

WORKING PAPER / 2010.06



# Assessing the Impact of Remittances on Child Education in Ecuador: The role of educational supply constraints

Geovanna Benedictis  
Germán Calfat  
Karina Jara



University  
of Antwerp



INSTITUTE OF DEVELOPMENT  
POLICY AND MANAGEMENT

Working Papers are published under the responsibility of the IOB Thematic Groups, without external review process. This paper has been vetted by Danny Cassimon, convenor of the Thematic Group Impact of Globalisation.

Comments on this Working Paper are invited. Please contact the author at **<geovanna.benedictis@ua.ac.be>**.

**Institute of Development Policy and Management**  
University of Antwerp

Postal address:	Visiting address:
Prinsstraat 13	Lange Sint Annastraat 7
B-2000 Antwerpen	B-2000 Antwerpen
Belgium	Belgium

tel: +32 (0)3 265 57 70  
fax +32 (0)3 265 57 71  
e-mail: [dev@ua.ac.be](mailto:dev@ua.ac.be)  
[www.ua.ac.be/iob](http://www.ua.ac.be/iob)

WORKING PAPER / 2010.06

# Assessing the Impact of Remittances on Child Education in Ecuador: The role of educational supply constraints

Geovanna Benedictis\*

Germán Calfat\*

Karina Jara\*\*

May 2010

\* IOB – Members of the Theme Group Impact of Globalization

\*\* IOB MA graduated

## TABLE OF CONTENTS

<b>TABLE OF CONTENTS</b>	<b>4</b>
<b>ABSTRACT</b>	<b>5</b>
<b>1. INTRODUCTION</b>	<b>6</b>
<b>2. OVERVIEW OF MIGRATION AND REMITTANCES</b>	<b>7</b>
2.1. The case of Ecuador	7
2.2. The development potential of Migration and Remittances	8
2.3. Literature on Remittances and Human Capital Accumulation	10
<b>3. DATA AND METHODOLOGY</b>	<b>13</b>
3.1. Data on Remittances and Educational Outcomes	13
3.2. Constructing the Index of Education Action	16
3.3. The Model	18
<b>4. EMPIRICAL EVIDENCE</b>	<b>21</b>
4.1. Expenditures in Education	21
4.2. Expenditures in Education by Students' Age Category	21
4.3. School Enrolment	22
4.4. School Enrolment under Different Educational Supply conditions	23
<b>5. CONCLUSION</b>	<b>24</b>
<b>REFERENCES</b>	<b>25</b>

## ABSTRACT

We analyse the links between remittances and child education in Ecuador with special emphasis on the influences in supply conditions at the regional level. Our results point out to the favourable role of remittances on education, suggesting at the same time, the importance of an efficient basic infrastructure in the educational system, as a key element in fostering positive outcomes. The positive effect of remittances on child education is better understood within the context of public policies designed to improve and equalize educational supply conditions among the population.

## 1. INTRODUCTION

The traditional emphasis of migration studies on the causes and consequences of population movements seems to have shifted in the recent years towards a more policy oriented focus related to the type of migration that will foster or hinder development (Skeldon, 2008). Since the phenomenon of migration is essentially the response of individuals to a changing development environment, it would be unfair to place the burden of any development strategy upon the shoulders of the agency of migrants instead of the institutional structures. Under this context the channelling of remittances likely to result in positive development outcomes, such as improvement in human capital in the form of child education, needs to be accompanied by appropriate policies that facilitate access to better schooling conditions.

Although the direction of causality between migration and educational outcomes has not been clearly determined yet, migration seems to have potential to influence educational outcomes through two clear channels: remittances and incentives. The remittances channel implies increases in income, removing financial constraints and allowing investment in education, while the incentives channel may have diverse and mixed effects.

For Ecuador, this latent relation between migration and education is of particular interest due to the importance of remittances and the constraints faced by individuals with respect to educational decisions. The aim of this article is to analyse how migration impacts educational outcomes in Ecuador.

Previous authors (López-Córdova, 2005; McKenzie and Rapoport, 2007; and Hanson et al., 2003; among others) have mainly focused on individuals' and households' decisions with respect to schooling, while making abstraction of the available educational supply conditions which constraint those decisions, and are consequently likely to influence the effects of migration. The present article includes the construction of an index which attempts to account for differences in educational supply conditions within a given region. This index will be considered as a proxy for the quality of the educational supply network.

In this study we look into the potential of remittances to impact child education in Ecuador and scrutinize whether differences in educational supply conditions are likely to influence the effects of migration.

In order to address the issues described above, this article has been divided into four sections. The first one provides the background information about migration and its importance on education. The second section describes both the methodology and data used for the analysis. The third part presents the empirical evidence, and finally the last section draws some conclusions and policy recommendations.

## 2. OVERVIEW OF MIGRATION AND REMITTANCES

### 2.1. The case of Ecuador

In Latin America, the officially recorded remittance flows have experienced a continuous increase from 1.9 billion dollars in 1980 to almost 50 billion dollars in 2005, amounting to more than 60 billion in 2007, being equivalent to 6.7 per cent of GDP in that year. Latin America and The Caribbean, together with East Asia and the Pacific, are the largest remittances recipients in the world. Within Latin America, Ecuador is ranked among the first ten countries receiving the most remittance flows both in absolute terms and as a share of GDP.

According to the World Bank (2009) the remittance flows to Ecuador, were expected to amount to 3,200 million dollars in 2008, however, the Central Bank of Ecuador estimated a total of 2,821.6 million dollars, resulting in an actual decrease of 8.6 per cent with respect to the previous year. In spite of this decline in the amount of remittances inflows, which is probably the result of changes in the expenditure patterns of migrants at destination<sup>1</sup>, remittances continue to play an important role in Ecuador.

Over the last decade, Ecuador has experienced an important increase in emigration flows, mainly motivated by economic factors; in 1999 a severe financial crisis resulted in a decrease of 6.3 per cent of the GDP, unemployment rates reached a 14 per cent, reduction of international reserves of 379.8 million dollars, and an inflation rate of more than 50 per cent. The country was finally forced to adopt the dollar as legal currency since the year 2000.

Contrasting with this poor economic performance and reflecting their countercyclical nature, remittances increased considerably and since 1999 became the second source of foreign income in the country after oil exports, accounting for a 6.35 per cent of GDP in 2005, and highly surpassing FDI inflows. (BCE and INEC, 2009)

According to a recent study (Social Development Report, 2007), the distribution of remittances among the Ecuadorian population, seems to confirm that 7.9 per cent and 18.9 per cent of poor and non-poor households, respectively, are remittance recipients, indicating that the poor are benefiting less from the effects of migration. In this respect, Calero et al. (2008) state that the bulk of remittances goes to middle and higher income households; the two richest quintiles of the population accounting for about 57 per cent of the recipients, while the two poorest quintiles account only for about 22 per cent of the recipients. This distribution can be explained by the fact that migration on its preliminary stages implies a series of costs, such as travel and settlement expenses among others, which can hardly be afforded by poor households. Consequently only members of households whose income can cover those expenses or who manage to have access to loans for that purpose, are able to migrate and benefit from remittances.

The size of remittances, as well as the channels through which they are transmitted, are decisions taken by the migrants themselves, who are expected to maximize the amount sent subject to the costs of transaction. The choice of transmission channel is likely to depend also

---

<sup>1</sup> The financial crisis tied to the reduction of employment in the construction sector in the USA and Spain (where the vast majority of Ecuadorian migrants live) led to the reduction of their disposable income at destination and therefore a lower volume of transfers to their places of origin.

on the availability of transmission agencies in a given area, so that recipients' access to them is facilitated. According to Ramirez Gallegos and Ramirez (2005) and; Ponce and Olivie (2008), the most popular transfer companies supplying services in Ecuador are Delgado Travel and Western Union. The costs of transmission differ among source countries and transfer companies, being Delgado travel the one charging the lower commissions.

According to the Encuesta de Condiciones de Vida (ECV2005-2006), the majority of remittances receiving households use these funds to finance expenditures on education, food, health and housing. Given the fungible nature of remittances, it is not possible to determine their specific use and therefore families only report the main items for which remittances are used for.

The importance of migration and remittances has encouraged research on their impact; recent literature suggests that migration has a development potential, by influencing education and health outcomes. In what follows, we describe the specific ways in which migration and education are related, and how the former is expected to have an impact on the later.

## **2.2. The development potential of Migration and Remittances**

Most of the studies dealing with the potential of remittances have mainly focused on poverty reduction, measured in monetary terms, while only a limited number of studies have considered the contribution of these flows to development through increases in human capital accumulation.

According to the UNESCO (2008), enrolment rates in Ecuador have increased from 83 to 87 per cent between the years 1999 and 2005 and, so far, 55 out of 129 countries have reached or will soon reach the internationally agreed education goals which intend to fulfil the learning needs of children, youth and adults by the year 2015<sup>2</sup>. In order to assess countries' progress within the area of education, UNESCO calculates the index of educational development (IDE)<sup>3</sup>, which placed Ecuador in the 71st position out of 129 countries, occupying a position belonging to the middle IDE group of countries.

Despite the rather discouraging position of Ecuador in this ranking, there are indications of improvements in terms of educational outcomes, for instance: enrolment rates in pre-primary education have increased from 64 per cent in 1999 to 77 per cent in 2005; the number of children in primary school age who are enrolled has increased from 1,899 to 2,000 thousands between 1999 and 2005; and an increase in enrolment rates in secondary education, from 57 per cent to 61 per cent has been observed in the same period. (UNESCO, 2008)

The increasing incidence of migration during the last decades has attracted attention towards the effects of migration both at the macroeconomic and microeconomic levels. The issue of migration has been, recently, addressed by academics and policy makers from a development

---

<sup>2</sup> Goal 1: Expand early childhood care and education. Goal 2: Provide free and compulsory primary education for all. Goal 3: Promote learning life skills for young people and adults. Goal 4: Increase adult literacy by 50 per cent. Goal 5: Achieve gender parity by 2005 and gender equality by 2015. Goal 6: Improve quality of education.

<sup>3</sup> The calculation of this index is based on the countries' progress towards achieving the expected educational goals that have been listed previously.



perspective, suggesting that migration has a potential to influence educational and health variables.

The effects of migration on education are expected to be transmitted through an income channel, which is based on the idea that remittances, being a source of income, play an important role in smoothing consumption and relaxing credit constraints in migrant households. Thereby, remittances would raise schooling levels by increasing the ability of households to invest in human capital such as education. (McKenzie and Rapoport, 2006) This is likely to be the case in the Ecuadorian context since, although the Constitution of the Republic guarantees public, universal and free education to individuals (Nueva Constitución, 2008), the high levels of poverty still constrain individual and households' decisions towards education.

The incentive channel is an additional way in which migration may impact education. If after migrating higher educated people tend to perceive higher wages, the expected returns to schooling will increase, which in turn will give incentives to use remittances to acquire education. However, this is not always the case since decisions with regard to education, as well as the outcomes obtained, can also be influenced by other factors involved within migration such as the change in the structure of households. (McKenzie and Rapoport, 2006) It is precisely those changes in the family structure that have encouraged, among Ecuadorians, the perception of migration as a threat to children's behaviour and particularly to their results in school, and consequently a series of studies around this topic have been performed, most of them qualitative due to the scarce information in quantitative terms.

In an effort to provide data regarding school performance, Ecuador, through its National System of Academic Achievements Measurement known as "APRENDO", gathers information about academic results in the areas of Mathematics and Language among third, seventh and tenth graders, and concludes that there has not been a significant improvement in the "quality of education" between 1996 and 2007. (MEC, 2007 Informe Técnico APRENDO) According to the UNESCO (2007), however, this kind of comparative tests are incomplete measures<sup>4</sup> because of its exclusive focus on two specific areas, ignoring others, and assessing results instead of aptitudes and skills, implying that their validity in evaluating quality of education is subject to scrutiny. It is important, hence, when looking at school performance to take into account factors, besides migration, which could be endangering the learning process, such as the inefficient or inexistent supply of educational services, and inappropriate, dangerous, or over populated educational environments.

The interest of analysing the effects of migration on child education in Ecuador emerges, therefore, from the contrasting effects on education that have been attributed to migration: how remittances, being an income source, impact educational outcomes; and how these effects are conditioned to additional factors such as the supply of educational services.

---

<sup>4</sup> A more complete evaluation process (National Evaluation of the Student's Performance) is currently being carried out through the so called "Pruebas SER Ecuador". Detailed results from the application of those tests are not yet available to the public.

### 2.3. Literature on Remittances and Human Capital Accumulation

Following the idea that migration affects development by both income and incentives channels, we look at the empirical evidence on how education as an indicator of development has been influenced by migration. The outcomes are still unambiguous, there are studies showing a positive effect of migration on education but also others with mixed (positive and negative) results.

Among several studies Lopez-Cordova's (2005) analysed whether education improves as the fraction of remittances-recipient households increases in Mexican municipalities. He focused on child illiteracy and school attendance as educational outcomes and used weather conditions and distance from Guadalajara as instruments to solve the endogeneity problem involved in the explanatory variable. He found that there are indeed positive effects of remittances on education but that the results differ among age groups (positive effects among young children while negative among older ones). Lopez-Cordova's work supports the notion that migration has an important effect on education; however, the data used isn't enough to explain the negative results, which could be reflecting a lack of educational infrastructure, incentives created by remittances for other household members to migrate, or the fact that older children must take over household responsibilities in absence of adults. (Lopez-Cordova, 2005)

A more complete study is the one undertaken by McKenzie and Rapoport (2007), which examines the impact of migration on school attendance and educational attainments in rural Mexico, accounting for delays in starting school and grade repetition. They used a dummy variable reflecting whether children belong to a migrant-household<sup>5</sup> as explanatory variable, and historical migration rates as instruments to control for endogeneity. Moreover, they allowed right-censoring data and non-linearity; classified educational grade attainment into categories; and estimated a censored ordered probit model via maximum likelihood. Their findings showed that belonging to a migrant-household lowers school-attendance probability, which could be explained by the side effects of migration such as absence of parents in the household that could reduce investment in children's education and an increase in the incidence of child work.

Acosta et al. (2007) evaluate the impact of remittances on poverty, education and health in eleven Latin American countries and conclude that a positive modest impact on poverty reduction does exist. They also observe strong heterogeneity regarding the impact which is frequently mentioned in remittance and migration literature. Hanson et al. (2003) found that children in migrant households complete significantly more schooling years than those in non-migrant households, which is consistent with emigration helping relax household credit constraint and allowing them to invest in education.

Other authors find a positive influence of remittances on education outcomes in some countries. For instance López Córdova (2005) finds positive results for Mexico where infant mortality and child illiteracy decline as a consequence of remittances; Yang (2004), examines the impact of migrant income shocks on investment outcomes in Philippine households, such as child schooling, and finds that the appreciation of a migrant's against local currency increases household's remittances, which in turn have a positive effect on human capital accumulation;

---

<sup>5</sup> Migrant-household refers to those households where there is at least one person who has migrated abroad.

favourable exchange rate movements led to greater child schooling, reduced child labour and increased educational expenditures in origin households.

For the specific case of Ecuador, there are only few studies dealing with the impacts of migration on childrens' education. Calero et al. (2008), investigated the role of remittances in influencing human capital accumulation in Ecuador, by using an IV-probit model to find the probability of being enrolled in school, participating in income generating activities or domestic work as a function of remittance transfers, and controlling for labour market and economic conditions. In addition they examined the effect of remittances on the quality of investment reflected by the substitution between public and private education. In order to control for endogeneity, the number of Western Union (WU) offices in the region as well as the countries source of remittances were used as instruments. The results of their study show that remittances have a positive impact on human capital accumulation; they increase school enrolment and improve quality of education decisions in households.

Calero et al's choice for private over public schools as an indicator of improvements in quality of education is, however, likely to be questioned since private schools do not necessarily imply a better quality of education. In a country as Ecuador it is possible to find high, as well as low quality education in both private and public schools. In addition, the use of the number of Western Union branches per province as an instrumental variable to control for endogeneity does not fully capture individuals' access to channels of transmission since it ignores distribution of those branches within the provinces. From Calero et al. (2008), we observe that, for instance, the provinces of Guayas and Pichincha have the largest number of WU offices (33 and 30 respectively), most of which are probably located in Guayaquil and Quito, the major population centres within these provinces.

Further research on this topic has been undertaken by Ponce et al. (2008), who analyse the impact of remittances on education, health and consumption outcomes in Ecuador, by using local dispersion in bank density as a source of exogenous variation, and find that there is a positive effect of remittances on consumption and health and education expenditures however the authors find no significant effects on educational or health outcomes. Additionally, their results indicate that remittance-recipient children have a higher probability of attending private schools. However, attributing this result to remittances might be misleading since recipient households belong in general to middle income class so those children would have attended private schools in spite of not receiving remittances. We consider that these results are likely to present selection bias problems since they only used a sample of 937 households, chosen from those cities absorbing the highest proportion of remittances in the largest Ecuadorian provinces. Besides, the authors used a dummy variable indicating the presence of banks or money transfer agencies within parishes as an instrument to control for endogeneity, without taking into account that the latter are likely to have lower costs than the former, and hence be preferred by migrants.

Finally, a more qualitative study by Pedone (2006), shows that in spite of the generalized belief that changes in traditional structures arisen from the migration process, have negative impacts on child behaviour and education, there is not enough evidence supporting it.

The literature review suggests that migration has a potential to influence human capital investments such as education, however there seems to be a lack of research on certain areas that might act as strong determinants of the outcomes.

First of all, remittances have in general been considered as exogenous flows of income which is far from being true. Although being aware that it would be necessary to use a counterfactual on the incomes obtained from remittances, the currently available data does not provide information about the migrants' characteristics in order to properly evaluate the changes in households' income after migration.

Secondly, education related variables such as school enrolment, school attainment and expenditures on education are probably, to a certain extent, determined by the educational supply conditions in place. For instance, even if a household (either recipient or non-recipient) is concerned about child education and likely to invest in schooling, an insufficient number of teachers, a poor infrastructure, as well as over populated schools<sup>6</sup> inhibit children's access to the desired education. Accordingly, attending schools which are distant from home imply transport and opportunity costs that households may not be able to afford even after receiving remittances. It is also possible that in order to access education, children would have to migrate to bigger cities. In an attempt to remedy this limitation, our article includes the construction of the so called "index of educational action" (IEA) proposed by the SINEC (Sistema Nacional de Estadísticas Educativas), which assess educational supply conditions in a given geographical area, and uses it to account for differences among cantons.

In order to assess improvements in development, the quality of education would be a useful indicator, however it is not easy to evaluate; private schools tend to be associated with higher quality but this is not always the case. In Ecuador for example, there are public schools, traditionally recognized for their quality in education; as well as private schools, known for accepting students whose poor performance has resulted in their rejection from previous educational establishments. One possible way to measure quality of education would be the entrance results to tertiary education however this would be restrictive to students who have finished high school and tried to enter higher education, besides obtaining this information would imply gathering data from universities and high-institutes. The IEA could also be taken as a proxy for differences in quality of education among regions, but it would be necessary to include additional information in the construction of the index.

The present analysis tries to avoid endogeneity between migration and education, by using the number of cantons per province to which Delgado Travel registers remittances flows, together with the main countries source of remittances, as instruments. These variables are able to account for transfer costs and accessibility to transfer services in a more complete way than previous studies.

Finally, and being aware of the limitation of performing the analysis at the provincial level only, this article takes into consideration, due to their influence in the effect of migration, differences within provinces. In line with this, the present study uses the IEA at a cantonal level, increasing in this way the variability in the sample.

---

<sup>6</sup> The term over-populated schools refers to schools with a low number of teachers and classrooms for a large population of students.

### 3. DATA AND METHODOLOGY

#### 3.1. Data on Remittances and Educational Outcomes

According to the most recent Encuesta de Condiciones de Vida (ECV2005-2006), nowadays 16 per cent of the Ecuadorians belong to a remittances recipient household, with transfers that on average represent almost 17% of their monthly household income.

Most of the population living in a remittances recipient household is concentrated mainly in the Sierra<sup>7</sup> region where more than half of the country remittances are directed. The distribution of remittances receiving households can be observed in Table 1.

*Table 1: Distribution of Remittances Recipients Households by Country Region*

Regional Distribution of Remittances Recipients	
Region	Recipient Households
Sierra	56.84%
Costa	37.44%
Amazonia	5.73%

*Source: Authors' calculation based on the ECV(2005-2006)*

The ECV (2005-2006) indicates that the presence of recipient households is particularly high in the provinces of Cañar and Azuay, where 44.16 per cent and 27.78 per cent of total households receive international remittances respectively. This is easily explained by the fact that both provinces also show evidence of an important historical migration process. According to Pedone (2006), in 1950 the “Panama hats” crisis in Azuay caused the first emigration flows from Ecuador to USA. Some authors estimate that since the 1970s, more than 150,000 people from Cañar and Azuay migrated to New York (Borrero and Vega, 1995 and Guzman and Peralta, 2001 in Pedone, 2006). Although, it was only in the 1980s that Cañar and Azuay became important poles of international emigration (Pedone, 2006).

According to the geographical distribution only four, out of twenty-one<sup>8</sup>, provinces concentrate almost 50 per cent of all remittance-recipient households in the country. The province with the highest number of recipient households (16.14 per cent) is Guayas, where the main international port (Guayaquil) is located. The second and third provinces with a high concentration of recipient-households are Azuay (12.84 per cent) and Cañar (10.52 per cent), where the incidence of historical migration has already been mentioned. And Pichincha, where the Ecuadorian capital city; Quito is located, appears as fourth in this distribution<sup>9</sup>.

<sup>7</sup> The term “Sierra” refers to the highlands in Ecuador. This region is located in the central part of the country (between the Coast and the Amazon regions)

<sup>8</sup> This does not include Galapagos. The provinces of Santa Elena and Santo Domingo de los Tsachilas did not figure as such by the time the LSS(2005-2006) took place, hence, in our study they are still considered as part of Guayas and Pichincha respectively.

<sup>9</sup> Quito, Guayaquil and Cuenca are the major cities in Ecuador and are located in the provinces of Pichincha, Guayas and Azuay respectively.

Table 2: Recipient Households

Recipient Households			
Share of total households		Distribution per Province	
Province	Percentage	Province	Percentage
CAÑAR	44.16	GUAYAS	16.14
AZUAY	27.78	AZUAY	12.84
EL ORO	22.40	CAÑAR	10.52
MORONA SANTIAGO	21.08	PICHINCHA	10.05
LOJA	20.75	EL ORO	9.67
GUAYAS	17.97	TUNGURAHUA	6.28
ZAMORA CHINCHIPE	16.67	LOJA	5.99
TUNGURAHUA	16.22	MANABI	4.77
PICHINCHA	14.20	LOS RIOS	3.96
PASTAZA	13.89	ESMERALDAS	3.45
MANABI	10.50	CHIMBORAZO	3.02
CHIMBORAZO	10.46	IMBABURA	2.83
NAPO	10.42	COTOPAXI	2.64
ESMERALDAS	10.30	MORONA SANTIAGO	2.03
LOS RIOS	10.27	BOLIVAR	1.42
IMBABURA	9.79	PASTAZA	0.94
COTOPAXI	9.12	ZAMORA CHINCHIPE	0.94
ORELLANA	6.99	CARCHI	0.76
BOLIVAR	5.93	NAPO	0.71
SUCUMBIOS	4.74	SUCUMBIOS	0.57
CARCHI	3.17	ORELLANA	0.47
Total	15.60	Total	100.00

Source: Authors' calculation based on the ECV(2005-2006)

When looking at individuals, rather than households, not much difference is found. Cañar and Azuay remain the provinces where most of the population belongs to remittance-recipient households; while Guayas, Azuay, Cañar, and Pichincha still account for almost 50 per cent of individuals living in recipient households.

In order to analyse the effects of remittances on child education in Ecuador, we have used the information from the ECV (2005-2006) provided by the INEC<sup>10</sup>. The survey is composed by a sample of 55,666 individuals belonging to 13,851 households and it is representative at provincial level.

In general, children start their pre-primary education at the age of 5 and should finish their secondary education at the age of 17, which is precisely the reason why the sample has been restricted to 16,953 individuals whose age is within this range.

The Ecuadorian educational system is divided into four main level: Basic Education comprising of one year of pre-primary, six years of primary and three years of secondary school, Intermediate Education including three years of secondary school, Superior and Post-Graduate

<sup>10</sup> Instituto Nacional de Estadísticas y Censos : National Census and Statistics Institute

Education. Access to education is free, universal and granted by the state in all public establishments up to the Superior level although for the later, access is restricted to the capacity of absorption of the network and/or performance of students on University entry evaluations. Accordingly we have divided the sample of individuals in school age (5 to 17 years old) in three groups: The first group is formed by 8,837 individuals whose age goes from 5 to 11 years old, which corresponds to pre-primary and primary education. The second group is composed by 3,238 children with ages from 12 to 14 years old, which coincides with the end of their secondary basic education. Finally, the third group is composed by 2,360 individuals within the 15-17 age range.

From the sample of individuals, whose age goes from five to seventeen years old, 16.34 per cent belong to a remittance recipient household.

In order to determine the potential of remittances to improve educational outcomes on recipient households, we will make use of two models: The first one attempts to measure expenditures on education differentiating by age category and controlling for the conditions of the educational supply side. The second model uses school enrolment as our main explanatory variable depending on the likelihood of receiving remittances and the quality of the local education network.



### 3.2. Constructing the Index of Education Action

The Ministry of Education provides statistics on main educational indicators at Province, Canton and Parrish level. By making use of the information recorded for the period 2005-2006 and trying to summarize different dimensions of the educational services available in a given territory, we replicated the construction of a so called “index of educational action” (IEA) used by the Ministry of Education but at a more aggregated level, The construction of this index uses the method of principal components and include the following indicators:  $SC_k$  = number of classrooms<sub>k</sub>/number of students<sub>k</sub>,  $ST_k$  = number of teachers<sub>k</sub> / number of students<sub>k</sub>,  $SS_k$  = number of schools<sub>k</sub> /number of students<sub>k</sub> .

Each indicator has an assigned weight, so that the IEA can be calculated as follows:

$$IEA_k = w_1 * (SC_k) + w_2 * (ST_k) + w_3 * (SS_k) \quad (0)$$

where  $k = 1, \dots, K$ , represents the territorial unit for which the index is calculated.

Making use of the principal components method we estimated the corresponding factor sectors and coefficients of the IEA index.

$$F_k^* = 0,48Z_1 + 0,64Z_2 + 0,59Z_3 \quad (2)$$

These factor coefficients define a new variable, which is precisely the “index of educational action” (IEA) considered in this study as a proxy for the conditions of the educational local network. This index has been calculated both at a provincial and cantonal level and, together with remittances, will be the main independent variables explaining the probability of being enrolled in school and the level of recipient household’s investments in education.

Table 3 shows the index at the provincial level, for primary and secondary education jointly.



Table 3: Educational Action Index by Province

Index of Educational Action	
Primary and Secondary Education	
Province	Index
GUAYAS	6,41
PICHINCHA	5,53
TUNGURAHUA	4,68
LOS RIOS	4,52
AZUAY	4,46
EL ORO	4,22
IMBABURA	4,22
ESMERALDAS	3,68
COTOPAXI	3,34
CAÑAR	3,32
ORELLANA	3,19
SUCUMBIOS	2,73
MANABI	2,57
NAPO	2,21
CARCHI	2,13
CHIMBORAZO	2,04
ZAMORA CHINCHIPE	1,63
MORONA SANTIAGO	1,45
BOLIVAR	1,45
PASTAZA	1,36
LOJA	1,00

Source: Authors' calculation based on data at school level from the Ministry of Education

The provinces of Guayas and Pichincha are ranked as first and second according to their educational supply conditions. This is not surprising as Guayaquil and Quito (capital cities of those provinces and the later capital city of the country) are both the most populated cities in the country and concentrate a significant volume of the national economic activities. In third place, we have Tungurahua, a province located in the centre of the Andean region whose capital city is Ambato, usually receives students from rural areas, not only from Tungurahua itself but also from neighbouring provinces in the secondary education level.

The use of the educational index is to provide an indication of the conditions of the local educational services. A higher index would imply better supply conditions and a larger local network believed to facilitate access to schools and to provide with more choices in terms of quality of education. However a higher number of teachers, classrooms or schools per student do not necessarily imply better quality of the educational services. While over populated classrooms and schools might have a negative impact on the children's education (UNESCO,2008) improving those ratios alone does not guarantee a better quality of he education.

For illustration purposes the IEA has been presented here at the provincial level, however, when performing the analysis we used this index calculated at the cantonal level which increases variability in the sample. Analysing the index at the cantonal level, we observe that among the highest ranked six positions the most important cities in the country are located; Guayaquil, Quito, Cuenca and Manta. In general, most of the cantons, ranked on a good position, include large urban areas in their territory. This means that the IEA is probably reflecting the better capacity of the educational system to absorb a higher number of students within those cantons. In contrast, cantons poorly ranked, are in general rather small and have a higher proportion of people living in rural areas.

### 3.3. The Model

In order to control for individual, household and regional characteristics that might influence the results, three sets of different variables have been included in the model. The first one provides personal information about the child such as age and gender; the second set of variables includes household information such as gender and unemployment status of the household head; level of education of the highest educated adult female, as a proxy to mother's education; the households' size; and variables indicating household wealth such as home and access to public services. Finally, regional dummies were included as a third set of controls.

Due to the characteristics of the households receiving remittances, the analysis is likely to present endogeneity problems. Therefore, it has been considered necessary to include variables that can act as instruments in the model, determining the probability of a household to receive remittance. The main instrument selected is the number of cantons per province that receive remittances through Delgado Travel agencies. The choice of this variable is justified based on the fact that Delgado travel is the transfer company charging the lowest costs, and therefore the most popular among migrants.

*Table 4: Market Share of Money Transfers Companies*

Transfer companies	
Delgado Travel	54,10%
Western Union	26,30%
Money Gram	6,90%
Others	12,70%

*Source: Olivier and Ponce (2008)*

*Table 5: Money transfer fees*

Money Transfer fees	
Transfer channel	Fee for sending 100usd
Delgado Travel	3 usd
MoneyGram	4.9 usd
Western Union	8.84 usd

*Source: Transfer Companies' web pages*

The number of cantons per province of which Delgado Travel agencies report inflows of remittances determines in part the frequency and the amount of remittances received by households, and does not have a direct effect on educational outcomes. This variable has been considered a useful and relevant instrument for the analysis due to the fact that it fulfils both the independence status with the outcome (expenditures on education or school enrolment) and captures the distribution of services of this channel of transmission within the province, avoiding their concentration in large cities.

In order to fully exploit the variation in the instruments and to increase the support for identification, the number of cantons receiving remittances through Delgado travel was interacted with source country dummy variables, so that transfer costs and access to channels of transmissions are accounted for.

*Table 6: Availability of Delgado Travel Agencies per canton*

Province	Cantons per Province	
	Total Number	With Delgado Travel services
AZUAY	15	7
BOLIVAR	7	1
CAÑAR	7	6
CARCHI	6	1
CHIMBORAZO	10	3
COTOPAXI	7	2
EL ORO	14	5
ESMERALDAS	8	1
GUAYAS	28	7
IMBABURA	6	2
LOJA	16	3
LOS RIOS	13	2
MANABI	22	4
MORONA SANTIAGO	12	3
NAPO	9	1
ORELLANA	4	0
PASTAZA	4	1
PICHINCHA	9	2
SUCUMBIOS	7	0
TUNGURAHUA	9	2
ZAMORA CHINCHIPE	9	1

*Source: Central Bank of Ecuador*

The two following models will be used to evaluate the impact of remittances on education. The first one uses a two stages least square estimation to predict monthly educational expenditures of the household per child (see equation 3) and the second uses iv-probit model to determine probability of school enrolment for children under school age (equation 4).

$$\begin{aligned} LnExpEduc_{ij} = & \beta_0 + \beta_1 RMS_j + \beta_2 IEA_k + \beta_3 age_i + \beta_4 femhhh_j + \beta_5 hhs_j + \\ & \beta_6 edfad_j + \beta_7 Yq_j + \beta_8 rural_j + \beta_9 \sum_{r=1}^3 regio + \varepsilon \end{aligned} \quad (3)$$

$$\begin{aligned} P(Enrolment = 1|x) = & \Phi(\beta_0 + \beta_1 RMS_j + \beta_2 IEA_k + \beta_3 age_i + \beta_4 age_i^2 + \beta_5 gender_i + \\ & \beta_6 femhhh_j + \beta_7 hhs_j + \beta_8 edfad_j + \beta_9 Yq_j + \beta_{10} rural_j + \beta_{11} \sum_{r=1}^3 regio + \varepsilon) \end{aligned} \quad (4)$$

$i = 1, \dots, I$  individuals,  $j = 1, \dots, J$  households;  $k = 1, \dots, K$  cantons; and  $r = 1, 2, 3$  regions

Where *Ln ExpEduc* represents the natural logarithm of the monthly equivalent educational related expenses reported by the family -per children-, *Enrolment* is a binary response variable taking the value of 1 if the child is enrolled in school and a value of zero otherwise, *RMS* is also a dichotomous variable taking the value of 1 if the family reports receiving remittances and zero otherwise, *IEA* is our Index of Educational Supply calculated at the level of cantons. As control variables we include a set for individual characteristics of the children in the sample, such as *age*, *age2* (age squared) and *gender*, a set on household characteristics including information on the gender of the households head (*femhhh*), the number of members in the household (in Adult Equivalent size) (*hhs*), the number of schooling years of the highest educated adult female (*edfad*), and the quantile in which the household is located according to the Income distribution of families in the sample (*Yq*), and finally *regio* is a dummy associated to regional characteristics.

Given that the probability of receiving remittances is an endogenous result of specific household characteristics, the models are solved in two stages: in the first stage, the endogenous variable, remittances in this case, is regressed on the instruments (source country and availability of transfer services). In a second stage, and using the fitted values obtained in our previous regression, educational expenditures and school enrolment are regressed on remittances, our index reflecting the availability of educational services at the cantonal level, and a series of individual, household and living conditions covariates.

## **4. EMPIRICAL EVIDENCE**

### **4.1. Expenditures in Education**

The results confirm the positive and significant effect of remittances on expenditures in education for recipient households vis-à-vis non recipient families. (see Annex 1) Recipient households, on average, spend 15 percent more on education services than the group of non-recipients which is consistent with similar findings from previous authors and emphasises the role of remittances at relaxing income constraints. The IEA also shows also a positive and significant effect on the expenditures in education confirming the hypothesis that a good educational infrastructure provides better probabilities for children not only to gain access to schools but to receive a better quality of instruction. A more diversified educational supply includes a higher proportion of private schools whose costs are higher than the public ones and consequently people, especially those living in urban areas; tend to move their children from public to private when their income increases what is consistent with the positive and significant effect of the Income variable ( $Yq$ ) in the model.

While private schools do not entirely guaranty a better quality of education, a certain sense of economic status tied to the believed educational quality factor enhances this trend of favouring private centres instead of public ones. On average, as people move from one income quintile to a superior one, the household expenditures on education increase by 24 percent.

The negative sign of the rural dummy explains two main aspects, the first one is the lower proportion of private schools located in rural areas that by default reduces the amount paid on school fees and school materials to zero for the children enrolled in a public centre but also reflects the availability of higher incomes in urban areas.

Households with larger number of children spend relatively less in education per child than smaller families.

### **4.2. Expenditures in Education by Students' Age Category**

The results by age category follow the same structure as in the full sample and they are presented in Annex 2. Remittances recipients spend progressively more in education for students in secondary than in primary school because the cost of education tends to increase with the age of the student. The opposite occurs under improvements of the local educational infrastructure given the fact that the educational network is larger and more diverse for primary educational centres than for the secondary ones, especially in small urban centres and rural areas.

For children with ages from 5 to 11 years old, families living in rural areas spend 35% less in education than those located in urban centres. This difference reduces as children reach higher education. Most likely this is due to the fact that children in rural areas have lower probabilities to reach the last years of secondary school or they move to high schools located in urban areas.

### 4.3. School Enrolment

The effect of remittances on the enrolment probability is captured using a probit model including instrumental variables. The first stage reveals that the variable showing the number of cantons per province in which Delgado travel registers international money transfers has a positive effect on the probability of belonging to a recipient household, as it can be observed in Annex 3. The countries, source of remittances, as well as their interaction with the channel of transmission variable, show also a positive and significant effect on our endogenous variable. This indicates that the instruments have been useful in providing support to the identification of the effects of remittances.

The second stage of our regression shows that there is, indeed, a positive and significant effect of receiving remittances on the probability of school enrolment, which confirms the hypothesis that migration, through remittances, affects educational outcomes positively by increasing income levels and, which in turn relaxes credit constraints allowing investment in human capital. Belonging to a remittances recipient household increases the probability of enrolment by 23 percent. The effects of IEA are still significant but show a negative sign as can be observed in Annex 3.

The negative sign of the IEA coefficient is in contrast to expectations. This result is probably due to the variables used in the construction of IEA index; a higher number of students, per school, classes and/or teachers does not necessarily imply a better capacity from the part of the educational system to absorb students in a determined canton, but, may also be reflecting the existence of overpopulated schools in certain cantons.

The covariates used present the expected signs: age has a positive but decreasing effect on the probability of being enrolled in school, which is partly determined by the fact that school is not compulsory after a certain age (15 years old) and that some adolescents reduce their interest in completing school, after entering into the labour market. Unfortunately girls are less likely to be enrolled in school.

When looking at the results regarding household level characteristics, we observe that children who belong to female headed households are less likely to be enrolled in school, which is probably due to the fact that since the mother or maternal figure in the family has to work outside the house, children must be left unattended and sometimes in charge of domestic work. However the proxy used for mother's education which is the educational level attained by the highest educated adult female in the household suggests a positive effect on school enrolment, indicating that the more educated mothers are, the more they care for educating their children.

The variables used as a proxy for household economic status show a positive influence on education, which is explained by the fact that households whose basic needs are covered are more likely to invest in education than less wealthy households. Those children who live in rural areas are less likely to be enrolled in schools.

#### **4.4. School Enrolment under Different Educational Supply conditions**

In order to confirm the robustness of the previous results, a second disaggregation was performed, this time cantons were classified into three groups according to their IEA as showing high, middle and poor supply conditions. The results showed again that the effect of remittances on educational outcomes is positive and highly significant for those children living in cantons with good education supply conditions. Although the effect remains positive for cantons with medium and poor supply networks, it turns not significant for the later reflecting how local constraints can restrict the development opportunities of families located in those areas. The corresponding results are included in Annex 4.

These results seem to give support to our hypothesis that the potential of migration to contribute to educational outcomes is bound to the local supply conditions.

## 5. CONCLUSION

From the analysis it has been observed that migration, through remittances, does have a positive and significant effect on educational outcomes in Ecuador. This goes in line with the idea that remittances, being a source of income, are able to smooth consumption and allow households to invest in human capital such as education. The effects of remittances on education are, however, bound by the available supply conditions in a determined geographical area. The results of our study indicate that better supply conditions have a positive impact on expenditures in education. Moreover, remittances have positive significant effects on school enrolment in those cantons where the educational infrastructure in place is adequate while their effect is null in areas with poor infrastructure.

These findings show that children's education is likely to be affected by migration and remittances, however the way in which they are affected will, in part, depend on some basic structural conditions. The results suggest that the Government has an essential role to play in guaranteeing individuals' quality of life by providing them with the necessary conditions to make them capable to positively receive shocks, such as remittances flows in this case.

Migration, as a typical globalisation event, is to be considered as an integral part of the development process. However, too much emphasis on the migration in isolation as a development tool, without placing structures and establishing the appropriate institutions, is deemed to failure and likely to produce undesirable results.

As a side result of the work is the clear need to create a more accurate measure of the educational supply conditions. The Index of Educational Action has been used in this study as a proxy for an educational quality measure within a given area however, the way in which this indicator is constructed only emphasises the quantitative perspective of the network by looking at the number of children who received educational services, while failing to incorporate a more qualitative perspective. Although the IEA is a valid measure of the physical educational supply constraints, it does not fully capture the effectiveness of the educational system on the population. Thus, more variables should be included when assessing supply conditions in a way that such characteristics would not only assess the quantitative side of supply conditions but also include a qualitative perspective. In this sense we suggest, for further research, the development of a stronger measure of educational quality supplied in order to assess better the impacts of remittances on child education accounting for the constraints faced by households to profit from the economic benefits obtained from the process of migration.



## REFERENCES

- Amuedo-Dorantes C., Geroges A. and Pozo S., (2008), "Migration, Remittances and Children's Schooling in Haiti". IZA Discussion Papers Series No.3657
- Acosta, P., Fajnzylber, P., and Lopez, H., (2007), "The impact of Remittances on Poverty and Human Capital: Evidence from Latin America Households Surveys". World Bank Policy Research Working Paper 4247
- Angrist, J. and Pischke, J-S, (2009), "Mostly Harmless Econometrics: An Empiricist's Companion", Princeton University Press.
- Banco Central del Ecuador – BCE - (2009) Informacion Estadistica, <http://www.bce.fin.ec>, (last consulted: May, 2009)
- Calero, C., Bedi, A., and Sparrow, R., (2008), "Remittances, Liquidity Constraints and Human Capital Investments in Ecuador", Institute for the Study of Labor (IZA).
- Greene, W. H., "Econometric Analysis", 5th edition (2003) Prentice Hall.
- Hanson, G., Woodruff, C., (2003), "Emigration and Educational attainment in Mexico". University of California San Diego and NBER National Bureau of Economic Research.
- Hidalgo, F., (2004), "Migraciones, Un Juego con cartas marcadas", Ediciones ABYA-YALA
- Lopez-Cordova, E., (2005), "Globalization, Migration, and Development: The Role of Mexican Migrant Remittances", The Brookings Institution.
- McKenzie, D., and Rapoport, H., (2006), "Can Migration Reduce Educational Attainments? Depressing Evidence from Mexico", Center for Research and Analysis of Migration (CReAM).
- McKenzie, D., and Sasin, M., (2007), "Migration, Remittances, Poverty, and Human Capital: Conceptual and empirical challenges", World Bank Policy Research Working Paper 4272.
- MEC, (2007). "Informe Técnico Aprendo 2007: Logros Académicos y Factores Asociados". Ministerio de Educacion – Ecuador.
- Pedone, C., (2006a), "Estrategias migratorias y poder: Tu siempre jalas a los tuyos", Ediciones ABYA-YALA
- Pedone, C., (2006b), "Los cambios familiares y educativos en los actuales migratorios ecuatorianos: una perspectiva transatlantica", Universidad Autonoma de Barcelona.
- Ponce, J, Olivie, I, (2008) "Remesas para el desarrollo? Analisis del impacto de las remesas en el desarrollo de Ecuador", Real Instituto Elcano and Flacso Ecuador
- Ponce, J., Olivé, I., Onofa, M., (2008), "The impact of remittances on human development outcomes in Ecuador", Documento de trabajo 06 305, Flacso-Ecuador
- Ramirez Gallegos, F. and Ramirez, J., (2005) "La estampida migratoria ecuatoriana, Crisis, redes transnacionales y repertorios de accion migratoria", Ediciones ABYA-YALA

Skeldon, R., (2008) "International migration as a tool in development policy: a passing phase?" Population and Development Review, vol. 34(1), 2008

Social Development Report., (2007) "Pobreza, Desigualdad, e Inversion Social". Secretaría Técnica del Ministerio de Coordinación de Desarrollo Social.

UNESCO (2008), Rapport mondial de suivisur l'EPT 2008. L'éducation pour tous en 2015. Un objectif accessible?, UNESCO

Unterhalter, E., (2003), Education, capabilities and social justice, UNESCO

World Bank (2009). Data Base <http://www.worldbank.org> , (last consulted: May, 2009)

Yan, D., (2004), International Migration, Human Capital, and Entrepreneurship: Evidence from Philippine Migrants' Exchange Rate Shocks, Mimeo. Ford School of Public Policy, University of Michigan.

## ANNEXES

### Annex 1: The effect of remittances on Expenditures in Education – 2SLS

<b>Number of obs</b>	14435
<b>Wald chi2(11)</b>	10396,91
<b>Prob &gt; chi2</b>	0
<b>R-squared</b>	0,4189
<b>Root MSE</b>	0,92602

#### First-stage regression

**Endogenous Variable** Remittances Recipient Household

<b>Instrumental Variables</b>	<b>Coefficient</b>	<b>Std. Err.</b>
Delgado Travel	0,017 ***	(0.0010)
Spain	0,209 ***	(0.0196)
USA	0,159 ***	(0.0211)
DTxSpain	0,163 ***	(0.0016)
DTxUSA	0,136 ***	(0.0014)
n_migrants	0,329 ***	(0.0052)
constant	0,099 ***	(0.0148)

<b>Number of obs</b>	14435
<b>F( 16, 14418)</b>	1857,75
<b>Prob &gt; F</b>	0
<b>R-squared</b>	0,6734
<b>Adj R-squared</b>	0,673
<b>Root MSE</b>	0,2159

#### Second Stage Regression

**Dependent Variable** Expenditures in Education (log)

<b>Independent Variables</b>	<b>Coefficient</b>	<b>Std. Err.</b>
Remittances recipients	0,1527 ***	(0.0264)
IEA	0,1307 ***	(0.0066)
age	0,0498 ***	(0.0022)
female household head	-0,0610 *	(0.0334)
married household head	0,0839 **	(0.0333)
household size	-0,1377 ***	(0.0036)
mother's education	0,0576 ***	(0.0021)
Income quintile	0,2439 ***	(0.0068)
rural	-0,2827 ***	(0.0200)
Amazonia	0,0720 ***	(0.0579)
Sierra	0,3491 ***	(0.0174)
constant	0,3358 ***	(0.0630)

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

### Annex 2: The effect of remittances on Expenditures in Education – 2SLS by Age Category

**Second Stage Regression**
**Dependent Variable**

Expenditures in Education (log)

Independent Variables	5 - 11 years old		12 - 14 years old		15 - 17 years old	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Remittances recipients	0,1364 ***	(0.0345)	0,1670 ***	(0.0530)	0,1649 ***	(0.0614)
IEA	0,1424 ***	(0.0084)	0,1129 ***	(0.0135)	0,1101 ***	(0.0163)
female household head	-0,0713	(0.0442)	-0,0115	(0.0656)	-0,0362	(0.0790)
married household head	0,0828 *	(0.0443)	0,1224 *	(0.0646)	0,0556	(0.0774)
household size	-0,1404 ***	(0.0446)	-0,1347 ***	(0.0075)	-0,1182 ***	(0.0094)
mother's education	0,0607 ***	(0.0028)	0,0610 ***	(0.0043)	0,0379 ***	(0.0052)
Income quintile	0,2556 ***	(0.0088)	0,2271 ***	(0.0137)	0,2173 ***	(0.0175)
rural	-0,3541 ***	(0.0259)	-0,2111 ***	(0.0400)	-0,0843 *	(0.0488)
Amazonia	0,0628	(0.0391)	0,0193	(0.0614)	0,2020 ***	(0.0753)
Sierra	0,4244 ***	(0.0225)	0,2450 ***	(0.0350)	0,2430 ***	(0.0428)
constant	0,6130 ***	(0.0767)	1,1341 ***	(0.1165)	1,3841 ***	(0.1354)
N	8837		3228		2360	
R-Squared	0,4341		0,3906		0,2488	
Wald Chi2	6772,89		2076,03		784,36	
Prob > Chi2	0		0		0	

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

*Annex 3: The Effects of Remittances on Enrolment – IVProbit Model*

Number of obs            16953  
Wald chi2(12)            2331,55  
Prob > chi2                0

**First Stage**

**Endogenous Variable:** Remittances Recipients

Instrumental Variables	Coefficient	Std. Err.
Delgado Travel	0,0188 ***	(0.0008)
Spain	0,2100 ***	(0.0159)
USA	0,1085 ***	(0.0172)
Italy	0,2989 ***	(0.0342)
DTxSpain	0,1686 ***	(0.0013)
DTxUSA	0,1414 ***	(0.0011)
DTxItaly	0,1490 ***	(0.0028)
n_migrants	0,1311 ***	(0.0042)
constant	0,1177 ***	(0.0163)
athrho	0,0161	(0.0185)
lnsigma	-1,6648 ***	(0.0054)
rho	0,1613	(0.0185)
sigma	0,1892	(0.0010)

**Second Stage**

**Dependent Variable:** Probability of School Enrolment

Independent Variables	Coefficient	Std. Err.
Remittances recipients	0,2303 ***	(0.0491)
IEA	-0,0245 ***	(0.0117)
age	0,6194 ***	(0.0240)
age2	-0,0325 ***	(0.0010)
gender	-0,0513 ***	(0.0276)
female household head	-0,1239 ***	(0.0372)
household size	-0,0680 ***	(0.0059)
mother's education	0,0759 ***	(0.0037)
Income quintile	0,0578 ***	(0.0122)
rural	-0,3804 ***	(0.0366)
Amazonia	0,2271 ***	(0.0548)
Sierra	0,0545 ***	(0.0313)
constant	-1,1982 ***	(0.1477)

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

*Annex 4: The effects of Remittance on Enrolment under three different educational supply conditions – IV Probit Model*

## Marginal effects after ivprobit

y = Fitted values (predict)  
= 1.5341208

y = Fitted values (predict)  
= 1.3574362

y = Fitted values (predict)  
= 1.588502

## Dependent Variable

Enrolment Probability

Independent Variables	Good		Regular		Poor	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Remittances recipient	0.2672 ***	(0.0853)	0.2192 ***	(0.0778)	0.1137	(0.0968)
age	0.6696 ***	(0.0382)	0.6396 ***	(0.0386)	0.4952 ***	(0.0529)
age2	-0.0346 ***	(0.0017)	-0.0337 ***	(0.0017)	-0.0269 ***	(0.0023)
gender+	-0.0506	(0.0440)	-0.0247	(0.0445)	-0.0985 *	(0.0598)
female household head+	0.1367 **	(0.0631)	-0.0218	(0.0601)	-0.2342 ***	(0.0733)
household size	0.0593 ***	(0.0090)	-0.0679 ***	(0.0095)	-0.0987 ***	(0.0147)
mother`s education	0.0669 ***	(0.0061)	0.0819 ***	(0.0059)	0.0823 ***	(0.00797)
Income quintile+	0.0295	(0.0189)	0.0961 ***	(0.0200)	0.0639 **	(0.0275)
rural+	-0.4424 ***	(0.0705)	-0.3475 ***	(0.0516)	-0.4145 ***	(0.0805)
Amazonia+	0.1869 ***	(0.0716)	0.3011	(0.2864)		
Sierra+	0.0523	(0.0616)	-0.0317	(0.0462)	0.1268 *	(0.0667)

(+) dy/dx is for discrete change of dummy variable from 0 to 1

\*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level



University  
of Antwerp



INSTITUTE OF DEVELOPMENT  
POLICY AND MANAGEMENT