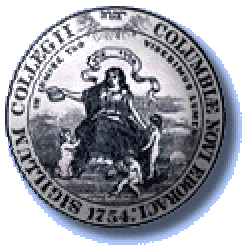

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Comments welcome

Do Households Resort to Child Labor to Cope with Income Shocks?*

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Abstract

Using four rounds of panel household data from the Kagera region of Tanzania, we show that transitory income shocks – measured by the value of crop lost by farming households – lead to significantly increased child labor. A one standard deviation increase in the shock is associated with a 10% increase in mean child working hours. Moreover, we find that households with collateralizable assets – which we interpret as a proxy for access to credit – are better able to offset the effects of income shocks. This evidence supports the view that credit market imperfections are an important determinant of child labor.

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1. Introduction

This paper examines the relationship between household income shocks, access to credit, and child labor. In particular, we investigate the extent to which income shocks lead to increases in child labor, and whether households can use access to credit to mitigate the effects of these shocks.

These questions are important for two reasons. First, they point at a potentially important determinant of child labor and, as a result, at mechanisms that can be used to tackle it. This is particularly relevant since child labor is often viewed primarily as a consequence of poverty. For example, in a recent publication, the World Bank defined child labor as "one of the most devastating consequences of persistent poverty" (Fallon and Tzannatos, 1998). To some extent, the stylized facts bear out this view. In 1995, the incidence of child labor was 2.3% among countries in the upper quartile of GDP per capita, and 34% among countries in the lowest quartile of GDP per capita (see Dehejia and Gatti, 2002, and Krueger, 1996). If poverty is the main cause of child labor, then the prevalence of child labor should decrease as countries get more developed. However, the relationship between poverty and child labor has been put into discussion by some recent within-country studies.[1] In particular, imperfections in labor markets, education and - as we, amongst others, claim – credit markets might be at the root of child labor. In this case, policies directed to correct such imperfections might be the most efficient in tackling child labor.

Second, in the theoretical literature on child labor (reviewed below), (lack of) access to credit plays a central role in child labor. Child labor arises from the inability of households to trade-off resources inter-temporally in an optimal way. By allowing a child to work today, the child makes an immediate contribution to household earnings. However, in the long-run child labor

[1] In their review of several studies, Canagarajah and Nielsen (1999) do not find clear evidence that poverty is associated with higher incidence of child labor within countries. Bhalotra and Heady (2001) demonstrate findings from Ghana and Pakistan in which the children of land-rich households are *more* likely to work (and less likely to be in school) than their counterparts in land-poor households. This is a finding they label a "wealth paradox" since it challenges the notion that child labor is observed more often among children in poor households. Their explanation for this paradoxical result is the combination of labor market failures and ill-functioning land markets.

compromises future earning potential to the extent that the time a child spends working could be used instead to build up the child's long-run human capital.[2] Two key economic variables that influence households' demand for and ability to smooth resources inter-temporally are income shocks and access to credit. Despite their theoretical centrality (see for example the discussion in Grootaert and Patrinos, 1999), little empirical research has been undertaken to examine the connection between income shocks and access to credit, and child labor. In particular, to our knowledge, this is the first paper to explicitly examine this link.

Using four rounds of panel household data from the Kagera region of Tanzania, we show that transitory income shocks lead to significantly increased child labor. Moreover, we find that households with collateralizable assets – which we interpret as a proxy for access to credit – are better able to offset the effects of income shocks. It is of course possible that a higher level of collateralizable assets mitigates the effect of child labor for reasons other than the ability to borrow. One of these confounding effects is a wealth effect, and another possibility is that level of collateralizable assets is correlated with unobservables such as a household's social network. Nonetheless, when we control for other sources of wealth, we find that our results remain robust.

The paper is organized as follows. In Section 2, we provide a brief review of the child labor literature. In Section 3, we outline our empirical strategy. In Section 4, we describe our data. In Section 5 we present our results. Section 6 concludes.

[2] In outlining child labor issues and directions for the World Bank, Fallon and Tzannatos (1998) point out that child labor can have additional costs in terms of harmful effects on physical health and mental well-being (such as psychological and social adjustment) of children. Moreover, others contend that the working conditions for children are far below those of adults in terms of hours worked, wages, and safety.

2. Literature Review

2.1 Theoretical perspectives: Child labor

Basu (1999) partitions the child labor literature into two groups: papers which examine intra-household bargaining (between parents, or parents and children) and those which examine extra-household bargaining (papers in which the household is a single unit and bargains with employers).

In the intra-household bargaining framework, child labor is an outcome of an optimization process which places different weights on household members, for example parents and children (see Bourguignon and Chiappori, 1994, and Moehling, 1995) or the mother (who altruistically cares for the children) and the father (who cares for himself in addition to the family. See Galasso, 1999). The weight that each member receives can depend upon his or her contribution to the family's resources. Collectively, child labor may be desirable because it contributes to the family income, and it may be desirable to the child because it increase his or her weight in the family decision function. Within this framework, the key variables are those that determine the relative bargaining strength of different members of the household. This could include wealth, the number, age, and gender of children, and earnings (wages) if an individual were to work (regardless of whether this is observed or not). Other key variables include the set of opportunities for education available to children (access to and quality of schooling).

The inter-household bargaining framework considers each household as a unitary entity (see Becker, 1964, and Gupta, 2000). The motivation behind this approach is that children's bargaining power is inherently very limited. The parents and the employer bargain about the child's wage and the fraction of that wage to be paid as food to the child. Within this framework, the key variables are those that determine the relative bargaining strength of the household vis à vis the

employer. These also include household wealth variables, but also variables such as the access to credit.[3]

The unitary model of the family à la Becker (1964) is best suited to understand the role of borrowing constraints as a determinant of child labor. Analytically, the question is closely related to the bequests literature which has highlighted that the non-negativity constraint in bequests can lead to an inefficient allocation of resources within the family (see for example Becker and Murphy, 1988). A recent strand of theoretical literature (Parsons and Goldin, 1989, Baland and Robinson, 2000, and Ranjan, 2001) has addressed the implications of this for child labor. In particular, these papers show that if parents care about their children, but parents' bequests are at a corner, child labor is not generally efficient. The basic intuition is that child labor creates a trade-off between current and future income (Baland and Robinson, 2000). Putting children to work raises current income, but by interfering with children's human capital development, it reduces future income. The future income is, of course, realized by the children and not the parents. Thus, if bequests are positive, then parents can compensate themselves for foregone current income by reducing bequests. Instead, when parents do not leave bequests for their children (for example, if they are poor) and when financial markets do not allow parents to trade-off future bequests with current income, child labor can be inefficiently high.

This theoretical approach suggests that the availability of credit should be a factor that predicts the incidence of child labor. To the extent that child labor competes with schooling in the time allocation decision, availability of credit can also affect school participation. Moreover, if such an effect is found, it will provide evidence of the inefficiency of observed child labor.

[3] Most theoretical models (and certainly the empirical literature) of child labor focus on the supply-side factors. Canagarajah and Nielsen (1999) outline demand-side factors which can play critical roles in perpetuating child labor. These include the non-pecuniary characteristics of children that may make them desirable employees for employers, such as being more willing to take orders and do monotonous work and less aware of rights, among other factors.

2.2 Empirical Work on Child Labor

Although the recent theoretical literature highlights income shocks and borrowing constraints as an important source of inefficiency in the allocation of resources within the family and, in particular, of inefficiently high child labor (Ranjan, 2001, and Baland and Robinson, 2000), the link between income shocks, access to credit, and child labor remains unexplored in the empirical literature.

There are a wide range of empirical studies of child labor at the micro-level using household survey datasets. These studies tend to estimate reduced-form participation equations for child work. For example, in a recent volume, Grootaert and Patrinos (1999) review findings of studies of child labor from Côte D'Ivoire, Colombia, Bolivia, and the Philippines. Canagarajah and Nielsen (1999) review findings from 5 studies from Côte D'Ivoire, Ghana, and Zambia. These are only several of a much wider list of studies in this area which have contributed to a better understanding of the factors that influence child labor. A consistent finding of these studies is that the child's age and gender, education and employment of the parents, and rural versus urban residency are robust predictors of child labor. Few studies examine child labor in Tanzania using household survey data (see Beegle, 1998), although several studies focus on schooling determinants in Tanzania.[4]

While we could not identify studies that examine the impact of income shocks or access to credit on child labor, some studies assess the relationship between schooling outcomes and shocks. Of course, it is not obvious that for children there is a one-to-one trade-off between time spent in school and time spent working (see for example the evidence in Ravallion and Wodon, 2000). Many children not enrolled in school are not necessarily working and, in many cases, enrolled

[4] These studies examine a range of schooling outcomes, such as: the general decision to enroll at primary or secondary levels (Al-Samarrai and Peasgood, 1998; Mason and Khandker, 1997); delayed enrollment decisions (Bommier and Lambert , 2000); urban-rural differentials (Al-Samarrai and Reilly, 2000); the impact of own health and illness among

children combine their schooling with work. Furthermore, hours in either activity may be sufficiently low on average that an increase in time spent in one activity will not crowd out time spent in another, as opposed to crowding out leisure time.

Jacoby (1994) examines the relationship between borrowing constraints and progression through school among Peruvian children. He concludes that lack of access to credit perpetuates poverty because children in households with borrowing constraints begin withdrawing from school earlier than those with access to credit. Jacoby and Skoufias (1997) is the only empirical work we identified rigorously addressing the issue that poor households lacking access to credit markets might draw upon child labor when faced with negative income shocks. Using data on school attendance patterns from six Indian villages, the authors conclude that fluctuations in school attendance are used by households as a form of self-insurance. However, these studies focus only on schooling and not child labor activities, which would likely be more directly affected by income shocks and inability to access credit. We discuss these papers again in the subsequent section as they directly motivate our empirical strategies.

Dehejia and Gatti (2002) use cross-country data on child labor to investigate the association between child labor and access to credit (as proxied by country-wide financial development) across countries. They find a significant negative and robust relationship between the two variables, which is particularly sizeable in poor countries. Moreover, their evidence suggests that in the absence of developed financial markets, households resort substantially to child labor in order to cope with aggregate income variability.

household member on attendance (Burke, 1998; Burke and Beegle, 2002); and the relatioship between orphanhood status and enrollment (Ainsworth et al., 2002).

3. Empirical Strategy and Specification

In this section, we outline the empirical strategy and specification we employ to identify the effects of income shocks and access to credit on child labor choices within households.[5] We are interested both in the direct effect of an income shock and in the extent to which access to credit helps families smooth the impact of shocks.

The literature on consumption and savings distinguishes between two types of shocks - transitory and permanent. The theoretical effect of these shocks on time allocation and borrowing decisions are different. If we believe that income affects child labor outcomes negatively (with a stronger relationship among the poor), we would expect a permanent negative income shock to increase child labor,especially for children in poor households. Furthermore, we do not expect households to borrow to offset the effect of such shocks. Conversely, credit or self-insurance through accumulated savings can be an effective tool in smoothing transitory shocks. Instead, increasing child labor in response to a transitory shock carries important costs for human capital development because of the often irreversible disruption in schooling.

In this paper, we focus on transitory shocks for three reasons. First, if we find that these shocks have a significant effect on child labor decisions, it will be evidence of incomplete insurance (and credit) markets at the household level. Second, this is a necessary condition for the hypothesis that access to credit will alleviate the effect of transitory shocks. Third, if we find such an effect, then there are clear policy implications, namely that improving household access to credit can mitigate the effect of income shocks.

Measuring credit constraints is particularly difficult. Ideally, one would want an indicator of those households that sought credit but could not obtain it, as well as a measure of how much credit they wanted. In practice, this is rarely observed. The literature suggests, though, that access to

credit is correlated with collateral (Townsend, 1994; Jacoby, 1994). In this paper, we observe the value of collateralizable assets (discussed more in the following section).

We first examine the effect of shocks on child labor hours. Our basic specification is:

$$y_{ijt} = b_0 + b_1 X_{ijt} + b_2 shock_{ijt} + e_{ijt} \quad (1)$$

where subscripts index individuals (i), households (j), and survey waves (t=1,…,T), y is child labor hours, *shock* is our measure of the income shock (discussed in detail in the next section), and X contains a set of controls including individual, household, and community characteristics. We expect transitory shocks to lead to an increase in child labor if credit or insurance are limited or non-existent, i.e. we expect $b_2 > 0$.

We then investigate the role of access to credit. In particular, we estimate the following specification:

$$y_{ijt} = b_0 + b_1 X_{ijt} + b_2 shock_{ijt} + b_3 (shock_{ijt} \cdot collateral_{ijt}) + b_4 collateral_{ijt} + e_{ijt} \quad (2)$$

Here the effect of interest is b_3, which captures the differential impact of a shock among households at different levels of collateralizable assets. We expect access to credit to mitigate the effect of transitory shocks, i.e. $b_3 < 0$.

We first estimate these equations with OLS, where we pool all rounds of our panel survey together and allow for clustering at the household level. Even though this specification controls for a wide range of observable individual and household characteristics and includes community

[5] Income shocks (either directly assessed through reports of lost income or deviations from "permanent" income, or proxied by weather or illness episodes) have been the focus of numerous studies in other contexts such as consumption

dummies, there are many potential dimensions of selection along unobservable characteristics. For example, less forward-looking households might be both more prone to income shocks (such as less careful management of their fields and crop in the case of crop loss as the measure of income shock) and more inclined to sending their children to work (because of lower value placed on formal education).

To address the problem of selection on unobservables, we allow for fixed effects and estimate the following:

$$y_{ijt} = a_j + d_t + g_w + b_1 X_{ijt} + b_2 shock_{ijt} + e_{ijt} \qquad (1')$$

$$y_{ijt} = a_j + d_t + g_w + b_1 X_{ijt} + b_2 shock_{ijt} + b_3 (shock_{ijt} \cdot collateral_{ijt}) + b_4 collateral_{ijt} + e_{ijt} \qquad (2')$$

where a_j, d_t, $?_w$, are household, time (season), and survey round fixed effects respectively. As a result, the model is estimated using within-household variation controlling for seasonal and wave effects. Note that fixed effects at the household level subsume community-level unobservable characteristics. However, we cannot rule out time-varying household-level unobservable characteristics.

4. Data Description and Summary Statistics

The data for this study are from a panel dataset for the Kagera region in Tanzania. The Kagera Health and Development Survey (KHDS) was part of a research project conducted by the World Bank and the University of Dar es Salaam. The KHDS surveyed over 800 households in the

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smoothing (see, for example, Paxson, 1992) and labor outcomes (see, for example, Kochar, 199X**).**

region up to four times from 1991-1994 with an average interval between surveys of six to seven months.[6] Households are drawn from 51 communities, mostly villages, in the six districts of Kagera.

This dataset has several features that make it particularly appropriate for the proposed analysis. First, the detailed household survey has a wide array of individual and household characteristics, including information on time use of all household members aged seven and older. This includes time spent last week working on household businesses (farm and non-farm), for wage-labor activities, and in household chores. The household survey also includes information on crop loss in the past 12 months (survey round 1) and 6 months (survey rounds 2-4) months as well as measures of physical and financial assets in each of the four interviews. The data are longitudinal which allow us to test and control for unobservable variables that may bias cross-sectional results.

Our definition of child labor is the total hours in the last week spent working in economic activities and chores (including fetching water and firewood, preparing meals, and cleaning the house). Economic activities for children consists predominately of work on the farming, including tending crops in the field, processing crops, and tending livestock. Few children are engaged in wage employment or non-farm family businesses. This is consistent with reports from the community data of limited child-labor markets. We include chores as well as economic activities for two reasons. First, the concept of child labor (by ILO standards) is not restricted to only economic activities.[7] Second, in the largely rural sample of households in this study, it may be

[6] The explicit objectives of the KHDS were to measure the economic impact of fatal illness (primarily due to HIV/AIDS) in the region and to propose cost-effective strategies to help survivors. For more information about this project, see Ainsworth *et al*. (1992) and World Bank (1993).

[7] Although, it should also be mentioned that the concept of child labor does not necessarily refer to simply any work done by a child, but, rather, work that stunts or limits the child's development or puts the child at risk. However, in survey data it is difficult (perhaps impossible) to appropriately isolate the portion of time spent working on the farm that qualifies under this very nuanced definition. Therefore, we follow the standard convention in the empirical literature.

difficult to conceptualize separating time in household chore activities and time spent preparing subsistence food crops. We focus on two age samples for our study. Our primary age group includes children 10-15 years. We also include a second group, children 7-15 years. Given the well-documented low enrollment levels and delayed enrollment in Tanzania, along with the low hours of work among younger children (7-9), we focus on child starting at age 10. The upper range of age for child-labor studies is typically 15 or 14 years, the age of completed primary schooling if enrolled on time.

Turning to our measure of income shock, we want an income shock that is exogenous to child labor decisions as well as of a sufficient magnitude to potentially affect household time allocation for the identification strategy to be credible. Our data reports the value of crop loss due to insects, rodents, and other calamities (such as fire) in the past 12 months for the first wave and the past 6 months for the following 3 interviews (which were spaced 6-7 months apart). We compute the total value of crop loss for all crops farmed. This measure of income shock has multiple advantages. First, since agriculture is the main economic activity in the Kagera region, these shocks are extremely relevant with respect to household income. As will be shown in the following section, they are large in magnitude. Second, they are by nature unpredictable at the family level (see further discussion on the issue of exogeneity below).

The proxy for credit access is collateralizable assets. In this setting, this is represented by the value of durable goods, such as radios, bicycles, fans, lamps and pots. This excludes cash holdings, business, and land value. As noted by Jacoby (1994), business and land value can be positively correlated with demand for child labor within the household. Consistent with this approach, fully 80% of all lenders (banks, NGOs, private individuals) in the community questionnaire required collateral for loans. In the regressions, we use the (log) value of durable assets per household member.

Table 1 presents the summary statistics of the sample in our study, broken down by the three samples in the regressions. In addition, the last 2 columns show the summary statistics for the main sample separated into those children in households that had experienced an income shock and those that had not. The pooled cross-section of children worked on average about 21 hours in the previous week. Among those in households with and without a shock, mean hours are similar, as are most covariates. More than 90 percent of children worked at least 1 hour in the last week. About one-third of children reside in households that report some crop loss. About one-half of children reside in households with any durables, our primary indicator of collateral.[8] Among those households that experienced a shock, the total value of the shock is about twice (in log terms) as the value of per capita durable goods. The prevalence of alternative indicators for collateral, cash holdings and physical assets, is larger. Nearly three-quarters of children live in households with some cash and all children live in households with some physical assets (including the value of land, business equipment, livestock, and dwellings). The average household size for these children is quite large, over 7 members on average. In part, this reflects the sample of households with children. In the entire sample (those without children 10-15), the average size is about 5.7 members. Levels of parental education are quite low. Few children have fathers who had attended school after the primary level (12% of children) and almost none had mothers with more than primary schooling (2%).

5. Results

We first discuss the effect of shocks on child labor as estimated with OLS and fixed effects. We then present estimates for the interacted model with shocks and collateral. Finally, we conduct

[8] For zero values of shock, durables, cash, and physical assets, the bottom value is coded at 1.

a number of robustness checks, including using alternative definitions for shocks and access to credit, and running the specification on a suitably restricted sample.

5.1 The Effect of Shocks

Table 2, column 1 reports OLS estimates of the effect of the income shock on child labor for children between the age of 10 and 15. An income shock is associated with significantly higher child labor. A one standard deviation income shock is associated with a 10% increase in mean hours in the last week. This effect is robust in magnitude and significance to including community dummies in the regression (column 2).

Column 3 reports the estimates from a household fixed effect model. Not surprisingly, since we are now controlling for a substantial range of effects (including effects related to households, seasons, and survey rounds), the estimated coefficient is smaller than the OLS estimate (0.22 vs. 0.33) but still statistically significant at the 1% level. This result confirms that the correlation between shocks and child labor is not driven by spurious unobserved family effects. We obtain similar results if we expand our sample to the 7-15 age range (column 4). Not surprisingly, we find that the magnitude of the coefficient on shocks decreases once the sample is enlarged to include 7-10 year old children. First, younger children work less on average. Moreover, we expect their work supply to be less responsive to shocks – to the extent that parents perceive them as less productive than their older siblings, they will be more willing to send the older children to work in response to a shock. We interpret all of these findings as evidence that households resort to child labor substantially when coping with income shocks.

5.2 The Effect of Credit

In Table 3, we estimate equations (2) and (2') using OLS (column 1) and fixed effects (columns 1-2 for 10-15 years olds, columns 3 for 7-15 year olds). These models allow for both shocks and access to credit, and in particular, for a differential response of child labor hours in households with different levels of collateralizable assets. Columns 4-7 extend the model to include additional wealth controls and a restricted sample of households with land.

First note that the effect of the income shock is stable across columns 1-3 and similar in magnitude and significance to the estimates reported in Table 2.

The OLS estimates (column 1) return a negative and significant coefficient on collateral, but no significant effect for the interaction between collateral and shock. As discussed in section 3, OLS estimates are potentially biased due to selection effects. There are two sources of concern. First, households with higher levels of collateral may also tend to have lower levels of child labor, simply due to wealth effects. Second, unobservable factors such as motivation and inter-temporal discount factors might lead some households both to value the long-term benefits of education and also to undertake actions to avoid income shocks. In both cases the between-household association of access to credit and child labor would be non-causal. Fixed effects in column 2 allows us to focus on the within-household interaction between collateral and income shock variations. There we see that the estimated effect of collateral switches sign to positive and is not significant and is completely absorbed by fixed effects (column 2). Conversely, the interaction between shock and collateral is consistently negative and significant in this fixed effect estimate. This suggests that the availability of credit mitigates the effect of the shock. In particular, a one standard deviation increase in the income shock is associated with a 10% increase in child labor hours for households with durable assets, whereas in a household with a median level of durables, the increase in child

labor hours is 5%. In other words, the availability of typical level of collateral offsets the presence of a shock.

When we run the estimation on the sample of children between age 7 and 15, estimates are similar in significance and magnitude (column 3) and are in line with results in table 1, column 4.

It is reasonably argued that the value of durables simply captures a wealth effect as opposed to the effect of access to credit. In order to preclude this alternative explanation, in columns 4-6 we control for other measures of wealth, namely cash holdings and per capita physical assets (land, equipment, and tools). Under these alternative specifications, the interaction of interest remains significant and stable, while the direct effect of the additional wealth controls is not significant.

To confirm the validity of our estimated effects, we examine the subset of households that are more directly affected by agricultural shocks. We do so in two ways. First, we include an indicator for whether the head of the household's main activity is farming. This indicator is not significant and its inclusion does not affect our estimates of interest (column 5). However, this indicator is not always a precise measure of the extent to which farming contributes to family income. As an alternative, we use the size of land ownership as an indicator of whether farming is likely to be the main income source for the whole household. We confine ourselves to the sample of households with more than one acre of land (anecdotally, this is generally considered the minimum land size for subsistence) - and also exclude the top 1% of land owners.

It is also possible that these additional sources of wealth matter differentially when the household is faced with an income shock. In particular, we would expect that households tap their cash holdings first when faced with a shock but resort to mortgaging land - for which there exist only thin markets in the region – only as an extreme remedy to a transitory shock. As such, we expect cash to perform a similar function to collateralizable durables, while ownership of physical assets should not, on average, matter in the interaction with the shock. It is also possible that

wealth variables proxy for the extent of households' social networks, which arguably are more valuable in times of need. When we include these three sources of wealth and their interaction with the shock in the same specification (column 7), income shocks remain positive associated with child labor. However, these additional wealth variables are highly collinear, and as a result the statistical significance of our coefficient of interest diminishes.

5.3 Robustness Checks

In Table 4, we examine the sensitivity of our results to the definition of income shock and collateral. One concern with our definition of income shock is that we find it to be positively correlated with household income. This could suggest that we might be more likely to observe large crop losses among richer households. However, an indicator of whether a significant crop loss occurred would still identify households without necessarily inducing a strong correlation with level of income. When we use this alternative definition of shock (adjusted to encompass income shocks of some relevance, above 10% of the total value of crop), we find that, similar to Table 2, shocks are positively and significantly associated with hours (column1). Crop losses of 10% or more of overall crop value are associated with 7% greater child hours. Moreover, in column 2 we find that the interaction between this new measure of shock and collateral is negative and significant. Children in households with no durables have 12% higher hours (evaluated at mean hours) with a crop loss of 10% total crop value, compared to 4% higher hours for children in households with median per capita durable assets. Column 3 reports the results for the sample restricted by land ownership. The increase in child labor hours associated with income shocks widens between children in households with and without collateralizable assets (8% and 19%, respectively).

We then examine alternative definitions of collateral while returning to our initial measure of income shock. Because of the large share of zeros in the distribution of durables (somewhat less than 50%), it is reasonable to examine the robustness of our result to a specification that uses an indicator for zero versus positive levels of collateral. In column (4), we note that the estimated coefficient on the interaction of interest is unchanged in sign and significance, although of course the magnitude changes since collateral is now a dummy rather than a continuous variable. One could also argue that it is the total value of durables in the household, as opposed to its per capita value, that matters as collateral. To account for this possibility, we use the total durable value as an alternative measure of collateral in column 5. When we do so, the estimates of our effects of interest are virtually unchanged, even after controlling for cash holding and value of physical assets (column 5).

6. Conclusions

This paper has examined the link between transitory income shocks, access to credit - as proxied by the value of collateralizable assets - and child labor. We show that child labor increases significantly in response to negative transitory income shocks. This evidence complements Jacoby and Skoufias's (1997) finding that school attendance patterns responded to income shocks in some villages in India. Moreover, we show that the availability of collateralizable assets offsets the effect of income shocks on child labor, even when controlling for other sources of wealth in the family. This result is important not only because it corroborates a large theoretical literature on the relevance of credit constraints in predicting child labor, but also because it suggests that expanding access to credit might be effective in mitigating the prevalence of child labor.

Our results have a number of limitations that we hope to address in future work. Chief among these is the lack of reliable measures of actual access to credit at the household level. In the present paper, we use the value of collateralizable assets. Even when controlling for other sources of wealth, one might argue that collateralizable assets capture characteristics other than the ability to borrow (for example, network connections). Because of these potential problems, it would be useful to support our findings with direct evidence on the link between borrowing and child labor. Second, it would be useful to apply a similar analysis to a dataset with a richer time series dimension so as to examine in greater detail the role of transitory versus permanent shocks in child labor. These are subjects for future research.

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Table 1: Summary Statistics

	(1) Ages 10-15	(2) Ages 7-15	(3) Ages 10-15 Land restriction	(4) Ages 10-15 with shock	(5) Ages 10-15 with no shock
Hours:					
Mean	21.23	18.13	21.27	22.41	20.62
	(14.91)	(14.83)	(14.87)	(16.35)	(14.09)
% > 0	0.94	0.90	0.94	0.95	0.94
Value of crop lost (log):					
Mean	2.92	2.96	3.00	8.60	0.00
	(4.21)	(4.23)	(4.26)	(1.87)	
% > 0	0.34	0.34	0.35	1.00	0.00
Per capita durables (log):					
Mean	4.28	4.21	4.30	4.22	4.31
	(4.13)	(4.12)	(4.08)	(4.03)	(4.18)
% > 0	0.54	0.53	0.55	0.55	0.53
Per capita cash (log):					
Mean	5.24	5.20	5.25	5.11	5.30
	(3.21)	(3.20)	(3.16)	(3.29)	(3.16)
% > 0	0.78	0.78	0.79	0.75	0.80
Per capita physical assets (log):					
Mean	11.20	11.15	11.28	11.15	11.23
	(1.44)	(1.46)	(1.28)	(1.35)	(1.48)
% > 0	1.00	1.00	1.00	1.00	1.00
Farm household =1 if yes, else 0	0.76	0.76	0.79	0.77	0.76
	(0.43)	(0.43)	(0.41)	(0.42)	(0.43)
Household size	7.86	7.83	7.99	7.83	7.87
	(3.74)	(3.66)	(3.77)	(3.41)	(3.90)
Father's schooling: 1-6 years =1 if yes, else 0	0.43	0.42	0.46	0.45	0.42
	(0.50)	(0.49)	(0.50)	(0.50)	(0.49)
Father's schooling: 7 years =1 if yes, else 0	0.30	0.33	0.30	0.28	0.31
	(0.46)	(0.47)	(0.46)	(0.45)	(0.46)
Father's schooling: 8+ years =1 if yes, else 0	0.12	0.12	0.10	0.13	0.11
	(0.32)	(0.32)	(0.29)	(0.34)	(0.32)
Mother's schooling: 1-6 years =1 if yes, else 0	0.37	0.35	0.37	0.39	0.35
	(0.48)	(0.48)	(0.48)	(0.49)	(0.48)
Mother's schooling: 7 years =1 if yes, else 0	0.28	0.31	0.26	0.28	0.29
	(0.45)	(0.46)	(0.44)	(0.45)	(0.45)
Mother's schooling: 8+ years =1 if yes, else 0	0.02	0.02	0.01	0.02	0.02
	(0.13)	(0.13)	(0.09)	(0.13)	(0.13)
Observations	3839	5591	3234	1302	2537

Notes: Standard deviations are in parentheses.

Table 2: Hours Worked in the Last Week and Income Shocks

	(1)	(2)	(3)	(4)
	OLS Ages 10-15	OLS with community dummies Ages 10-15	FE Ages 10-15	FE Ages 7-15
Shock: value of crop lost (log)	0.33***	0.30***	0.22***	0.17***
	(0.09)	(0.09)	(0.08)	(0.07)
Father's schooling:1-6 years	-1.61*	-1.31	-0.36	-0.55
	(0.94)	(0.93)	(1.61)	(1.20)
Father's schooling: 7 years	-1.64*	-1.69*	0.13	0.44
	(0.98)	(0.98)	(1.61)	(1.22)
Father's schooling: 8+ years	-1.44	-0.61	-2.20	-0.14
	(1.34)	(1.27)	(2.26)	(1.63)
Mother's schooling: 1-6 years	-0.61	-0.76	0.44	0.15
	(0.79)	(0.74)	(1.34)	(1.01)
Mother's schooling: 7 years	-0.02	0.27	1.54	0.43
	(0.89)	(0.83)	(1.40)	(1.00)
Mother's schooling: 8+ years	-7.36***	-3.72**	1.82	-0.23
	(2.01)	(1.83)	(3.38)	(2.55)
Observations	3839	3839	3839	5591
Number of individual children	636	636	636	716
R-squared	0.05	0.09	0.04	0.15

Notes: Standard errors are in parentheses. In columns 1 and 2, standard errors are computed correcting for heteroskedasticity and correlation within household clusters. Fixed effects are computed at the household level. Hours include time spent on economic activities and household chores. *** indicates significance at 1%; ** at 5%; and, * at 10%.
Other regressors included, but omitted from the table, are age and age squared and indicator variables for missing parental education, the season at time of interview, district (columns 1 & 2) and the round of the interview.

Table 3: Hours Worked in the Last Week, Income Shocks, and Collateral

	(1) OLS Ages 10-15	(2) FE Ages 10-15	(3) FE Ages 7-15	(4) FE Ages 10-15	(5) FE Ages 10-15	(6) FE Ages 10-15 Land restriction	(7) FE Ages 10-15 Land restriction
Shock: value of crop lost (log)	0.34***	0.34**	0.27***	0.33**	0.33**	0.37**	1.01*
	(0.11)	(0.10)	(0.08)	(0.11)	(0.11)	(0.11)	(0.58)
Collateral: per capita durables (log)	-0.18**	0.13	0.06	0.12	0.12	0.20	0.18
	(0.085)	(0.15)	(0.12)	(0.15)	(0.15)	(0.17)	(0.17)
Shock * collateral	-0.01	-0.03*	-0.02**	-0.03*	-0.03*	-0.04**	-0.02
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Liquid wealth: per capita cash (log)				-0.13	-0.13	-0.18	-0.14
				(0.10)	(0.10)	(0.11)	(0.14)
Shock * Liquid wealth							-0.01
							(0.02)
Illiquid wealth: per capita physical assets (log)				0.47	0.47	0.61	0.77
				(0.30)	(0.30)	(0.38)	(0.41)
Shock * Illiquid wealth							-0.06
							(0.05)
Farm household					-0.59		
					(1.00)		
Father's schooling: 1-6 years	-0.91	-0.35	-0.57	-0.35	-0.35	-0.77	-0.78
	(0.93)	(1.61)	(1.20)	(1.61)	(1.61)	(1.75)	(1.75)
Father's schooling: 7 years	-1.39	0.070	0.42	0.016	0.010	-0.051	-0.081
	(0.96)	(1.61)	(1.22)	(1.61)	(1.61)	(1.80)	(1.80)
Father's schooling: 8+ years	-0.35	-2.30	-0.17	-2.34	-2.33	-2.99	-3.00
	(1.26)	(2.26)	(1.63)	(2.26)	(2.26)	(2.65)	(2.65)
Mother's schooling: 1-6 years	-0.71	0.40	0.13	0.40	0.39	0.05	0.05
	(0.74)	(1.34)	(1.01)	(1.34)	(1.34)	(1.41)	(1.41)
Mother's schooling: 7 years	0.45	1.53	0.41	1.49	1.48	1.35	1.34
	(0.82)	(1.40)	(1.00)	(1.40)	(1.40)	(1.49)	(1.49)
Mother's schooling: 8+ years	-2.87	1.84	-0.22	1.85	1.81	-1.74	-1.69
	(1.91)	(3.38)	(2.55)	(3.38)	(3.38)	(4.20)	(4.20)
Observations	3839	3839	5591	3839	3839	3234	3234
Number of individual children	636	636	716	636	636	571	517
R-squared	0.10	0.04	0.15	0.04	0.04	0.04	0.04

Notes: Standard errors are in parentheses. In column 1, standard errors are computed correcting for heteroskedasticity and correlation within household clusters. Fixed effects are computed at the household level. Hours include time spent on economic activities and household chores. *** indicates significance at 1%; ** at 5%; and, * at 10%.
Column 1 includes community dummy variables. Other regressors included, but omitted from the table, are age and age squared and indicator variables for missing parental education, the season at time of interview, district (column 1) and the round of the interview.

Table 4: Hours Worked in the Last Week, Income Shocks, and Collateral – Robustness Checks

	(1)	(2)	(3)	(4)	(5)
	FE	FE	FE	FE	FE
	Ages 10-15	Ages 10-15	Ages 10-15	Ages 10-15	Ages 10-15
Definition of shock:	Dummy of crop share lost>.1	Dummy of crop share lost>.1	Dummy of crop share lost>.1	log(crop lost)	log(crop lost)
Definition of collateral:		per capita durables	per capita durables	durables>0	total durables
			Land restriction	Land restriction	Land restriction
Shock	1.48**	2.47***	3.38***	0.34***	0.36***
	(0.75)	(0.96)	(1.06)	(0.12)	(0.12)
Collateral		0.10	0.18	1.42	0.15
		(0.15)	(0.17)	(1.25)	(0.14)
Collateral * shock		-0.28**	-0.33**	-0.24*	-0.03**
		(0.14)	(0.16)	(0.13)	(0.01)
Per capita cash (log)		-0.13	-0.18	-0.18	-0.16
		(0.10)	(0.11)	(0.12)	(0.11)
Per capita physical (log)		0.51*	0.64	0.61	0.43
		(0.30)	(0.38)	(0.38)	(0.38)
Household size					-0.83
					(0.22)
Father's schooling: 1-6 years	-0.35	-0.35	-0.78	-0.76	-1.13
	(1.61)	(1.61)	(1.75)	(1.75)	(1.74)
Father's schooling: 7 years	0.12	-0.01	-0.05	-0.01	
	(1.61)	(1.61)	(1.80)	(1.80)	(1.80)
Father's schooling: 8+ years	-2.19	-2.33	-2.96	-2.95	-3.48
	(2.26)	(2.26)	(2.65)	(2.65)	(2.65)
Mother's schooling: 1-6 years	0.45	0.40	0.06	0.071	0.15
	(1.34)	(1.33)	(1.41)	(1.41)	(1.41)
Mother's schooling: 7 years	1.58	1.53	1.36	1.35	1.46
	(1.40)	(1.40)	(1.49)	(1.49)	(1.49)
Mother's schooling: 8+ years	2.00	1.85	-1.89	-1.85	-1.86
	(3.38)	(3.38)	(4.20)	(4.20)	(4.19)
Observations	3839	3839	3234	3234	3234
Number of individual children	636	636	517	517	517
R-squared	0.04	0.04	0.04	0.04	0.05

Notes: Standard errors are in parentheses. Fixed effects are computed at the household level. Hours include time spent on economic activities and household chores. *** indicates significance at 1%; ** at 5%; and, * at 10%.
Other regressors included, but omitted from the table, are age and age squared and indicator variables for missing parental education, the season at time of interview, and the round of the interview.