Global financial crisis, credit access and children: Evidence from Tanzania

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Abstract

We employ the difference-in-difference framework to examine households' access to credit as a possible transmission channel of the global financial crisis to child labour in Tanzania. To deal with the endogeneity of access to credit, we propose a new instrument that considers the regional concentration of available micro-finance institutions and the number of households' assets. Our instrument incorporates information on both demand and supply sides of credit access irrespective of whether a household has actually received credit. The empirical results reveal that a negative shock on credit-recipient households is associated with a significant increase in child labour in Tanzania.

Keywords: global financial crisis, child labour, credit access, Tanzania

1. Introduction

The global financial crisis that burst in 2008 affecting economies worldwide has had serious social effects. More specifically, concerns have been raised on its impact on vulnerable groups (women and children). This paper investigates the extent to which the global financial crisis has affected child labour in the context of Tanzania. In partic-

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ular, we investigate the extent to which a negative shock on credit-recipient households led to an increase in child labour. Indeed, financial shocks may distort household's decision at the expense of vulnerable groups, pushing households to resort to child labour to offset the loss of 'income'. Worryingly, unlike transitory or idiosyncratic shocks (loss of crops to insect, fire, droughts,floods, etc.), shocks such as the global financial crisis cannot be insured against within a community- which exacerbates the issue even further.

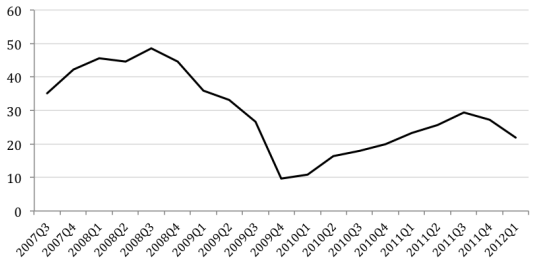
Although several theoretical frameworks have attempted to highlight the determinants of child labour, perhaps the unitarian family model (see Becker (1964))-later developed by Becker and Murphy (1996) - is best suited to explaining the role of credit constraint on child labour. The main conclusion is that child labour creates a trade-off between current and future income and, thus, access to credit can help to explain the prevalence of child labour. Similarly, the permanent income hypothesis and consumption smoothing theory (see Zeldes (1989); Ravallion and Chaudhuri (1997); Morduch (1994); among others) implies that the lack of buffer stocks or a credit constraint can lead households to use child labour as a means of offsetting income shocks.

On the empirical front, several studies have explored the effect of economic shocks on child labour in developing countries (see for example, Blanco et al. (2006); Guarcello et al. (2010)). Most of these studies suggest that children in households that suffer from an economic shock are more likely to participate in child labour. Other studies (see Dehejia and Gatti (2002); Guarcello et al. (2010)) have also examined how borrowing constraints affect child labour. The reported evidence is consistent with credit constraints being associated with higher levels of child labour. Within the context of Tanzania, the focus of the present study, Beegle et al. (2006) finds that income shocks lead to an increase in child labour but that household asset holding can mitigate this effect.

The present study contributes to the literature on the following ways. First, there are no studies that have analysed the impact of the recent global financial crisis on child labour

in Tanzania; a country that has been fighting child labour for a long time. Following the global shock, credit constraints to both individuals and businesses became harsher in Tanzania with no sign of recovery until 2012, see Fig. 1.

Figure 1: Credit to Tanzanian private sector: Annual growth rate % ($2007Q3$ – $2012Q1$)



Source: Bank of Tanzania, Quarterly Economic Bulletins 2007-2012

Second, we exploit the global financial crisis as an exogenous shock to address a major shortcoming in other studies that use self-reported incidences of shocks. Third, we adopt a difference-in-difference DiD methodology which allows us to compare households that were credit recipients before the crisis with households that were not recipients of credit either prior to the crisis or in its immediate aftermath. Fourth, we take into account the important issue of endogeneity in access to credit. Indeed, this study introduces a new instrument that accounts for both supply and demand sides of credit. More specifically, our proposed instrument takes into account the regional concentration of available micro-finance institutions and the number household assets. The remainder of this paper is as follows: section 2 presents the dataset; section 3 outlines our econometric methodology; section 4 presents the empirical results and section 5 concludes.

2. The Dataset

We use data from the Tanzanian National Panel Survey (TNPS) conducted by the Tanzanian National Bureau of Statistics. The analysis is based on data from the TNPS for households observed in two periods: a pre-financial crisis period 2008/2009 and a crisis period 2010/2011. Households are asked whether they have applied for credit

and, if they have, what they used the credit for. Unfortunately, no information on rejected applications is collected and only those with successful applications are observed. In relation to the sample used in this study, the data includes information on 3,280 households, 6% of which are credit recipients. Attrition does not seem to be a concern since that about 97% of period one households were also present in period two. Table 1 presents the main characteristics of children aged 6 to 16 and the households in which they were located in 2008/2009. For the DiD analysis reported later, the treatment group is comprised of children aged 6 to 16 whose households received credit in 2008/2009 while the control group is formed by children from households that neither received credit in 2008/2009 nor in 2010/2011. Table 1 indicates that children in the credit never-recipient group were equally likely to attend school than children belonging to credit recipient households. However, they are significantly less likely to join the labour market. Although the same pattern can be observed in both the overall sample and the rural sample, the size of the reported effects tend to be higher in the rural sample. There is no significant difference between these groups in terms of their mean age. However, there do seem to be significant gender effects: for the overall sample 50% of children in the never-recipient group are girls compared to 55% in the credit recipient group, while the equivalent figures for the rural sample are 51% and 59% respectively. These reported differences in gender are also statistically significant across the control and treatment groups analysed.

3. Empirical Methodology

This study uses a difference-in-difference (DiD) technique to compare households that were credit recipients before the crisis with never-recipient households. The DiD estimator will capture the differential effect of the crisis on children from the credit recipient households relative to children in non-recipient households. To control for observables, we include child and household characteristics as follows.

$$Y_{it} = \beta_0 + \beta_1 Credit_i + \beta_2 Crisis_t + \beta_3 Credit_i.Crisis_t + \phi X_i + \epsilon_{it} \quad (1)$$

Where Y_{it} is the outcome of interest; $Credit_i$ is a dummy variable that takes the value

Table 1: Characteristics of children aged 6 to 16 and of their households in 2008/2009 by credit status of the household

	Overall sample			**Rural sample**		
	Control	Treat	Diff	Control	Treat	Diff
Child	a	b	a-b	c	d	c-d
childwork	0.08	0.11	-0.02***	0.12	0.18	-0.06***
childstudy	0.97	0.96	0.00	0.96	0.93	0.02
female	0.50	0.55	-0.05***	0.51	0.59	-0.08***
age	10.35	10.17	0.18	10.29	10.24	0.05
Household						
HH size	6.43	7.04	-0.62***	6.63	6.76	-0.12
members under 18	9.35	11.40	-2.046***	8.08	8.61	-0.53***
female head	0.23	0.19	0.04***	0.22	0.18	0.04***
married head	0.71	0.72	-0.01	0.73	0.82	-0.1***
age head	46.58	43.69	2.9***	46.90	44.10	2.80***
parent educ	0.40	0.43	-0.04***	0.35	0.39	-0.04
inc HH	7.72	10.53	-2.81***	6.08	9.79	-3.7***
Region						
rural	0.64	0.58	0.06***	-	-	-
HDI	0.51	0.53	-0.01***	0.48	0.47	0.01***
micro.asset	0.05	0.09	-0.04***	0.05	0.05	0.00***
Obs.	10334	842		6582	500	

Sample: Children 6 to 16 years of age in the 2008/2009 round the Tanzanian National Panel Survey. Non-recipients includes households that did not receive credit in period I nor in period II.
*** denotes significant at 0.01 significance level. HDI is the Human Development Index computed by the UNDP.

of one if the child belongs to a household that received credit in period I (treatment group) and zero if the child belongs to a household that did not receive credit in period II (control group); $Crisis_t$ is a dummy that takes the value of one for period I (post-treatment) and zero for period I (pre-treatment) and $Credit_i.Crisis_t$ is an interaction term that takes the value one only for the treatment group in the post-treatment (crisis) period. The coefficient of β_3 yields the DiD estimator. X_i is a series of control variables related to child and household characteristics. These are gender and age of the child, a dummy for being in a rural area, the number of household members, a dummy variable indicating whether the head of household is a female, a dummy variable that reflects whether the head of household is uneducated, household income and a regional human development index (HDI). The outcome variables y_{it} represents either child work (*childwork*) or child study (*childstudy*).

3.1. Estimation issues

The DiD produces unbiased estimates under the condition that both treatment and control groups reacted to the shock in a similar way, except for the behaviour associated to the change in access to credit. This assumption arguably may fail if credit recipients are different from non-recipients on some unobservable variables; that is, if households are selected into signing up for a loan. Thus, DiD estimates are likely to be biased downward. Therefore, to avoid possible endogeneity, we instrument for those who belong to the credit recipient group. Following Alcaraz et al. (2012), we first estimate a probit model of the endogenous variable *credit* on the proposed instrument to obtain the predicted value of *credit* (*credit.hat*). Then, the predicted value is used in a two stages least squares (2SLS) framework to estimate the effect of the financial crisis on children's work and schooling through household access to credit. This gives an exactly identified system (two endogenous variables *credit* and *credit.crisis* and two instruments *credit.hat* and *credit.hat.crisis*).

3.2. Household access to credit: A new instrument

Existing access to credit in the literature include the ratio of private credit issued by banks to GDP (Dehejia and Gatti, 2002), the value of household collateralizable assets

(Beegle et al., 2003), the presence of a commercial bank in the community(Ersado, 2005), actual loan acquiring (Arun et al., 2006), credit limit (Diagne, 1999). Other studies such as Field and Torero (2006) propose a link between holding housing equity and the likelihood of having access to credit. In this context, macro measures of credit access may be not useful to policy makers in the sense that they are more likely to be affected by the overall development status of the country. Similarly, using the presence of commercial banks in a region may not be a good measure of household access to credit as these banks might not have the products that serve poor household needs. Other measures such as the total value of household assets is more likely to be associated with wealth effects and so related to child labour decisions. In addition, measures that rely on either the actual loan uptake, or dichotomous membership in a microcredit organisation, obviously, suffer from selection problems. Accordingly, the current study proposes a new instrument that overcomes these shortcomings.

We introduce a new *micro.asset* index as an instrument for the extent to which a household has access to credit. This is a composite and continuous index that takes any value between zero and one. It combines the number of microfinance institutions in the region where a household lives multiplied by the number of assets possessed by a household, which can be used as collateral to borrow. The index has a lower bound of zero, which represents no access to credit, and as the index goes to one it implies higher access to credit.[1].

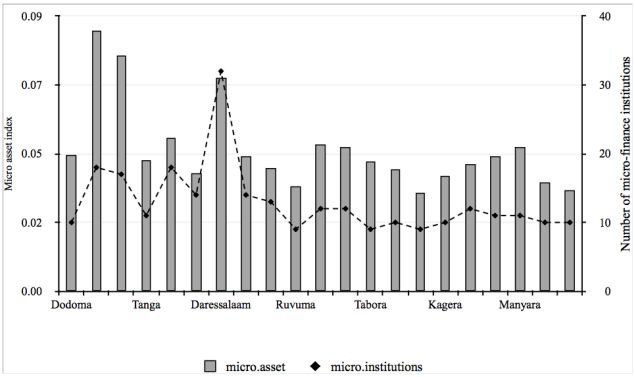
The proposed *micro.asset* index reflects both demand and supply considerations related to credit accessibility irrespective of whether a household has an actual loan[2]. By utiliz-

[1]The new *micro.asset* index can be described as follows: $micro.asset_i = A_i \times M_i$, where $A_i = \frac{1}{A}\sum_{a=1}^{A=13} asset_a$ and $M_i = \frac{1}{M}\sum_{m=1}^{M=41} micro_m$. Accordingly, $micro.asset_i$ is the value of the index for household i; A_i is the ratio of the number of collateralizable assets that household i possess to the total number of assets and M_i is the proportional of the regional coverage of microfinance institution exist in which the household resides, and $M = 41$ is the total number of microfinance institutions that are members of the Tanzanian Association of Microfinance Institutions (TAMFI, 2012) as of 2011/2012.

[2]Many authors have underlined this fact. For example, Diagne (1999) argues that household demand for credit cannot be modelled separately from its supply and suggests that household access to credit depends on both the lender and borrowers characteristics and actions. Moreover, Quach et al. (2005) argue that what actually matters is the supply of credit and therefore, a good instrumental variable must be those which well

ing information on the regional coverage of microfinance institutions, the *micro.asset* index not only reflects the supply side of credit access but, more importantly, draws on how information about available credit products may be disseminated. Since that the majority of households in Tanznia have not been banking before (80%), nor have a bank account (70%), this would reflect financial illiteracy without violating the exogeneity requirment. On the demand side, having assets to borrow against is a basic requirement of the microfinance instiutions in Tanzania[3]. The asset component of the index counts the number of assets in the household and not their value and so we argue it will not be a pure wealth effect, which will be correlated with the child labour decision.

Figure 2: Distribution of micro.asset index and microfinance regional coverage



Source: Author's colaboration

Figure 2 plots the *micro.asset* index along with the regional distribution of microfinance institutions. It shows that those who live in regions with higher numbers of micro-finance institutions have better higher opportunities to access credit. However, a possible concern is a potential correlation between micro-credit coverage in a region and the level of development of households living in that region. Consequently,

describe the characteristics of the lender. They emphasize on the fact that lender characteristics influence the supply of credit without having a direct household welfare

[3]The lack of collateral is the key reasons for which households did not apply for credit in Guarcello et al. (2010).

we control for regional Human Development Index (HDI) extracted from the Tanzania socio-economic database (TSED, 2002).

4. Empirical Results

The DiD approach examines the effect of a negative shock on access to credit on child labour and school attendance. Specifically, the analysis captures the differential effect of the crisis on children from credit recipient households relative to children in non-recipient households[4]. The data indicates about a 40% drop in the average value of loans (2005 prices) received by Tanzanian households between period I (2008/2009) and period II (2009/2010). This reduction in the average values of loans can be directly attributed to the global financial crisis where lenders became more reluctant to lend (formal credit). A similar effect is expected to restrict informal sources of credit, such as borrowing from a friend, and thus increase the burden on households.

4.1. Differences-in-differences estimates

Table 2 presents the mean values of the main outcomes for both control and treatment groups in both period I (2008/2009) and period II (2010/2011). The DiD estimator is equal to the difference between the treatment and control groups, and offers an estimate of the effect of access to credit on child labour and schooling. Defining period I (2008/2009) as a baseline, 8.4% of children in the control group were working while the equivalent figure for the treatment group was 10.8%. Moving to period II (2010/2011), the incidence of child labour increased for both groups. In particular, the incidence of child labour increased by 8.6 and 19.8 percentage points in the control and treatment groups respectively. The simple DiD estimator is therefore equal to 11.2 percentage points, which is statistically significant at the 5% significance level. This implies that on average all households have responded to the shock to credit access arising from the global financial crisis by increasing the supply of child labour. However the response of the treatment group is significantly larger than the control group, implying these

[4] A child is considered to be working if in the week previous to the survey he or she participated in some type of economic activity for at least one hour, with or without pay.

households suffered most from restrictions arising from the crisis on credit.

A similar pattern of response is found for the school attendance variable. On average school drop-outs increased for both groups but the increase was larger for the treatment group than for the control group: equivalent to 6.6 percentage points for the treatment group compared to only 2 percentage points for the control group. The DiD analysis therefore suggests that children belonging to credit-recipient households (treatment group) were 4.6% more likely to drop out from school after the shock compared to children belonging to credit never-recipient households (control group). This finding suggests that the larger reduction in school attendance found for the treatment group was mostly likely due to changes in credit conditions following the crisis. The effect is statistically significant at the 5% significance level.

Table 2: Difference in difference estimations

Child work	Period I	Period II	**Dif**
Control	0.084	0.17	0.086
Treatment	0.108	0.306	0.198
Dif	0.045**	0.136***	**0.112*** **
SE	(0.012)	(0.011)	(0.016)
Child study			
Control	0.967	0.947	-0.02
Treatment	0.962	0.896	-0.066
Dif	-0.006	-0.052***	**-0.046*** **
SE	(0.008)	(0.008)	(0.012)

Note: The treatment group is composed of children aged 6 to 16 in period I that belong to households that declared receiving credit in period I. The control group is composed of children aged 6 to 16 in period I that did not receive credit in period I nor in period II. Number of children: 842 for the treatment group and 10465 for the control group.
Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In addition to the simple DiD analysis reported above, we also consider the difference between treatment and control groups but allowing for the influence of a number of other observable characteristics. Therefore, Table 3 reports linear regression estimates for four different specifications, each of which includes additional controls. The left hand side panel presents the DiD estimates of the effect of credit on the probability that a child works, while the DiD estimates of the effect of credit on the probability that a child will remain in school are presented in the right hand panel in the same table.

Columns (1) and (5) correspond to the case where no additional controls are included, and therefore the estimates here coincide with those reported in Table 2. Columns (2) and (6) include a number of child and household characteristics, household income is controlled for in columns (3) and (7), and finally whether the child belongs to a rural family is included in columns (4) and (8). The highlighted interaction term $credit.crisis$ is the main coefficient of interest, which shows the DiD estimate of the effect of the crisis on credit access between treatment and control groups.

Looking first at the child labour outcome, the estimated coefficient of the interaction term *credit.crisis* is positive and statistically significant at 1% significance level in all specifications. The results reported in columns (1) to (4) suggest suggest that in response to the credit squeeze following the global financial crisis children in Tanzania were 10% more likely to participate in the labour market. With respect to the school attendance, on the other hand, the highlighted coefficient is negative and statistically significant. Depending on the specification used therefore children are between 4.6% (column 5) and 2.7% (column 8) more likely to drop out of school in response to a credit squeeze following the crisis. Tanzanian households, therefore, were more likely to react to having less credit as a consequence of the global financial crisis by taking their children out of school and sending them to work. This conclusion supports the simple DiD findings reported in Table 2. Similar findings are reported for Guatemala, where households that were hit by shocks increased children's labour supply and reduced children's school attendance (Guarcello et al., 2010). In this context, Beegle et al. (2003) also show that households in Tanzania tend to respond to transitory income shocks by increasing child labour.

The coefficients of the other variables reported in Table 3 seem to be consistent with prior expectations. A child is more likely to work and drop-out from school if she is a girl, older, lives in a big family, or lives in a rural area. Across all specifications reported in Table 3, age was a significant factor in predicting child labour and school attendance. Similarly, a child is less likely to join the labour market and drop-out from school if the household head is married or lives with an older household head. Finally,

Table 3: DiD results for child labour and school attendance

	Dep. Var.: Child Labour				**Dep. Var.: School Attendence**			
	1	2	3	4	5	6	7	8
crisis	0.086***	0.080***	0.094***	0.073***	-0.020***	-0.021***	-0.026***	-0.019***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)
credit	0.024**	0.030***	0.040***	0.032***	-0.006	-0.014*	-0.016**	-0.014*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.008)	(0.007)	(0.007)	(0.007)
credit.crisis	0.112***	0.100***	0.105***	0.095***	-0.046***	-0.028**	-0.033**	-0.027**
	(0.019)	(0.018)	(0.019)	(0.018)	(0.014)	(0.013)	(0.014)	(0.013)
female		0.015***	0.007	0.015***		-0.010***	-0.006*	-0.010***
		(0.004)	(0.005)	(0.004)		(0.003)	(0.003)	(0.003)
age		0.019***	0.019***	0.019***		-0.017***	-0.017***	-0.017***
		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
HH size		0.007***	0.007***	0.006***		-0.002***	-0.002***	-0.002***
		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
siblings		-0.003***	-0.003***	-0.002***		0.001***	0.001***	0.001**
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
female head		-0.005	-0.003	-0.006		0.004	0.009	0.005
		(0.007)	(0.008)	(0.007)		(0.005)	(0.006)	(0.005)
married head		-0.082***	-0.076***	-0.081***		0.035***	0.034***	0.035***
		(0.006)	(0.007)	(0.006)		(0.005)	(0.005)	(0.005)
age head		-0.001***	-0.001***	-0.001***		0.000***	0.001***	0.001***
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
parent educ		-0.037***	-0.037***	-0.028***		-0.004	-0.006	-0.006
		(0.005)	(0.006)	(0.005)		(0.004)	(0.004)	(0.004)
inc HH			-0.003***				0.000	
			(0.000)				(0.000)	
rural				0.090***				-0.024***
				(0.004)				(0.003)
cons.	0.084***	-0.030***	-0.007	-0.088***	0.967***	1.118***	1.101***	1.129***
	(0.003)	(0.012)	(0.013)	(0.012)	(0.002)	(0.009)	(0.010)	(0.010)
N	23471	23370	23370	23370	23370	23370	23370	23370
R2	0.026	0.079	0.085	0.094	0.006	0.086	0.086	0.089

Sample: Children aged 6 to 16 in period I 2008/2009. The table presents the Linear Probability estimation of Equation 1. *Credit* is a dummy equal to one if the child belongs to a household that in period I (2008/2009) declared receiving credit (treatment group), and it is equal to zero if the child belongs to a household that did not receive credit in period I (2008/2009) nor in period II (2010/2011) (control group). *Crisis* is a dummy variable that takes the value of one for period II (2010/2011) and zero for period I (2008/2009). The coefficient on interaction term *credit.crisis* is the DiD estimate of the impact on the outcome variables (child labour and school attendance) of the negative shock on access to credit due to the global recession aftermath the global economic crisis in 2008. Standard errors are reported in parentheses and ***, ** and * denotes significant coefficients at 1%, 5% and 10% significance level

the child is less likely to join the labour market if the parents are educated.

4.2. Instrumental variables specification

The first panel of Table 4 presents the results of the credit choice probit model. The coefficient of *micro.asset* is positive and statistically significant at the 1% significance level, indicating the more micro finance institutions working within the region and the more assets in the household's possession the higher is the probability of receiving credit.

Table 4 presents the first stage results from the 2SLS estimation. The bottom panel of the table also presents results from different tests assessing the relevance of our instruments: the first-stage F-statistic for the significance of the instruments and the Kleibergen-Paap rank Wald statistic for weak identification. As explained earlier, Equation 1 includes two right hand endogenous variables. These are the *credit* variable and the interaction term *credit.crisis*. Accordingly, Table 4 reports results for the first stage associated with the endogenous variable *credit*, as well as for the first stage of the interaction term *credit.crisis*. The first stage estimates are reported in the second and third panels of Table 4 respectively. The coefficients of *credit.hat* from the first stage of *credit* and of *credit.hat.crisis* from the first stage of *credit.crisis* are statistically significant and have the correct sign in both cases.

Finally, instrumental variable estimates are presented in Table 5, which show a large and significant effect of credit on the incidence of child labour. When not controlling for household labour income or a development index (HDI), the increase in the probability of child labour in response to a decrease in credit access arising from the crisis is 39.6 percentage points higher (column 1). This estimate increases to 70 percentage points when all the additional controls are included (column 3). The higher impact suggested by the IV estimates compared to the OLS results may be partly explained by the endogeniety issue. Similarly, the instrumental variable estimates show strong evidence of the financial crisis having a significant effect on child labour. However,

Table 4: First stage estimations

	probit				First stage				First stage			
	Dependent Var. credit				**Dependent Var. credit**				**Dependent Var. credit_crisis**			
	1	2	3	4	1	2	3	4	1	2	3	4
micro.asset	**0.783*** **	**0.534** **	**0.826*** **	**0.634*** **								
	-0.212	0.226	0.218	0.212								
credit.hat					**1.756*** **	**1.753*** **	**2.149*** **	**2.052*** **	0.010	0.291***	0.333***	0.067
					(0.164)	(0.119)	(0.108)	(0.170)	(0.061)	(0.059)	(0.057)	(0.069)
credit.hat.crisis					-0.037	-0.112*	-0.001	0.284**	**0.683*** **	**0.826*** **	**0.879*** **	**0.958*** **
					(0.136)	(0.065)	(0.069)	(0.138)	(0.104)	(0.049)	(0.054)	(0.111)
crisis					0.014	0.017***	0.010*	-0.015	0.020**	0.009**	0.003	-0.002
					(0.012)	(0.005)	(0.006)	(0.012)	(0.009)	(0.004)	(0.005)	(0.010)
female	0.049**	0.034	0.036	0.045*	0.026***	0.021***	0.024***	0.024***	0.014***	0.011***	0.012***	0.012***
	(0.024)	(0.0243)	(0.024)	(0.023)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
age	0.008**	0.008**	0.007**	0.007**	-0.002***	-0.002***	-0.002***	-0.002***	-0.000	-0.001	-0.000	-0.000
	(0.003)	(0.004)	(0.004)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
HH size	0.018***	0.016***	0.015***	0.017***	-0.003***	-0.003***	-0.004***	-0.006***	-0.000	-0.002***	-0.002***	-0.002***
	(0.004)	(0.0038)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
siblings	0.018***	0.0128***	0.014***	0.017***	-0.004***	-0.002***	-0.004***	-0.006***	0.000	-0.000	-0.001***	-0.001*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
female head	0.039	0.063	0.065*	-0.002	-0.011**	-0.013**	-0.012**	0.003	-0.002	-0.003	-0.001	0.004
	(0.037)	(0.039)	(0.038)	(0.036)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
married head	-0.088	-0.053*	-0.056*	-0.127***	0.038***	0.029***	0.040***	0.064***	0.008*	0.015***	0.018***	0.019***
	(0.0314)	(0.032)	(0.032)	(0.030)	(0.006)	(0.005)	(0.005)	(0.007)	(0.004)	(0.004)	(0.004)	(0.005)
age head	-0.0074***	-0.006***	-0.006***	-0.007***	0.001***	0.001***	0.001***	0.001***	0.000	0.000***	0.000***	0.000**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
parent educ	-0.0726**	-0.096***	-0.0934***	-0.068**	0.025***	0.025***	0.030***	0.025***	0.001	0.004	0.005	-0.000
	(0.029)	(0.023)	(0.030)	(0.028)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
HDI			0.804***				-0.261***				-0.100***	
			(-0.140)				(0.031)				(0.021)	
inc HH				0.000***				0.000				0.000***
				(0.000)				(0.000)				(0.000)
cons	-1.361	-1.649***	-1.754***	-1.3488***	-0.096***	-0.060***	-0.003	-0.152***	-.018	-0.029***	0.004	-0.044***
	(0.065)	(0.082)	(0.108)	0.061	(0.014)	(0.012)	(0.018)	(0.018)	(0.011)	(0.009)	(0.014)	(0.010)
region	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No
month	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No
N	23370	23370	23370	23370	23370	23370	23370	23370	23370	23370	23370	23370
Pseudo R^2	0.0218	0.0835	0.0731	0.0212	0.022	0.058	0.055	0.058	0.047	0.085	0.081	0.074
F-statistic					57.37	108.02	198.25	73.91	30.18	151.13	138.2	39.3
Kleibergen-Paap F statistic for weak identification (tests both instruments simultaneously)									16.215	92.417	111.698	33.247
Wu-Hausman									3.536	38.488	39.555	3.031
p-value									0.029	0.000	0.000	0.048
Durbin-Wu-Hausman									7.070	76.871	78.961	6.072
p-value									0.029	0.000	0.000	0.048

Note: First stage results for the 2SLS estimation of Equation 1 where *credit* is instrumented with *credit.hat* and *credit.crisis* with *credit.hat.crisis*. *credit.hat* is obtained from the probit estimation of credit on *micro.asset* and controls X. *credit* is a dummy equal to one if the child belongs to a household that in period I (2008/2009) declared receiving credit (treatment group), and it is equal to zero if the child belongs to a household that did not receive credit in period I (2008/2009) nor in period II (2010/2011) (control group). Crisis is a dummy variable that takes the value one for period II (2010/2011) and zero for period I (2008/2009). The HDI index corresponds to the UNDP Human Development Index.
Robust standard errors in parentheses.
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 5: Instrumental variables estimation

	Dep. Var.: Child Labour				**Dep. Var.: Child Study**			
	1	2	3	4	1	2	3	4
crisis	0.058***	0.034***	0.029***	0.056***	-0.007	-0.004	0.003	-0.012
	(0.017)	(0.008)	(0.008)	(0.012)	(0.009)	(0.006)	(0.006)	(0.007)
credit	-0.128	-0.234***	-0.057	-0.075	0.094**	0.172***	0.067*	0.071
	(0.087)	(0.073)	(0.067)	(0.080)	(0.048)	(0.044)	(0.039)	(0.049)
credit.crisis	0.396*	0.712***	0.729***	0.416***	-0.227**	-0.313***	-0.369***	-0.220***
	(0.204)	(0.077)	(0.086)	(0.139)	(0.098)	(0.060)	(0.062)	(0.079)
female	0.013**	0.009*	0.004	0.007	-0.006*	-0.007**	-0.005	-0.007*
	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)
age	0.019***	0.018***	0.018***	0.019***	-0.017***	-0.016***	-0.016***	-0.017***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
HH size	0.007***	0.004***	0.002***	0.004***	-0.003***	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
siblings	-0.003***	-0.003***	-0.003***	-0.003***	0.001***	0.000	0.001**	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
female head	-0.013*	-0.013*	-0.015**	-0.010	0.007	0.008	0.007	0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.005)	(0.005)
married head	-0.086***	-0.062***	-0.067***	-0.058***	0.036***	0.032***	0.035***	0.031***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
age head	-0.001***	-0.000	0.000	-0.000	0.001***	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
parent educ	-0.036***	-0.021***	-0.019***	-0.024***	-0.007*	-0.005	-0.004	-0.002
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
HDI			-0.522***				0.145***	
			(0.029)				(0.022)	
inc HH				-0.000***				0.000
				(0.000)				(0.000)
cons	-0.012	0.023	0.243***	-0.049***	1.105***	1.093***	1.023***	1.112***
	(0.013)	(0.015)	(0.021)	(0.015)	(0.010)	(0.012)	(0.016)	(0.011)
N	23370	23370	23370	23370	23370	23370	23370	23370
Pseudo R^2	0.065	0.121	0.027	0.161	0.067	0.099	0.064	0.119

Note: Second stage instrumental variables estimations of Equation 1. First stage results presented in Table 4. The coefficients on the interaction term *credit.crisis* indicate the effect of the negative shock on access to credit on the variables of interest (child labour and school attendance). *Credit* is a dummy equal to one if the child belongs to a household that in period I (2008/2009) declared receiving credit (treatment group), and it is equal to zero if the child belongs to a household that did not receive credit in period I (2008/2009(nor in period II (2010/2011) (control group). Crisis is a dummy variable that takes the value one for period I (2008/2009) and zero for period II (2010/2011). The HDI corresponds to the UNDP Human Development Index.
Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

access to credit *per se* does not seem to be statistically significant except in model (2).

Interestingly some of the IV results reported in Table 5 are not in line with the results reported earlier in Table 3. This applies most notably to the size and significance of the effects associated with access to credit, the crisis and the interaction term. However, elsewhere there are similarities in the pattern of results found in both the OLS and IV estimates. For example, a child is less likely to work if she is female, older or lives in a big size family. The child is less likely to work if she has more siblings or if the household head is female, married, older or educated. Finally, the estimated coefficient for the regional HDI is negative and statistically significant at the 1% significance level. This indicates that children in more developed areas are less likely to join the labour market.

With respect to school attendance, there is a large and significant reduction in the probability that the child goes to school as a consequence of the credit shortage. Without household income and development measures as controls, the effect of the shortage of credit is estimated to be of 22.7 percentage points. The results remain around 30 percentage point when adding more controls. Remarkably, the magnitude of the coefficients for school attendance is much smaller as compared to the probability of child work, even after correcting for endogeneity. This observation may be partially explained by two separate considerations. First, the Tanzanian legislation system imposes a compulsory education level while does not totally prohibit child work. Second, children may have joined the labour market without necessarily dropping out from school. Similar findings have been reported elsewhere in the literature. Ravallion and Wodon (2000) and Deb and Rosati (2002), for example, found that schooling and child labour are not one to one substitutes. Other studies such as Khanam (2010) has shown that there is a trade-off between child labour and schooling.

In a related context, an early study by Akabayashi and Psacharopoulos (1999) used household data from Tanzania and found a trade-off between hours of work and study. However, their results show that a child's allocation of time between these two dif-

ferent activities is affected by both household and community characteristics, and that working hours tended to be more responsive than study hours. What is more, access to credit is shown to be positive and statistically significant, indicating that access to credit by households is associated with an increase in the probability of children going to school. In particular, a child is unlikely to attend school if she is female, older or lives in a big family. Additionally, a child is less likely to drop-out from school if she has more siblings or if the household head is female, married or older.

4.3. Robustness check

In order to check the robustness of the instrumental variable estimates reported in Table 5, instrumental variable estimates are reported for a number of different samples: (i) based on the age of the child, where the sample is restricted to children aged 8 and above; (ii) based on separate rural and urban samples; and (iii) based on a sample of households above and below the national poverty line.

Table 6 shows the IV estimates for children age 8-16. The results from this restricted sample match those of the full sample, confirming a positive effect of access to credit during the crisis on child labour and a negative effect on school attendance. However, in contrast to the full sample results the magnitude of these two effects are now much more similar. This may indicate that the likelihood of dropping out of school when joining the labour market increases as the child gets older, especially in crisis times.

Given child labour is prominent feature in rural communities in developing countries, it is useful to assess the extent to which the IV results reported in Table 5 are the result of children living in rural households. Accordingly, Table 6 show separate IV estimates for children who belong to households located in rural areas and those who live in urban areas. As can be seen from the table, the results for rural areas are similar to the results reported in Table 5 for the full sample. However, the corresponding results for urban areas are oppositely signed and statistically insignificant. This suggests the effect on child labour of access to credit during the crisis was mainly due to its effect

Table 6: IV estimations for a number of selected sub-samples: Coefficients on the interaction term *credit.crisis*

	Dep. Var.: Child Labour				**Dep. Var.: Child Study**				N
	1	2	3	4	1	2	3	4	
Full	0.396*	0.712***	0.729***	0.416***	-0.227**	-0.313***	-0.369***	-0.220***	23370
	(0.204)	(0.077)	(0.086)	(0.139)	(0.098)	(0.060)	(0.062)	(0.079)	
8-16	0.881	0.821***	0.694***	0.816***	-0.552*	-0.494***	-0.574***	-0.637***	17319
	(0.646)	(0.095)	(0.106)	(0.108)	(0.310)	(0.075)	(0.096)	(0.095)	
Rural	0.133	0.914***	0.448	0.093	-0.891**	-0.581***	-0.695***	-0.653***	15602
	(0.424)	(0.101)	(1.824)	(0.298)	(0.433)	(0.083)	(0.112)	(0.222)	
Urban	-0.170	-0.031	-0.062	-0.052	0.107**	0.067	0.069	0.065	7768
	(0.120)	(0.079)	(0.080)	(0.077)	(0.047)	(0.048)	(0.046)	(0.044)	
Above	0.876***	0.780***	0.601***		-0.198**	-0.166***	-0.174***		13244
	(0.159)	(0.100)	(0.101)	-	(0.081)	(0.061)	(0.062)		
Below	-0.100	0.401***	0.752		-0.403	-0.337***	-0.384		10126
	(0.348)	(0.116)	(0.853)		(0.569)	(0.124)	(1.672)		
Region	No	Yes	No	Yes	No	Yes	No	Yes	
income	No	No	Yes	Yes	No	No	Yes	Yes	
HDI	No	No	Yes	No	No	No	Yes	No	
Month	No	Yes	Yes	Yes	No	Yes	Yes	Yes	

Notes: Robust standard errors in parentheses. Regional dummies were included for 14 and most coefficients were statistically significant.
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

on children living in rural communities, where access to credit tends to be lower in any case. The estimates reported in Table 6 suggest that in rural communities access to credit during a crisis could increase child labour by as much as 90 percentage points depending on whether monthly control variables are included in the specification.

The estimates reported in Table 6 for school attendance also suggest that access to credit during the crisis affected children in rural households more than children in urban households. Specifically children living in rural households are much more likely to experience a reduction in school attendance as a result of the credit squeeze than children living in urban areas. This result is likely to be due in part to differences in schooling costs. Specifically with schooling costs being higher in rural areas it implies that any restriction on credit arising from a crisis is likely to lead to a greater tightening of household budget constraints in rural areas. Consequently children in rural households are, other things being equal, more likely to have to work to offset s worsening of the household budget constraint.

Finally Table 6 shows IV estimates based on separate samples of households who are above and below the poverty line respectively. Interestingly, a significant credit access effects during the crisis is only consistently found for children living in households with income levels above the poverty line. Moreover, the estimated effect tends to be larger in these households than for children living in households below the poverty line. This suggests a threshold above which credit access might be a helpful policy tool to combat child labour. However, below that threshold, the credit access might not be enough as the poverty effect will dominate the relationship and household may still send their children to work.

5. Conclusion

In contrast to the existing literature where self reported shocks are used to examine household behaviour, this study uses the global financial crisis as an exogenous event to consider the effect on household decisions related to child labour and school attendances through an access to credit channel. The study finds empirical evidence of households responding to a negative shock to credit by increasing the likelihood of child labour and reducing the likelihood of school attendance. Given the magnitude of the response is different for child labour and school attendance decisions the data suggests that the two decisions are not mutually exclusive. However, the results do suggest households in Tanzania use borrowing as a mechanism to relax income constrained budgets and that during a crisis they respond by substituting child labour for credit. The credit route in Tanzania therefore seems to have been an important transmission mechanism for the global financial crisis.

Two policy implications follow from these results. First, policies designed to ease household access to credit have the potential to reduce child labour and increase school attendance, particularly in times of financial crises. Second, in such crisis periods, particular attention needs to be given by policy makers to not only the credit circumstances of rural households but also to households with income levels above the poverty line.

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