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International Remittances and Human Capital Formation

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Summary. — This article investigates the effect of international migration on children left behind in Peru. The theoretical model is based on human capital theory and educational investment decision linked to remittances. The model analyzes the role of international remittances on the investment decision between sending children to a public school or to a private school. Using data for the period 2007–10, this study addressed the problem of a left-censored endogenous variable for panel data by using a two-step estimation, and found that international remittances have a positive effect on the likelihood to send children to private schools controlling for absenteeism of parents.

Key words — international remittances, international migration, human capital

1. INTRODUCTION

One of the main problems facing policy-makers in Peru is improving the quality of public education in order to enhance human capital in the country, and thus leave the bottom rank in the *Programme for International Student Assessment* (PISA) evaluation compiled by the Organisation for Economic Co-operation and Development (OECD). Although educational coverage has increased to almost the same level as in developed countries (UNESCO-UIS/OECD, 2005), the quality of Peruvian education remains low. PISA (2003) results show that Peru has an average score of 327 points which is the lowest score in the Latin American region (Argentina, Chile, Mexico, Brazil, and Peru) and much lower than the average of the OECD countries (500 points) (UMC, 2004). As a consequence of PISA's results the Peruvian education has been declared to be in a state of emergency by the national government.

The educational system in Peru reflects the high inequality experienced within Peruvian society; private schools provide better education compared to that provided by public schools. According to the results on reading literacy skills reported in PISA (2003), the difference in student performance within Peru for the year 2000 between the highest and the lowest quintile is 314 points (UMC, 2004).[1] This gap is explained by the differences among schools, and around 58% of student's performance in PISA is explained by school factors (UMC, 2004). This fact highlights that a better quality of education is provided by private schools compared to public schools.

Attending school, especially private schools, has become a pathway to move up and improve socio-economic status (SES) which may have a larger impact on children from low- and middle-income households. Evidence from the US suggests that children from private schools have a higher probability of accessing a better college education (Griffith & Rothstein, 2009), which in turn increases their job opportunities. Children from low-income households are doomed to attend public schools which in turn make them less competitive than children educated in private schools.

The main constraint to access not only private but also public education in Peru is its cost and the opportunity cost of children's work. Public education in Peru is free and provided by the government, however, parents need to pay for additional expenses such as uniforms, transportation, and school supplies that may pose a high economic burden on especially low income families. Saavedra and Suarez (2002) find that Peruvian families contribute to 32% and 33% of the total public spending for primary and secondary education, respectively. Hence, sending children to school becomes prohibitive for families in the lower group of Peruvian's income distribution. International remittances might loosen this income constraint allowing families left behind by, *firstly* sending children to school, and *secondly* affording a private education for their children. However, there is still not a clear effect of remittances on schooling (Borraz, 2005; Hu, 2012) and to my knowledge all the studies on remittances' effects have evaluated only quantity without including quality of schooling. Only one paper (Calero, Bedi, & Sparrow, 2008) approaches the quality decision for Ecuador but it uses one-year information and did not include absenteeism of parents.

International remittances may be used to acquire more years of education and a higher quality of schooling but according to Rapoport and Docquier (2006) there are several motives for sending back money to the origin country. The empirical evidence is not clear; some studies find that remittances are used for consumption whereas other studies find that remittances are used to acquire investment goods such as education and health (Yang, 2006). Based on the permanent income hypothesis, if remittances are considered as a temporary income they will be invested rather than spent (McKenzie & Sasin, 2007). Hence, the allocation of remittances income is not perfectly fungible with other income sources of the household, and the expected effect is not straightforward.

This paper focusses on the effect of remittances on human capital investment of children left behind in the home country. The potential positive effect of remittances on financial constraints changes the opportunity cost of acquiring more schooling; thus, families may find it optimal to send children to school instead of sending them to the labor market. Researchers have explored remittances' effects on different indicators of human capital. Cox and Ureta (2003) employed dropping out of school as an indicator to explain the large and positive effect of remittances on human capital in comparison to other income sources for El Salvador. Amuedo-Dorantes

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and Pozo (2010) focused on children's school attendance from the Dominican Republic and found a positive effect among secondary school-age children and higher order of birth siblings. In a similar vein, Calero *et al.* (2008) found that international remittances have a positive effect on school enrollment in Ecuador. On the contrary, Acosta, Fajnzylber, and Lopez (2007) found a negative effect of remittances on educational attainment in the Dominican Republic, and Meza and Pederzini (2008) stated that remittances in rural Mexico have a negative effect on school achievement.

Receiving international remittances is associated to having a migrant family member which may pose a negative impact on children's human capital. Migration of parents may produce a negative effect on children's educational outcome due to the lack of parental control and by producing a change in children's expectations. First, a household experiencing migration is similar to a disrupted family that has a negative psychological effect on children which in turn affects their educational performance (Bennett, Clifford, & Falkingham, 2012; Kandel & Kao, 2001). In addition, migration places rearing and housework responsibilities on children left behind affecting their allocation of time to school work. Children left behind must take the parents' role as a provider by entering the labor force at earlier ages and becoming a parent figure for younger siblings (Booth & Tamura, 2009; McKenzie & Rapoport, 2010).

Second, if children perceive that their immigrant parents (or relatives and friends) gain higher wages by working in unskilled jobs in the receiving country then children may have none or less incentive to pursue higher levels of education. According to Kandel and Kao (2001), migration is perceived as an alternative to achieve economic success without having higher levels of education. Children with migrant parents may increase their likelihood to migrate (Kandel & Kao, 2001; McKenzie & Rapoport, 2010), and thus they do not acquire more education because the marginal return to education from the origin country is lower in the receiving country. Evidence from Mexico found that children left in migrant households obtain less years of schooling in comparison to those children living in non-migrant households (McKenzie & Rapoport, 2010). In a similar vein, Frisancho and Oropesa (2011) found a negative impact on educational attainment for children in Peru living in households with a high risk of migration; however, they did not control for amount of remittances and only employed data for Lima (capital of Peru).

However, the brain gain hypothesis in the migration literature posits a positive relationship between labor migration and human capital formation. Evidence for Tajikistan shows that the long-term migration of parents increases the enrollment rate of children left behind, but this study did not control for remittances (Bennett *et al.*, 2012). Theoretical studies such as Vidal (1998) pointed out that in a dynamic system there exists a threshold of human capital, $h^{\#}$, such that sending countries with an initial human capital above $h^{\#}$ will invest more on education and will convert to a high level equilibrium. A country with a highly educated population will send emigrants who are more likely to earn a higher return to their education in the receiving country, which may have a positive influence on their relatives and friends remaining in the sending country to invest more in education. Likewise, Stark and Wang (2002) state that migration may have a positive effect on educational investments in developing countries as it is used as a substitute for education subsidies.

The net effect for international migration will depend on whether remittances or absenteeism of parents have the larger effect. It is not clear a priori which effect will be larger; after controlling for the absenteeism of migrant family members, the positive effect of remittances may lose its statistical significance. Based on Dominican Republic data, Amuedo-Dorantes and Pozo (2010) concluded that migration of family members offsets the positive effect of remittances. On the other hand, Hu (2012) found that for the case of internal migration in China, the positive effect of remittances partially compensates for the negative effect of absenteeism of parents. And, Borraz (2005) found a positive but small effect of remittances on years of school for children living in remittances-receiving households in Mexico controlling for absent parents.

The main contribution of this paper is to extend the literature on international migration, especially for the Peruvian case, by exploring *the role of receiving international remittances in the quality of human capital formation of children left behind controlling by the absenteeism of parents*. Due to limitations in the data, the absenteeism of parents in this research may be caused by migration, divorce or other reasons. Using longitudinal data for Peru retrieved from the National Survey of Households (ENAHO), this paper focuses on the quality rather than the quantity effect of remittances on schooling by including an indicator for attending private schools instead of public schools. Unlike previous studies for Peru, this research includes data for the whole Peruvian coast and not only for the capital (Lima). Likewise, the amount of remittances is included in the analysis instead of a dummy indicator of receiving remittances.

The Peruvian case is different from other cases such as Mexico or Central American countries due to the geographical distance to the United States, which is the main destination country (32.6% of Peruvians migrated to the US over the period 1990–2009) that poses a high cost for Peruvian migrants. Thus, relatively more affluent people are more likely to migrate (Frisancho & Oropesa, 2011) and they are less likely to have liquidity constraints to afford schooling costs. Hence, relatively small and even negative effects of remittances on schooling have been found in previous studies for Peru.[2] Yet international remittances in the Peruvian case should be explored beyond the quantity effect, i.e., years of schooling, and the effect of remittances on the quality of education should be included in the analysis.

The econometric analysis addresses the censored and endogenous nature of the remittances variable by applying a two-step panel data model proposed by Vella and Verbeek (1999). In addition, Random-Effects Probit and Pooled Probit with IV are undertaken as alternative econometric specifications. The main results show that international remittances have a positive effect on the likelihood to send children to private schools controlling for absenteeism of parents regardless the econometric specification employed.

The remainder of the paper is organized as follows: Section 2 presents a brief background of Peru related to the economy, remittances, and education. Section 3 outlines the model associated to the hypothesis proposed. Data and variable definition are presented in Section 4. The estimation strategy is discussed in Section 5. The results are discussed in Section 6, and Section 7 concludes.

2. PERUVIAN BACKGROUND

The Peruvian economy has made a remarkable progress since 1990 with indicators showing a high rate of economic growth, low rate of inflation, macroeconomic stability, and poverty reduction (World Bank, 2013). Moreover, Peru's average growth rate of 6.3% between 2002 and 2010 is considered

as one of the historically highest rates among the Latin America region. However, inequality remains as a main social problem in Peru with an income based Gini coefficient of 0.45 in 2011. Employment creation and earnings have been unevenly distributed, with the youth population in Lima experiencing an unemployment rate of 21% in 2005 (ECLAC, 2008; Jaramillo & Zambrano, 2013; World Bank, 2013). This suggests that the low quality of education is becoming a constraint for the youth population to meet the requirements in the labor market (Cotlear, 2006).

The economic growth in Peru has created a growing middle class that has increased from 43.6% in 2005 to 47.8% in 2011, and it is mostly comprised by urban population. This middle class has also increased its income per capita from US$3.2 daily PPP (purchasing power parity) in 2005 to US$ 7.8 daily PPP in 2011 (Jaramillo & Zambrano, 2013). Despite this economic success, Peru still shows a high out-migration flow of non-returning Peruvians emigrants, which has rapidly increased since 2000 although there was a slight reduction in 2009 as shown in Fig. 1. The stock of Peruvians living abroad who did not return during the period 1990–2009 is 7.0% over the total expected population for 2009, and 51.0% are from Lima, the capital of Peru (IOM, 2010). The main destination country of Peruvian migrants is the US: over the period 1990–2009, 32.6% migrated to the US, 16.6% to Spain, 13.5% to Argentina, 10.0% to Italy, 7.8% to Chile, and 4.2% to Japan (IOM, 2010).

The high number of emigrants produces a higher volume of remittances, which rose from 700 million to over 2 billion dollars during the period 2000–09 (BCRP). Fig. 1 shows that remittances have followed the same increasing trend of permanent emigration in Peru, especially since 1995. And, the importance of international remittances in the national economy has increased from 0.29% of GDP in 1990 to 1.89% (BCRP) in 2009.

According to figures from ENAHO, for the period 2004–10, around 81.1% of international remittances are sent to the Peruvian coast, and Lima is the main destination area receiving around 41.5%; 11.2% are sent to Peruvian highlands and 7.7% are sent to Peruvian jungle. [3] Hence, the main impact of international remittances is on the Peruvian coast. However, official figures collected by BCRP are downward biased because 8.7% of international remittances during 2007–10 were received through friends and relatives instead of financial institutions. [4] For the same period of time, 78.6% were allocated to regular household expenses such as consumption whereas 13.4% were allocated to education, 3.9% to housing, and 4.1% to savings. [5] Hence, remittances might have an important impact on educational investment decisions, although the main motivation for sending remittances is not to invest on education.

The economic success experienced by Peru, however, has not enhanced the educational system. According to the National Assessments in 2004, only 12.1% and 7.9% of the students evaluated showed a good performance in reading comprehension and mathematics, respectively. Although the performance in 2008 has showed improvements in comparison to that in 2007, the public education lags behind the private education (UNESCO, 2010). Calónico and Ñopo (2007) show that returns to private education are higher than those of public education for the urban areas in Peru, and this gap has been expanded during the last two decades in spite of the economic growth experienced in Peru. Based on income equations, Calónico and Nopo (2007) find that early investments in primary and secondary education by sending children to private schools explain the earning gap in the labor market whereas tertiary education has a small effect. For example, graduates from public universities but with private secondary education earn 70% more than those with public secondary education.

3. THE THEORETICAL MODEL

The theoretical model is based on the human capital theory and educational investment decisions linked to remittances. The model is used to analyze the role of international remittances and the absence of parents on the investment decision between sending children to a public or to a private school, that is, the decision to acquire a higher quality of education.

The model assumes a continuum of school alternatives according to school quality where a higher value of h reflects a higher quality of education. The schooling decision is based on the following education production function from Catsiapis (1987) but including migration:

$$h = h(M, T_p(Mg);\ H_0)$$

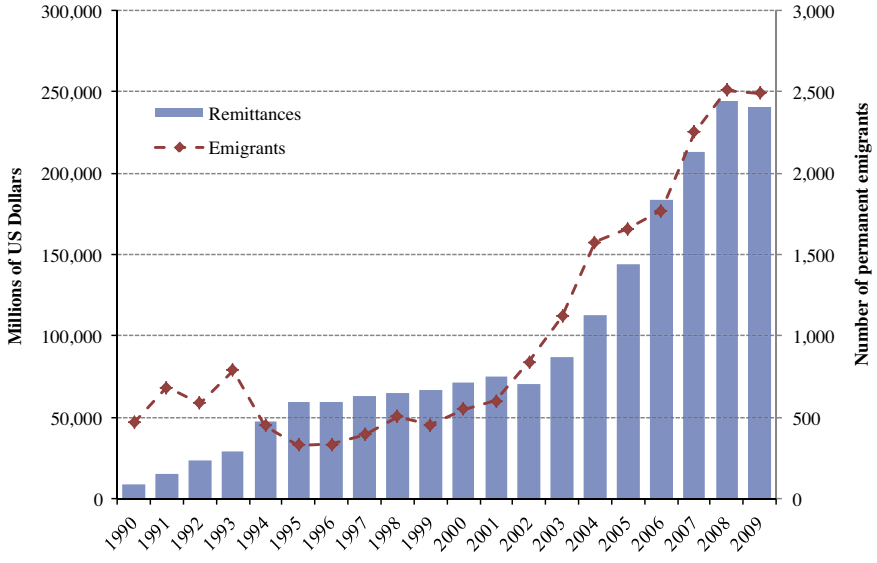

Fig. 1. *Remittances and permanent emigration, 1990–2009. Source: OIM (2010) and BCRP.*

where H_0 is the initial stock of human capital that measures parent's education, M are market resources, Mg is migration, and T_p is parents' time. The model does not include children's time (T_c) because it is assumed that T_c affects educational performance but not the school choice between public and private schools.

This model captures the effect of absent parents through $T_p(Mg)$. Generally, remittances- receiving households have a parent living abroad which negatively affects the parent's time allocated to educating his or her children: $\frac{\partial T_p}{\partial Mg} < 0$. Likewise, it is assumed that parents have a positive influence on the schooling decisions of their children; parents who invest time in their children's education are more likely to send them to private schools: $\frac{\partial h}{\partial T_p} > 0$. In the empirical model, the number of parents present in the household is included to control for the effect of a parent's migration.

On the other hand, the cost of producing education depends on (1) direct costs ($p * M$) where p is the price of market goods (school tuition or school supplies are examples of direct costs), and it is assumed that private schools have higher direct costs than public schools, (2) forgone earnings for children ($w_c * T_c$): in developing countries such as Peru children have to work,[6] (3) and forgone earnings of parents ($w_p * T_p$); w_c and w_p are the opportunity cost of children's and parent's time in the production of education, respectively. Assuming an initial cost (C_0) that can be understood as expenses on subsistence needs, the total cost function is:

$$TC = p * M + w_c * T_c + w_p * T_p(Mg)$$

and $TC \leq HB + R(Mg) - C_0$

where HB is the household budget, R is remittances, that is, total cost cannot exceed family resources including remittances after covering subsistence goods (C_0), e.g., cloths, food, and housing. It is assumed that remittances depend positively on migration, $\frac{\partial R}{\partial Mg} > 0$: a household with a migrant member will receive a positive amount of remittances.

The objective is to maximize human capital investments by acquiring a higher quality of education subject to education costs, thus:

$$\max\ h = \max\ h(M, T_c, T_p(Mg); H_0)$$

$$s.t.\ TC = p * M + w_c * T_c + w_p * T_p(Mg)$$

plugging $HB + R(Mg) - C_0$ into the restriction, it follows that:

$$HB + R(Mg) - C_0 = p * M + w_c * T_c + w_p * T_p(Mg)$$

Thus, the Lagrangean equation to maximize is:

$$\max\ L = \max\ h(M, T_c, T_p(Mg);\ H_0) + \lambda(HB + R(Mg) - C_0 - p * M - w_c * T_c - w_p * T_p(Mg))$$

From the first-order condition, the total effect of migration is obtained as follows:

$$\frac{\partial L}{\partial Mg} = \frac{\partial h}{\partial T_p} * \frac{\partial T_p}{\partial Mg} + \lambda\left(\frac{\partial R}{\partial Mg} - w_p * \frac{\partial T_p}{\partial Mg}\right)$$

Based on the assumptions of this model, $\frac{\partial L}{\partial Mg}$ has an ambiguous effect since:

1. $\frac{\partial h}{\partial T_p} > 0$ and $\frac{\partial T_p}{\partial Mg} < 0$, thus $\frac{\partial h}{\partial T_p} * \frac{\partial T_p}{\partial Mg} < 0$, and
2. $\frac{\partial R}{\partial Mg} > 0$ and $\frac{\partial T_p}{\partial Mg} < 0$, but theoretically is not possible to determine whether $\frac{\partial R}{\partial Mg} > w_p * \frac{\partial T_p}{\partial Mg}$ or $\frac{\partial R}{\partial Mg} < w_p * \frac{\partial T_p}{\partial Mg}$, thus the sign $of\left(\frac{\partial R}{\partial Mg} - w_p * \frac{\partial T_p}{\partial Mg}\right)$ is undetermined.

From the theoretical part, it is clear that an empirical estimation is needed to determine the net effect of migration through remittances and absenteeism of parents on human capital of children left behind.

The hypothesis to test is that receiving international remittances improves the quality of human capital by sending children left behind to private schools in spite of absenteeism of parents.

4. DATA AND VARIABLE DEFINITIONS

The data are retrieved from the "National Survey of Households" (ENAHO) which is publicly available and conducted by the National Institute of Statistics and Computing (INEI) in Peru. The ENAHO is a yearly survey, nationally representative, undertaken by the INEI since 1995 which provides information at national, dominion,[7] and stratum level[8] of statistical inference. However, the panel data analysis proposed in this research only includes ENAHO 2007 through 2010, because the methodology of compiling data was changed in 2004 and the INEI stopped following 2004–06 panel households to re-start a new dataset of panel households in 2007.

The unit of analysis in our estimating sample is the school-age children attending primary and secondary schools who are single and never-married to examine only those who depend on their parents' support. In Peru, children start primary school at the age of 6 and they need to complete 11 years of schooling: 6 years of primary and 5 years of secondary. In 2007, children between 3 to 18 years old are included in the analysis to allow for grade advance and delay, children between 4 and 19 are considered in 2008, children between 5 and 20 in 2009, and children between 6 and 21 are considered in 2010.

The children in the sample live in remittances receiving and non-receiving households on the Peruvian coast since it is the main recipient area of international remittances. Including information for the Peruvian highlands and the Peruvian jungle may bias the analysis due to the high percentage of households without remittances. The balanced panel consists of 559 observations at the individual level for each year from 2007 to 2010, making a total of 2,236 observations.

The main interest of this paper is the *quality of education* as an indicator for human capital formation. The analysis focuses on the role of international remittances in the decision to acquire a higher quality of education by sending children to a private school. Accordingly, the *dependent variable* employed is a dichotomous variable, whether the child is currently attending a private school (high quality) or a public school (low quality).

The independent variables included in the analysis are based on the theoretical model and similar studies. They are divided into three groups: child, household, and head of household. There are *two main independent variables of interest*: the logarithm of the annual amount of international remittances received in a year, and absenteeism of parents, both variables included in the household group.

The annual amount of international remittances is calculated using two questions in the survey: (i) frequency of remittances received from individuals or households overseas, and (ii) the amount of remittances received from individuals or households overseas. The remittances information is provided at the individual level from the receiver perspective and not from the sender perspective. The remittances received by each member of the household are added to calculate the total amount of remittances in a household.

Households receiving remittances are experiencing migration of at least one family member who can be the father or mother of the children or someone else[9] who sends money back, but his/her absence may negatively affect schooling investment decisions.

The variable absenteeism of parents is constructed using two questions in the survey: (i) are you a member of the household?, and (ii) are you absent from the household for 30 days or more days? A parent absent for more than 30 days is labeled as an absent parent. Absenteeism of parents is used as a proxy for migrant parent; although it is possible that absenteeism may be due to a divorce or widowhood rather than migration. According to Bennett *et al.* (2012) and Kandel and Kao (2001), a migrant household is similar to a disrupted family, that is, an absent parent due to migration or other reasons will have a similar effect than that of a migrant parent. Due to limitations in the data, however, international migration of parents cannot be identified.[10] To control for the potential negative effect of parents living outside the household, the sample in this research includes children and grandchildren of the head of household in the sample. Migrant parents often leave their children under their grandparents' supervision. To measure absenteeism of parents, the variable 'number of parents living in the household' with a range from 0 to 2 is constructed; 0 means that neither of the parents are in the household, 1 means that only one parent (either father or mother) lives in the household, and two means that both parents live in the household suggesting that there are no migrant parents.

(a) Child variables

The variables sex, only child, age, age squared, and years of education are measured for each child in the data. Years of education for children is included to control for any difference between primary and secondary school (Amuedo-Dorantes & Pozo, 2010; Lopez-Cordova, 2005).

(b) *Household variables*

This group includes an index for household assets, number of children, number of parents present, and logarithm of international remittances received. The variable indicating being the only child and the number of children in the household (Amuedo-Dorantes & Pozo, 2010; Cox & Ureta, 2003; Frisancho & Oropesa, 2011; Hu, 2012) are included since a higher number of children will reduce the probability of attending a private school.

The decision to send children to a private school is associated with household income (Cox & Ureta, 2003; Calero *et al.*, 2008; Hu, 2012); however income is not included in the analysis because it may pose an endogeneity and multicollinearity problem. First, the endogeneity or reverse causality problem arises because having school-age children may sway certain strategies undertaken by households to increase their income, but having a higher income may sway the decision to send children to private schools. Second, there exists a multicollinearity problem between income and remittances. The decision to send remittances may be correlated with the low income level of the household in the origin country. To address these problems, I follow the literature and include an index for household assets as a proxy for household income (Calero *et al.*, 2008; Hu, 2012). This index is created by using principal component analysis which considers five factors: internet (i.e., has a computer), TV cable (i.e., has a television), land phone, cell phone, and electricity. These five household factors measure household wealth which reflects a more permanent economic status than income level that changes according to current circumstances (Hu, 2012).

(c) *Head of household variables*

The characteristics included are sex, years of education, age, age squared, and employment status. The perception of the returns to education depends on parents' education as pointed out in the theoretical model and literature (Acosta *et al.*, 2007; Bennett *et al.*, 2012; Cox & Ureta, 2003; Frisancho and Oropesa, 2011; Hu, 2012; Kandel & Kao, 2001; McKenzie & Rapoport, 2010). A more-educated parent will consider education as an investment good rather than as a consumption good, which makes him or her more likely to send children to private schools. The variable related to the employment status of the head of household is an indicator for being employed or self-employed to account for any economic activity generating an income.

Table 1 reports the descriptive statistics and the test of means for the variables included in the econometric analysis for the panel sample, and for the samples of children living in remittances receiving and non-receiving households. A higher proportion of children living in remittances-receiving households attend private schools and they have more years of education. This suggests that remittances might be invested on the education of children who remained in the original country. Households receiving remittances have a higher index of wealth, and the head of household has more years of education. Table 5 in the Appendix A presents the correlation matrix. Only years of education and age for children, and number of parents in the household and sex of the head of household show a high correlation coefficient, 0.96 and 0.72, respectively.

5. ESTIMATION STRATEGY

To estimate the effect of international remittances controlling by absenteeism of parents on human capital formation of children left behind, I first use the Random-Effects Probit to model the probability of attending a private school (=1) or public school (=0). The empirical model estimates the following schooling decision equation:

$$y_{it}^{*} = \beta_0 + x_{it}\beta_1 + R_{it}\beta_2 + \varepsilon_{it} \quad (i = 1, \ldots, N) \text{ and } (t = 1, \ldots, T) \tag{1}$$

$$y_{it} = \begin{cases} 1 & \text{if} \quad y_{it}^{*} = 1 \\ 0 & \text{otherwise} \end{cases}$$

where y_{it}^{*} denotes the unobservable variable, and the observed outcome $y_{it} = 1$ is the propensity of the child i in the year t of attending to a private school. The vector x_{it} captures the child, household, and head of household characteristics. And, R_{it} is the amount of remittances received (in logarithm).

However, two main concerns arise in the Probit estimation: selection and endogeneity.

(a) *Selection bias*

The decision of sending children to a private or public school is only observed for those children who are enrolled in the primary or secondary school which poses a potential selection bias problem. The existence of unobservable characteristics that sway the decision to send children to school also may sway the decision to send children to a private school.

Table 1. *Descriptive statistics*

	Pooled Data (2007–10)					Remittance households	Non-remittance households	Test of means[a]
	Obs	Mean	Std. Dev.	Min	Max	Mean	Mean	
Dependent variable								
Child attending private school (=1)	2194	0.191	0.394	0	1	0.564	0.176	−8.5681***
Independent variables								
Household characteristics								
Log of international remittances received	2213	0.325	1.673	0	10.726	8.759	0.000	
Number of parents present	2236	1.833	0.379	0	2	1.524	1.853	7.9429***
Index for household assets	2236	0.384	1.418	−2.038	5.114	1.853	0.331	−9.7395***
Number of children	2236	3.214	1.665	0	12	3.159	3.235	0.4068
Child characteristics								
Sex (1 = male)	2236	0.526	0.499	0	1	0.427	0.531	1.8578*
Only child (=1)	2236	0.087	0.282	0	1	0.146	0.079	−2.1737*
Age	2236	11.184	3.824	3	21	11.780	11.165	−1.4314
Age squared	2236	139.702	88.433	9	441	154.195	139.207	−1.5087
Years of education	2235	4.940	3.481	0	15	5.915	4.903	−2.5896***
Head of household characteristics								
Sex (1 = male)	2236	0.877	0.329	0	1	0.744	0.890	4.0513***
Years of education for head of household	2236	8.720	4.537	0	18	10.756	8.658	−4.1310***
Age for head of household	2236	42.947	11.046	0	84	50.634	42.670	−6.4740***
Age squared for head of household	2236	1966.378	956.562	0	7056	2852.976	1933.565	−8.6997***
Head of household has a job (=1)	2235	0.923	0.267	0	1	0.707	0.932	7.5161***

[a] *z*-test for dichotomous variables and *t*-test for continuous variables.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

However, since education in Peru is compulsory, almost 100% of the children are observed for the econometric analysis of quality of education. Based on the ENAHO, only 1.8% of the pooled data does not attend school for the period 2007–10.

(b) *Endogeneity bias*

The endogenous relationship between international remittances received and schooling decisions may be explained by two reasons. First, there exists a reverse causality between educational investment and remittances. An individual may decide to migrate and send remittances because he or she has school-age children, and in turn remittances affect educational investment by loosening liquidity constraints. And, second, there exist unobserved characteristics included in the error terms that may be correlated with both the decision to send remittances and the decision to send children to a private school; for instance, individual attitudes such as ambition may sway the decision to send children to schools with a better quality (i.e., private schools) and the decision to migrate for sending remittances. To address the endogeneity problem, I use two different approaches: a Pooled Probit with instrumental variables (IV), and the Vella and Verbeek (1999) correction for censored endogenous variables.

(c) *Pooled Probit with IV*

The IV approach requires a two-stage procedure. In the first-stage, I estimate the endogenous variable remittances as follows:

$$R^*_{it} = \lambda_0 + x_{it}\lambda_1 + IV_{it}\lambda_2 + \upsilon_{it} \quad (2)$$

where R^*_{it} denotes remittances received that is partly unobservable as remittances: $R_{it} = R^*_{it}$ if $R^*_{it} > 0$ and zero otherwise. x_{it} is the vector of exogenous variables including child, household, and head of household characteristics. IV_{it} represents the instrumental variable, and the *F*-stat test is employed (rule of thumb: $F > 10$) to evaluate the significance of the instrument. Eqn. (2) is estimated using a pooled Tobit since remittances are left-censored. Households that receive remittances record a positive amount since it is not possible to send a negative amount of money; whereas households that do not receive remittances record zero.

The *identification strategy* is based on the literature, and the historical department-level migration rate is used as an instrument for remittances shocks (Borraz, 2005; Hu, 2012; McKenzie & Rapoport, 2010; Nguyen & Purnamasari, 2011). The historical migration rate refers to the percentage of permanent out-migrants by departments who have left Peru and have not returned to Peru during the period 1995–2005. The identification assumption is that the historical migration rate at department level determines current migration behavior which is a good indicator for receiving remittances but the historical migration rate at the department level does not affect current schooling-decision at the household level. The Tobit estimation of remittances shows (see Table 6, model 2) that the IV 'Historical rate of department migration' is significant at a 1% level with an *F*-stat of 32.67.

In the second stage, a Pooled Probit model is used to estimate the educational equation as follows:

$$y^*_{it} = \beta_0 + x_{it}\beta_1 + \hat{R}_{it}\beta_2 + \varepsilon_{it} \quad (i = 1, \ldots, N) \text{ and } (t = 1, \ldots, T) \quad (1.2)$$

$$y_{it} = \begin{cases} 1 & \text{if } y^*_{it} = 1 \\ 0 & \text{otherwise} \end{cases}$$

where R_{it} denotes the fitted values for remittances calculated in the first stage.

(d) *Vella & Verbeek correction*

The second approach to correct for endogeneity follows Vella and Verbeek (1999) who suggest estimating the educational equation by a two-step panel data model for a censored endogenous variable. Unlike other panel data estimators, Vella & Verbeek's methodology proposes to separate time-invariant individual effects from the individual time effects, and captures the state dependence producing endogeneity.

Consider the following primary equation to estimate educational decisions that observes N children $(i = 1, \ldots, N)$ through T consecutive time periods $(t = 1, \ldots, T)$:

$$y^*_{it} = \beta_0 + x_{it}\beta_1 + R_{it}\beta_2 + \mu_i + \eta_{it} \tag{1.3}$$

where y^*_{it} is unobservable but $y_{it} = 1$ if $y^*_{it} > 0$, i.e., children attend private school; and zero otherwise, i.e., children attend public school. x_{it} is the vector of exogenous variables, and R_{it} represents the endogenous remittances variable that is left censored.

The endogenous remittances variable is estimated using Random-Effects Tobit:

$$R^*_{it} = \lambda_0 + x_{it}\lambda_1 + R_{it-1}\lambda_2 + NB_{it}\lambda_3 + \alpha_i + \upsilon_{it} \tag{2.2}$$

x_{it} is the vector of independent exogenous variables specified in Eqn. (1.3), NB_{it} is the number of household members, and R_{it-1} is the lagged remittances that controls for dynamics and state dependence. Thus, the state dependence producing endogeneity is not captured by the error terms. R_{it-1} and NB_{it} are the exclusion restrictions needed to estimate Eqn. (2.2), and they are not included in the educational equation. R_{it-1} is excluded under the assumption that its effect on school investment operates only through its current values since school decisions depend on the current liquidity constraints (assuming no savings). NB_{it} is excluded on the basis that the higher number of members in the household will pose a higher requirement of remittances and although it may pose a restriction on the education quantity, it will not sway the quality schooling decision.

However, the lagged value of remittances included in Eqn. (2.2) as an explanatory variable cannot be assumed truly exogenous due to the presence of individual effects α_i. Vella and Verbeek (1999) propose to follow Heckman (1981) and include pre-sample information of all the exogenous variables (x_{it}) as instrumental variables to estimate the lagged value of remittances. The lack of data prior to 2007 makes it necessary to use a different approach but following in a similar vein. Based on the literature, the historical rate of department migration is considered as instrumental variable (IV_{it}) for lagged values of remittances. The results in Table 6 (model 4) show that historical migration is significant at a 1% level which suggests that it is a strong determinant for lagged values of remittances. Additionally, lagged values of independent exogenous variables (x_{it-1}) are included to estimate the lagged remittances using Random-Effects Tobit:

$$R_{it-1} = \gamma_0 + x_{it-1}\gamma_1 + IV_{it}\gamma_2 + NB_{it}\gamma_3 + \omega_{it-1}, \tag{2.3}$$

and the fitted values are used to estimate Eqn. (2.2).

The errors in Eqns. (1.3) and (2.2) comprise random invariant individual effects, μ_i and α_i, and random individual specific time effects, η_{it} and υ_{it} which are assumed to be independent across individuals. The errors are defined as follow: $\varepsilon_{it} = \mu_i + \eta_{it}$; $u_{it} = \alpha_i + \upsilon_{it}$; $\bar{u}_i = T^{-1}\sum_t^T u_{it}$, and $E\{\varepsilon_{it} \mid \mathrm{x_{it}}, u_{it}\} = \tau_1 u_{it} + \tau_2 \bar{u}_i$ is assumed to allow for heteroskedasticity and autocorrelation in η_{it}. To correct for endogeneity, u_{it} and $\bar{u}_i$ (calculated from Eqn. (2.2)) are included as additional explanatory variables in the educational equation with coefficients τ_1 and τ_2 to obtain consistent estimators. The endogeneity test is the joint significance of τ_1 and τ_2; $\tau_1 = \tau_2 = 0$ indicates that there is no endogeneity. The term $\bar{u}_i$ indicates the time-invariant unobserved individual effects, and u_{it} indicates the time-varying effects.

The results in Table 2, under the assumption of exogenous lagged remittances (model 3) and endogenous lagged remittances (model 4), show that only $\bar{u}_i$ is statistically significant, and its negative effect suggests that the time-invariant unobserved individual effects make it less likely to send children to a private school as remittances increase. For instance, if $\bar{u}_i$ reflects the unmeasured productivity of a family business, this will increase remittances and decrease the probability of sending children to a private school. On the other hand, u_{it} is not significant which suggests that the time-varying effects generating the simultaneity between school decisions and remittances do not affect the school investment decision. However, according to the Wald test, the null hypothesis of no endogeneity $(\tau_1 = \tau_2 = 0)$ is rejected for both models with a statistic of 14.21 (prob > chi2 = 0.0008) and 19.44 (prob > chi2 = 0.0001), respectively. This suggests that correcting for endogeneity is the best approach to estimate the educational equation.

The second-step educational equation is estimated using a Random-Effects Probit as follows:

$$y^*_{it} = \beta_0 + x_{it}\beta_1 + R_{it}\beta_2 + \tau_1 u_{it} + \tau_2 \bar{u}_i + \varepsilon_{it} \tag{1.4}$$

where u_{it} and $\bar{u}_i$ correct for endogeneity.

6. RESULTS

In this section, four sets of regression results according to the estimation strategy are reported over the full sample to estimate the dependent variable (see Table 2). The first column shows the Random-Effects Probit model considering remittances as exogenous. The second column is the Pooled-Probit with IV to correct for the endogeneity problem caused by remittances. The third and fourth columns report the results from the Vella and Verbeek (1999) correction. The third column assumes that lagged remittances are exogenous whereas the fourth column accounts for the endogeneity of the lagged remittances.

First, the impact of remittances on quality of education estimated by means of Random-Effects Probit without controlling for endogeneity as the reference model is discussed. The associated marginal effect of log of remittances received (Table 2, column 1) shows that remittances are significant at a 1% level but with a small effect on the quality of education. A unit increase in the log of remittances received will increase the probability of sending children to a private school by 0.7 percentage points whereas the number of parents present does not have a significant effect. This result suggests that remittances have a positive impact on education decisions in spite of the absenteeism of parents measured by the number of parents present in the household.

The second column of Table 2 shows the Pooled Probit with IV to correct for endogenoeity. The results are similar to those estimated by Random-Effects Probit. The log of remittances received remains significant at a 1% level but with a smaller effect. A unit increase in the log of remittances will increase by 0.6 percentage points the probability to attend a private school. In this model, however, the number of children

Table 2. *Marginal effects for the educational investment equation*

Method	Random effect probit	Pooled Probit	Random effect probit	Random effect probit
Vella & Verbeek (1999) correction	No	No	Yes	Yes
Remittances	Exogenous	First-stage/Endogenous	Dynamic	Dynamic
Lagged values of remittances	Not included	Not included	Exogenous	Endogenous
Instrumental variable		Historical rate of migration		Historical rate of migration
Dep. Var.:Child attending private school (=1)	(1)	(2) [a]	(3)	(4)
Household characteristics				
Log of international remittances received	0.007***	0.006***	0.018**	0.007*
	(2.63)	(3.58)	(2.32)	(1.76)
Number of parents present	−0.003	−0.012	0.072	−0.009
	(−0.14)	(−0.44)	(1.17)	(−0.29)
Index for household assets	0.036***	0.057***	−0.002	0.023***
	(5.51)	(7.96)	(−0.11)	(2.97)
Number of children	−0.009	−0.034***	−0.037***	−0.023***
	(−1.40)	(−5.14)	(−2.93)	(−2.72)
Child characteristics				
Sex (1 = male)	−0.002	0.020	0.041	0.013
	(−0.13)	(1.29)	(1.56)	(0.73)
Only child (=1)	0.067**	0.004	−0.061	−0.000
	(2.48)	(0.16)	(−1.11)	(−0.00)
Age	−0.022**	−0.033***	−0.024*	−0.031**
	(−2.37)	(−3.39)	(−1.79)	(−2.46)
Age squared	0.001**	0.002***	0.002***	0.001***
	(2.57)	(4.36)	(3.46)	(3.08)
Years of education	0.008	−0.002	−0.012	0.004
	(1.05)	(−0.21)	(−0.88)	(0.44)
Head of household characteristics				
Sex (1 = male)	0.039	0.052*	0.102**	0.079**
	(1.37)	(1.91)	(2.32)	(2.04)
Years of education for head of household	0.009***	0.006***	−0.003	0.006*
	(3.76)	(2.58)	(−0.42)	(1.73)
Age for head of household	−0.007***	−0.003	−0.000	−0.001
	(−3.29)	(−1.00)	(−0.05)	(−0.16)
Age squared for head of household	0.000***	0.000	−0.000	−0.000
	(2.79)	(0.71)	(−0.50)	(−0.01)
Head of household has a job (=1)	−0.012	0.034	0.086*	0.029
	(−0.65)	(1.16)	(1.80)	(0.98)
u_{it}			−0.010	0.000
			(−1.53)	(0.01)
$\bar{u}_i$			−0.007***	−0.009***
			(−3.39)	(−3.73)
Observations	2,171	2,171	1,616	1,615
Number of groups	554		550	550

z-Statistics in parentheses.
[a] Predicted remittances from the first-stage are included as predictor in the independent variables set.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

becomes significant with a negative effect whereas being the only child is not longer significant. Additionally, the sex of the head of household becomes significant in this model but the age of the head of household is no longer significant.

The last two models presented in Table 2 use a Vella and Verbeek (1999) correction. The results from these models are similar in their significance, although the variables: index for household assets, years of education, and job status of the head of household are not significant when lagged of remittances are assumed exogenous (column 3). The results show that the impact of remittances is overestimated under the assumption of no endogeneity. Receiving remittances will increase the probability of sending children to private schools by 1.8 percentage points when no endogeneity is assumed (column 3), and by 0.7 percentage points under the assumption of endogeneity.

The Wald test indicates that there exists an endogeneity problem; hence the best approach is to follow a Vella and Verbeek (1999) correction for censored endogenous variables such as remittances. The results are presented in Table 2, column 4 and explained below.

The results show that wealthier households measured as 'index for household assets" are more likely to send children to a private school. Children living in households with a higher

Table 3. *Marginal effects for migrant households comparing with previous models*

Method	Pooled Probit	Random effect probit	Pooled Probit
Vella & Verbeek (1999) correction	No	Yes	No
Remittances equation	First-stage	Dynamic	First-stage
Lagged values of remittances	Not included	Endogenous	Not included
Instrumental variable	Historical rate of migration	Historical rate of migration	Historical rate of migration
Dep. Var.: Child attending private school (=1)	(1)	(2)	(3)
Household characteristics			
Migrant household			0.394***
			(2.94)
Log of international remittances received	0.006***	0.007*	
	(3.58)	(1.76)	
Number of parents present	−0.012	−0.009	
	(−0.44)	(−0.29)	
Index for household assets	0.057***	0.023***	0.067***
	(7.96)	(2.97)	(12.30)
Number of children	−0.034***	−0.023***	−0.028***
	(−5.14)	(−2.72)	(−4.25)
Child characteristics			
Sex (1 = male)	0.020	0.013	0.011
	(1.29)	(0.73)	(0.78)
Only child (=1)	0.004	−0.000	0.016
	(0.16)	(−0.00)	(0.63)
Age	−0.033***	−0.031**	−0.040***
	(−3.39)	(−2.46)	(−4.11)
Age squared	0.002***	0.001***	0.002***
	(4.36)	(3.08)	(4.10)
Years of education	−0.002	0.004	0.009
	(−0.21)	(0.44)	(1.08)
Head of household characteristics			
Sex (1 = male)	0.052*	0.079**	0.043
	(1.91)	(2.04)	(1.43)
Years of education for head of household	0.006***	0.006*	0.010***
	(2.58)	(1.73)	(4.59)
Age for head of household	−0.003	−0.001	−0.005**
	(−1.00)	(−0.16)	(−2.07)
Age squared for head of household	0.000	−0.000	0.000*
	(0.71)	(−0.01)	(1.83)
Head of household has a job (=1)	0.034	0.029	0.022
	(1.16)	(0.98)	(0.74)
Observations	2,171	1,615	2,193

z-statistics in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

index of assets are more likely to attend a private school by 2.3 percentage points since wealthier households face less liquidity constraints. On the other hand, the greater number of children in the household will decrease the likelihood to attend a private school by 2.3 percentage points since more children pose a competition for the family financial resources. Meanwhile, children's age has a non-linear impact on attending to a private school. Age has a negative effect and age squared has a positive effect which reflects the greater investment in secondary school-age children. This may be explained by the fact that the entrance examination to the university in Peru that is based on the secondary education; thus parents would decide to acquire a higher quality of education for their older children attending secondary school.

Finally, only two head of household variables have a significant effect on the schooling decision. Children with a male head of household are more likely to attend a private school by 7.9 percentage points whereas the positive effect of a head's education is only 0.6 percentage points. As stated in the theoretical section, more educated parents will invest more in his children's education through private education.

In sum, the international remittances' effect on educational investment is similar regardless of the model employed but the magnitude varies: the Vella & Verbeek correction considering lagged remittances as exogenous estimates the larger effect and the smaller effect is estimated by the Pooled Probit. The difference in the magnitude responds to the different estimation methodologies undertaken. These results suggest that receiving a higher amount of remittances increases the probability of children attending private schools whether or not the endogeneity of remittances is controlled for. Furthermore, remittances remain significant regardless of the number of parents living in the household (which does not have a significant effect).

Table 4. *Remittances equations and marginal effects for education investment controlling for Lima using Vella & Verbeek correction*

Method	Random Effect Tobit	Random Effect Tobit	Random effect probit/Marginal effects
Lagged values of remittances	First-stage	Endogenous	–
Instrumental variable	Historical rate of migration	–	–
Dependent variable:	Lagged remittances[a]	Remittances[b]	Attending private school
Household characteristics			
Log of international remittances received		0.253	0.012*
		(1.27)	(1.92)
Number of parents present	−4.576	−6.260*	0.013
	(−1.52)	(−1.89)	(0.31)
Index for household assets	2.452***	1.568*	0.019*
	(3.24)	(1.90)	(1.69)
Number of children	1.149	1.112	−0.032**
	(0.85)	(0.81)	(−2.53)
Number of household members	0.612	0.489	
	(0.57)	(0.42)	
Child characteristics			
Sex (1 = male)	−3.363	−1.596	0.020
	(−1.49)	(−0.69)	(0.96)
Only child (=1)	6.903*	7.852*	−0.036
	(1.74)	(1.88)	(−0.65)
Age	−1.307	−0.906	−0.027*
	(−0.81)	(−0.45)	(−1.93)
Age squared	0.037	0.001	0.001***
	(0.61)	(0.02)	(2.94)
Years of education	0.942	1.188	−0.000
	(0.77)	(0.86)	(−0.03)
Head of household characteristics			
Sex (1 = male)	−3.067	−4.374	0.092**
	(−0.89)	(−1.15)	(1.99)
Years of education for head of household	0.745**	0.697*	0.003
	(2.17)	(1.81)	(0.54)
Age for head of household	−0.943***	0.109	−0.001
	(−3.37)	(0.14)	(−0.19)
Age squared for head of household	0.012***	0.001	−0.000
	(3.59)	(0.15)	(−0.10)
Head of household has a job (=1)	−4.217*	−5.220*	0.053
	(−1.70)	(−1.87)	(1.35)
u_{it}			−0.005
			(−0.91)
$\bar{u}_i$			−0.006**
			(−2.47)
Historical rate of department migration	1.807**		
	(2.11)		
Lima (Capital of Peru)	−62.268*	7.761**	−0.061
	(−1.89)	(2.52)	(−1.11)
Constant	−17.133	−20.623	
	(−1.50)	(−0.89)	
F-stat	4.45		
Observations	1,658	1,645	1,615
Number of groups	559	555	550

z-statistics in parentheses.
[a] Lagged independent variables are included in the estimation.
[b] Predicted remittances from the first-stage are included as predictor in the independent variables set.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

An additional empirical model is estimated to capture the net effect of migration. [11] I estimate a Pooled Probit with IV to analyze the net effect of migration on the probability to attend private schools. The Vella and Verbeek (1999) is not used in this case since the endogenous variable is a dichotomous rather than a censored variable. To construct the variable 'migrant households', I use remittances since households receiving remittances have at least one migrant family member who sends money back; thus I identify the effect of migration rather than the effect of the amount of remittances.

The results presented in Table 3 show that the net effect of migration affects positively the decision to send children to a private school but this effect is overestimated when the remittances and migration effects are not included in the econometric analysis. Comparing the results with those from the previous models (Pooled Probit with IV and Vella & Verbeek), I found that the significance of most of the variables remain the same but the variables in the head of household group. The sex of the head of household is no longer significant whereas age and age squared of the head of household become significant. These results suggest that net migration is masking the effect of absent parents that is now captured by the variable age of the head of household. Migrant parents left their children under their grandparents' supervision, thus the age of the head of household may indicate if the head of household is the grandparent of the children. The non-linear relationship between age and schooling decision suggests that older heads of households may capture the effect of migrant parents with a negative effect for age but with a positive although negligible effect for age squared.

To test the sensitivity of the results for the preferred model (Column 4, Table 2), one additional model was estimated. A dichotomous variable for Lima (capital of Peru) is included in the independent variables set (see Table 4). Ten departments are included in the analysis; however, Lima receives 41.5% of the international remittances, and being the capital of a highly centralized country such as Peru, makes it more relevant to control for Lima than for department effects. The results remain similar with a significant and positive effect of remittances on the decision to send children to private schools and Lima does not have a significant effect.

7. CONCLUSIONS

This research has provided theoretical and empirical analyses of the effect of remittances controlling for absenteeism of parents on the human capital investments on children left behind. Using Peruvian data for the period 2007–10, this study shows that 'logarithm of international remittances received' has a statistically significant and positive effect on the human capital investment of children left behind. Unlike previous studies, this research evaluates the effect of international remittances on the probability of acquiring a higher quality of education by sending children to private schools.

Much of the literature has focused on the effects of either remittances or migration, and only a quantitative educational outcome has been considered in previous analysis. Migration in Peru, unlike other countries close to the main destination country (US), is undertaken mostly by relatively affluent people; hence the effect of migration and remittances should be evaluated not on quantity but quality of education. Furthermore, education coverage in Peru is at the same level as in developed countries but the quality remains at among the lowest places in international evaluations such as PISA.

The results suggest that families receiving remittances are more likely to send their children to private schools. Thus, unlike other studies for Peru, this research finds a positive and statistically significant effect of remittances on human capital which is not only an individual benefit but also a key factor for growth and development of the country. Although, international remittances have an important role on improving human capital, there is little room for policy interventions on private decisions made by receiving-remittances households. However, new financial instruments to reduce transaction costs of remittances can be created by governments and private firms such as the 'cell phone-based remittance service' implemented by Kenyan telecom provider (Yang, 2011). Evidence based on Salvadoran migrants in the US shows that reducing transaction fees increases the amount of remittances (Aycinena, Martinez, & Yang, 2010).

NOTES

1. PISA (2003) constructs a combined reading literacy scale based on student's performance with an average score of 500 points as level 5 which is the highest level (UMC, 2004).

2. See Acosta *et al.* (2007) and Frisancho and Oropesa (2011).

3. Own elaboration based on ENAHO.

4. Own elaboration based on ENAHO.

5. Own elaboration based on ENAHO.

6. In 2007, 2.8% of the children population between 6 and 14 years old participate in the labor market and contribute to the 21.7% of the household budget (INEI, 2009).

7. Dominion level refers to departments that are the second major territorial division in Peru (similar to states in the US).

8. Stratum level refers to rural-urban division within a department.

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APPENDIX A

Table 5. *Correlation matrix*

	Dep. Var	Household characteristics				Child characteristics					Head of household characteristics				
	Attending private school	Log of remittances	No. parents present	Index for hh assets	Number of children	Sex (1 = male)	Only child (=1)	Age	Age squared	Years of education	Sex (1 = male)	Years education head	Age for head of household	Age sq. for head of hh	Head of hh has a job
Dependent variable															
Child attending private school (=1)	1														
						Household characteristics									
Log of international remittances	0.1812	1													
Number of parents present	−0.0403	−0.1837	1												
Index for household assets	0.4873	0.1842	0.0283	1											
Number of children	−0.215	−0.0207	−0.001	−0.2071	1										
Child characteristics															
Sex (1 = male)	0.0057	−0.0479	0.0119	0.0109	−0.0642	1									
Only child (=1)	0.115	0.0526	−0.0552	0.0567	−0.4005	0.0234	1								
Age	0.0722	0.0292	−0.0347	0.0716	−0.0147	0.0028	−0.0266	1							
Age squared	0.0992	0.0315	−0.0319	0.0903	−0.0265	0.0008	−0.0113	0.9814	1						
Years of education	0.1168	0.0523	−0.0369	0.1377	−0.0845	−0.0236	−0.0113	0.9588	0.9513	1					
Head of household characteristics															
Sex (1 = male)	0.005	−0.0942	0.7248	0.0284	0.0104	0.0242	−0.0603	0.0003	0.0043	−0.0071	1				
Years of education forhead of hh	0.3174	0.0884	0.0744	0.492	−0.2598	−0.0187	0.0475	0.017	0.0347	0.1087	0.088	1			
Age for head of household	0.0782	0.1305	−0.0408	0.1643	0.1422	0.0333	−0.0069	0.2137	0.2103	0.1969	0.0336	0.0221	1		
Age squared for head of household	0.0927	0.1778	−0.0783	0.1742	0.137	0.0369	0.0066	0.1966	0.193	0.1822	0.0094	−0.0633	0.9548	1	
Head of household has a job (=1)	−0.046	−0.1758	0.1644	−0.0618	0.0177	−0.0095	−0.0398	0.0197	0.0244	0.0158	0.1793	0.0127	−0.1248	−0.208	1

Table 6. *First stage: Remittances equations used to calculate the correction terms and fitted values to include in the educational equation in Table 2*

Method	Pooled Tobit	Random Effect Tobit	Random Effect Tobit	Random Effect Tobit
Lagged remittances	Not included	Exogenous	First-stage	Endogenous
Instrumental variable	Historical rate of migration		Historical rate of migration	
Dep. Var.	Remittances	Remittances	Lagged remittances [a]	Remittances [b]
Model (related to Table 2)	(2)	(3)	(4)	
Household characteristics				
Lagged log of international remittances received		0.395		0.579***
		(0.63)		(3.13)
Number of parents present	−8.048***	−8.676**	−4.461	−6.189*
	(−4.12)	(−2.57)	(−1.48)	(−1.86)
Index for household assets	2.371***	2.667***	2.482***	1.461*
	(4.39)	(3.39)	(3.26)	(1.74)
Number of children	1.528***	0.777	0.885	0.650
	(3.32)	(0.57)	(0.67)	(0.47)
Number of household members		0.636	0.717	0.235
		(0.52)	(0.67)	(0.20)
Child characteristics				
Sex (1 = male)	−2.474	−3.032	−3.215	−1.138
	(−1.44)	(−1.37)	(−1.43)	(−0.49)
Only child (=1)	6.053**	6.653	6.093	5.024
	(2.26)	(1.62)	(1.55)	(1.26)
Age	−1.577	−0.747	−1.414	−0.398
	(−1.39)	(−0.38)	(−0.88)	(−0.20)
Age squared	0.003	−0.021	0.032	−0.023
	(0.07)	(−0.35)	(0.53)	(−0.37)
Years of education	1.965**	1.614	1.187	1.130
	(2.12)	(1.15)	(0.97)	(0.82)
Head of household characteristics				
Sex (1 = male)	−1.201	−3.581	−2.676	−2.203
	(−0.47)	(−0.94)	(−0.78)	(−0.60)
Years of education for head of household	0.703***	0.838**	0.727**	0.388
	(2.63)	(2.18)	(2.13)	(1.06)
Age for head of household	−0.733***	−0.158	−0.917***	0.417
	(−3.36)	(−0.20)	(−3.31)	(0.52)
Age squared for head of household	0.010***	0.005	0.012***	−0.003
	(4.30)	(0.62)	(3.55)	(−0.41)
Head of household has a job (=1)	−5.899**	−5.672*	−4.446*	−5.462*
	(−2.45)	(−1.93)	(−1.79)	(−1.92)
Historical rate of department migration	0.240***		0.209***	
	(5.72)		(3.09)	
Constant	−5.431	−18.628	−10.755	−12.070
	(−0.68)	(−0.82)	(−1.02)	(−0.52)
F-stat	32.67		9.54	
Observations	2,212	1,646	1,658	1,645
Number of groups		555	559	555

z-statistics in parentheses.
[a] Lagged independent variables are included in the estimation.
[b] Predicted remittances from the first-stage are included as predictor in the independent variables set.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.