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Remittances and child labor in Bolivia

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Abstract

This article explores the effect of remittances on the prevalence and intensity of child labor in Bolivia. Using household survey data, we find that children in remittance-receiving households are less likely to be actively supplying labor, and the number of hours worked per week declines with the size of remittances received. The size of the impact varies between urban and rural households. Remittances to urban households have a larger impact on moving children completely out of the labor force, but a smaller increase in remittance size is needed for an equal reduction in number of hours worked in rural areas.

JEL codes: F24, O15, E26

Keywords: Remittances, Migration, Child labor, Bolivia

1 Introduction

Remittances to Bolivia have grown from US$7.4 million in 1995 to US$1.2 billion in 2013 (World Bank 2015). This tremendous growth has led to remittances being an increasingly important part of the Bolivian economy. Personal remittances to Bolivia have totaled as much as the equivalent of 8.04 % of GDP (see Fig. 1). Despite the sizable role remittances are now playing in the Bolivian economy, surprisingly little research has looked at the impacts remittances are having in that country. The few studies that do exist have found evidence that some Bolivian households are effectively using remittances as part of an income diversification strategy to overcome insurance and capital market imperfections (Alcala et al. 2014) and that remittances are helping to reduce poverty in urban areas (Lopez-Videla and Machuca 2014). The present study adds to the small, but important, body of research related to Bolivian remittances by exploring the relationship between remittance receipt and the use of child labor in Bolivia. While the relationship between remittances and child labor has been studied for other countries (see below), this relationship is of particular importance in the Bolivian context, since in July of 2014 lawmakers took the unprecedented step of lowering the legal working age in Bolivia from the minimum age of 14 established by international labor conventions to 12 years old for formal contracted employment and 10 years old for self-employment (Watson 2014). Ostensibly, the government argued that since they were essentially powerless to prevent the need for child labor among impoverished households, the change in the law was necessary in order to afford legal protections to children who would have been working anyway. However, it is possible that the Bolivian government has yet to exhaust all of its available resources. This study explores the relationship between remittances and child labor, and the potential

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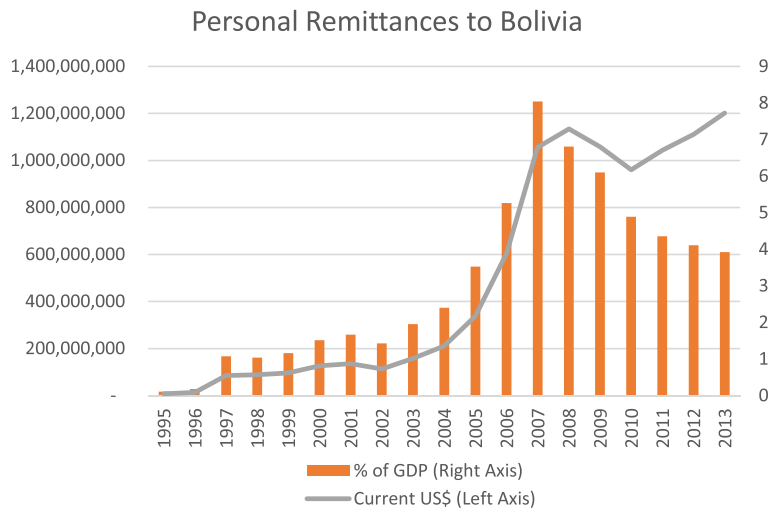


Fig. 1 Remittances to Bolivia 1995–2013. Data Source: World Bank, World Development Indicators 2015

for utilizing remittance income to reduce the prevalence and intensity of child labor. The results presented below suggest that the government may have given up too soon and that remittances might prove to be an effective tool in the fight against child labor in Bolivia.

2 Background

Bolivia experienced a dramatic increase in out-migration during the 1980s, coinciding with the period of hyperinflation that occurred from 1984–1985. Between 1980 and 1990, the number of Bolivians living abroad grew by 36 % (see Table 1). A stagnant economy in the 1990s only saw the rate of emigration grow. Between 1990 and 2000, the number of Bolivians living abroad grew by 60 %, then nearly doubled again in the following decade. By 2010 nearly 700,000 Bolivian citizens, 6.9 % of the population, were living outside of the country (World Bank 2011, 2015). Along with the growth in migration came an even larger growth in remittance transfers. Between 1995 and 2013, annual remittance flows grew by approximately 16,000 %, giving Bolivia one of the fastest remittance growth rates in the world. Remittance flows grew fastest in the 5 years leading up to the Great Recession in 2008 (see Fig. 1). Although they declined in the 2 years following the global financial crisis, by 2013 they were back above their pre-recession level.

The period corresponding to the Great Recession also saw a dramatic decline in children's schooling in Bolivia. This trend, however, did not bounce back to pre-crisis levels. Between 2006 and 2013, the number of out-of-school children increased from 40,640 to 169,291. Net primary school enrollments fell from 95.57 % to 87.73 %

Table 1 Bolivian population living abroad

Year	1960	1970	1980	1990	2000	2010
Emigrant population	120,536	139,100	166,734	226,404	361,475	684,998
Growth rate (%)	–	15.4	19.9	35.8	59.7	89.5
Share of population (%)	3.3	3.1	3.0	3.3	4.3	6.9

Source: Author's calculations using data from Global Bilateral Migration Database (World Bank 2011) and World Development Indicators (World Bank 2015)

(UNESCO 2015). While this drop is itself substantial, it is likely that certain groups within the country were affected disproportionately. Despite a 1994 Educational Reform Law that proclaimed the government was duty-bound to offer free universal education and provide education to indigenous populations in their native languages, disparities in educational attainment still persist between rich and poor, and Spanish and indigenous-language speakers (ILO-IPEC 2012, Reimáo and Taş 2015). Furthermore, net enrollment rates are not necessarily reflective of the true state of education, as they do not account for children who are enrolled in school, but may not attend regularly, or the quality of the education they receive. Many children enrolled in school opt not to go because they must travel large distances, and those who do go to school often arrive to find schools with inadequate supplies (ILO-IPEC 2012).

Although complete data are unavailable for the corresponding period, it is likely that the change in school attendance during this time is correlated with an increase in child labor activity. While the vast majority of Bolivian children are enrolled in school, most of them also split their time between school and work. Despite ratifying several International Labor Organization conventions on child labor, many children in Bolivia are engaged in some form of economic activity. A 2012 report on child labor and education in Bolivia, which analyzed data from the 2008 Survey of Child Labor (Encuesta de Trabajo Infantil), found that only 14.8 % of children aged 6–13 reported school attendance as their only activity. Most children reported some combination of schooling and work, either paid or unpaid, with 1.3 % reporting devoting time to both school and paid work, 61.5 % reporting going to school and contributing unpaid household labor, and 20.9 % reporting a combination of the three (ILO-IPEC 2012). This rate of labor participation is largely unchanged from its 2001 levels (Zapata et al. 2011). Much like educational access, child labor activity is also disproportionately distributed among certain groups. Older children are more likely to work than younger children, indigenous children are more likely to work than non-indigenous children, and children in rural households are more likely to work than children in urban households (ILO-IPEC/INE 2010).

While many countries saw their economies shrink during the Great Recession, Bolivia did not slip into a recession itself, although its growth rate did decline somewhat (World Bank 2015), so changes in the local economy are unlikely to explain any observed changes in school attendance and child labor activity. But Bolivia did see a decline in remittance income. Given remittances' important role in the Bolivian economy, it is possible that the decline in remittance flows that occurred during this period contributed to an increase in child labor and, therefore, indirectly to a decline in school enrollment. This relationship will ultimately depend on how individual households are affected by remittances, and whether remittances contribute to a reduction in child labor. This study explores the relationship between remittances and child labor at the household level to determine the extent to which changes in remittance income contribute to changes in child labor.

Several recent studies have examined the ability of remittances to reduce child labor. To the extent that child labor is largely driven by extreme poverty (Basu and Van 1998), it follows that if remittances can help lift households above some minimum income threshold, then they should help to alleviate the need for children to work. Furthermore, Epstein and Kahana (2008) propose that out-migration of working-aged adults can serve to raise wages in the home country, vis-à-vis a decrease in the supply

of labor, thus reducing the need for child labor by increasing non-remittance income as well. Additionally, remittances can mitigate financial shocks which might otherwise require children to enter the workforce (Beegle et al. 2003).

In general, the existing empirical literature supports the argument that remittances reduce the supply of child labor. In a cross-country study of 82 countries, Ebeke (2010) finds significant evidence that an increase in remittances as a share of GDP is associated with a reduction of the share of the 10–14-year-old population actively engaged in work. His study also finds that remittances have a stronger effect on the reduction of child labor in countries where credit constraints are higher and GDP growth more volatile, indicating that remittances help insure against negative income shocks that can contribute to the need for children to help supplement household income. Several country-level studies also find evidence that remittances can reduce the need for child labor. Acosta (2011) finds that remittance receipt significantly reduces the likelihood that children will engage in paid labor in El Salvador. Alcaraz et al. (2012) find a significant increase in the prevalence of child labor in Mexico following the decline in remittances resulting from the 2008 US financial crisis. Dimova et al. (2015) find evidence that migrant transfers reduce the supply of child labor in Tanzania. The underlying assumption in all of these studies is that remittances help reduce liquidity constraints and increase household income sufficiently to reduce the need for child labor.

Not all studies find uniformly positive results, however. For example, while Acosta (2011) does find that remittances are associated with a decrease in wage labor, he also finds that remittances tend to increase the prevalence of domestic labor, suggesting that remittances simply lead to a reallocation of child labor from paid to unpaid work. Similarly, in the case of El Salvador, Calero et al. (2009) find that remittances only reduce the incidence of paid child labor among rural and non-poor households and that remittances increase the incidence of domestic labor in urban households. These studies suggest that while increased income vis-à-vis remittances may benefit the household, disruption caused by the loss of a working-aged household member to migration may have negative impacts on the children left behind. Other studies have found similar effects with respect to investment in children's human capital. Bansak and Chezum (2009) examine the effects of migration and remittances on children's schooling in Nepal. Their findings indicate that an increase in net remittance income increases the probability that young children are in school. However, they also find that increasing the number of absentee adults significantly reduces the probability of being in school for children of all ages. Similarly, Amuedo-Dorantes et al. (2008) examine the differing effects of remittances when they are received by an immediate member of the household versus when they are received by extended family or friends. They find that in certain Haitian communities, remittances only have a positive effect on children's schooling when they are received from extended family or friends, rather than household members who have migrated. That is, the disruption caused by losing a household member to out-migration diminishes any benefits gained from receiving remittances.

In addition to contributing to the body of research specific to Bolivia, this study also contributes to the broader literature pertaining to remittances and child labor. With the exception of Dimova et al. (2015), all of the empirical studies mentioned above measure the effects of remittances on child labor at the extensive margins, i.e., whether a child works or not. While this is indeed an important point, it may underestimate the

full impact of remittances. For instance, if we wish to curtail child labor so that children may attend school, then a significant reduction in the number of hours worked may have a larger impact than moving a child at the margins completely out of the labor force. Thus, it is important to look beyond the incidence of child labor and examine remittance income's effect on the intensity of child labor as well. Similarly, Acosta (2011) and Alcaraz et al. (2012) both estimate their models with binary indicators for remittance receipt. This, too, may be misrepresenting the true impact of remittances, as remittance size can vary widely across households. Furthermore, from a policy standpoint, it is important to differentiate between the potential impacts of increasing the share of households receiving remittances (i.e., encouraging more migration) and adopting policies to increase the flows of remittances to households that already have a member abroad. This study addresses these issues by analyzing the relationship between the size of remittance income and the number of hours worked by children in the household, in addition to the relationship between remittance receipt and the prevalence of child labor.

3 Theoretical framework

The theoretical framework for this analysis builds off of the model proposed by Basu and Van (1998), extended to include remittance income in the household budget constraint. Parents maximize utility with respect to consumption and their children's leisure. Children's leisure is considered a luxury good, and only enters the parent's utility function once some minimum subsistence level has been achieved. The parent's preferences are expressed by the Stone-Geary utility function

$$u(c,e) = \begin{cases} (c-s)(1-e) & if \quad c \geq s \\ c-s & if \quad c < s \end{cases} \tag{1}$$

where c is the parent's consumption, e is each child's labor effort level, and $e \in [0, 1]$. The minimum subsistence level, s, is a parameter.

The household's budget constraint is

$$nc + m\beta c = mew_c + nw_a + r \tag{2}$$

where $n(\geq 1)$ is the number of adults in the household, $m(\geq 1)$ is the number of children in the household, each child consumes $\beta(< 1)$ share of what an adult consumes, w_a and w_c are the wages[1] paid to adults and children, respectively, and r is the remittance income.

Solving this model for the case where $c \geq s$ gives the optimal allocation of children's effort as

$$e*(w_a, w_c, m, n, r) = \begin{cases} 0 & if \quad s(n+m\beta) + mw_c \leq nw_a + r \\ 1 & if \quad s(n+m\beta) - mw_c \geq nw_a + r \\ \dfrac{s(n+m\beta) + mw_c - nw_a - r}{2mw_c} & \text{otherwise.} \end{cases} \tag{3}$$

For the case of the interior solution, comparative statics are given by Eqs. 4 through 8 below.

$$\frac{\partial e*}{\partial w_a} = \frac{-n}{2mw_c} \tag{4}$$

$$\frac{\partial e*}{\partial r} = \frac{-1}{2mw_c} \tag{5}$$

$$\frac{\partial e*}{\partial n} = \frac{(s - w_a)}{2mw_c} \tag{6}$$

$$\frac{\partial e*}{\partial m} = \frac{nw_a + r - ns}{2w_c m^2} \tag{7}$$

$$\frac{\partial e*}{\partial w_c} = \frac{n(w_a - s) + r - sm\beta}{2mw_c^2} \tag{8}$$

Equations 4 and 5 show child labor decreases with an increase in adult wages and remittance income. However, remittance receipt is more complex than just a change in non-labor household income, since migration necessarily requires removing at least one member from the household to go abroad, i.e., a decrease in n. Equation 6 gives the change in optimal child labor effort with respect to the number of adults in the household. This implies that when the adult wage is less than the minimum subsistence level, migration will lead to a decrease in child labor and when the adult wage is greater than the minimum subsistence level migration leads to an increase in child labor, before accounting for any change in remittance income. Combining this with the fact that child effort is decreasing in r means that in the case where adult wages are less than the subsistence level of consumption, migration and remittances unambiguously reduce child effort. Furthermore, a large enough increase in remittance income that leads to the case where $s(n + m\beta) + mw_c \leq mw_a + nw_a + r$ yields the corner solution of $e = 0$, thereby moving a child completely out of the labor market. On the other hand, when adult wages are greater than the subsistence level of consumption, migration and remittances reduce child effort only if $r > (w_a - s)$. That is, if remittances are insufficiently small, such that they do not offset the loss of the adult wage due to migration, then migration can increase child labor. Intuitively, we would expect that a rational, utility maximizing household would not send a member abroad in this case unless they expected remittance income to offset the loss of domestic income. However, since the realized income may differ from the expected income, it is possible that migration may indeed lead to an increase in child labor effort. Thus, ex ante it is uncertain whether remittances will reduce child labor on average.

Equation 7 gives the change in child labor effort with respect to an increase in the number of children. Child labor is increasing in the number of children when $sn < nw_a + r$. That is, in households where the adult income exceeds subsistence, increasing the number of children increases child labor effort. While this may seem counterintuitive at first glance, recall from Eq. 3, if $sn + sm\beta + wm_c \leq nw_a + r$, then we reach the corner solution where $e = 0$. As such, the result form Eq. 7 only holds if $sn < nw_a + r < sn + sm\beta + mw_c$. This would imply that although more children might necessitate an increase in child labor, this need can be offset by an increase in income. Therefore, we can potentially expect to see both child labor and remittances increase with respect to the number of children in the household.

Finally, Eq. 8 indicates that there are both income and substitution effects determining the child labor supply. When total child subsistence, $sm\beta$, exceeds adult surplus income, $(w_a - s)n + r$, child labor is decreasing with an increase in the child wage. Thus, when less

labor is needed to meet the subsistence need, less labor is supplied. However, when adult surplus income exceeds the child subsistence level, child labor is increasing in child wages. Thus, children can be enticed back into the workforce by increasing the wage. However, this result also only holds for the special case where $sn + sm\beta < nw_a + r < sn + smb + mw_c$, otherwise we reach the corner solution of no child labor effort.

4 Empirical strategy

This study addresses two general empirical questions. First, are children in households that receive remittances more or less likely to work? Second, how does the size of the remittances received by the households affect the number of hours worked by children? The first question is addressed by estimating the effects of remittance receipt on child labor at the extensive margins. That is, remittance receipt and labor supply are measured using indicator variables equal to one if the household receives any positive amount of remittance income and if the child worked at least 1 h in any labor activity. This approach is consistent with the previous literature which investigates how remittance receipt influences the propensity for children to work. To address the second question, the effects are then estimated at the intensive margins, replacing the indicator variables used in the first model with measures of the total number of hours a child works and the amount of remittance income the household receives, both measured on a weekly basis. Both models are estimated first on the entire sample. The models are also estimated separately for urban and rural households, as well as for male and female children in order to explore any potential heterogeneity between these groups.

In both models, endogeneity is likely to lead to biased results. If the decision to migrate and send remittances is part of a household's income diversification strategy, then many of the factors contributing to this decision (both observed and unobserved) will also influence the decision over whether and how much children in the household will work, leading to problems with simultaneity bias. To control for potential endogeneity issues, the models are estimated using an instrumental variables (IV) strategy. Given the nature of the model, finding an instrument that affects the size of remittances being sent without directly affecting the number of hours worked by children in the household can be challenging. The instrument chosen to predict the incidence and size of remittances received by the household is the existence of migration networks, which is an instrument commonly employed in the migration and remittance literature (Alcala et al. 2014, Acosta et al. 2008, Acosta 2011, Calero et al. 2009). In particular, the share of households receiving remittances in the household's geographical department is used as a proxy for migrant networks. Migrant networks are useful instruments because such networks can reduce the costs of migration and improve employment opportunities in the destination countries. Thus, they can affect both the decision to migrate and the size of remittances being sent, without necessarily being correlated with the unobserved factors influencing labor supply decisions by the household receiving the remittances. It is expected that reduced costs of migration, as indicated by a larger migrant network, will lead to an increase in both the likelihood that a household receives remittances and the size of the remittances received. Aggregate measures, such as share of households receiving remittances, are also useful as instruments because they are less susceptible to issues of reverse causality. That is, the aggregate measure will impact the household's decisions, but the individual household is too small relative to the rest

of the population to affect the aggregate measure in any meaningful way. On the other hand, aggregate measures do not allow for the possibility that the presence of migrant networks may affect households differently, depending on their ability to access them. To account for this, an interaction term between remittance receipt at the department level and a household wealth index is also included. Inclusion of household wealth allows for the fact that international migration can be quite costly, so wealthier households will be in a better position to take advantage of the presence of migrant networks than poor households.

The general model is:

$$L_{ij} = \beta_1 X + \delta R_j + \in_{1ij}, \tag{9}$$

$$R_j = \beta_2 X + \Phi Z + \in_{2ij} \tag{10}$$

where L_{ij} is a labor supply variable pertaining to child i in household j, and R_j is a variable related to remittances received by household j. X is a vector of individual and household characteristics, and Z is a vector of instruments. Individual characteristics of the children include age and gender. Household characteristics are per capita monthly income, a wealth index[2], an indicator of whether the household is below the poverty line, the number of children across various age/gender dimensions, age, gender, and marital status of the household head, highest education level in the household, and whether Spanish is the first language of any household member.

In the first part of the analysis, both L_{ij} and R_j are indicators equal to one if the child works and the household receives remittances, such that

$$\begin{cases} L_{ij} = 1 \ \ if \ \ L_{ij}^* > 0 \\ L_{ij} = 0 \ \ if \ \ L_{ij}^* = 0 \end{cases} \tag{11}$$

and

$$\begin{cases} R_j = 1 \ \ if \ \ R_j^* > 0 \\ R_j = 0 \ \ if \ \ R_j^* = 0 \end{cases} \tag{12}$$

where L_{ij}^* is the observed number of hours worked by child i in household j, and R_j^* is the observed value of remittances received by household j.

As Acosta (2011) points out, there are several methods available for analyzing models with binary endogenous and outcome variables. There is also some debate on which of these methods is preferred. Angrist (2001) suggests that a two-stage least squares (2SLS) linear probability model is sufficient if the intent is to identify causality. 2SLS has the added benefit of providing an easy method for assessing instrument validity. On the other hand, 2SLS also has a number of shortcomings with binary endogenous and outcome variables. First, predicted values in linear probability models are not bound within the unit interval. This can contribute to heteroscedasticity in single-equation models and lead to "awkward" interpretations of conditional probabilities (Wooldridge 2002, p. 455). Additionally, as Moffitt (2001) and Wooldridge (2002) indicate, neglecting to control for non-linearity in the first stage of the linear probability model can lead to inconsistent estimates in the second stage. Another method, which controls for nonlinearities, is the bivariate probit model developed by Heckman (1978). The bivariate probit model eliminates the problems associated with non-linearity in the two equations. However, identification in the bivariate probit model requires stronger

assumptions than 2SLS, most notably the exclusion restriction, which assumes that the instruments only affect the outcome variable via the treatment variable (Angrist et al. 1996). Despite both models having strengths and weaknesses, Chiburis et al. (2012) find that the bivariate probit model tends to perform better than 2SLS when there are continuous covariates, sample size is less than 5000, and treatment probability is close to 0 or 1. In the analysis below, both models are estimated. However, since these conditions outlined by Chiburis et al. (2012) closely align with the data used in this study, the bivariate probit is the preferred model for this study.

In the second part of the analysis, the indicator variables for remittances and labor supply are replaced by the natural logs of the observed values plus one, such that Eqs. 11 and 12 become

$$\begin{cases} L_{ij} = ln\left(L_{ij}^{*} + 1\right) & if \;\; L_{ij}^{*} > 0 \\ L_{ij} = ln(1) = 0 & if \;\; L_{ij}^{*} = 0 \end{cases} \tag{13}$$

and

$$\begin{cases} R_{j} = ln\left(R_{j}^{*} + 1\right) & if \;\; R_{j}^{*} > 0 \\ R_{j} = ln(1) = 0 & if \;\; R_{j}^{*} = 0 \end{cases} \tag{14}$$

In addition to the endogeneity issues mentioned above, another source of potential bias in the second model comes from the fact that 75.9 % of children in the sample reported working zero hours. If a significant share of the observed zero values occurred due to unemployment, rather than choosing not to participate in the labor force, then this variable is censored at zero and OLS estimates of Eq. 9 will lead estimates being biased toward zero (Greene 2011). Similarly, since only 8.4 % of households report receiving remittances, Eq. 10 is also subject to censoring at zero. In a single-equation model, this source of bias is typically corrected for with the use of a Tobit model (Tobin 1958). Given that endogeneity is still an issue, the model is again estimated through the use of instrumental variables. A standard IV Tobit model, however, assumes an uncensored continuous variable in the first-stage regression. Thus, to control for censoring in both equations, the model is estimated using a bivariate Tobit model. The bivariate Tobit model is not widely used in the economics literature, but it has been shown to be particularly useful in cases where the dependent variables may be jointly determined (Yoo 2005, Rahman 2014), as is the case in the present study.

5 Data

Data for this analysis are from the 2011 Survey of Bolivian Households (Encuesta de Hogares Bolivia). The survey, conducted by the Bolivian National Statistics Institute (Instituto Nacional de Estadistica de Bolivia), is a sample of 33,821 individuals living in 8851 households and is weighted to be nationally representative. The survey covers a wide range of economic and demographic characteristics of the household and its members. Most importantly for this analysis, the survey documents the labor activity and income sources, including remittance income, of all household members over the age of 7. For the purpose of this study, the analysis is restricted to include only children under the age of 14, which was the legal working age at the time of the survey.[3] The

survey contains data on 5351 children between the ages of 7 and 13. Table 2 presents summary statistics of selected key variables. Labor activity is determined by a series of questions asking if they were employed, worked growing food or raising animals, helped with a family business, worked as a street vendor, or engaged in any other activity which earned money for at least 1 h in the previous week, or had a job, but did not work in the previous week because of vacation, illness, or other various reasons. Thus, the measure of labor activity used includes both employment in the formal and informal labor markets, as well as unpaid domestic labor, such as farming. 24.1 % of children aged 7 to 13 reported being engaged in at least 1 h of labor activity.[4] The children who work reported working an average of 23.8 h per week. These numbers vary widely between urban and rural households, however. In rural households, 49.9 % of children aged 7–13 reported working at least 1 h per week, whereas 7.7 % of children in urban households reported working. On the other hand, working children in urban households work more hours per week, on average, than working children in rural households, with the former reporting an average of 24.7 h and the latter 18.8 h per week.

Table 3 gives the distribution of child labor activity by type of work at the national level and by urban and rural households. Nationwide, 76.5 % of working children are employed in agriculture. This is largely driven by the fact that child labor is much more prevalent in the rural areas, and agriculture makes up 92.7 % of the work done by children in rural areas, compared to only 11 % in urban areas. Agricultural work done by children includes preparing the land for planting, harvesting crops, tending to livestock, and other jobs typical to farming. The largest category of activity among urban children is sales jobs. Sales jobs can include being employed as a cashier, working in a family run store, or working as a street vendor. 39.3 % of urban child labor is sales, while this only makes up 3.6 % of child labor in rural areas. The sales category excludes the sale of prepared food, which is included in the food service category. Food service also includes working at a food stand or restaurant in any capacity, whether it is in sales, cooking, or washing dishes. Food sales constitute 26.8 % of child labor in urban areas, and 2 % in rural areas. The next largest category of job in urban areas is working in the skilled trades, such as construction, carpentry, or mechanic/auto body. This makes up 6.4 % of child labor activity in urban areas. Children working in these areas typically report being "assistants" and doing ancillary jobs such as cleaning tools and mixing paint. This type of work is not a significant component of rural labor activity. Other jobs which are more common in urban areas, but not significant in rural areas, include light manufacturing or making of artisanal crafts, child care, and housekeeping/domestic work.

Overall, 8.4 % of the children in the sample live in households that report receiving remittances. This is slightly higher among urban households (9.5 %) than rural households (6.7 %). A similar pattern holds for size of remittances. The median remittance-receiving household receives 466 bolivianos, approximately US$67[5], per week. In rural areas, the median remittance-receiving household receives 233 bolivianos (US$34) per week, whereas the median urban household receives 699 bolivianos (US$101) per week. Across the entire sample, children in remittance-receiving households are slightly less likely to work than children in households not receiving remittances, at 19.7 and 24.5 %, respectively. This difference persists in urban households, but the propensity to work is very similar between the two groups in rural households.

Table 2 Selected Summary Statistics, survey-weighted mean values for children ages 7–13

	Full sample			Rural households			Urban households		
	All households	Remittances	No remittances	All households	Remittances	No remittances	All households	Remittances	No remittances
Child works	0.241	0.197	0.245	0.499	0.508	0.498	0.077	0.059	0.079
	(0.007)	(0.020)	(0.007)	(0.013)	(0.046)	(0.013)	(0.005)	(0.015)	(0.005)
Hours worked per week if hours >0	20.01	17.92	20.16	18.8	18.1	18.9	24.74	17.35	25.31
	(0.49)	(1.22)	(0.51)	(0.50)	(1.34)	(0.53)	(1.31)	(2.92)	(1.38)
HH receives remittances	0.084			0.067			0.095		
	(0.004)			(0.006)			(0.006)		
Age	10.07	10.16	10.06	9.98	10.10	9.97	10.12	10.19	10.11
	(0.030)	(0.098)	(0.031)	(0.050)	(0.183)	(0.052)	(0.037)	(0.115)	(0.039)
Male	0.523	0.529	0.523	0.531	0.506	0.533	0.518	0.539	0.516
	(0.008)	(0.026)	(0.008)	(0.013)	(0.046)	(0.013)	(0.009)	(0.031)	(0.010)
Household income per capita (Bs/m)	711.67	868.49	697.25	439.37	541.44	432.09	884.49	1013.30	870.90
	(10.83)	(36.96)	(11.30)	(14.78)	(74.51)	(14.89)	(14.12)	(40.70)	(15.00)
Poverty indicator	0.586	0.463	0.597	0.714	0.617	0.721	0.504	0.395	0.515
	(0.008)	(0.026)	(0.008)	(0.012)	(0.047)	(0.012)	(0.009)	(0.031)	(0.010)
Rural	0.388	0.307	0.396						
	(0.008)	(0.024)	(0.008)						
HH age	42.56	46.90	42.16	42.85	48.53	42.45	42.38	46.18	41.98
	(0.17)	(0.69)	(0.17)	(0.28)	(1.30)	(0.28)	(0.21)	(0.82)	(0.21)
HH female	0.184	0.337	0.170	0.146	0.291	0.135	0.208	0.357	0.192
	(0.006)	(0.024)	(0.006)	(0.010)	(0.042)	(0.010)	(0.008)	(0.030)	(0.008)
HH married	0.594	0.509	0.602	0.628	0.566	0.633	0.573	0.484	0.582
	(0.008)	(0.026)	(0.008)	(0.013)	(0.046)	(0.013)	(0.009)	(0.031)	(0.010)

Table 2 Selected Summary Statistics, survey-weighted mean values for children ages 7–13 *(Continued)*

Max education	10.59	11.42	10.52	8.29	9.31	8.22	12.06	12.35	12.03
	(0.060)	(0.190)	(0.063)	(0.082)	(0.281)	(0.085)	(0.071)	(0.226)	(0.074)
Children 0–5	0.68	0.60	0.69	0.87	0.68	0.88	0.56	0.56	0.56
	(0.013)	(0.043)	(0.014)	(0.024)	(0.087)	(0.025)	(0.014)	(0.048)	(0.015)
Boys 6–17	1.33	1.27	1.34	1.52	1.37	1.54	1.21	1.23	1.21
	(0.016)	(0.051)	(0.017)	(0.030)	(0.091)	(0.031)	(0.018)	(0.061)	(0.019)
Girls 6–17	1.25	1.28	1.25	1.35	1.28	1.35	1.19	1.28	1.18
	(0.015)	(0.050)	(0.015)	(0.025)	(0.085)	(0.026)	(0.018)	(0.061)	(0.019)
Spanish first language	0.84	0.88	0.83	0.60	0.64	0.60	0.98	0.99	0.98
	(0.006)	(0.016)	(0.006)	(0.012)	(0.043)	(0.013)	(0.002)	(0.006)	(0.003)
Number	5351	447	4904	2036	149	1887	3315	298	3017

Note: Standard errors in parentheses. Means and standard errors are calculated using probability weights

Table 3 Child employment by industry

	All children	Rural	Urban
Agriculture	0.7654	0.9271	0.1095
	(0.0133)	(0.0100)	(0.0206)
Sales	0.1062	0.0356	0.3926
	(0.0096)	(0.0072)	(0.0331)
Food service	0.0691	0.0201	0.2677
	(0.0078)	(0.0051)	(0.0300)
Skilled trades	0.0137	0.0013	0.0642
	(0.0040)	(0.0013)	(0.0189)
Other	0.0456	0.0159	0.1660
	(0.0067)	(0.0051)	(0.0250)

Note: Standard errors in parentheses. Industry shares are calculated using probability weights

Remittance-receiving households tend to have higher incomes and are less likely to be below the poverty line. The household heads are more likely to be female and less likely to be married. The household is also more likely to have higher levels of education and more likely to speak Spanish as their first language. These patterns are consistent between rural and urban households.

6 Results

6.1 Propensity to work

Table 4 reports coefficient estimates of Eq. 9 for all children aged 7–13, where child labor and remittance receipt are measured as indicator variables equal to one for any non-zero value. Columns 1 and 3 report the naïve OLS and probit models, which do not control for any potential endogeneity biases. Both coefficients for remittance receipt are positive, but not significant. Column 2 presents the results of the two-stage linear probability model. The remittance coefficient is negative and highly significant, indicating that OLS estimates are biased toward zero, which is consistent with results found by previous studies (Acosta 2011; Alcaraz et al. 2012). As noted above, an advantage of 2SLS is the ability to test for instrument validity. Results of Hansen's J test of over-identifying restrictions are presented at the bottom of column 2. With a p value of 0.3767, the null hypothesis that the instruments are valid cannot be rejected. Furthermore, in Table 5, column 1 presents the first-stage estimates of the 2SLS model. Both of the instruments are positive and highly significant. This result is consistent with the hypotheses that reduced costs of migration, as measured by larger migrant networks, increase the probability that households receive remittances and that wealthier households are better positioned to leverage these networks. Additionally, propensity to receive remittances is significantly higher for households with female heads and increases with the age of the household head. Also, recall that the theoretical model above suggested that remittances may increase when there are more children present in the household. The results in Table 5 indicate that households with more adolescent girls are more likely to receive remittances; however, the effect of an increase in adolescent boys or children under the age of 5 is not significant.

Unfortunately, since expected values of dependent variables in linear probability models are not bounded between zero and one, the usefulness of the linear probability

Table 4 Estimation results of propensity to work, children aged 7–13

	(1)	(2)	(3)	(4)
	OLS	2SLS	Probit	Bivariate probit
Remittance indicator	0.0028	−0.6828***	0.00003	−0.9281***
	(0.0181)	(0.1718)	(0.0891)	(0.2780)
Age	0.0272***	0.0276***	0.1288***	0.1243***
	(0.0028)	(0.0031)	(0.0130)	(0.0130)
Male	0.0331*	0.0419**	0.1302*	0.1373*
	(0.0144)	(0.0162)	(0.0624)	(0.0611)
Household income per capita	0.00002*	0.000002	0.0001*	0.0001*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Poverty indicator	0.0105	−0.0062	0.0024	−0.0289
	(0.0152)	(0.0179)	(0.0698)	(0.0692)
Rural	0.2506***	0.2558***	0.9312***	0.8955***
	(0.0182)	(0.0202)	(0.0650)	(0.0677)
HH age	0.0002	0.0022**	−0.0003	0.0027
	(0.0005)	(0.0008)	(0.0023)	(0.0024)
HH female	−0.0012	0.0511*	0.0073	0.0889
	(0.0156)	(0.0214)	(0.0720)	(0.0751)
HH married	0.0347**	0.0219	0.1362*	0.1098*
	(0.0127)	(0.0143)	(0.0566)	(0.0555)
Max education	−0.0014	−0.0016	−0.0166	−0.0163*
	(0.0018)	(0.0021)	(0.0085)	(0.0083)
Children 0–5	−0.0026	0.0043	−0.0085	0.0037
	(0.0076)	(0.0084)	(0.0309)	(0.0305)
Boys 6–17	0.0048	0.0054	0.0330	0.0341
	(0.0074)	(0.0081)	(0.0290)	(0.0284)
Girls 6–17	0.0193**	0.0267***	0.0944***	0.1023***
	(0.0066)	(0.0076)	(0.0276)	(0.0271)
Spanish first language	−0.2813***	−0.2908***	−0.7366***	−0.7313***
	(0.0232)	(0.0247)	(0.0702)	(0.0699)
Wealth index	−0.0215***	−0.0129*	−0.0889***	−0.0735***
	(0.0041)	(0.0051)	(0.0176)	(0.0184)
Constant	0.0113	−0.0196	−2.1979***	−2.1552***
	(0.0502)	(0.0558)	(0.2114)	(0.2103)
Number	5351	5351	5351	5351
F	120.47	102.64		
χ^2			1148.50	1512.71
Hansen's *J* statistic		0.7816		
p value		0.3767		

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

model can often be limited to addressing the direction of causality and testing instrument validity. Indeed, in the present model, the coefficient of −0.68 is much too large to be realistic, since it implies remittance receipt would place the predicted probability of working well below zero for a significant share of the sample. Thus, as mentioned

Table 5 First-stage/remittance equation estimates, children aged 7–13

	(1)	(2)
	2SLS	Bivariate probit
Age	0.0008	0.0101
	(0.002)	(0.0146)
Male	0.0144	0.0980
	(0.0101)	(0.0710)
Household income per capita	−2.25e−6	−3.8e−5
	(8.18e−6)	(4.75e−5)
Poverty indicator	−0.0275*	−0.1947*
	(0.0121)	(0.0772)
Rural	0.0021	0.0191
	(0.012)	(0.0835)
HH age	0.0029***	0.0166***
	(0.0005)	(0.0024)
HH female	0.073***	0.4038***
	(0.0135)	(0.0697)
HH married	−0.0168	−0.0870
	(0.009)	(0.0645)
Max education	0.0003	0.0042
	(0.0014)	(0.0095)
Children 0–5	0.009	0.0435
	(0.005)	(0.0355)
Boys 6–17	−0.0002	0.0026
	(0.004)	(0.0321)
Girls 6–17	0.0108*	0.0804*
	(0.0049)	(0.0323)
Spanish first language	−0.0074	−0.0321
	(0.0122)	(0.0943)
Wealth index	−0.0167***	−0.1085*
	(0.0057)	(0.0462)
Share of households receiving remittances	0.9064***	6.3666***
	(0.1429)	(1.0362)
Share*wealth	0.2849***	1.7559***
	(0.0624)	(0.4513)
Constant	−0.1388***	−2.9277***
	(0.0375)	(0.2568)
ρ_{12}		0.5451**
		(0.1960)

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

above, the preferred model for this analysis is the bivariate probit model, the results of which are presented in column 4. Again, the coefficient for remittance receipt is negative and highly significant. In Table 5, it can be seen that the signs and significance of the variables determining remittance receipt are consistent with those of the 2SLS model.

While the interpretation of coefficient estimates obtained by the bivariate probit model are not as straight forward as those obtained by 2SLS, estimates of causal treatment effects can be recovered using the predicted values (Angrist et al. 1996). Average treatment effects (ATE) and the average treatment effect on the treated (ATT) for the bivariate probit models are estimated using the method proposed by Nichols (2011). The ATE is estimated as the mean of the difference between the predicted probability that a child works when $R_j = 1$, and the predicted probability when $R_j = 0$, with other covariates held at their observed values. The ATT is estimated as the mean difference in predicted probabilities conditional on the child living in a household that receives remittances. The effects of remittance receipt corresponding to the results in Tables 4 and 5 are presented in the first row of Table 6. These results indicate that remittances receipt is expected to reduce the likelihood a child works by an average of 16.6 % among all households, and by 25.5 % among the subgroup of remittance-receiving households.

There are also a number of other noteworthy results among the control variables in Tables 4. As was seen in the summary statistics, children in rural households are significantly more likely to work than their urban counterparts, and boys are more likely to work than girls. The propensity to work increases with the child's age, and children in households where Spanish is the first language are significantly less likely to work than children in households with an indigenous first language. In addition to acting as a proxy for a household's ethnicity, the primary language spoken also serves as an indicator for economic opportunity. Although Bolivia has 35 officially recognized languages (Taylor 2004), Spanish is the traditional language of the elite class and also the most common shared language between groups. As such, poor Spanish skills can lead to economic exclusion of the parents, thus increasing the need for children to help supplement income. Furthermore, although the Education Reform Bill of 1994 called for education to be provided in indigenous languages, indigenous schools are typically of lower quality than Spanish language schools, thereby making the opportunity cost of work lower for indigenous children. This relationship between economic inclusion and education, and the propensity to work can be seen in other variables as well—the likelihood of working declines with the level of education in the household, as well as with household wealth. Finally, in Table 5, the estimate of the correlation between the errors of the two equations of the bivariate probit model, ρ_{12}, is positive and significant,

Table 6 Treatment effect estimates of remittance receipt on propensity to work

	Average treatment effect (ATE)	Average treatment effect on the treated (ATT)
All children	−0.166	−0.255
	(0.116)	(0.092)
Rural	−0.408	−0.408
	(0.103)	(0.216)
Urban	−0.114	−0.476
	(0.077)	(0.136)
Male	−0.168	−0.251
	(0.119)	(0.098)
Female	−0.184	−0.316
	(0.130)	(0.010)

Note: Standard deviations in parentheses

indicating that unobserved factors contributing to an increase in propensity to remit are also associated with an increase in the propensity of children to work and confirming that estimating the two equations separately would lead to biased results.

Given that the results above indicate different propensities to work between rural and urban households, as well as between male and female children, the following section explores how remittances affect these groups differently. Table 6 presents the estimated treatment effects of remittance receipt for urban and rural households and for male and female children obtained by estimating the bivariate probit model separately for each group (complete estimation results are presented in Tables 7 and 8). Despite large differences in the propensity to work between boys and girls, the average treatment effects appear to be fairly similar. However, the treatment effect on the treated is substantially larger for females. Thus, it would appear that although boys are significantly more likely to work than girls, remittance income tends to be directed toward reducing the labor effort of girls.

Comparison of the treatment effects between urban and rural households yields many interesting results. First, the ATT is approximately 7 percentage points larger for urban households than rural households. It is not entirely surprising that remittances are more effective at reducing child labor in urban areas than rural areas. First, children are significantly more likely to work in rural areas regardless of whether their household receives remittances. Second, if the child labor decision is a function of alternative uses of the child's time, e.g., going to school, there may be fewer options available in rural areas. Finally, if child labor is determined by household labor demand (rather than the need for income), labor market imperfections in rural areas can make hiring adult wage labor more difficult in rural areas, thus increasing the need to compensate with child labor.

Additionally, the ATT for both groups are quite large relative to the observed share of children who report working. This would imply that although the observed difference between the share of children working in households that receive remittances and those who do not is fairly small, under the counterfactual of no households receiving remittances, these differences would be much larger. Thus, the observed differences found in the summary statistics significantly underestimate the causal impact of remittances on reducing the prevalence of child labor.

Perhaps the more striking result is the comparison between ATE and ATT for the two groups. In urban households, the effect on the treated is four times as large as the average treatment effect. This would suggest that urban households who opt to send migrants abroad benefit much more than the average household would, i.e., that there is positive selection into migration. However, this does not necessarily appear to be the case for rural households, as the ATE and ATT are roughly equivalent, at an approximate 41 % reduction in the probability that a child will work. One possible explanation might be a kinship effect that could exist in the rural areas. That is, if rural villages tend to be made up largely of extended families or close knit indigenous populations, then income and expenditure decisions might be made at the community level, rather than the household, and benefits from remittance income might be spread across the entire village. Whereas in urban areas, the population may be more segmented and remittance income would remain contained among recipient households. Unfortunately, the current data does not contain information on inter-household relationships, so this hypothesis is not directly testable.

Table 7 Bivariate probit estimates of propensity to work by gender, urban and rural households

	(1)	(2)	(3)	(4)
	Boys	Girls	Rural	Urban
Remittance indicator	−0.9338*	−1.0764**	−1.4099***	−1.3881**
	(0.4032)	(0.3446)	(0.2174)	(0.4722)
Age	0.1440***	0.1041***	0.1085***	0.1332***
	(0.0191)	(0.0176)	(0.0176)	(0.0308)
Male			0.1666*	0.0588
			(0.0805)	(0.0904)
Household income per capita	0.0001*	0.0001	0.0000	0.0001*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Poverty indicator	−0.0012	−0.0758	0.2814*	−0.4582***
	(0.0964)	(0.0983)	(0.1153)	(0.0901)
Rural	0.9665***	0.8100***		
	(0.1039)	(0.0909)		
HH age	0.0033	0.0025	0.0061	0.0002
	(0.0036)	(0.0032)	(0.0032)	(0.0053)
HH female	0.0407	0.1686	0.0010	0.2568*
	(0.1070)	(0.1020)	(0.0983)	(0.1225)
HH married	0.0828	0.1417	0.2497***	−0.1414
	(0.0785)	(0.0772)	(0.0725)	(0.0749)
Max education	−0.0229	−0.0098	0.0067	−0.0374**
	(0.0118)	(0.0117)	(0.0116)	(0.0122)
Children 0–5	0.0354	−0.0262	−0.0539	0.1333**
	(0.0431)	(0.0424)	(0.0359)	(0.0489)
Boys 6–17	0.0162	0.0534	−0.0270	0.1435***
	(0.0398)	(0.0410)	(0.0376)	(0.0421)
Girls 6–17	0.0701	0.1378***	0.0278	0.2005***
	(0.0400)	(0.0360)	(0.0375)	(0.0384)
Spanish first language	−0.6804***	−0.7856***	−0.6529***	−0.4461
	(0.0986)	(0.0981)	(0.0753)	(0.2624)
Wealth index	−0.0660**	−0.0763**	−0.0793***	0.0098
	(0.0249)	(0.0272)	(0.0228)	(0.0344)
Constant	−2.2175***	−1.9548***	−1.5062***	−2.1299***
	(0.2873)	(0.3022)	(0.2636)	(0.3416)
Number	2758	2593	2036	3315
χ^2	790.9926	766.8504	582.4423	396.2101

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

6.2 Intensity of work

Table 9 presents coefficient estimates of Eq. 9, replacing the remittance and labor supply indicator variables with measures of the value of weekly remittance income and the number of hours worked per week, respectively, as described by Eqs. 13 and 14. Column 1 reports estimates of a simple Tobit model. The coefficient is negative, but not significant. Columns 2–4 report the results of instrumental variable models with various levels of control for censoring in the dependent variables. Columns 2 and 3 are

Table 8 First-stage/remittance equation estimates by gender, urban and rural households

	(1)	(2)	(3)	(4)
	Boys	Girls	Rural	Urban
Age	0.0182	0.0040	−0.0012	0.0143
	(0.0197)	(0.0215)	(0.0255)	(0.0179)
Male			0.0044	0.1344
			(0.1186)	(0.0892)
Household income per capita	−0.0000	−0.0000	−0.0002	−0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Poverty indicator	−0.1884	−0.2005	−0.0638	−0.2886**
	(0.1080)	(0.1117)	(0.1362)	(0.0898)
Rural	−0.0776	0.1609		
	(0.1116)	(0.1229)		
HH age	0.0175***	0.0159***	0.0231***	0.0131***
	(0.0032)	(0.0037)	(0.0040)	(0.0030)
HH female	0.3920***	0.4120***	0.3838**	0.4154***
	(0.1003)	(0.0990)	(0.1215)	(0.0874)
HH married	−0.0152	−0.1750	−0.1432	−0.0921
	(0.0916)	(0.0907)	(0.1091)	(0.0789)
Max education	0.0179	−0.0096	0.0543***	−0.0114
	(0.0138)	(0.0128)	(0.0156)	(0.0114)
Children 0–5	0.0685	0.0084	0.0164	0.0859
	(0.0462)	(0.0559)	(0.0500)	(0.0480)
Boys 6–17	0.0547	−0.0651	−0.0865	0.0679
	(0.0413)	(0.0522)	(0.0503)	(0.0422)
Girls 6–17	0.0414	0.1145*	−0.0392	0.1536***
	(0.0456)	(0.0458)	(0.0583)	(0.0395)
Spanish first language	−0.0008	−0.0804	−0.1530	0.4972
	(0.1312)	(0.1363)	(0.1060)	(0.3403)
Wealth index	−0.1554*	−0.0453	−0.1776*	−0.1326
	(0.0649)	(0.0643)	(0.0880)	(0.0733)
Share of households receiving remittances	5.6515***	7.6036***	10.6868***	4.9584**
	(1.4282)	(1.4798)	(2.3359)	(1.9128)
Share*wealth	1.9761**	1.4407*	2.4640**	2.1800**
	(0.6427)	(0.6318)	(0.8744)	(0.7331)
Constant	−3.1419***	−2.7499***	−3.4957***	−3.2247***
	(0.3600)	(0.3518)	(0.4557)	(0.4917)
ρ_{12}	0.5911	0.6164*	1.0518***	0.9456
	(0.3042)	(0.2560)	(0.2271)	(0.7980)

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

presented for mainly expository purposes, while column 4 is the preferred specification. Column 2 presents the results of a 2SLS model. The coefficient estimate for remittance income is negative and significant. However, since neither equation controls for censoring, these estimates are likely to be biased. The 2SLS model is presented primarily for the purpose of testing instrument validity. Results of Hansen's *J* test are presented at

Table 9 Estimation results of intensity of work, Ln(hours per week + 1), children age 7–13

	(1)	(2)	(3)	(4)
	Tobit	2SLS	IV Tobit	Bivariate Tobit
Ln(remittances + 1)	−0.0365	−0.3103***	−2.0792***	−0.3456**
	(0.0408)	(0.0760)	(0.5027)	(0.1071)
Age	0.3576***	0.0874***	0.3646***	0.3587***
	(0.0336)	(0.0093)	(0.0428)	(0.0340)
Male	0.3445*	0.1226**	0.4839*	0.3680*
	(0.1625)	(0.0469)	(0.2117)	(0.1646)
Household income per capita	0.0004**	0.0001**	0.0005**	0.0004**
	(0.0001)	(0.0000)	(0.0002)	(0.0001)
Poverty indicator	−0.0625	−0.0446	−0.5011	−0.1549
	(0.1980)	(0.0541)	(0.2770)	(0.2007)
Rural	2.7294***	0.6771***	2.7957***	2.7262***
	(0.1788)	(0.0591)	(0.2358)	(0.1802)
HH age	0.0026	0.0068**	0.0345**	0.0073
	(0.0061)	(0.0021)	(0.0113)	(0.0064)
HH female	0.0730	0.1729**	1.1981**	0.2537
	(0.1975)	(0.0647)	(0.3672)	(0.2098)
HH married	0.2672	0.0425	0.0627	0.2314
	(0.1526)	(0.0415)	(0.1964)	(0.1531)
Max education	−0.0503*	−0.0024	−0.0518	−0.0501*
	(0.0231)	(0.0061)	(0.0297)	(0.0234)
Children 0–5	−0.0232	0.0149	0.0997	0.0002
	(0.0792)	(0.0242)	(0.1034)	(0.0801)
Boys 6–17	0.1231	0.0283	0.1756	0.1337
	(0.0771)	(0.0239)	(0.0984)	(0.0780)
Girls 6–17	0.2591***	0.0778***	0.4345***	0.2897***
	(0.0731)	(0.0231)	(0.1062)	(0.0750)
Spanish first language	−1.6864***	−0.8026***	−1.8707***	−1.7215***
	(0.1705)	(0.0723)	(0.2272)	(0.1740)
Wealth index	−0.2374***	−0.0418**	−0.0856	−0.2143***
	(0.0466)	(0.0151)	(0.0689)	(0.0480)
Constant	−6.4294***	−0.2371	−6.9997***	−6.4940***
	(0.5557)	(0.1611)	(0.7126)	(0.5609)
Number	5351	5351	5351	5351
F	173.0204	86.0245		
χ^2			1302.5538	3056.4818

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

the bottom of column 2. The p value of 0.1238 indicates that the null hypothesis cannot be rejected and the instruments are valid. Additionally, results of the first stage, presented in Table 10, show that factors determining remittance size have the same relationship, in terms of sign and significance, as those determining the incidence of remittance receipt. Column 3 presents results of the IV Tobit model. The coefficient is much larger than those presented in the 2SLS model, indicating that a strong upward

Table 10 First-stage/remittance equation estimates, children age 7–13

	(3)	(2)	(4)
	2SLS	IV Tobit	Bivariate Tobit
Age	0.0045	0.0047	0.1089
	(0.013)	(0.0128)	(0.1495)
Male	0.0768	0.0780	0.9443
	(0.0629)	(0.0629)	(0.7264)
Household income per capita	0.00004	0.00003	−0.0002
	(0.00006)	(0.0001)	(0.0005)
Poverty indicator	−0.2270***	−0.2275**	−2.2450**
	(0.0778)	(0.0778)	(0.7891)
Rural	0.0092	0.0116	0.2004
	(0.0738)	(0.0739)	(0.8560)
HH age	0.0158***	0.0159***	0.1643***
	(0.0158)	(0.0030)	(0.0235)
HH female	0.5226***	0.5240***	4.3580***
	(0.0900)	(0.0899)	(0.6994)
HH married	−0.0853	−0.0841	−0.8552
	(0.0568)	(0.0568)	(0.6570)
Max education	0.0036	0.0044	0.0429
	(0.0088)	(0.0087)	(0.0951)
Children 0–5	0.0540	0.0533	0.4179
	(0.0304)	(0.0303)	(0.3613)
Boys 6–17	0.0177	0.0160	0.1049
	(0.028)	(0.0279)	(0.3314)
Girls 6–17	0.0836***	0.0830**	0.8643**
	(0.031)	(0.0309)	(0.3315)
Spanish first language	−0.0620	−0.0435	−0.4457
	(0.0694)	(0.0678)	(0.9720)
Wealth index	−0.1283***	−0.0996**	−1.2015*
	(0.0361)	(0.0348)	(0.4819)
Share of households receiving remittances	6.041***	6.4682***	66.4583***
	(0.9084)	(0.8758)	(10.9832)
Share*wealth	2.102***	1.7666***	19.1313***
	(0.413)	(0.3816)	(4.6627)
Constant	−0.8671***	−0.9342***	−30.2639***
	(0.234)	(0.2300)	(2.5959)
ρ_{12}			0.3381**
			(0.1118)
Hansen's *J* statistic	2.369		
p value	0.1238		

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

bias occurs when censoring in the labor supply equation is not controlled for. However, the IV Tobit model does not account for censoring in the remittance receipt equation. Column 4 presents results from the bivariate Tobit model, which controls for censoring

in both equations. The coefficient of −0.35 indicates that a 10 % increase in remittance income is associated with a 3.5 % decrease in the number of hours worked by children. This result highlights the fact that in addition to remittances being effective at moving some children completely out of the labor force, they can also help to reduce the burden of labor on others, thus potentially freeing more time to devote toward human capital accumulation.

Tables 11 and 12 presents estimates of the bivariate Tobit model for male and female children, as well as rural and urban households. There does not appear to be a large difference between the effects for male and female children. There does, however, appear to be a large difference between coefficient estimates for urban and rural households. Table 11 indicates for rural households a 10 % increase in weekly remittance income is associated with a 7 % decrease in hours worked. For urban households, a 10 % increase in remittance income is associated with a 10.8 % decrease in hours worked. While some of this discrepancy may be due to different economic conditions in rural areas (labor market frictions, lack of alternative uses for child's time, etc.), it is worth noting that much of this result may also be driven by differences in the levels of remittance income. Recall that the median remittance-receiving urban household receives 699 bolivianos (US$101), whereas the median rural household receives only 233 bolivianos (US$34). Thus, in absolute terms, a 10 % increase for an urban household is nearly three times the amount of a rural household. To put it another way, for a child working the mean number of hours per week, living in a household receiving the median amount of remittances, it would take a 17.9 boliviano increase in remittance income to reduce their weekly employment by 1 h in a rural area, whereas it would take 26.16 bolivianos in an urban household. When viewed in this way, the marginal effect of a remitted boliviano is larger in rural areas. Furthermore, this also suggests that remittances ability to reduce child labor may be diminishing as remittance income increases.

Many of the other variables found to impact the labor supply decision at the extensive margins also carry through to the intensive margins. Children in rural households work more hours per week than their urban counterparts. Boys work more hours per week than girls, and older children work more than younger children. Children whose first language is Spanish work significantly less than children from indigenous-language households. Household education reduces the number of hours worked in urban households, but not in rural households. Similarly, the number of children in the household tends to increase the amount of work in urban households, but has no significant effect in rural households.

7 Conclusions

The dramatic rise of remittances flowing to Bolivia in the past several years is undoubtedly affecting the economy in a number of ways. This study has explored how remittances are affecting the prevalence and intensity of child labor. The results presented above provide evidence that remittances can potentially be used to help reduce the prevalence and extent of child labor in the country. Whereas previous research has found that remittances can play a role in moving children out of the labor market, this study also finds that remittances can significantly reduce the number of hours worked by children who continue to engage in economic activity. While it may be preferable that children not work at all, even a modest reduction in economic activity can free up

Table 11 Bivariate Tobit estimates of hours worked by gender, urban and rural households

	(1)	(2)	(3)	(4)
	Boys	Girls	Rural	Urban
Ln(remittances + 1)	−0.3619*	−0.3828*	−0.7038***	−1.0878*
	(0.1471)	(0.1546)	(0.0499)	(0.4502)
Age	0.4090***	0.3091***	0.2605***	0.7861***
	(0.0497)	(0.0458)	(0.0402)	(0.0939)
Male			0.3826*	0.2710
			(0.1838)	(0.5159)
Household income per capita	0.0004*	0.0003	0.0001	0.0008**
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Poverty indicator	−0.0209	−0.3483	0.5829*	−2.7517***
	(0.2763)	(0.2942)	(0.2941)	(0.5588)
Rural	2.9289***	2.4878***		
	(0.2527)	(0.2553)		
HH age	0.0085	0.0067	0.0228**	−0.0047
	(0.0092)	(0.0087)	(0.0077)	(0.0251)
HH female	0.0729	0.5071	0.2346	1.3522
	(0.2972)	(0.2933)	(0.2378)	(0.7940)
HH married	0.1473	0.3548	0.4647**	−0.8779
	(0.2152)	(0.2159)	(0.1758)	(0.4511)
Max education	−0.0678*	−0.0325	0.0391	−0.2169**
	(0.0330)	(0.0328)	(0.0279)	(0.0698)
Children 0–5	0.0924	−0.0957	−0.0865	0.6800*
	(0.1128)	(0.1122)	(0.0810)	(0.3010)
Boys 6–17	0.0903	0.1825	−0.0503	0.8560***
	(0.1088)	(0.1127)	(0.0913)	(0.2353)
Girls 6–17	0.2075	0.3842***	0.0505	1.1363***
	(0.1099)	(0.1018)	(0.0886)	(0.2580)
Spanish first language	−1.5095***	−1.9637***	−1.4282***	−2.6289*
	(0.2391)	(0.2538)	(0.1703)	(1.1791)
Wealth index	−0.1980**	−0.2239**	−0.1761**	0.0293
	(0.0653)	(0.0711)	(0.0537)	(0.1738)
Constant	−6.7260***	−5.9101***	−3.7725***	−12.2943***
	(0.7629)	(0.8138)	(0.6351)	(2.3495)
Number	2758	2593	2036	3315
χ^2	1569.4078	1579.3853	858.4691	411.7604

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

time for children to increase their human capital and propel them onto a sustainable path to lift themselves and future generations out of poverty and into a higher standard of living.

While the findings suggest that remittances can lead to an across the board reduction in child labor, the difference in magnitudes of the effect between urban and rural areas indicates that remittances are more effective in some areas than others. In particular, the findings above indicate that remittances are more effective at moving children

Table 12 Bivariate Tobit estimates, remittances equation by gender, urban and rural households

	(1)	(2)	(3)	(4)
	Boys	Girls	Rural	Urban
Age	0.1885	0.0496	0.0670	0.1701
	(0.1981)	(0.2216)	(0.2226)	(0.1823)
Male			0.0489	1.2967
			(1.0250)	(0.9041)
Household income per capita	−0.0003	−0.0001	−0.0017	0.0000
	(0.0007)	(0.0007)	(0.0009)	(0.0005)
Poverty indicator	−2.1848*	−2.2761*	0.7878	−3.1085***
	(1.0882)	(1.1517)	(1.3333)	(0.9103)
Rural	−0.8053	1.7174		
	(1.1290)	(1.2616)		
HH age	0.1728***	0.1544***	0.1927***	0.1267***
	(0.0302)	(0.0363)	(0.0341)	(0.0307)
HH female	4.1826***	4.4889***	3.0631**	4.5613***
	(0.9948)	(0.9963)	(1.1255)	(0.8542)
HH married	−0.1532	−1.7226	−0.5232	−0.8319
	(0.9006)	(0.9431)	(0.9779)	(0.8144)
Max education	0.1803	−0.1024	0.5475***	−0.1133
	(0.1346)	(0.1295)	(0.1320)	(0.1178)
Children 0–5	0.6790	0.0531	0.0052	0.8532
	(0.4637)	(0.5686)	(0.4413)	(0.4675)
Boys 6–17	0.6575	−0.6051	−0.9621*	0.7760
	(0.4226)	(0.5321)	(0.4505)	(0.4281)
Girls 6–17	0.4343	1.2362**	−0.6108	1.6087***
	(0.4625)	(0.4714)	(0.4899)	(0.3886)
Spanish first language	−0.2836	−0.8063	−3.1752***	5.1546
	(1.3428)	(1.3997)	(0.8889)	(3.5112)
Wealth index	−1.7588**	−0.4324	−2.2230**	−1.4578
	(0.6521)	(0.6794)	(0.7024)	(0.7888)
Share of households	59.1451***	78.4058***	123.3242***	53.6113**
Receiving remittances	(14.8499)	(15.7588)	(18.5647)	(16.8350)
Share*wealth	22.0506***	14.8830*	26.4385***	23.5423**
	(6.3731)	(6.6495)	(6.9854)	(7.8643)
Constant	−32.0373***	−28.6078***	−35.1037***	−33.9478***
	(3.5546)	(3.6442)	(4.0603)	(4.7715)
ρ_{12}	0.3694*	0.3678*	1.2965***	0.6923
	(0.1633)	(0.1577)	(0.1113)	(0.4437)

Robust standard errors in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

completely out of the labor market in urban areas than rural areas. At the same time, after controlling for the initial level of remittance income and hours worked, the marginal impact of a remitted boliviano on the number of hours worked is larger in rural areas than urban areas. This suggests that migration policy can play an important role in addressing child labor in Bolivia, and that policy regimes should differ between rural

and urban areas. In urban areas, the gains are larger when increasing the incidence of remittances than increasing the size of remittances. As such, policies geared at encouraging more migration will likely have a more significant impact on reducing child labor. The evidence presented above showed that reducing migration costs, as proxied by size of migrant networks, can significantly increase the incidence of remittances. As such, policies aimed at reducing the costs of migration can be effective at encouraging migration. Such policies could be monetary transfers, such as subsidizing travel expenses, but also could be simply providing information about job opportunities abroad and assisting with job placement. Additionally, rural areas benefit more from larger remittances than a higher incidence of remittances. Given the high prevalence of child labor in rural areas, it may be the case that labor market imperfections are preventing children from completely leaving the labor force. In which case, policies aimed at encouraging more out-migration may eventually serve to exacerbate the problem. Thus, policies geared toward increasing the size of remittances, rather than the incidence, will have a larger impact in the fight against child labor. Such policies may include increasing communications coverage in rural areas and expanding access to financial institutions in order to facilitate transfers.

While increasing the flow of remittances is certainly not a panacea, the evidence presented in this study indicates that it is at least one tool that can still be leveraged to reduce not only the prevalence but also the intensity of child labor.

Endnotes

[1]Since most children contribute unpaid domestic labor, "wages" in this context refers to an individual's contribution to household consumption, and not necessarily monetary compensation.

[2]The wealth index was created using the first principal component method, utilizing variables for whether the household owned their home, the number of rooms in the house, construction materials of the walls and floors of the home, whether the home had running water, sanitation facilities, and electricity, whether household members had phone and internet service, and whether the household had an oven, refrigerator, computer, television, video player, video game, microwave, electric washer and dryer, air-conditioning, and/or a personal vehicle.

[3]The results presented below are robust to expanding the upper bound to 16 years old. These results are available upon request.

[4]This measure of child labor includes both formal and informal labor market activities, but excludes domestic chores. The estimates of child labor activity are consistent with findings by Zapata et al. (2011), who report 28.2 percent of children aged 7-14 worked in market activities, and working children worked an average of 20.9 hours per week.

[5]Currency is converted at the official exchange rate of 6.94 BOB/US$ (World Bank, 2015).

Competing interests
The IZA Journal of Migration is committed to the IZA Guiding Principles of Research Integrity. The author declares that he has observed these principles.

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