1.58e-169	1.34e-123
N	2294	1290	1004

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < .01$

- Variable Child age square is divided by 5 in eq. (1) and (2) for optimisation.

- Variable Per capita expenditure is divided by 10 in eq. (3).

Idiosyncratic and Covariate Shocks

We used censored ordered probit model to estimate the effect of shocks on child grade attainment (Table 7). Results are reported for all children, male and female children. The estimated coefficient of idiosyncratic shock is negative (as expected) and significant (at 10 percent level of significance); showing that household level shocks do affect child grade progression. Children grade attainment in households who experience some sort of idiosyncratic shock (i.e. illness, job loss etc.) is different on average to the

grade attainment of children in households who did not experience any shock. This result only stands true for all children. The estimated effect of idiosyncratic shock is insignificant in separate regressions for boys and girls. This evidence contradicts the earlier evidence reported in (Thai and Falaris, 2014).

In contrast, the effect of covariate shock is significant in all regressions i.e. for all children and separately, for boys and girls. Furthermore, the estimated coefficient of covariate shock in all regressions is negative; showing that child grade attainment is lower in communities who faces a covariate shock than in communities who did not face the shock. More importantly, the devastating effect of covariate shock is higher on girl's grade attainment (almost by 10 percent) than that of boys. It maybe that parents first draw-down investment in daughter's education than son's education in the onset of a shock. (Debebe, 2010; Escobal et al., 2007) studies conclude that aggregate shocks do not affect children education. Whereas idiosyncratic shocks negatively affect children education. Ferreira and Schady (2009) illustrates that covariate shocks simultaneously affect household income and labour markets in the rural communities. In response the opportunity cost of child school attendance gets lower. Hence, children labour market participation becomes less attractive for households to substitute child schooling with work. But a major strand of empirical studies from developing countries do reports that a bigger proportion of the children neither work nor go to school (Bhalotra, 2003; Bhalotra and Tzantosh, 2003; Khan, 2019). School attendance not only involves only the opportunity cost, but a major fraction constitutes direct costs like transportation, school fee and cost of stationary etc. In such circumstances children simply stay at home instead of work or school.

Child Characteristics

We also control for the possible effect of children characteristics like child age, age-square and child gender. The effect of child age and age-square is positive and statistically significant at 1 percent level of significance as shown in Table 7. The effect of age-square is positive, which contradicts the common notion that older children are easily involved in economic activities due to higher opportunity cost of education as child age increases. This shows that the probability of dropping out of younger children is higher when a household exposes to a negative shock. Alternatively, to what we get Glick et al., 2016, stated that the probability of dropping out of older children increases when households exposed to negative shocks.

Household Characteristics

We also included, in the analysis, important household characteristics like father and mother education, household expenditure (per capita) and household head gender. These variables are assumed to play an important role in child schooling decisions.

The effect of variables father education and mother education on child grade attainment is statistically significant and positive. The probability of grade attainment is increases, for all children, with increase in father education. Similar is the case for maternal education. The results suggest that educated parents may have more opportunities to increase income and they do not need additional labour from their children (Guarcello et al., 2010; Dillon, 2012; Thai and Falaris, 2014). Furthermore, the

effect of parental education in separate regressions, both for boys and girls, is also positive and significant showing that educated parents invest more in children education as they themselves have been to school and are aware of the importance of schooling (Alderman, 2001).

We also control for the effect of gender of the household head. The data shows that most of the households are headed by male members. The estimated coefficient of household head gender is positive but its effect on child grade attainment is statistically insignificant.

In addition, child grade attainment is increasing in household expenditure. The estimate of variable household expenditure is positive and statistically significant for all children and girls shown in Table 7. The higher the household expenditure the higher is the grade attainment (Guarcello et al., 2010).

We also include provincial level dummies in our analysis. The data comprise of three provinces of the country; Punjab Sindh and KP. Their estimated effect shows that child grade attainment is on average the same in all provides as the estimated coefficients of provincial level dummies, both Punjab and Sindh, are not significantly different than zero in the survey.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This paper investigates the effect of idiosyncratic and covariate shocks on child grade attainment in rural Pakistan, for children ages 5 to 15 years, while using Pakistan Rural Household Panel Survey (PRHPS-2012). The data provide detail information on education, expenditure and information related to negative shocks. The data covers the rural areas of the three provinces of the country; Punjab, Sindh and KPK. For estimation purpose we used censored ordered probit model in our analysis.

The effect of idiosyncratic shocks on child grade attainment is statistically insignificant; showing that household level shocks do not affect child grade progression. Children grade attainment in households who experience some sort of idiosyncratic shock (i.e. illness, job loss etc.) is the same on average to the grade attainment of children in households who did not experience any shock. The result also stands true for both genders i.e. boys and girls. On the contrary, the effect of covariate shocks is statistically significant in our study. The estimated coefficient of covariate shocks in all regressions is negative; showing that child grade attainment is lower in communities who faces a covariate shock than in communities who did not face the shock. (Ferreira and Schady, 2009) illustrates that covariate shocks simultaneously affect household income and labour markets in the rural communities. In response the opportunity cost of child school attendance gets lower. Hence, children labour market participation becomes less attractive for households to substitute child schooling with work. But a major strand of empirical studies from developing countries do reports that a bigger proportion of the children neither work nor go to school (Bhalotra, 2003; Bhalotra and Tzantosh, 2003; Khan, 2019). School attendance not only involves only the opportunity cost, but a major fraction constitutes direct costs like transportation, school fee and cost of stationary etc. In such circumstances children simply stay at home instead of work or school.

In addition to shocks, our analysis also includes important control variables. As presumed, grade attainment is increasing in child age. The estimated effect of parental education is statistically significant and positive, showing that educated parents value education. Furthermore, households with greater per capita expenditure have higher child grade attainment in rural Pakistan.

5.2. Policy Recommendations

These findings highlight an important dimension that how crucial could be negative shocks to child grade attainment in the rural areas of the country. Opposing to idiosyncratic shocks, covariate shocks are detrimental to child grade progression. This means that covariate shocks adversely affect investment and spending decisions of many households sharing the same neighbourhood. Hence, resulting in lower human capital, which feeds into lower wellbeing and growth. The detrimental effect of these shocks may largely be reduced in the presence of well structure and effective safety net policies. Therefore, social assistance or social insurance mechanisms should be devised, so that parents may not rely on drawing down child education in the presence of shocks. As in the case of covariate shocks, private insurance may not work to mitigate negative effects of these shocks.

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