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Working Paper

Remittances, liquidity constraints and human capital investments in Ecuador

IZA Discussion Papers, No. 3358

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Calero, Carla; Bedi, Arjun S.; Sparrow, Robert (2008) : Remittances, liquidity constraints and human capital investments in Ecuador, IZA Discussion Papers, No. 3358, Institute for the Study of Labor (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/34947>

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IZA DP No. 3358

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February 2008

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ABSTRACT

Remittances, Liquidity Constraints and Human Capital Investments in Ecuador

Over the last decade Ecuador has experienced a strong increase in financial transfers from migrated workers, amounting to 6.4 percent of GDP and 31.5 percent of total exports of goods and services in 2005. This paper investigates how remittances via trans-national networks affect human capital investments through relaxing resource constraints and facilitate households in consumption smoothing by reducing vulnerability to economic shocks. In particular, we explore the effects of remittances on school enrolment and child work in Ecuador. Identification relies on instrumental variables, exploiting information on source countries of remittances and regional variation in the availability of bank offices that function as formal channels for sending remittances. Our results show that remittances increase school enrolment and decrease incidence of child work, especially for girls and in rural areas. Furthermore, we find that aggregate shocks are associated with increased work activities, while remittances are used to finance education when households are faced with these shocks. This suggests that liquidity constraints and vulnerability to covariate risk are especially relevant in rural areas, as it affects household's investments in human capital of school age children. In this context both child labour supply and transnational remittances serve as coping mechanisms.

JEL Classification: I20, J22, O15

Keywords: migration, remittances, trans-national networks, education, child labour, Ecuador

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1. Introduction

Ecuador has experienced a strong increase in financial transfers from migrated workers during the last decade. Since 1999 these resource flows constitute the second largest source of foreign income in Ecuador after oil exports, amounting to 6.4 percent of GDP in 2005. Despite the magnitude of this remittance inflow there is relatively little empirical research that examines the role of remittances on the economy of Ecuador and livelihoods and behaviour of remittance receiving households.

In general, the literature on international migration and remittances does not provide an unambiguous picture on the outcomes for the receiving economy. A number of studies point out negative effects of remittances as they may discourage labour supply and effort of recipient households (Funkhouser, 1992) or finance current consumption promoting dependency of receiving countries (e.g. Taylor *et al.*, 1996a and 1996b). On the other hand, more recent empirical evidence emphasizes the role of remittances in encouraging economic growth and development by enabling recipients to overcome liquidity constraints and finance productive investments (see Rapoport and Docquier, 2006, for an extensive literature review).

Taking a cue from the latter line of research, this paper investigates the potential role of remittances in influencing human capital accumulation in Ecuador. Resource constraints and imperfect capital markets play a notable role in households' decisions concerning investment in children's human capital in Ecuador (e.g. Moser, 1996, Vos and Ponce, 2004, Moser and Felton, 2006, Ponce *et al.*, 2003, and León and Troya, 2000). By reducing financial constraints, remittances can promote schooling investment and increase child reservation wages, thereby reducing children's labour force participation. In addition, trans-national social networks provide income diversification strategies and alternative coping mechanisms for consumption

smoothing, through remittances, in response to economic shocks. In the context of imperfect financial markets, investments in human capital are typically compromised by income variability (e.g. Beegle, Dehejia and Gatti, 2003, Dehejia and Gatti, 2002, and Jacoby and Skoufias, 1997).

Several studies have found evidence that international migration and remittances are associated with increased educational attainment and reduction in child labour supply. For example for El Salvador, Acosta (2006) finds that girls and boys under 14 years old from recipient families are more likely to attend school than those from non-recipient households, while remittances also seem to reduce child labour supply. Further, Cox-Edwards and Ureta (2003) show that school dropout hazard rates are reduced by remittances. Hanson and Woodruff (2002) find that having a migrated family member has a positive effect on educational outcomes for girls in Mexico (aged 10 to 15) whose mothers have a very low level of education. Borraz (2005) finds similar results using data from the Mexican census, which suggest a positive but small effect on schooling for boys and girls with low educated mothers and who reside in cities with less than 2,500 inhabitants. Yang and Martínez (2005) find declines in child labour supply amongst households whose migrant members experience favourable exchange rate shocks in the Philippines. Mansuri (2006) finds strong positive effects of temporary economic migration on investments in children's schooling in Pakistan, especially for girls.

However, other findings present mixed results of the effect of migration and remittances on child schooling. McKenzie and Rapoport (2006) identify the overall effect of migration and find a negative effect on schooling attendance and education attainment among 16-18 year old girls and 12-18 year-old boys, but a positive effect for younger girls with uneducated mothers in rural Mexico. They attribute these

outcomes to side effects of migration. For instance, the absence of parents in the household due to migration could lead to reduced investment in their children's education and an increase in the incidence of child work. López-Córdova (2005) shows that these effects are especially relevant for secondary school age children in Mexico, as receiving remittances positively affect school attendance for children aged 6 to 14, but negatively for boys and girls aged 15 to 17. In a study on 11 Latin American countries, Fajnzylber and López (2006) find that only in 6 countries in the region (Nicaragua, Guatemala, Honduras, Ecuador, Haiti, and El Salvador) are children in remittance-receiving households more likely to attend school, the effect being larger for children whose mothers have a low level of education.

Recent empirical work also brings to light the importance of remittances as coping mechanism against shocks. Yang and Choi (2005) argue in favour of an insurance motivate for international migration among households in the Philippines, as there is a negative relationship between remittances and income variation for migrant households. Halliday (2006) provides evidence that agricultural shocks, particularly livestock loss and harvest loss, result in an increment of remittances received by Salvadorian households. Miller and Paulson (1999) show that in Thailand remittances respond to aggregate (rainfall and GDP) and idiosyncratic shocks (medical expenditures), in particular when recipient household face negative shocks, suggesting that remittances are used as a risk management strategy.

The main contribution of this paper is linking the two strands of literature discussed above, by evaluating: (i) the direct contribution of remittances to investment in human capital, (ii) the effects of shocks on these investments, and (iii) the role of trans-national networks as coping mechanisms (through remittances) for households in dealing with these shocks. Similar to other studies on remittance and human capital, we

focus on outcomes such as school enrolment and child labour. In addition, we probe further by examining the effect of remittances on the quality of these investments, as reflected in substitution between public and private education.

Caution is required when interpreting estimated effects of remittances on school enrolment and child work as causal relations because of the endogenous nature of remittances. In this paper, identification relies on instrumental variables that exploit information on source countries of remittances and regional variation in the availability of bank offices that function as formal channels for receiving remittances. These instruments capture information on transfer costs and accessibility to channels of transmission, which partly determine the volume and frequency of funds transferred, while they are not expected to affect school enrolment and child labour.

Our results show that remittances increase school enrolment and decrease incidence of child work, especially for girls and in rural areas of Ecuador. We further find that aggregate shocks are associated with increased work activities, while remittances are used to finance education when households are faced with these shocks. This suggests that liquidity constraints and vulnerability to covariate risk are especially relevant in rural areas, as it affects household's investments in human capital of school age children. In this context both child labour and remittances function as coping mechanisms.

The paper is organized as follows. The next section describes the data used in the analysis, while section 3 illustrates the context of education, migration and remittances in Ecuador. Our empirical strategy is set out in section 4 and the results are presented and discussed in section 5. Section 6 concludes.

2. The data

Our analysis draws on a nationally representative living standard household survey for Ecuador from 2005/2006, *Encuesta Condiciones de Vida – Quinta Ronda* (ECV). The ECV covers a wide range of socioeconomic indicators for households and individuals, including school enrolment and work activities in the previous week. We focus on work activities that contribute to household income and domestic work, for which information is collected for children 10 years and older. Information on remittances includes the size of cash transfers received from abroad, the country where the remittances come from and how they were spent (e.g. construction, investment, non-durable consumption, food, housing, education and health care). The survey also asks questions regarding unexpected events and shocks that have affected households' income during the last year. These include idiosyncratic shocks such as severe illness, accidents or death of a household member, and covariate shocks such as natural disasters, droughts, insect plagues and unexpected periods of frost.

The 2005/2006 survey includes 55,666 individuals from 13,581 households and is representative at the province level. We restrict our analysis to a sample of 8,600 children age 10 to 17 of which 14 percent live in a household that receives remittances. Table 1 presents descriptive statistics for the sample separately for children from recipient and non-recipient households.

3. Remittances, education and child work in Ecuador

Migration and remittances

Over the last decade Ecuador has experienced a large international out-migration motivated primarily by economic factors. The financial and foreign exchange crisis during 1999 and the dollarization process in 2000 led to a severe deterioration of

living standards and disrupted labour markets. GDP declined from 23,255 million dollars in 1998 to 16,674 million dollars in 1999, and GDP per capita fell by 30%. The unemployment rate increased dramatically, peaking at 14.4% in 1999. Poverty rates increased from 39.3% before the crisis (1995) to 52.2% in 1999 (SIISE, 2007). As a result, a large number of Ecuadorians left the country to find work opportunities elsewhere (Acosta *et al.*, 2004 and 2005, Ramírez and Ramírez, 2005). According to the Inter-American Development Bank (2006) an estimated one million Ecuadorians migrated to Spain, United States and other countries in Central America between 2000 and 2005. Spain is the main migration destination, accounting for about half a million Ecuadorian migrants (Inter-American Development Bank, 2006).

The most visible economic consequence of this out-migration wave is the substantial and increasing amount of money that Ecuadorian migrants have been remitting. The Central Bank of Ecuador estimates that from 1996 to 2005 remittances have grown at an average rate of 19 percent and since 1999 constitute the second largest source of foreign income after oil exports, exceeding official development aid and foreign direct investment. In 2005 remittances reached a total of 2,318 million dollars, which amounts to 6.35 percent of GDP and 31.5 percent of total exports of goods and services (Central Bank of Ecuador).

According to ECV 2005/2006 about 16 percent of Ecuadorians live in a household that receives international transfers (Table 2). On average these households received US\$ 28.83 per capita per month. For recipient households this is equivalent to about 21 percent of monthly household income. Three quarters of these households reside in urban areas and almost all live in the Sierra and Costa regions. This is due to the higher incidence of remittances in these areas, but for the most part due to population size. The bulk of remittance flows goes to middle and higher income

households. The richest 40 percent of the population account for about 57 percent of the recipients, while 22 percent of the recipients come from the poorest 40 percent of the population. The latter group roughly represents those that live below the poverty line.¹ The amount received also strongly increases with overall level of consumption. The average remitted amount per capita (i.e. per head of the receiving household) is four times larger for the richest quintile compared to the poorest.

Recipient households report that they use income from remittance mainly for education, food, health and rent (89.4%).² The remainder is said to be used for construction and property investments (3.1%), settlement of debts (2.9%), savings (1.2%), business investments (1.2%), household assets such as fridges, stoves and laundry machines (0.9%), acquisition of vehicles (0.3%) and other forms of consumption (1.0%). Interestingly, these reported spending patterns do not differ much between urban and rural households, although households in rural areas use a higher percentage of remittances for the acquisition of household assets and reserve a smaller share for savings.

Table 3 shows the remittance flow reported for the last 12 months by source country.³ More than half of the recipients receive transfers from Spain, while 35.4 percent receive funds from the United States, 9.8 percent from Italy, 2.1 percent from the Andean Community countries and 4.5 percent from other countries. In terms of total volumes, Spain is the main source with the USA a close second. The amount of remittances originating from Spain is due to the large number of Ecuadorian migrants, but not the size of the transfers, as remittances from Spain are relatively small on a per capita basis. The share of recipients that receive remittances from Ecuadorians

¹ In 2006 the poverty headcount for Ecuador is estimated at 38.3 percent, and severe poverty at 12.8 percent (SIISE, 2007). The quintiles in Table 2 are based on monthly per capita consumption.

² Unfortunately the data does not allow use to decompose this further to the different types of expenses.

³ The survey classifies source countries as Spain, United States, Italy, Andean Community countries (Colombia, Bolivia, Peru and Venezuela) and others countries.

working in the Andean Community is small, but the average amount remitted is relatively large.

These migration flows and associated financial transfers manoeuvre through trans-national networks. We speak of trans-national networks when the reproduction of social and economic life of communities transcends national borders, connecting migrants in host country with their communities of origin, families, relatives, and friends (Herrera, 2002). Goycochea and Ramirez (2002) describe how for Ecuador these networks include migrants, their relatives and friends, social organizations and associations⁴, and other micro-networks formed by travel agencies, informal agents and intermediaries, and money lenders. Social ties are maintained by regular money transfers, the exchange of letters, photos and phone calls. Ramirez and Ramirez (2005) relate how remittances allow migrants and their relatives to have common plans – such as building houses, paying school fees, planning familiar meetings – maintain an affective interaction and prolong familial ties over long distance.

In addition, trans-national networks play an important role in migration decisions. They facilitate migration “through providing information on the migration process itself, such as crossing the border; through providing information on destinations and jobs, and aiding integration after arrival; and through helping financing the cost of migration” (Dolfin and Genicot, 2006: 2). Ethnographic studies by Goycochea and Ramirez (2002), Pedone (2000) and Wamsley (2001) provide an account of how trans-national networks support international migration by Ecuadorians.

⁴ E.g. *Asociación de Migrantes Ecuatorianos*, in Spain “Rumiñahui”.

Education and child work

Between 1995 and 2005 school enrolment increased at all school levels. Primary schooling in Ecuador starts at 6 until 11 years, with secondary school age typically being 12 to 17 years. Table 4 shows net school enrolment for primary schooling increasing from 89 percent in 1995 to 94.2 percent in 2005, while net secondary school enrolment increased from 49.7 to 55.4 percent.

With increased school enrolment, child work has decreased from 1995 to 2005. Table 4 reports incidence of economic work activities, excluding domestic work, amongst children aged 10 to 17. In 1998 and 1999 incidence of child work was at 44.6 percent which decreased to 39.2 percent in 2005.

In this paper we study the effect of remittances on school enrolment as it is a better reflection of the household's investment decision than school attendance, given the fixed costs that are associated with it (e.g. school enrolment fees). Table 5 shows average school enrolment and work incidence separately for boys and girls from recipient and non-recipient households in the ECV 2005/2006 sample. Remittances seem to be associated with higher enrolment and lower incidence of child work, both domestic and non-domestic work. Here, non-domestic work is defined as any work activity that involves earning income or being compensated in kind.

Remittances are positively associated with private education (Table 6). About three quarters of enrolled children attend a public school, but the share of private education increases with age level, from 21.9 percent among children aged 10 to 11 years to 29.2 percent among 15 to 17 year olds. The enrolment rate in private school is higher for remittance households compared to non-remittance households. For all age groups, about a third of students from remittance receiving households attend a private school. This would suggest that remittances are partly used to increase quality

of education, if we take into account that private schooling in Ecuador typically provides higher quality education at higher costs.⁵

Idiosyncratic and aggregate shocks

Idiosyncratic and aggregate shocks occur frequently, as shown in Table 7. Household specific shocks such as death of a household member, illness or accident are reported by 14.7 percent of households. We observe similar incidence of aggregate shocks, such as droughts (14.7 percent reported incidence), damage to agricultural produce due to frost (10.1 percent) and plagues (13.2). Interestingly, while aggregate shocks may be expected to be a rural phenomenon, there is still some non-trivial incidence in urban areas. This would particularly reflect the urban fringes, which are likely to be susceptible to these aggregate shocks. In general, the incidence of aggregate shocks is negatively correlated with wealth. This is cause for concern in the multivariate analysis, as it could reflect non-random sorting of risk and shocks. For example, poor households may be more likely to move into high risk areas. Indeed, there seem to be regional patterns in the distribution of shocks. The Sierra region is a high risk area for all type of shocks, where agriculture is highly concentrated. The Costa region which is located at sea level and related to trade, fishing and production of export products (bananas, tuna, shrimps, among others) is more likely to be affected by droughts and plagues, than by frost which takes place at high altitude. Finally, the tropical and sparsely populated Amazonia area, where oil extraction is the dominant economic activity, mainly experiences plagues. The strong association of aggregate shocks with geographic location and wealth would suggest that any bias from a non-random distribution of shocks could be greatly reduced by

⁵ Ponce (2000) finds that repetition rates and the average number of years needed to graduate are lower in private schools, while PREAL *et al.* (2006) find lower drop out rates and better education outcomes (test scores) for private schools compared to public.

including regional and rural area indicator variables, and control for socio-economic characteristics of households. Individual shocks seem more evenly distributed, which could indicate that potential bias from idiosyncratic shocks is limited.

4. Empirical approach

Empirical specification

To estimate the impact of remittances on human capital investments we take a reduced form approach, where we model the probability of being enrolled in school, participating in income generating activities or domestic work as a function of remittance transfers, individual and household characteristics, and regional labour market and economic conditions. Besides dichotomous enrolment and work decisions, we investigate the effects of remittances on the quality of investment in human capital of children. We use substitution between public and private schooling as an indicator of quality.

The absolute amount of monthly per capita remittances received by households is our main explanatory variable of interest. Note that in the analysis we are ignoring the migration decision itself and focussing only on the marginal effects of international transfers on schooling and labour supply. The disadvantage of this approach is that we do not analyse to what extent international migration is an integral part of a household's income diversification strategy. Instead, we treat remittance transfers as outcomes of existing trans-national networks. Thus, we do not identify the effects of migration but we examine the role of trans-national networks in consumption smoothing, relaxing liquidity constraints and human capital investments.

We do not include income or household expenditures as covariates as there might be an endogenous relationship with the outcome variables. Schooling and work

decisions directly affect household spending, while unobserved heterogeneity is likely to introduce additional confounders. Instead, we treat the household characteristics as proxies for the socio-economic status of the household. For individuals we control for age and gender, while household characteristics include information on the head of households (gender, marital status), education level of highest educated males and females, household size and living conditions (home ownership, type of floor and sanitation, and access to electricity, telephone and water by public network).

We consider both idiosyncratic shocks (a member of the household has recently been severely ill, had an accident or died) and covariate shocks (droughts, insect plagues or crops affected by frost) that households may be exposed to. In particular the latter are expected to affect human capital decisions as both market based and informal insurance and coping mechanisms may break down under aggregate shocks (e.g. Glewwe and Hall, 1998, Jacoby and Skoufias, 1997, Morduch, 1995 and 1999, and Skoufias, 2003). It is here that trans-national networks and remittances can play an important role as informal safety nets, as they transcend country specific developments.

Since labour supply, schooling and remittances may all be driven by regional specific labour market and economic characteristics, we control for the poverty headcount and unemployment rate in the province where the child lives, and the urban-rural composition and average age of the province population. In addition, we include dummy variables for the three main geographic areas of Ecuador: Sierra, Costa and Amazonia.

Identification

Remittances received by households are potentially endogenous to human capital decisions and child labour supply. This can be due to, for example, unobserved heterogeneity associated with both presence of trans-national networks and schooling decisions, or to income shocks affecting human capital investments and labour supply while simultaneously adjusting remittances to reduce income volatility. There may even be reverse causality if households consider migration and remittances as an explicit means of funding education of their children.

Historical migration rates and presence of migration networks have been used as instrumental variables for current migration in a number of studies (e.g. Acosta, 2006, Hanson and Woodruff, 2002, Mansuri, 2006, and McKenzie and Rapoport, 2006). The migration variables in these studies typically indicate individuals living in migration or remittance receiving households. Justification of this instrument lies with sociological literature which argues that trans-national social networks promote migration of other household members. Thus, historical migration patterns partly determine current migration rates. But while these instruments may work for migration status of households, it is less suitable for the amount of remittances as past migration patterns are unlikely to explain variation in the amount of remittances amongst remittance receiving households (McKenzie, 2005).

In this paper we attempt to identify causal effects of remittances by exploiting exogenous variation in transaction costs of international financial transfers. Such transaction costs of transmission partly determine the volume and frequency of funds transferred internationally. At the same time we do not expect these transaction costs to directly affect school enrolment and child labour supply. We use two sources of information that reflect transaction costs and accessibility to channels of transmission:

the source countries of the remittances and regional variation in availability of Western Union bank offices that function as formal channels for transferring remittances (following Amuedo-Dorantes and Pozo, 2006). The variation in Western Union branches across provinces is shown in Table 8. Availability of Western Union branches per province is interacted with all source country dummy variables so as to fully exploit the variation in the instruments and increase support for identification.⁶

5. Results

The impact of remittances on school enrolment and child work are estimated by means of IV probit for the full sample of 8,600 children age 10 to 17.⁷ The IV probit approach takes a linear specification for the first stage regression, where the instruments are jointly significant at a 1 percent level. We investigated the support of the instruments further by estimating the first stage equation as tobit in addition to a probit analysis of the probability of remittance receipt.⁸ We find that the Western Union variable is a strong determinant of the probability of receiving remittances but to a lesser extent for the amount sent. The country dummy variables are highly significant for the amount remitted. These results suggest that the instruments combined, and with interaction terms, provide strong support for identification of the effects of remittances.

With these instruments there remains the threat that they capture unobserved confounders besides transaction costs. For example, the availability of Western Union

⁶ There is considerable variation between countries in the transaction costs of international money transfers. We called a number of Western Union branch offices in several countries by phone (January 2008), inquiring about the costs of transferring \$100 to Ecuador. The quoted costs amounted to \$11.99 from the US (Houston), \$7.72 from Spain, \$8.70 from Bolivia and \$22.50 from Colombia. Rates quoted on the Western Union website for internet transactions of the same amount ranged from \$5.99 in the US (California) to 14.50 Euro in Italy.

⁷ In case remittances are not instrumented, we find that the effects of remittances are underestimated; the biased estimates are generally smaller in absolute magnitude and not always significantly different from zero.

⁸ First stage estimates are not shown here but are available upon request.

branch offices could be correlated with local economic environment. The set of variables reflecting regional labour market and economic characteristics should remove part of this threat. Moreover, the coefficients of the instruments are not sensitive to excluding the regional variables, suggesting the instruments do not pick up regional effects. In addition to this, we also estimated a linear probability specification in order to perform a Sargan over-identification restrictions test. For both school enrolment and economic and domestic work the validity of the instruments was not rejected (χ^2 test statistics of 15.785 and 12.349 and 10.664 respectively, with 10 degrees of freedom).

The potential endogeneity of the shock variables is another source of concern. Given the number of shock variables, instrumental variables is not a viable option for dealing with this source of unobserved heterogeneity. Given the wide range of individual and regional characteristics in the specification, it is likely that much of the possible bias has been removed. In any case, we find the results are robust to including shock variables, and that remittance estimates are not affected. If any bias would remain then the effects from shocks would be over estimated.

The associated marginal effects for monthly per capita remittances and shocks are reported in the first columns of Table 10 (enrolment) and Table 11 (work). The remaining columns in these tables show the results for different sub-samples: male/female, urban/rural and non-poor/poor. The estimates for the specification without shock variables are shown in Table 9.

Remittances are used to finance schooling, in particular that of girls, children in rural areas and amongst the poor. A \$1 increase in remittances per month leads to a 0.09 percentage point increase in the enrolment rate. Extrapolating this would suggest that, on average, remittances increase enrolment by 2.59 percentage point. While this

seems small in terms of enrolment, it is substantial in terms of non-enrolment, as it is equivalent to a 19 percent decrease of non-enrolment (taking the enrolment rates in Table 5 as baseline). For girls, rural areas and the poor the effect is larger. While remittances increase school enrolment amongst the poor, this is not the case for the non-poor. This suggests that investments in human resources amongst the poor are bound by resource constraints. At the same time we find that remittances reduce incidence of child work only amongst the non-poor and in rural areas, suggesting that reservation wages are higher for the non-poor compared to the poor. The marginal effect of remittance is -0.27 percentage point in rural areas and -0.13 for the non-poor. Thus, while remittances may increase human capital investments amongst the poor, they are not sufficient to offset earnings from child labour. We find little effect of remittances on domestic work, except for children in urban areas. Here remittances increase the probability of domestic work, which probably reflects increased work pressure in the home due to out migration of adult family members.

Shocks do not seem to have any effect on schooling, but they do have severe implications for both economic and domestic work activity of children. Especially exposure to covariate shocks increases incidence of child work. Exposure to a drought or period of frost increases economic work incidence by approximately 9.5 percentage point on average (see Table 11). The effects are relatively large for girls, in rural areas and children from poor households. We observe similar patterns for domestic work, albeit with slightly smaller marginal effects. These results are consistent with the notion that alternative insurance mechanisms are less effective in poor rural environments, hence a relatively larger role for child labour as contingency asset.

Probing the role of trans-national networks and remittances, we estimated the model for sub-samples of children that were exposed to certain shocks and those that were not.⁹ The results are given in Table 12. We find no evidence that remittances reduce the pressure on households to draw on their child labour. This is somewhat surprising since the probability of work is sensitive to economic shocks. However, we do find that remittances are used to finance education when households are faced with these shocks, while schooling itself did not seem sensitive to shocks. For all type of shocks the effects of remittances is significantly larger for children if their household experienced a shock compared to households that did not.

This evidence suggests that education is indeed partly financed by international remittances, and that reducing investment in children's education is generally not considered as a coping mechanism by households when faced with unexpected income shocks; at least not in the short term. In fact, remittances serve as insurance mechanism in order to maintain school enrolment in response to these shocks.

Child work, on the other hand, seems sensitive to shocks, but not affected by remittances. In other words, shocks drive households to fall back on child labour, while remittances are generally not high enough to increase reservation wages such that it reduces child work (except for the non-poor), irrespective of households' exposure to shocks. This would suggest that, like trans-national networks, child labour is just one alternative for consumption smoothing.

The effect of remittances on the choice of public or private school is estimated by means of multinomial logit where the predicted remittances are used

⁹ We initially experimented with interaction terms of remittances and shock, but our results were sensitive to specification. The more flexible approach, by estimating the effects for different sub-samples, was robust to choice of instruments. Note that this approach may introduce new confounders for the remittances estimates, even though the results are robust to including shock variables as control variables. In this case the instrumental variables will remove any bias.

instead of actual monthly per capita remittances. Table 9 shows that remittances increase school enrolment mainly through increasing the probability of enrolling into private school (a marginal effect of 0.13, suggesting that an average monthly remittance transfer is associated with a 12.3 percent increase in private school enrolment, taking enrolment rates in Table 6 as baseline). Interestingly we see this result for all population groups, even where we found no significant effect on school enrolment. For boys, urban areas and the non-poor there is a clear substitution effect between public and private schooling, without any effect on overall enrolment. In rural areas and for the poor remittances lead to an increase in enrolment for both school types and a substitution effect from public to private school. For females the increase in enrolment is due to increased private schooling, with no visible effect on public school enrolment, suggesting that any positive effects for female enrolment into public schools are offset by substitution effects.

6. Conclusion

During the last decade, Ecuador has experienced a large increase in financial transfers from international migrants. The scale of the transfers offers an opportunity to analyse the effect of remittances on human capital formation. In particular, through its exploration of the effect of remittances on school enrolment and child work and the role of remittances in mitigating vulnerability to economic shocks, this paper brought together two strands of the literature. The main contribution of the paper is that we provide empirical evidence on the role of remittances as a source for investment in human capital, and the role of remittances and trans-national networks as mechanisms that preserve human capital investments when households are faced with income volatility.

Identification relied on instrumental variables, which exploit information on source countries of remittances and regional variation in the availability of bank offices that function as formal channels for sending remittances. These instruments capture information on transfers costs and accessibility to channels of transmission, which partly determine the volume and frequency of funds transferred, while they are not expected to affect school enrolment and child labour. Over-identifying restrictions tests confirm the validity of the instruments.

Our results showed that remittances increase school enrolment, in particular for girls and in rural areas. To a lesser extent remittances also reduced child labour supply. We further found that especially aggregate shocks are associated with increased work activities. Schooling, on the other hand, did not seem sensitive to shocks, suggesting that households employ other coping mechanisms rather than compromise human capital investments. Besides increasing school enrolment, remittances affected the choice of school type. We found that remittances led to a net substitution from public to private schooling, hence increasing the quality of human capital investments in children.

Not only do remittances provide a source for human capital investments, transnational networks also function as insurance mechanism, as we found that remittances are used to maintain education when households are faced with economic shocks. This suggests that liquidity constraints and vulnerability to covariate risk are relevant for human capital accumulation of school age children, especially in rural areas. Within the context of uncertainty both child labour and remittances function as informal insurance coping mechanisms.

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Tables

Table 1 Selected descriptive statistics, sample includes all children aged 10 to 17

Variables	Non-recipients		Recipients	
	Mean	[s.d.]	Mean	[s.d.]
School enrolment	0.819	[0.385]	0.884	[0.320]
Non-domestic work activities	0.386	[0.487]	0.306	[0.461]
Domestic work activities	0.274	[0.446]	0.233	[0.423]
Monthly per capita remittances	0.000	[0.000]	23.082	[40.505]
Age	13.272	[2.265]	13.512	[2.307]
Female	0.479	[0.500]	0.490	[0.500]
Female head of household	0.075	[0.263]	0.159	[0.366]
Head of household is married	0.643	[0.479]	0.664	[0.473]
Highest educated female: none	0.083	[0.275]	0.041	[0.200]
Highest educated female: primary	0.479	[0.500]	0.316	[0.465]
Highest educated female: secondary	0.289	[0.453]	0.421	[0.494]
Highest educated female: higher	0.149	[0.356]	0.221	[0.415]
Highest educated male: none	0.045	[0.207]	0.024	[0.154]
Highest educated male: primary	0.470	[0.499]	0.347	[0.476]
Highest educated male: secondary	0.326	[0.469]	0.395	[0.489]
Highest educated male: higher	0.159	[0.366]	0.234	[0.424]
Household size	6.196	[2.265]	6.047	[2.115]
Home owner	0.752	[0.432]	0.747	[0.435]
Dirt floor	0.116	[0.320]	0.062	[0.241]
Access to water by public network	0.548	[0.498]	0.764	[0.425]
Access to electricity	0.918	[0.274]	0.983	[0.130]
In-house toilet	0.744	[0.436]	0.894	[0.308]
Telephone	0.259	[0.438]	0.494	[0.500]
Death, illness, accident	0.143	[0.351]	0.236	[0.425]
Drought	0.235	[0.424]	0.168	[0.374]
Periods of frost	0.171	[0.377]	0.138	[0.345]
Plagues	0.216	[0.412]	0.111	[0.315]
Rural area	0.533	[0.499]	0.384	[0.487]
Poverty headcount in district	0.432	[0.123]	0.392	[0.121]

Unemployment rate in district	0.110	[0.045]	0.121	[0.043]
Rural population in district	0.487	[0.211]	0.457	[0.220]
Average age district	26.959	[1.743]	27.168	[1.546]
Sierra region	0.517	[0.500]	0.548	[0.498]
Costa region	0.385	[0.487]	0.380	[0.486]
Amazonia region	0.098	[0.297]	0.072	[0.258]
Number of observations	7,371		1,229	

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida* 2005/2006.

Table 2 Distribution of size of remittances (average per month)

	Incidence (% of population)	Share (% of recipients)	Average amount (US\$ per capita)
Quintile 1 (poorest)	5.6	7.0	10.73
Quintile 2	12.1	15.2	11.90
Quintile 3	16.8	21.1	19.38
Quintile 4	23.3	29.3	30.37
Quintile 5 (richest)	21.8	27.4	48.05
Urban	18.6	74.4	30.37
Rural	11.2	25.6	24.38
Sierra	16.9	48.2	32.20
Costa	15.5	48.7	25.84
Amazonia	10.3	3.1	23.58
Ecuador	15.9	100.0	28.83

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida* 2005/2006.

Table 3 Source country and average size of remittances in past month

Source country	Share of recipients (%)	Transfer per capita (US\$)	Total remittances (US\$)
Spain	51.54	25.89	26,773,019
USA	35.42	33.12	24,122,609
Italy	9.84	30.95	4,771,111
Andean Community	2.08	39.01	1,703,870
Other countries	4.54	36.66	3,472,769

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida* 2005/2006.

Table 4 Work activities and net school enrolment, 1995-2005 (percentages)

	1995	1998	1999	2005
Primary education	89.0	89.4	90.3	94.3
Secondary education	49.7	52.9	51.4	55.4
Work (age 10-17)	42.8	44.6	44.6	39.2

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida* 1995, 1998, 1999 and 2005/2006.

Table 5 School enrolment and work for remittance recipients and non-recipients aged 10 to 17 (percentages)

	Remittance recipients			Remittance non-recipients		
	Boys	Girls	All	Boys	Girls	All
Enrolment						
10-11	98.55	99.16	98.88	97.57	97.12	97.34
12-14	91.52	93.50	92.48	85.74	83.14	84.54
15-17	78.87	78.93	78.90	67.75	70.19	68.95
10-17	88.27	89.69	88.98	82.75	82.68	82.72
Work - non domestic						
10-11	11.78	13.11	12.51	19.66	12.95	16.26
12-14	29.20	19.92	24.69	38.35	27.93	33.53
15-17	45.18	32.18	38.76	54.41	36.04	45.43
10-17	31.34	22.57	26.91	38.88	26.43	32.86
Work - domestic						
10-11	8.38	12.39	10.58	12.30	10.99	11.64
12-14	18.37	18.94	18.65	22.43	25.48	23.84
15-17	29.56	28.47	29.03	29.88	31.87	30.86
10-17	20.38	20.65	20.52	22.30	23.53	22.89

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida 2005/2006*.

Table 6 Public-private mix among enrolled children aged 10 to 17 (percentages)

	All		Remittance recipients		Remittance non-recipients	
	Public	Private	Public	Private	Public	Private
10-11	78.08	21.92	66.18	33.82	80.30	19.70
12-14	74.47	25.53	66.67	33.33	76.12	23.88
15-17	70.79	29.21	64.15	35.85	72.47	27.53
10-17	74.53	25.47	65.69	34.31	76.43	23.57

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida 2005/2006*.

Table 7 Distribution of shocks during past year (% of population affected)

	Individual	Drought	Periods of frost	Plague
Quintile 1 (poorest)	15.7	27.8	18.8	27.5
Quintile 2	16.7	18.8	12.0	16.9
Quintile 3	15.0	13.3	9.6	11.1
Quintile 4	14.4	9.6	7.0	7.8
Quintile 5 (richest)	11.6	4.2	3.4	3.0
Urban	13.5	2.4	1.7	1.7
Rural	16.7	36.0	24.7	33.3
Sierra	16.7	20.3	19.3	16.7
Costa	12.1	10.6	2.7	9.9
Amazonia	21.8	3.8	0.7	14.8
Ecuador	14.7	14.7	10.1	13.2

Note: Individual shocks include severe illness, accident or death of a household member.

Source: Authors' analysis based on data from *Encuesta Condiciones de Vida* 2005/2006.

Table 8 Remittances and number of Western Union branches by province

Province	Western Union branches	Remittance recipients (%)	Average per month (US\$ per capita)
Sierra region			
Azuay	17	30.0	43.40
Bolivar	5	6.3	13.30
Canar	6	47.0	38.36
Carchi	2	3.0	13.15
Cotopaxi	1	9.7	18.96
Chimborazo	5	10.2	28.89
Imbabura	3	11.0	18.37
Loja	2	20.7	30.58
Pichincha	30	15.2	30.95
Tungurahua	5	16.6	23.58
Total	76	16.9	32.20
Costa region			
El Oro	7	21.5	34.40
Esmeraldas	3	9.8	21.97
Guayas	33	17.9	25.96
Los Rios	10	10.5	21.09
Manabi	13	10.7	21.20
Total	66	15.5	25.84
Amazonia region			
Morona Santiago	4	15.1	33.53
Napo	1	8.0	31.78
Pastaza	2	8.9	27.31
Zamora Chinchipe	2	19.9	10.00
Sucumbios	1	5.4	10.35
Orellana	3	5.7	15.53
Total	13	10.3	23.58
Ecuador	155	15.9	28.83

Table 9 Effect of remittances on school enrolment and work incidence amongst children age 10 to 17, marginal effects, by population group, excluding shock variables

	All	Male	Female	Urban	Rural	Non-poor	Poor
IV probit							
School enrolment	0.0009*	0.0006	0.0013*	-0.00001	0.0042**	0.0001	0.0045+
Non-domestic work incidence	-0.0007	-0.0009	-0.0007	-0.0002	-0.0024	-0.0013*	0.0031
Domestic work incidence	0.0006	0.0008	-0.0001	0.0008+	-0.0011	-0.0002	0.0027
IV MNL							
Enrolment in public school	-0.0005	-0.0010	0.0001	-0.0018*	0.0020*	-0.0018*	0.0009
Enrolment in private school	0.0013**	0.0015*	0.0011+	0.0017*	0.0010*	0.0019*	0.0011*
Number of observations	8,600	4,466	4,134	4,199	4,401	4,384	4,200

+ significant at 10%; * significant at 5%; ** significant at 1%

Note: Other covariates have been omitted for convenience. These include the child's characteristics (age, age squared and gender), characteristics of the head of household (gender, marital status, education), household characteristics and living conditions (household size, owns home, house has dirt floor, access to water by public network, access to electricity, in-house toilet, telephone), and regional welfare and demographic characteristics (rural dummy variable; poverty headcount, unemployment rate, percentage rural population and average age in province; Sierra-Costa-Amazonia dummy variables). Detailed estimation results are available upon request. Standard errors in brackets.

Table 10 Determinants of school enrolment amongst children age 10 to 17, by population group (IV probit marginal effects)

	All	Male	Female	Urban	Rural	Non-poor	Poor
Monthly per capita remittances	0.0009*	0.0007	0.0013*	-0.00005	0.0043**	0.0001	0.0044+
Shocks							
Death, illness, accident	-0.0039	-0.0115	0.0038	-0.0099	-0.0030	-0.0081	-0.0004
Drought	0.0014	-0.0023	0.0080	0.0239	0.0037	-0.0003	0.0103
Periods of frost	-0.0092	-0.0021	-0.0160	-0.0210	-0.0192	-0.0108	-0.0085
Plagues	0.0085	0.0098	0.0042	0.0276	0.0122	-0.0002	0.0168
Number of observations	8,600	4,466	4,134	4,199	4,401	4,384	4,200

+ significant at 10%; * significant at 5%; ** significant at 1%

Note: Other covariates have been omitted for convenience, with specification similar to Table 9. Detailed estimation results are available upon request. Standard errors in brackets.

Table 11 Determinants of work incidence amongst children age 10 to 17, by population group (IV probit marginal effects)

Non-domestic work	All	Male	Female	Urban	Rural	Non-poor	Poor
Monthly per capita remittances	-0.0007	-0.0009	-0.0008	-0.0002	-0.0027+	-0.0013*	0.0029
Shocks							
Death, illness, accident	0.0154	0.0063	0.0178	-0.0206	0.0594**	-0.0091	0.0303
Drought	0.0949**	0.0919**	0.1056**	0.0028	0.1048**	0.0308	0.1266**
Periods of frost	0.0968**	0.0633*	0.1229**	0.0735	0.1075**	0.1072**	0.0716*
Plagues	0.0280	0.0483+	0.0030	-0.0177	0.0239	0.0474+	0.0148
Domestic work							
Monthly per capita remittances	0.0005	0.0008	-0.0002	0.0009+	-0.0014	-0.0002	0.0024
Shocks							
Death, illness, accident	0.0070	0.0125	-0.0016	-0.0107	0.0339	0.0075	0.0086
Drought	0.0727**	0.0609**	0.0864**	0.0143	0.0883**	0.0161	0.1060**
Periods of frost	0.0744**	0.0494*	0.1047**	0.0496	0.0961**	0.0761**	0.0733**
Plagues	0.0188	0.0261	0.0120	0.0054	0.0157	0.0141	0.0205
Number of observations	8,600	4,466	4,134	4,199	4,401	4,384	4,200

+ significant at 10%; * significant at 5%; ** significant at 1%

Note: Other covariates have been omitted for convenience, with specification similar to Table 9. Detailed estimation results are available upon request. Standard errors in brackets.

Table 12 Effect of remittances on school enrolment and child work incidence amongst children age 10 to 17, by type of shock (IV probit marginal effects)

	School Enrolment	Non-domestic work	Domestic work	N
No individual shock	0.0004	-0.0011	0.0003	7,253
Individual shock	0.0026*	-0.0004	-0.0001	1,347
No drought	0.0006119	-0.0010	0.0004	6,664
Drought	0.0046*	-0.0001	0.0012	1,936
No periods of frost	0.0009+	-0.0009	0.0007	7,168
Periods of frost	0.0033*	-0.0022	-0.0023	1,432
No plagues	0.0007+	-0.0004	0.0006	6,870
Plagues	0.0067*	-0.0030	-0.0021	1,730
No aggregate shock	0.0005	-0.0009	0.0004	5,996
Aggregate shock	0.0043**	-0.0013	-0.0001	2,604

+ significant at 10%; * significant at 5%; ** significant at 1%

Note: Other covariates have been omitted for convenience, with specification similar to Table 9. Detailed estimation results are available upon request. Standard errors in brackets.