Impact of adverse economic shocks on the Indian child labour market and the schooling of children of poor households

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Abstract

This paper analyses the impact of adverse economic shocks on human capital formation in the case of India. It uses the extended theoretical model of Basu and Van (1998). The study has been carried out for the period between 1999 and 2002 and covers 385 districts. The results show that during a crisis, there is a fall in the school enrollment rate and a rise in the child labour participation rate. The study also argues that in the absence of a well-functioning credit market, to mitigate the adverse economic shocks on the children of poor households, the government must provide an incremental cash/in-kind conditional transfers to poor households with children.

JEL Classification*: B 21, E 62, C 33, D 81.*
Keywords*: Adverse economic shock, Child labour, Poverty, Labour market, Education, Human capital formation, Mid-day meal programme.*

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Introduction

Developing economies are subject to frequent adverse economic shocks. In the wake of any adverse economic shocks, the poor are likely to suffer more than others. Since the formal credit market is barely accessible to the poor, borrowing options to smoothen their consumption stream is unworkable, and the reliance on the informal credit market is always an expensive option. So, what do poor people do in the face of adverse economic shocks? Poor Indian households are not self-insured against economic or income shocks. At present, the financial market does not offer any popular or successful products to the poor Indian households to hedge against shocks. However, the Indian government does offer direct as well as indirect cash/in-kind transfers to the poor to diminish the impact of adverse economic shocks. In case the government supports are not a full insurance, households might take their own decisions to overcome the adverse economic shocks and that could have a major effect on the economy. Household-level decisions could be detrimental to long-term economic development if it disrupts children's education. Education is the long-term equalizer of a society and educating the poor household's children could stop the transmission of inter-generation poverty.

There is much literature to prove that economic shocks have an impact on children's schooling and the child labour market. Pörtner (2001) found that children were often used as insurance against negative income shocks. Grimm (2009) found that the temporal drought shocks affected children's schooling by resulting in food inflation, which translated to a loss of purchasing power. In this case, parents smooth their consumption by discontinuing their children from school and letting them work. Jacoby and Skoufias (1997) found that children in rural India discontinued their education due crop failures. In the case of developing countries, a number of studies have thus focused on adverse shocks to the agricultural sector affecting children's education. However, the study by Behrman et al. (1999) found that macroeconomic stability and international trade factors could also affect children's education. Guarcello et al. (2009) assessed the impact of individual shocks and collective shocks on households and found that adverse shocks resulted in an increase in child labour. Skoufias and Parker (2002) found that severity of the economic shocks affecting children's joining the next year of school varied depending on the child's gender. They argued that female children were more likely to stay at home to help with domestic work. Manning (2000) found that temporary shocks could push children permanently into the labour force.

So, there is enough evidence to show the impact of adverse economic shocks on children's schooling and child labour. However, one could argue that could child labour is pro-cyclical. This is possible if child labour is demand-driven. In such a scenario, economic shocks would

push the economy to a lower level of activity. This would result in a lower demand for labour, and hence a lower demand for child labour. Thus, during an economic shock, one might expect higher enrollment of poor students in schools, which would allow them to benefit from the minimum incentives of attending school, for example, free mid-day meals for all students, provided by the Indian government.

This paper has seven sections. The first section is the introduction. The second section describes the evidence of adverse economic shocks, fact of child labour in India and the related literature. The third section is the theoretical model developed to describe the child labour market in the face of adverse economic shocks and also analyse the government intervention in the child labour market through the conditional in-kind transfer programme. The fourth section contains the data construction methods and sources. The fifth and sixth section discuss the empirical model and the results, respectively. The penultimate section describes the limitation of the study, and the eighth and last section is the conclusion.

In the paper, I extend the theoretical work of Basu and Van (1998) with special reference to adverse economy shocks. Firstly, I theoretically prove that child labour could be counter-cyclical even if there is a conditional in-kind transfer for attending school. Secondly, I empirically model and prove that child labour is counter-cyclic in case of India. During a crisis, children join the labour force to raise the household income; this could be because children wage income is higher than the condition in-kind transfer to attend the school.

Adverse Economic Shocks in India

Economic shocks[1] may come in many forms and their acuteness depends on the structure of the economy. In the beginning of the 1990s, the structure of the Indian economy was dominated by the agricultural sector. According to the National Sample Survey Organisation's (NSSO) employment and unemployment household survey for the reference period 1993-94, agriculture supported the livelihood of over 74 percent of households in the country. However, the structure of the economy has seen dramatic changes due to the introduction of liberalisation policies in 1991. This change was captured in the employment and unemployment survey[2] of 2009-10, conducted by the Ministry of Labour and Employment – in 2009-10, agriculture accounted for only 45 percent of the labour force.

[1] My research focuses on adverse economic shocks, which affect a group of people, or collective shocks such as drought, flood, recession and food inflation. I do not deal with shocks pertaining to individual households.

[2] This was the first survey conducted by the Ministry of Labour and Employment, and the survey does not capture the household characteristics such as those captured by the NSSO surveys. The Ministry of Labour and Employment survey is a thin survey (i.e. which covers a smaller sample size). The NSSO conducts thick employment and unemployment surveys (i.e. which cover a larger sample size) once in five years. However, in recent years, since 1999 onward, in between the five years of the thick survey, the NSSO also conducts thin employment and unemployment surveys. Thin surveys have few limitations in interpreting or linking with thick survey results. The NSSO thick employment and unemployment survey results for the reference period 2009-10 are officially scheduled to public release in 2011. This survey is expected to capture the impact of the global financial crisis on Indian households.

Shocks to the economy can come from different sources. Shocks that impinge directly on the economy are very visible and manifest themselves as a fall in output or in higher inflation. When the economy was dominated by agriculture, the failure of sufficient rainfall in the monsoons period served as a large shock. In the recent decades, India has had significant agricultural shocks due to the failure of the monsoons over a number of years (1972-73, 1979-80, 1987-88, 2002-03 and 2009-10). Survey evidence by Cole et al. (2009) during the 2004 and 2006 from two Indian states, namely, Andhra Pradesh and Gujarat, found that 99 percent of the agriculture-dependent households reported that variation in local rainfall was the most severe risk that they faced. Regions that have seen an increase in the coverage of irrigated land may have been better protected against the vagaries of the monsoons. However, there could be many other shocks to the agricultural sector, such as pests, insects, the non-availability of key inputs to farmers etc.

Moving away from agriculture to industry or services might have also helped mitigate the impact of a monsoon failure. As of 2009-10, the share of the industry and services sectors was also significant with regard to the total output and employment in the economy. So, shocks to the non-agricultural sector would also have had an impact on the economy as a whole. The liberalisation policies of 1991 concentrated mainly on changes in the manufacturing sector. Thus, one might theorize that the industrial sector would be most affected by global shocks in the economy. India could have been affected by the following global shocks – the 1997 Asian financial crisis, the 2000 Dotcom bubble burst and the 2007 global financial crisis. Since most services are within the non-tradable sector, there have been no significant shocks that have directly impacted the services sector in the past.

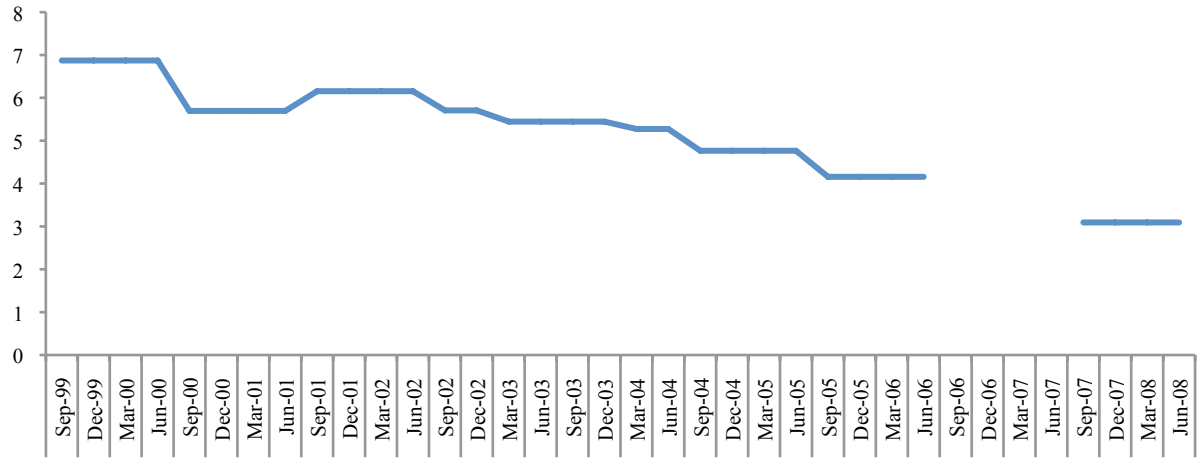
Facts and Literature on Child Labour in India

Children's education plays a very crucial role in the development of poor households. Such households usually have little or no physical assets and so, educating the children could potentially help break the vicious cycle of poverty through human capital accumulation. At the same time, child labour in India continues to be a matter of concern. However, India does not have very good statistical information on the incidence of child labour. The definition of child labour as well as misreporting by guardians during official surveys underestimates the rate of child labour. The NSSO's exclusive ad hoc survey on education (Education in India: 2007-08) found that the most important reasons for non-enrollment in or discontinuation from educational institutions were that the parents were uninterested in educating their children, financial constraints and that education was not considered necessary. However, the cost of education seems to be the dominant obstacle in educating the children of poor households. The survey found that, out of those children who discontinued their education in the age groups 5-9 and 10-13, about 24.8 percent and 23.8 percent, respectively, discontinued owing to financial constraints. For the same age groups, out of those children who had never enrolled in the first place, about 22.8 percent and 28.7 percent did not enroll because of financial constraints. Only a very small proportion of the respondents cited child labour as a reason. As argued by Basu (1999) and Edmonds and Pavcnik (2005), this could be because of the limitation in official

surveys on information about child labour. Also, households headed by those who consider education unnecessary may have been using their children for domestic work or sending them to work elsewhere, leading to serious under-reporting.

The 2001 Census estimated that there were 12 million child labourers in the country. With the help of the NSSO household surveys, I estimate the children's labour force participation for the age groups of 5-9 and 10-14. Assuming the response rate of child labour force participation is constant. I find that child labour force participation is falling over time, but that it is still significant for the age group of 10-14, and that it is marginal for the age group of 5-9. Figure 1 provides the child labour force participation rate for the age group of 10-14.

Figure1. Child Labour Force Participation Rate Age between 10 and 14 (in percent)



Source: NSSO

An important factor that could underlie this fall could be the fall in the incidence of poverty in the country. There are a number of research papers to support the theory that poverty is the main underlying cause of incidence of child labour (e.g. Blunch and Verner - 2000, Baland and Robinson - 2000 etc). The Indian Planning Commission estimated that the incidence of poverty[3] fell from 26.1 percent in 1999-2000 to 21.8 percent in 2004-05. However, the existing incidence of poverty remains very high. The Planning Commission estimated that there were 238.5 million people living in poverty in 2004-05.

Apart from the fall in poverty, other factors could also have contributed to a fall in the incidence of child labour - improvements in the educational infrastructure, an increase in the return on

[3] Incidence of poverty is measured by the percentage of people living below the poverty line. The Planning Commission is the nodal agency, which estimates the incidence of poverty. Estimates are based on the large consumer expenditure survey conducted by the National Sample Survey Organisation conducted once in five years.

education, an increase in the adult wage rate and the launch of educational programmes for poor households.

Microeconomic studies of India by Rosenzweig and Evenson (1977) and Duflo and Pande (2007), cited in Edmonds et al. (2007), focus on the district[4] as the relevant labour market unit because of very low rates of permanent mobility between districts. This has been captured in the observation of the district-level child labour participation. While the incidence of child labour force participation has been declining across the country as a whole, there remain locational differences. Table 1 presents the child labour force participation for urban and rural areas across districts for the year 2004-05, using the NSSO employment and unemployment survey.

Table 1. Child Labour Force Participation Rate, Labour and Population Age Group of 10-14 years (2004-05)

Participation Rate	Rural			Urban		
(Range)	No of Districts	Labour	Population	No of Districts	Labour	Population
(%)	(No.)	(In thousands)		(No.)	(In thousands)	
0	288	0	35918	355	0	7937
0.001-4	141	523	28498	122	258	12113
5-9	63	803	10751	45	198	3008
10-14	34	607	4986	24	123	995
15-19	22	660	3898	6	17	97
20-29	17	829	3483	12	81	327
30 & above	13	576	1535	7	29	88
Total	**578**	**3999**	**89069**	**571**	**707**	**24565**

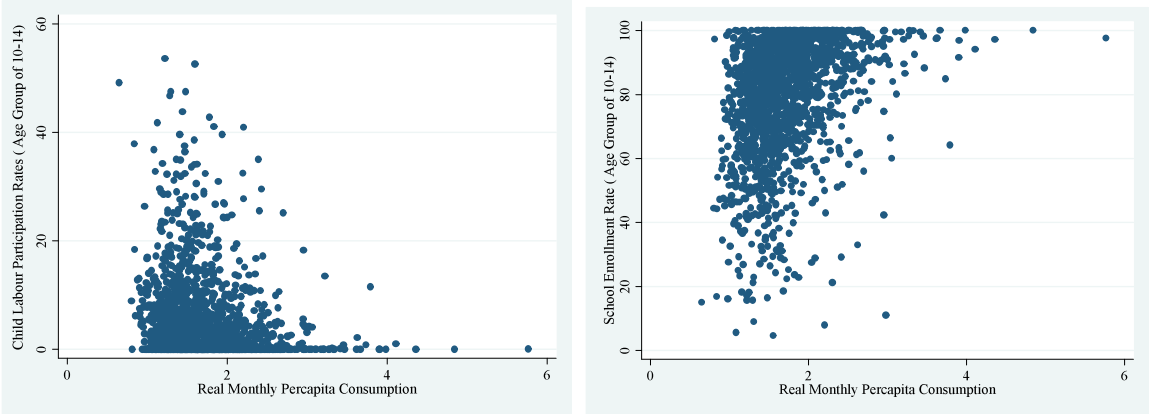
Source: Own calculations using NSSO houlholds survey 2004-05

The incidence of child labour is not the same across districts, and it seems that child labour is more a rural phenomenon than an urban one.

In case of India, Edmonds et al (2007) found that the low level of enrolment in schools is primarily because of the incidence of poverty rather than parental preferences. I look at the correlation between the standard of living and child labour force participation rate and school enrollment rate at district level. I find that there exists a negative correlation between child labour force participation and living standards. Conversely, there exists a positive correlation between school enrollment rate and living standards.

[4] A district is an administrative division of an Indian state or union territory.

Fig 2. Relationship between the Standard of Living, Children's School Enrollment Rate and Children Labor Force Participation Rate.



Note: Standards of living are measured by monthly real per capita consumption expenditure using four rounds (55th, 56th, 57th and 58th) of the NSSO sample households survey between 1999 and 2002. Real monthly per capita expenditure has been deflated by the Consumer Price Index (CPI) - CPI of agricultural labourers for the rural population and the CPI of urban non-manual employees for the urban population). The difference in cost of living between states is adjusted by the state-level poverty line estimates given by the Indian Planning Commission.

Basu et al. (2010) found that due to imperfections in the adult labour market, the households of two Indian states, namely Himachal Pradesh and Uttaranchal, used their children on the farms instead of hiring adult labour outside the family.

However, the study's findings cannot be applied to the country as whole, because district-level evidence shows that many districts with low levels of living standards do have a large child labour market for market work.

The Theory

In this section, I discuss the theoretical model of the child labour market. I use the theoretical model constructed by Basu and Van (1998) with some alterations of a few assumptions. I create three scenarios – the first scenario is the basic model, which illustrates why households decide to send their children to the labour market. The second scenario is modeled to explain effect of conditional in-kind transfer to the poor children who attend school. The last scenario shows the impact of adverse economic shocks in the labour market when the government provides conditional in-kind transfers to the children who attend school.

The Basic Model

The main assumptions of the model are a combination of selected assumptions from Basu and Van (1998) and the assumptions I introduced in the model. The assumptions I follow from Basu and Van (1998) are that all the households are identical in size, the economy produces single consumption goods, all firms are identical, and a household will send the children to the labour

market if the household income drops below the subsistence level of consumption (the luxury axiom) and from a firm's point of view, adult and child labourers are substitutes (the substitution axiom). The assumptions I introduce in the model are unequal distribution of capital to the households, cost of education is zero, households consume all its income, the credit market don't exist and all firms' capital is owned by households.

Some assumptions are used for the expositional purposes, which make the numerical calculations easy to understand. For example, households are considered to consist of one adult and one child - two parents are considered to be one adult. Similarly, two children are considered to be one child. The family preference is described in equation 1 by a binary relation defined in the set.

$$\{(c,e) \mid c \geq 0, e \in \{0,1\}\}, \qquad (1)$$

Where *c* is the consumption by each family member and *e* is the child work effort, which can only take the value 0 or 1. The assumptions are that adults always work no matter what the wages are and that a child's consumption is equal to that of an adult. A family sends its children only if the family income does not the meet the minimum subsistence level of per capita household consumption *S*is exogenously determined. Total number of Households N_T is classified into two groups; one group consists of total poor households N_{PH}, whose income is less than *2S,*and the other group consists of total rich households N_{RH}, whose income is greater than or equal to *2S.* Incidence of poverty is denoted as γ.

$$\gamma = \frac{N_{PH}}{N_{PH} + N_{RH}} \qquad (2)$$

Households are indexed by *i*, where $i = 1,\ldots,N_{T..}$ Each household has the following income function.

$$I_i = f(e_i, k_i, w, \eta) \qquad (3)$$

Where

'I_i" total income of household 'i'

'e_i' child work effort in household 'i'

'k_i' capital owned by household 'i'

'w' market wage for an adult labourer

'η' state of the economy, captures any positive or negative shocks in the economy

Rich households are indexed by i, $i = 1,\ldots,N_{RH.}$ Each rich household has the following income function.

$$I_i = f(e_i, k_i, w, \eta), \forall \text{ I} > 2S \& \; e=0 \qquad (4)$$

Poor households are index by i, i = 1,…,$N_{PH.}$ Each household has the following income function.

$$I_i = f(e_i, k_i, w, \eta), \forall \text{ I} < 2S \& \; e=1 \qquad (5)$$

The labour supply N comprises of the total adults in the economy N_{TA} , Child labour supply N_{PHC} is the number of poor household children.

$$N = N_{TA} + N_{PHC} \qquad (6)$$

To derive the market demand for adult and child labourers, adults and children are assumed to be substitutes in production subject to adult-equivalent scaling, given by λ, where 0< λ<1. It is also assumed that the economy produces single consumption goods, and N_F is the number of identical firms.

Each firm's production function is

$$x_j = f(A_j + \lambda C_j), f' > 0, f'' < 0, \qquad (7)$$

Where x_j is firm j's output of consumption goods, A_j and C_j are the number of adult labourers and child labourers employed in the firm. The firm is a wage taker. Firm j chooses the A_j and C_j where it reaches the maximum profit.

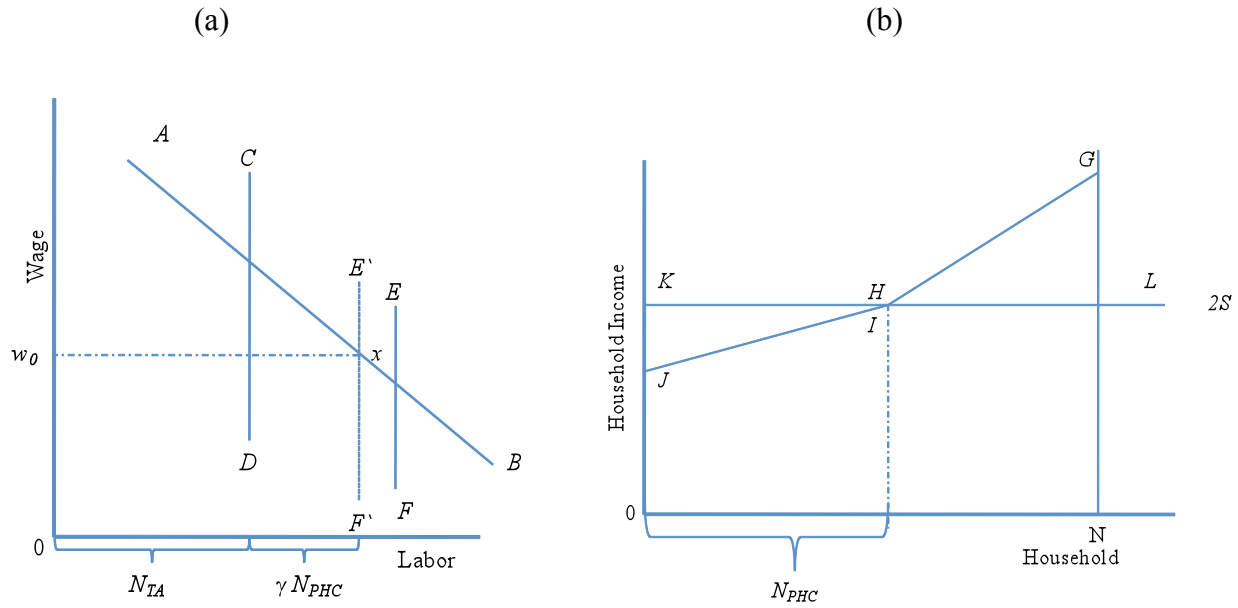
$$\max_{A_j, C_j} f(A_j + \lambda C_j) - A_j w + C_j w\lambda \qquad (8)$$

Where w is the adult wage rate. The firm pays $w\lambda$ to the child, i.e., adjusted to the adult-equivalent scale. Firms always ensure the following condition.

$$f'(A_j + \lambda C_j) = \min\{w, w\lambda\} \qquad (9)$$

Now I describe the basic model in a diagrammatic representation. The labour market and households' decision to send the children together determine the number of children to be sent to the labour market and the wage in the labour market. The labour market and household's decision are portrayed in panel (a) and panel (b) of Figure 3.

Figure 3. Basic Model of the Child Labour Market

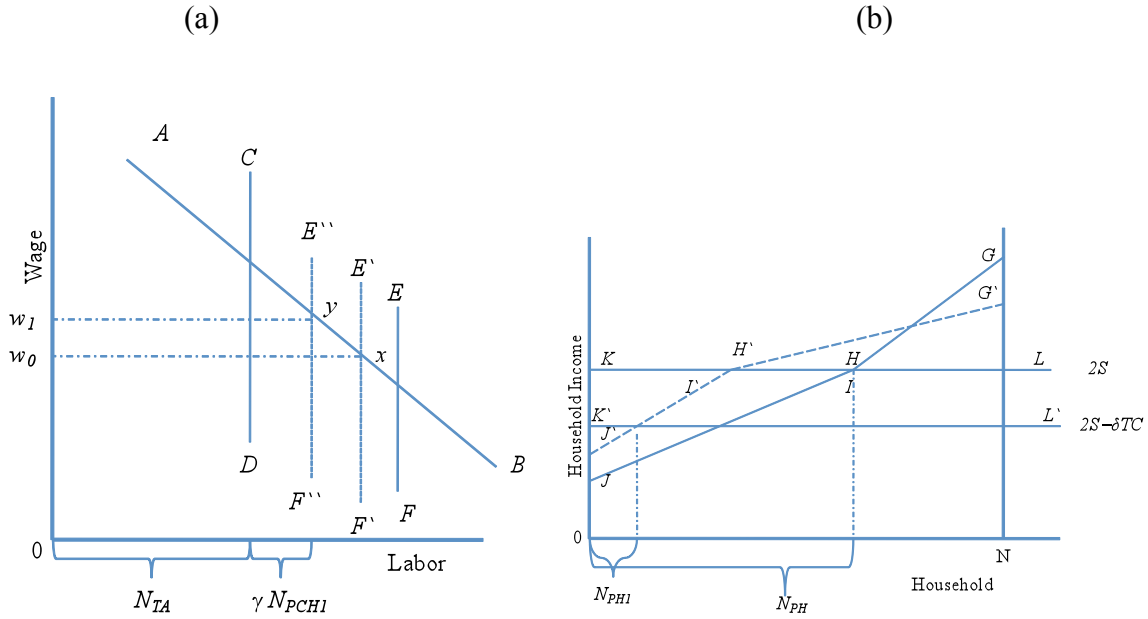


In figure 3, panel (a), the Y-axis represents the wage rate and X-axis represents the number of labourers. *AB* is the supply for adult labour. The quantity supply of adult labour is N_{TA} and the adult-equivalent scalar adjusted quantity supply child labour is λN_{PHC} is the number of poor household children. Adult-equivalent scalar is defined as λ, where $0<\lambda<1$. *CD* is the supply of adult labour, *E'F'* is the aggregate supply of adult and child labour. The horizontal difference between *CD and E'F'* is equal to λ multiplied by N_{PHC}. *EF* is the maximum adult and children labour supply in the economy. *E'F' is less than EF,* because rich households exist in the economy. Those households whose income is less than the minimum level of subsistence consumption 2*S* determine the number of poor household children

Here, I discuss the reason why households send their children to the labour market. In Figure 3, panel (b), the Y-axis represents the household's income level and X-axis represents the number of households. Households derive income from the endowment of labour and capital. Households have equal amounts of endowment in labour but different levels of endowment in capital. The income curve for the households' income is upward-sloping because of the difference in capital endowments. The income curve for rich households is named *GH*, whose income is greater than 2*S*.Theincome curve for the household whose income is less than *2S* is named *IJ,* and will have a different slope. I assume *IJ* is flatter than *GH* because poor households receive wage income from both the adult and the child. In other words, if the poor households don't send their children to the labour market, their income curve will be placed south from the *IJ* curve. The horizontal line *KL* is the minimum subsistence level of consumption. The vertical

distance between *x-axis* and *KL* is *2S*. In this scenario, the equilibrium point has settled at *x*, and the number of child labourers in the market is N_{PHC} and the adult wage is w_0.

Figure 4. Extended Model of Child Labour when the Government Provides Conditional In-kind Transfer to Children who Attend School



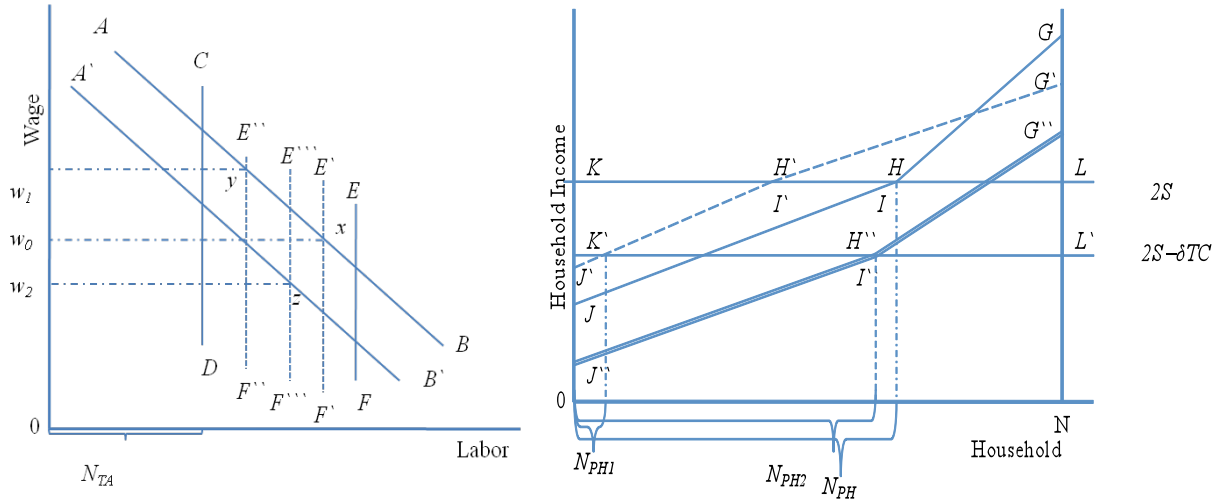
Initially, the economy is at equilibrium *x*. Now the government starts the conditional in-kind transfer programme to increase the children's school enrollment. The conditional in-kind transfer programme provides mid-day meals to children who attend school. In figure 4, panel (b), *TS* is the amount of money spent on a mid-day meal per child. This will have an impact on the minimum subsistence consumption level. Since the government spends amount *TS* per child in the form of in-kind transfers, I assume that this will not have an equal reduction in a households' subsistence consumption level. So, the household subsistence consumption level is reduced by δTS and the *KL* line shifts downward by δTS, where $0<\delta<1$. The new minimum level of the subsistence curve is *K'L'*. So, initially, some portion of the households will take their children from the labour market and send them to school. As a result, the wage rate in the labour market will go up. The households who gain sufficiently from the rise in wage income and will also send their children to school. In this process, the labour supply curve *E''F''* will take place leftwards from the previous labour supply curve *E'F'*. And the labour market will reach equilibrium *y* from *x* and adult wage will be w_1, greater than w_0.

A rise in the wage rate will have different effects on different households, depending on their capital endowment. The income will go up for those households whose major income is derived from wage income. At the same time, income will fall for the households whose major income source is capital endowment. Because the return of capital (or the firms' profit) will come down due to the rise in wage cost, the income curve for the rich households will be *G'H'*. The line

G'H' is lengthier than *GH* because many poor households move to the rich household group due to the wage raise gain and the conditional in-kind transfer programme. However, rich households will now get less than the previous income level. So, the *G'H'* income line will intersect *GH*. At the same time, the income curve for the poor households will be shorter than *IJ*. The new curve will be *I'J'*. It will be placed above *IJ*, because the poor also benefit due to the gain from the wage rise.

Figure 5. The Child Labour Market in the face of Adverse Economic Shock and the Governments provides Conditional In-kind Transfers to Children who Attend School.

(a) (b)



In this scenario, the economy is at equilibrium *y*, and it is faced with an adverse economic shock. As a result, the aggregate demand for labour shifts downwards from *AB to A`B`*, and the economy reaches the new equilibrium *z*, Total labour supply is raise E```F``` from E``F`` because of many households' income level fall below the subsistence level of income and more child labour will enter to the labour market.

In figure 5, panel (b), due to the adverse economic shock, the firms' profit and wage rate will come down. As a result, the rich households' income curve will shift downwards from *G'H'* to *G''H''*. Due to the fall in profit and wage rate, some rich households would move to the poor household group. Since the poor households' income would also come down because of fall of wage rate. The new income curve for poor households will move downwards from *I'J'* to *I''J''*. Since the conditional in-kind or cash transfer is constant during the adverse economic shock it does not make any difference households decision. Hence, the theoretical model shows that child labour could be counter-cyclical even if conditional in-kind or cash transfer were given to children to attend in schools.

Data Construction and Sources

I have used panel data for the empirical model. It covers the period between 1999 and 2002, and 358 districts in India. The detailed definitions and constructions of the variables are explained in Table 2. The data sources of the exercise are based on the different rounds of NSSO's sample household surveys and Census 2001.

Table 2. Data Sources and Definitions

Name of the Variable	*Definition/Construction of Variable*	*Source*
Child labour force participation rate	District-wise percentage of children between the age groups of 10 and 14, involved in full-time gainful economic activity.	Four rounds (55th, 56th, 57th and 58th) of the NSSO's sample household surveys between 1999 and 2002.
Children's school enrollment rate	Districts-wise percentage of children between the age groups of 10 and 14, enrolled in school.	-do-
Employment dependency on agriculture	District-wise percentage of agriculture employment.	-do-
Coverage of the mid-day meal programme	Districts-wise percentage of children who consume at least 15 meals in a month under the mid-day meal programme	-do-
Real per capita monthly expenditure	Districts-wise average real monthly per capita expenditure has been deflated by the Consumer Price Indices (CPI) - CPI of agricultural labourers for the rural population and the CPI of urban non-manual employees for the urban population. The difference in the cost of living between states has been adjusted by the state-level poverty line estimates given by the Indian Planning Commission.	Nominal per-capita consumption at the district level has been sourced from four rounds (55th, 56th, 57th and 58th) of the NSSO's sample household surveys. CPI data has been sourced from the Labour Bureau. The poverty line data has been sourced from the Indian Planning Commission.
Transport infrastructure	Districts-wise percentage of villages with bus services.	Census 2001.
School infrastructure	Districts-wise percentage of villages which have middle school.	-do-

The Empirical Model and Results

The empirical model consists of two stages. The first stage explores the determinants of children's school enrollment rate and child labour participation in India. Determinants are classified as income and non-income factors. The second stage analyses the impact of adverse income shocks on school enrollment and child labour participation. If the first stage shows that income does not play an important role in determining children's school enrollment rate and child labour participation, then there is no need to extend the empirical exploration to second stage. Hence, the results of the first stage of analysis are the precondition for the second stage analysis.

The models for the determinants of children's school enrollment rate and child labour participation model is as follows.

$$CS_{it} = \pi Y_{it} + \kappa AE_{it} + \tau R_i + \nu S_i + \rho Z_{it} + \omega_{it} \quad (10)$$

The expected signs of the coefficients are $\eta>0, \kappa<0, \tau>0, \nu>0, \rho>0$.

$$CW_{it} = \alpha Y_{it} + \beta AE_{it} + \chi S_i + \phi Z_{it} + \varepsilon_{it} \quad (11)$$

The expected signs of the coefficients are $\alpha<0, \beta>0, \chi<0, \phi<0$.

Where i = district and t = time,

CS = children's school enrollment rate,

CW = child labour force participation rate,

Y= real per capita consumption,

AE=share of agriculture employment,

R=transport infrastructure,

S= school infrastructure,

Z= coverage of mid-day meal programme,

ε/ω capture the unobserved characteristics.

If a child has only two options – either to go to school or to join the labour force - then the factors that influence her towards joining the labour force are the same factors that influence her not to enroll in school. However, in the real world, a child may have the option of not being either in the labour market or in school. Also, guardians may give full information if a child goes to school, but may misreport if she is in the labour force. Therefore, to avoid anomalies, I have separate models for the determinants for child schooling and child labour participation. The independent variables consist of income and non-income factors. Real per capita consumption is proxy for income. The non-income factors - school infrastructure, transport infrastructure and agriculture employment are control variables used to capture the time-invariant characteristics of districts. The coverage of mid-day meal programme is a proxy to measure the government intervention in the child labour market. The correlation matrix of the independent variables is given in Table 3. Correlation coefficients among the independent variables are low, which shows no problem of multicollinearity.

Table 3. Correlation Coefficients between Independent Variables

	Y	AE	S	R	Z
Y	1.00				
AE	-0.40	1.00			
S	0.23	-0.30	1.00		
R	0.37	-0.28	0.34	1.00	
Z	0.02	-0.02	0.12	0.23	1.00

To estimate equations 5 and 6, the possible model estimation methods are OLS (ordinary least squares), fixed effects and random effects techniques. The choice between random effects and fixed effects models is decided by the Hausman test. If the test finds that there are no fixed effects, then we choose between OLS and random effect by applying the Breush-Pagan Lagrange Multiplier test. Time-fixed effects are included based on the results of the joint test. If the Wald test indicates the presence of heteroskedasticity, we use robust regression.

Table 4. The Empirical Results of Determinants of Children's School Enrollment and Child Labour Participation

	Dependent Variable							
	CS				CW			
Name of Independent Variable	Fixed	Random	Random	Random, Robust	Fixed	Random	Random	Random, Robust
Y	6.16***	7.24***	6.59***	7.24***	-2.11***	-2.24***	-2.06***	-2.24***
	[1.38]	[1.08]	[1.13]	[1.09]	[0.66]	[0.49]	[0.52]	[0.44]
AE	-0.12***	-0.09***	-0.09***	-0.09***	0.04***	0.03***	0.03***	0.03**
	[0.03]	[0.02]	[0.02]	[0.03]	[0.01]	[0.01]	[0.01]	[0.01]
S	6.00E-07	5.86E-06	6.14E-06	5.86e-06**	-6.03E-07	-2.63E-06	-2.80E-06	-2.63e-06*
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R	0.01	0.10***	0.11***	0.10***				
	[0.20]	[0.02]	[0.02]	[0.02]				
Z	0.11	0.1	0.09	0.10**	-0.03	-0.02	-0.02	-0.02
	[0.09]	[0.07]	[0.07]	[0.05]	[0.04]	[0.03]	[0.03]	[0.02]
Year=2000			0.11				0.14	
			[1.10]				[0.53]	
Year=2001			1.75				-0.77	
			[1.14]				[0.54]	
Year=2002			1.7				-0.16	
			[1.13]				[0.54]	
Constant	73.5***	65.5***	65.6***	65.5***	6.7***	7.8***	7.7***	7.8***
	[9.63]	[2.74]	[2.76]	[2.80]	[1.57]	[1.26]	[1.28]	[1.25]
Observations	1433	1433	1433	1433	1437	1437	1437	1437
No of Districts	358	358	358	358	359	359	359	359
Diagnostics Tests								
Hausman test (Prob> chi2)#	0.32				0.42			
BPLM test (Prob> chi2)##		0.00				0.00		
Joint test (Prob> f) ###			0.23				0.34	
Wald test (Prob> chi2)####	0.00				0.00			

Null hypothesis is that the preferred model is random effects vs. the alternative (the fixed effects).

Breusch-Pagan Lagrange Multiplier (BPLM) test, Null hypothesis is that variances across districts is zero.

Null hypothesis is that all the year coefficients are jointly equal to zero.

Null hypothesis is homoskedasticity.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Robust standard errors and standard errors are in brackets.

Table 4 presents the empirical results of the determinant models. Equations 5 and 6 indicate the presence of random effects and heteroskedasticity. Therefore, I chose the random effects model with robust regression to estimate them.

The result of the first stage analysis shows that income significantly influences the school enrollment rate and child labour participation with expected signs. Therefore, there is a need to proceed to the second stage of the empirical model – the shock model.

In the shock model, since school infrastructure and transport infrastructure and agriculture employment are time invariant in nature given the short time panel of four years, I have not considered them. Mid-day meal coverage could possibly be taken in the shock model, but during the study period between 1999 and 2002, the scheme was in the stage of implementation[5]. So, many states may not have had the capacity to provide mid-day meals in case of a massive, sudden rise in the number of enrolled school children. Therefore, I have dropped the coverage of the mid-day meal in the shock model.

I've removed the linear time trend from the variables CW, CS and Y, and the residuals of the series are named DCW, DCS, and DY, respectively. Residuals of each variable are proxy for shock components of each variable. The time trend for each variable has been estimated for each district separately.

Generating the shock components, we get

$$CS_{it} = a_i + b_i t \pm DCS_{it} \quad (12)$$

$$CW_{it} = a_i + b_i t \pm DCW_{it} \quad (13)$$

$$Y_{it} = a_i + b_i t \pm DY_{it} \quad (14)$$

Where i = district and t = time,

DCS = shock to children school enrollment

DCW = shock to child labour participation

DY= shock to real consumption

Where $DY>$ is defined as positive income shocks and $DY<$ is defined as adverse income shocks.

The shock model of children's school enrollment and child labour participation model is as follows.

[5] The mid-day meal scheme has a long history especially in Tamil Nadu and Gujarat, and has now been expanded to all parts of India after a landmark direction by the Supreme Court of India on November 28, 2001.

$$DCS_{it} = \psi DY_{it} + \vartheta_{it} \quad (15)$$

$$DCW_{it} = \xi DY_{it} + \theta_{it} \quad (16)$$

The expected co-efficient signs are $\psi>0$, $\xi<0$.

Table 5 presents the results of the shock model. Equation 15 shows a presence of random effects, time-fixed effects and heteroskedasticity. Therefore, I have chosen the random effects model with time-fixed effects using robust regression. The results, as expected, are positive coefficients. Thus, during the adverse economic shock children are not likely to join school. Equation 16 shows a presence of random effects and heteroskedasticity. Therefore I have chosen the random effects model using robust regression.

Table 5. The Empirical Results of Economic Shocks on Child Labour and Children School Enrollment

	Dependent Variable								
	CS					CW			
Name of Independent Variable	Fixed	Random	Random	Fixed	Random, Robust	Fixed	Random	Random	Random, Robust
DY	5.92***	5.83***	5.17***	5.24***	5.17***	-1.69***	-1.68***	-1.31**	-1.68***
	[1.69]	[1.69]	[1.75]	[1.75]	[1.83]	[0.66]	[0.57]	[0.59]	[0.58]
Year=2000			1.09	1.05	1.09			0.16	
			[1.08]	[1.08]	[1.03]			[0.36]	
Year=2001			3.30***	3.32***	3.30***			-0.67*	
			[1.10]	[1.10]	[1.05]			[0.37]	
Year=2002			2.80***	2.79***	2.80***			0.29	
			[1.08]	[1.08]	[0.96]			[0.36]	
Constant	76.32***	76.28***	74.49***	74.54***	74.49***	0.00	0.00	0.05	0.00
	[0.38]	[0.69]	[0.96]	[0.77]	[0.77]	[0.15]	[0.13]	[0.26]	[0.13]
Observations	1543	1543	1543	1543	1543	1543	1543	1543	1543
No. of Districts	385	385	385	385	385	385	385	385	385
Diagnostics Tests									
Hausman test (Prob> chi2)#	0.04					0.97			
BPLM test (Prob> chi2)##		0.00					0.00		
Joint test (Prob> f) ###			0.01	0.01				0.05	
Wald test (Prob> chi2)####				0.00				0.00	

Null hypothesis is that the preferred model is random effects vs. the alternative (the fixed effects).

Null hypothesis is that all the year coefficients are jointly equal to zero

Breusch-Pagan Lagrange Multiplier (BPLM) test, Null hypothesis is that variances across districts is zero.

Null hypothesis is homoskedasticity.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Robust standard errors and standard errors in brackets.

Results Discussion

Predictions of the theoretical model are in line with the empirical model results. First, I discuss the determinants of children's school enrollment rate and child labour participation.

In the children's school enrollment model, the coefficient of real consumption π is positive and statistically significant at the 1 percent level. Conversely, in the child labour participation model, the coefficient of real consumption α is negative and statistically significant at the 1 percent level. Thus, these findings show that income channels are strong influences on children's education and incidence of child labour. It is observed that the policy outcome of lifting the income takes a long time. So, in the interim, the transfer of resources is very necessary to arrest child labour participation and increase school enrollment.

As of 2002, the agricultural sector accounted for 65 percent of the child labour in the country. This has also been revealed in the results of this study. In the child labour model, the agricultural employment coefficient β is positive and statistically significant at the 5 percent level. In the children's school enrollment model, the agricultural employment coefficient κ is negative and statistically significant at the 1 percent level. These could be interpreted as demand side channels since child labour is normally less skillful and repetitive in nature. So, such work might have a lot of scope in the agricultural sector rather than the non-agricultural sector.

In the children's school enrollment model, the education infrastructure coefficient ν is positive and statistically significant at the 5 percent level. Also, the transport infrastructure coefficient τ is positive and statistically significant at the 1 percent level. This could be because of the lack of transport infrastructure, which might act as a barrier to children's education for those households who don't have middle schools close to their residence. As of NSSO 2007-08, 21 percent of rural households didn't have schools with middle classes within 2 kilometers of their residence.

The mid-day meal programme has positively influenced the children's school enrollment rate. In the children's school enrollment model, the coverage of the mid-day meal programme coefficient ρ is positive and statistically significant at the 5 percent level.

In the child labour model, only real consumption and agricultural employment are expected coefficients and statistical significantly at the 5 percent level or above. Though the other explanatory variable coefficients have turned out as expected, they are not statistically significant at the 5 percent level. This could be because the children may have the option of not going school and not being part of the labour force, or the households could be misreporting if the child is employed in gainful economic activity.

In the shock model, the adverse economic coefficient ψ is positive and statistically significant at the 1 percent level, and adverse economic coefficient ξ is negative and statistically significant at the 1 percent level. This proves that child labour in India is counter-cyclical.

Limitations

The limitation of the study is that the 58th round of NSSO's survey has a shorter reference period than the other rounds used in the study. However, the exclusion of the 58th round data does not change the result findings.

Conclusion and Policy Recommendations

The study concludes that child labour in Indian is counter-cyclical. So, any temporary adverse shock in India will lead to permanent consequences to the economy. This will be visible in the long run and be detrimental to the human capital formation of the country. There are lots of reasons to argue why the government should put enough resources to break the counter-cyclical behaviour of child labour participation. Most importantly, the public return on children's education would be very high as compared to the private rate of return. The literature also supports that the private return on education rises after additional levels of schooling from the threshold schooling level. Another important factor in developing countries like India is that during an adverse economic shock, households face the bigger question of survival rather than optimization of current vs. future streams of income. Since the poor households do not have access to the formal credit market they are forced to make a flawed decision. The theoretical model shows that during an adverse economic shock, the government should raise the existing in-kind transfers to poor children who attend the school. Maintaining the status quo in the in-kind transfer scheme may not yield any improvement on in children's school enrollment.

For future studies, it would be interesting to analyse the latest rounds to see the effects the global economic crises of 2007-08 and the National Rural Employment Guarantee Act (NREGA) in the child labour market. NREGA may have acted as a counter-shock policy. It could be that the incidence of child labour may not have risen in these periods of adverse economic shocks. So, in summation, an apt research question would be 'Did NREGA help to break the counter-cyclical behaviour of the incidence of child labour in India? If not, to what extent did it mitigate the damage of the economic shock?'

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