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Rafael Arias  
*Universidad de Costa Rica*

Gregorio Giménez  
*Universidad de Zaragoza, Spain*

Leonardo Sánchez  
*Universidad de Costa Rica*

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## Impact of Education on Poverty Reduction in Costa Rica: A Regional and Urban-Rural Analysis

Rafael Arias

*Universidad de Costa Rica*

Gregorio Giménez

*Universidad de Zaragoza, Spain*

Leonardo Sánchez

*Universidad de Costa Rica*

**Abstract.** In this article, we analyze the relationship between levels of education and poverty for the different planning regions and also according to urban and rural areas. For the purposes of the study, we use the methodology of Unsatisfied Basic Needs (UBN) to measure poverty in a multidimensional way: access to decent shelter, access to health, access to knowledge, and access to other goods and services (consumption capacity). Based on empirical evidence that uses data from the Population Census of 2011, we conclude that achieving greater levels of education helps people from rural and urban areas and people living in the different planning regions of Costa Rica to escape poverty. Using the methodology of propensity score matching, we show that people who finish secondary education reduce poor shelter between 8.0% and 33.0%, reduce low levels of knowledge between 26.0% and 44.0%, and reduce poor consumption between 12.0% and 30.0%. This is also consistent with the results of finishing secondary education in urban and rural areas since completing secondary education in urban areas would have a significant impact on reducing poverty of shelter in about 36.0%, poverty of access to knowledge in 48.0%, and in 22.0% regarding access to other goods and services (consumption capacity), while completing secondary education in rural areas would reduce poverty of shelter in 18.0%, poverty related to access to knowledge in 30.0%, and poverty in consumption capacity in 32.0%.

**Keywords:** human development, capability approach, education, poverty, social work, basic needs, propensity score matching, planning regions, rural areas, urban areas

The capabilities approach has revolutionized the theory and practice of development, demonstrating that quality of life should be measured not only by material wealth, but also by the degree of freedom that can be experienced. According to the capabilities approach, an individual or household is poor when they are unable to reach certain achievements considered basic to social functioning. In this sense, the "achievements" become measurement thresholds: being able to communicate through reading and writing, living a long and healthy life, having access to goods and services which provide some comfort. These are so-called "basic skills" and they are considered to be necessary for an individual to function and be integrated into society (Sen, 2001). This theoretical approach has played a very important role in contemporary social work because it has been very useful, not only in approaching social intervention with new analytical tools, but also by providing a transdisciplinary approach that enables a more integrated understanding of social problems such as poverty, social exclusion and inequality in Costa Rica (Moya de Lozano, 2008).

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Rafael Arias, Universidad de Costa Rica, Institute of Economic Research in Economic Sciences; Gregorio Giménez, Universidad de Zaragoza, España; Leonardo Sanchez, Universidad de Costa Rica. Correspondence concerning this article should be addressed to Rafael Arias, Institute of Research in Economic Sciences, University of Costa Rica, Postal 2060-2050, San José; Email: [rafael.arias.ramirez@una.cr](mailto:rafael.arias.ramirez@una.cr)

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The mechanisms that maintain and perpetuate poverty and social exclusion operate at various levels. In homes, the levels of education and income of one generation influence the human development of the next, as well as the aspirations and autonomy that people have. On the other hand, governments, especially in less developed countries, have historically reinforced poverty and exclusion through asymmetric tax structures, poor regulatory capacities of the state, concentration and centralization of public and social policy in urban areas, institutions that discriminate and reproduce the differences between population groups, poor transparency, clientelism, corruption and weak public commitment to public action (CEPAL, 2009).

Differences in access to education and quality of education are of fundamental importance in explaining the differences in development between countries (Hanushek, 2013) and income inequality between individuals (Autor, 2014; Checchi, 2008). The education received both in terms of quantity and quality, affects wages throughout an individual's working life. In addition, more educated individuals have higher rates of employability. Therefore, education becomes the key factor in explaining the differences in wage income. Thus, access to education must be seen as a right that not only implies progress toward its enforceability to all persons without discrimination, but also as part of the context of other social rights, in particular, the right to health and gainful employment which are strongly linked. Education, in addition to contributing to improving key factors of economic development and distribution of opportunities for social wellbeing, enables the construction of citizenship, promotes democratic values, and ultimately, strengthens social cohesion. The mechanism of the transmission of intergenerational inequalities has shifted to secondary education and towards higher education. It is estimated that the completion of secondary education is a basic condition (or minimum educational capital) to access jobs that allow people stay out of poverty during their working lives (Arias, Sanchez & Sanchez, 2011).

Under the capability approach, education is conceived as a crucial basic capacity to reduce poverty and social exclusion in the medium and long term. However, there are barriers of various kinds that exclude large segments of the population from formal education. These include territorial or geographical barriers, which are reflected in the spatial distribution of resources and educational infrastructure. These tend to be highly concentrated in urban centers. In this regard, the farther a population is from the main centers of economic agglomeration, the more they will suffer from infrastructure problems and greater distances impeding access to primary and secondary education. This urban-rural divide and spatial inequalities become structural factors that adversely affect the low literacy levels and lack of other important basic needs of rural population. As it has been stated by Pugh and Cheers (2010), "...in many places the most pressing welfare priorities for rural populations require interventions directed towards more fundamentals needs: for clear water, satisfactory housing, basic health care and education" (p. 6). In this direction, Muñoz Franco (2007), using the capability approach in social work intervention, argues the importance of designing and implementing public social policies able to guarantee greater levels of human development by improving a better access to public health and education.

The recognition of the persistence of regional inequalities and the differences in quantity and quality between urban and rural areas in accessing formal education in Costa Rica has motivated our study to determine the impact of investments in public education on poverty reduction in rural and urban areas as well as for the different regions that make up the country. Most of these regions, with the exception of the Great Metropolitan Area, are considered to be rural. Preliminary results of our empirical research demonstrate that improving access to the public

education system and higher levels of education reduces poverty levels in both urban and rural areas. These results can be used by decision makers in the design of public policy for the allocation of educational investment, taking into consideration geographic criteria that would allow populations that are at a disadvantage to access educational resources. This is particularly important to break the vicious circle of poverty and social exclusion and the asymmetric development between the urban and rural, which has geographic, generational (age), ethnic and racial connotations.

In analyzing the impact of education on poverty, it should be considered that people with higher incomes are able to access higher levels of education compared with the deciles of the population with lower incomes. Therefore, the distribution of education levels among the population is not a random event; if an estimator that does not consider this situation is used, the results to be obtained would be biased.

To solve this problem, a semi-parametric approach based on the methodology of Propensity Score Matching (PSM) is used. With this methodology, poverty levels are compared in the different planning regions of Costa Rica for segments of the population with a certain level of education compared to others with similar characteristics, but with a lower educational level. This aims to determine whether a higher level of education helps reduce poverty levels in each of the dimensions of poverty using the method of Unsatisfied Basic Needs (UBN). The relevance of this approach is that it allows us to empirically demonstrate the impact that higher levels of schooling have on reducing poverty. Application of PSM contributes methodologically in approaching the problem under study in a manner that has not been done in Costa Rica, namely, measuring the impact of education on poverty in the different regions and in urban and rural areas.

Although the relationship between education and poverty is a subject of great interest in the development of public policies with economic, social and political implications, empirical studies are scarce, particularly in determining whether it is possible to verify a causal link between variables. The present study seeks to contribute to the discussion and to determine empirically the impact of education on poverty in the planning regions of Costa Rica. The analysis is also made to assess the impact in urban and rural areas, since rural areas have historically maintained high levels of poverty incidence. The differences in impact of completing different levels of education in urban and rural areas provides a relevant indicator of the persistence of asymmetries between these areas in the allocation, accessibility, and quality of education, and are highly concentrated in urban areas (Khatti, Riley & Kane, 1997). It is also accepted that improving the levels of literacy is one of the key factors to reduce poverty incidence and create capabilities and social capital at the household level, as well as at the community level. This can also be crucial for rural development and the social welfare of rural population (Falk & Kilpatrick, 2000).

For the purposes of the study, we used the method of unmet basic needs (UBN): adequate shelter, health, knowledge, and other goods and services (capacity consumption) from the complete database of the Census of Population and Housing 2011. Through the application known as the "Propensity Score Matching" method, individuals with similar characteristics are compared, with the difference that some have a higher educational level than others, and the level of poverty at which they live is analyzed (differentiating by type of UBN). In this way, it is possible to establish whether individuals with more education have a lower incidence of poverty, or whether, on the contrary, there is not a relation of causation between educational levels and poverty levels.

Figure 1 (Appendix A) shows that poverty has a direct relationship to location and space. As we study areas further away from the Greater Metropolitan Area, we find that poverty levels rise in Costa Rica. The study of the UBN is an important way to shed light on this relationship; it is also an important way to identify the differences in access to basic needs in urban and rural areas of Costa Rica. In the Great Metropolitan Area, poverty levels range between less than 18% up to 27%. This is relevant given that no other area (mostly rural) has a poverty percentage of less than 18%. With this said, those areas that present the highest poverty rates in the country are also the furthest away from urban areas. This is illustrated by those areas that range from 38% to 50% and from 50% to 57%.

### **Distribution of Regions in Costa Rica**

Costa Rica is divided into seven planning regions (see Figure 2, Appendix A). This regional distribution was created in 1975 by the Ministry of Planning and Economic Policy (MIDEPLAN) using physical, geographical, social and economic criteria. Currently, the most important region in terms of population density and economic agglomeration is the Great Metropolitan Area (GAM) which accounts for 52% of the population of the country (2.2 million) in a geographical area of around 4% of the entire territory Costa Rica. The GAM is the largest urban area of the country with 95% of people living in this region in urban areas (65% of the urban population of Costa Rica is concentrated in the GAM). The remaining 6 regions are mostly rural, with low population densities and less than 500 thousand inhabitants in each of them. They are characterized by farming, agriculture, tourism-related services and commercial activities for local consumption.

### **Propensity Score Matching Method**

The Propensity Score Matching (PSM) method is used to compare two samples with similar characteristics but with the difference that one has received a specific treatment and the other has not. Therefore, the methodology is useful for assessing the impact of certain programs or policies that affect different socioeconomic groups in society. Lane, Yen To, Kyna, and Henson (2012) highlight the importance that the implementation of this methodology can have in education economics. For example, PSM has been used for applications as diverse as assessing the impact of education on wage levels and poverty issues, as well as in testing whether the public or private nature of school affects the academic performance of students. PSM has also been used to estimate the impact of investment in educational infrastructure on the development of rural areas.

On this topic, Fan (2012) departs from the premise that graduates have a higher salary levels than non-graduates and uses the PSM to quantify the gap. In order to do this, he selects two samples with similar characteristics, that is, individuals who possess the same skills but differ in that one sample has a university education and the other sample does not. When these two samples are compared, we find that university graduates have a higher wage level, although these wage levels are lower than expected. PSM methodology has also been used in studies for different countries in Latin America. Specifically, Ordaz (2009) discusses the importance of investment in education in rural areas of Mexico. He concludes that this type of investment has a positive effect as a mechanism to reduce the poverty levels in nutrition, capabilities and patrimony. Also, Newman et al. (2002) use the PSM to estimate the impact of small investments in infrastructure in rural areas of Bolivia. They compare the effects of investment in education, health, and the water supply among areas that received or did not receive these types of investments. The results

conclude that there are benefits for the population of rural areas that receive these investments, with the greatest benefits coming from investments in health and the water supply.

In other studies, such as Verner (2004), using *probit* models with data from Brazil, it is determined that education is the most important factor for poverty reduction. According to the author, if the educational level is higher, then the probability of being below the poverty line is lower. The results of this study conclude that with a full secondary education, the probability of being poor is four times lower than with only primary education being completed. However, the possibility of living in conditions of poverty is six times lower with a university education than with having only completed primary school.

Meanwhile, Appleton (2001) examines the relationship between education and poverty in Uganda in the nineties. In this study the empirical evidence shows that education contributes to reducing poverty. At the national level, poverty in Uganda decreased during the period between 1992 and 2000 and that the reduction was greater in households where the heads of the household had higher educational levels.

Other studies show that the resources allocated to education contribute to economic growth and poverty reduction (Jung & Thorbecke, 2003; Tanzi & Chu, 1998), and improve the distribution of income (Bourguignon, Fournier & Gurgand, 1998; Cortes, 2001; Legovini, Bouillon & Lustig, 2001). For example, Heckman and Masterov (2007) find that it is important to invest in young children born in unfavorable conditions through programs that improve human capital in order to break the generational cycles of poverty and inequality.

For the particular case of Costa Rica, Sánchez (2014) uses the PSM method in determining the impact of education on poverty in urban and rural areas in Costa Rica. She states that completing secondary education has a positive impact on poverty reduction in both urban and rural areas, although to a lesser extent in the latter. One aspect influencing the lower impact of completing secondary education on reducing poverty in rural areas has to do with a specialization in agricultural activities that requires unskilled labor and, therefore, is characterized by low levels of wages.

On the other hand, Rojas (2013) uses the pseudo-panel technique to estimate the returns on education in Costa Rica. With this methodological approach, the author reduces bias "skill" because of the correlation between the level of education and certain unobservable characteristics of the individual. The author finds that the returns on education increase as the sample that is used includes older people. Similarly, we find that the income of younger cohorts is higher than the income of older cohorts, once the experience and economic fluctuations are controlled. The author concludes that: a) the differences in income between generations are explained by the different levels of education, and b) short-term fluctuations in growth rates of GDP mostly affect those households and individuals with lower levels of education.

## **Data and Methodology**

The data used is from the 2011 Census of Population and Housing of the National Institute of Statistics and Census of Costa Rica (INEC - abbreviation in Spanish). The census contains information on household characteristics, and information on social and demographic variables.

The advantage of using census data is that it allows for an analysis with an in-depth geographical breakdown, which is not possible with household surveys (Feres & Mancero, 2001).

The UBN method identifies households and household members who fail to satisfy a set of needs considered essential by welfare levels accepted as universal. These households are considered to be in critical situations of need and their characterization is very useful in the design, implementation and evaluation of public policies aimed at reducing poverty caused by such needs. Through the use of census data, it is possible to express UBN with abundant detail (PNUD, 2014).

The UBN method defines a number of dimensions, and within each dimension, a number of components are evaluated to determine levels of critical gaps that households may have. For the establishment of indicators regarding universality, geographical breakdown and its relationship to income, standard steps are followed. The procedure for estimation begins with defining four dimensions, also known as macro-necessities. These dimensions include: a) access to adequate shelter, b) access to health or healthy living, c) access to knowledge, and d) access to other goods and services. Within each dimension components are defined, except in access to goods and services where there is only one component. Justification and the components of each macro-necessity are shown below.

### **Access to Adequate Shelter**

Access to adequate or quality housing is crucial for household members to have protection from environmental risks, quality interaction, and the enablement of individual development. To measure this dimension, three components are taken into account: housing quality, overcrowding and access to electricity. The quality component is measured by housing type and the condition and materials of a household. The component of overcrowding in homes is defined as more than two people per bedroom, affecting the coexistence in family and opportunities for individual development. The third component refers to the absence of electric lighting inside the house.

### **Access to Health or Healthy Living**

The health of people depends, among other things, on the sanitary conditions in which they live and access to drinking water. Homes must have the right conditions so that members can grow in a healthy environment. The quality of water is taken into account in order to meet the needs of food, hygiene and excreta disposal.

### **Access to Knowledge**

This is a minimum requirement in order for people to achieve a productive and social life; in this regard it is considered a basic need. To quantify the shortage of needs in access to knowledge, two components were considered: the first is school attendance and the second refers to educational underachievement for the population between 7-17 years of age. Thus, those households with at least one member between 7-17 years of age who did not attend primary or secondary education are considered to have a shortage of need in access to knowledge. This is the same if one or more household members are attending school but with interruptions or delays of two or more years.

## Access to Other Goods and Services

This dimension is not aimed to capture a particular need; instead, it is aimed to reflect the available potential of household resources to acquire goods and consumer services in order to meet basic needs. Because there are needs that cannot be measured with census information (clothing, food, transportation, etc.), an estimate is intended to be established through this indicator. For this dimension components are not defined, but the variables used to measure this deficiency are: age and education of the head of the household, the presence and education of regular wage-earners in the household, and the number of dependents.

Once the UBN method was determined as the most appropriate for the purposes of our research to establish the relationship between education levels and poverty in the various planning regions of Costa Rica, we focused on defining the age range of the population to be considered in the study, which was restricted to the population of working age, that is, older than 12 years of age, and those older than 25 years of age who were not heads of households. The decision to not include heads of households was made in order to avoid problems of multi-collinearity in the estimates, since the education of household heads is a relevant variable to explain the educational levels of the other household members.

Also, because the analysis is done for different planning regions of the country, the following variables were generated, based on the Census 2011 database for each region separately: a) no schooling or incomplete primary (takes the value of 1 if the person is illiterate or has at most the fifth grade of primary school), b) complete primary (takes the value of 1 if the individual has completed six years of primary school), c) secondary incomplete (takes the value of 1 if the person has completed up to the fourth year of academic secondary school and up to the fifth year secondary technical school), d) complete secondary (takes the value of 1 if the person has completed up to the fifth year of academic secondary school or the sixth year secondary technical school), and e) some college (takes the value of 1 if the person has completed a year of technical college or college).

For each case, a model *probit* (the model for each region is estimated separately) was used with two specifications in order to obtain statistically robust results. Also, a number of control variables that may influence the decision to have complete primary, secondary and/or university education as highest level of education were used.

In the first specification the following variables were used: a) education of the head of household, b) age, c) household size measured by the number of members, d) marital status (takes the value of 1 if married or cohabiting), e) the physical state of the housing (takes the value of 1 if the house has a dirt floor or if the walls are disposable), f) access to sewage or a septic tank (takes the value of 1 if the household has one of the two), g) the urban variable (takes the value of 1 if the individual lives in urban areas) and h) an interactive variable: the product of age and sex (takes the value of 1 if the individual is male).

In the second specification, the variable of the head of household's schooling was removed and the product of the head of household's schooling and the number of women in it was included as a variable. In addition, the number of children under 12 in households was included. It must be assessed whether each case and specification meets the balance property.

In order to assess the impact of education on poverty, it is necessary to know how the levels of this indicator differ in each of the planning regions when one education level is scaled. Since it is not possible to observe a person with differing levels of education, the counterfactual structure initially proposed by Rubin (1974), was used. With this structure, the effects of "treatment" on a certain group of people are analyzed to have a comparison with a similar group of people in certain characteristics but that do not have the same levels of education (control group).

The probability of being at a certain poverty level and having a certain level of education (the result with treatment) will be denoted by  $Y_1$ , while the probability of having a lower educational level is  $Y_0$  (the result without treatment). The difference in these probabilities will likely reflect the impact of education on the four Unsatisfied Basic Needs evaluated in each of the seven planning regions (Greater Metropolitan Area, Rest of the Central region, Brunca region, Chorotega region, Atlantic Huetar region, Northern Huetar region and Central Pacific region). This allows identifying whether, as a result of having a higher educational level, individuals achieve a reduction in poverty. This is also applied for the urban-rural analysis.

In choosing the control group, it should be considered that some people choose to discontinue their studies based on certain characteristics, such as their low-income level is an obstacle to staying in school or their underdeveloped innate abilities. Because of this, there is not an experimental design and the control group can be very different compared to the group treated. Therefore, the use of a non-experimental estimator to estimate the impact of education on poverty can skew the results. To solve this problem, the Propensity Score Matching method was used. This method is designed to estimate the effects of treatment with non-experimental data and also in cases when the assignment to the treatment group is determined by a large number of variables. Rosenbaum and Rubin (1984) define the propensity score as the probability of receiving treatment given certain characteristics.

Thus, the similarity of people will be reflected in the propensity score, which indicates the probability that a given individual will receive treatment given certain characteristics, namely:

$$1) p(X) = Pr\{D = 1|X\} = E\{D|X\}$$

Where  $p(X) = F(h(X))$ , and  $F(h(X))$  is a function index indicating the likelihood of receiving treatment and may be the function of normal or logistic cumulative distribution.  $E(.)$  represents expectations.  $D = 1$  if the individual is treated and  $D = 0$  otherwise.  $X$  is a vector of characteristics prior to treatment.

Regarding the above equation, Rosenbaum and Rubin (1983) point out that the comparison between the control group and the treatment group should be given in the so-called common support zone, *i.e.*, in the zone where there are sufficient units to make comparisons. In addition, it is necessary to meet the following condition, known as the balancing property:

$$2) D \perp X p(X)$$

If this condition is met, observations with the same propensity score must have the same distribution of characteristics, regardless of treatment status. This means that for a given propensity

score, assignment to treatment is random, so each individual has the same probability of assignment.

A second proposal raised by Rosenbaum and Rubin (1983) states that without confusion in treatment allocation, *i.e.*:

$$Y_1, Y_0 \perp D \mid X$$

There is no confusion in the allocation of treatment given the propensity score.

$$Y_1, Y_0 \perp D \mid P(\cdot)$$

After calculating the propensity score, the Average Effect of Treatment on the Treated (ATT) can be estimated as follows:

$$ATT = E\{Y_{1i} - Y_{0i} \mid D = 1\}$$

$$ATT = E\{Y_{1i} - Y_{0i} \mid D = 1, p(X) \}$$

$$3) ATT = E\{E\{Y_{1i} \mid D_i=1, p(X_i)\} - E\{Y_{0i} \mid D_i=0, p(X_i)\} \mid D_i=1\}$$

Where  $Y_{1i}$  is the result if the area of common support is treated. Similarly,  $Y_{0i}$  is the result if the area of common support is not treated.

The value of ATT indicates the impact of education on poverty. As the probability of observing two individuals with exactly the same propensity to have a certain educational level is zero, since  $F(\cdot)$  is a continuous function, an estimated propensity score is not enough to estimate the ATT. Therefore, the Nearest Neighbor Matching method is applied. With this method, the result obtained by each individual treated with the individuals in the control group, whose propensity score is the closest, are compared. The difference between each pair of matched scores is estimated in the variable that we want to measure; and finally, the ATT is obtained as the average of all these differences.

## Results

The results presented are obtained from the estimations of a *probit* model for each of the specifications from which matching scores are made, allowing us to compare control units with units treated. From the ATT the impact of scaling different educational levels (primary, secondary, and university) on poverty in Costa Rica is determined; this is done on a regional level and also by urban and rural areas. The effect of having completed primary education, secondary education, and/or some level of college education is analyzed for each of the four dimensions of poverty referred to in the UBN method for different planning regions and according to urban and rural areas of the country.

### Regional Analysis of the Results

**Effect of completing primary education.** As can be seen in table 2 (Appendix B), the probability of having completed primary education and not having a lower educational level

increases depending on the level of education of the head of household, living in urban areas, and when the household has access to sewage and drainage systems. On the contrary, it decreases with age, when a household has more members (most regions), and when the floor of the house is unpaved.

Based on propensity scores obtained from the results of the table above, we proceeded to estimate the ATT of primary education. Table 3 (Appendix B) shows the estimate for planning regions. The table shows that for poverty in shelter and capacity of consumption, the effects are negative and statistically significant in all cases. In the case of poverty in health and hygiene, the effect is negative but only significant in two regions, which can be due to the extensive coverage of drinking water, access to sewer systems, and septic tanks. Poverty in access to knowledge shows different effects depending on the region, two of them being non-significant. This is not inconsistent and shows, in a way, the low effect that finishing only primary school has. This is a result that is useful as a tool to demonstrate continued need with assistance in education and the reduction of setbacks in education.

On average, completing primary education reduces the probability that a typical individual in a planning region in Costa Rica is in poverty because of a lack of access to shelter by between 2.53% and 4.93%, and in the case of poverty in consumption by between 4.17% and 7.44%. This would imply lowering the percentage of poverty caused by lack of access to shelter for people who did not complete primary school, by region, between 11.3% and 27.3%. In the case of poverty in capacity of consumption, the percentage would be lowered by between 15.3% and 28.2%. In planning regions where the coefficients were significant to reduce poverty in hygiene the percentage could be lowered by between 7.0% and 10.0%, and between 5.0% and 15.0% in the case of poverty in the access to knowledge.

These results suggest that primary education is an important tool to help individuals escape poverty. According to the results, the impact of primary education on poverty reduction is relatively minor in most urbanized regions, while its impact is greater in rural areas.

Figure 3 (Appendix B) shows an even clearer illustration of the impact that completing primary education has on reducing poverty in its various dimensions. Moreover, the differentiated effect can be seen in the way this variable is behaving in the different planning regions in which the country is divided. For example, for the Greater Metropolitan Area (GMA), when an average person completes primary education, the chances of being in poverty of shelter are reduced by 4.0%, poverty of access to knowledge is reduced by 1.9%, and poverty in consumption capacity by 4.7%. The estimated effect that completing primary education has on people compared to those with a lower education level, represents a reduction of 27.3% in poverty rates in the GMA in needs of shelter, 14.9% in needs of knowledge, and 27.2% in basic consumption needs. Overall, the effects found regarding the completion of primary education and its effects on reducing poverty tend to be significant in all regions.

**Effect of completing secondary education.** In order to estimate the impact of completing secondary education on poverty, we proceeded similarly to the case of primary education. The first step was to estimate the propensity scores for the seven planning regions by type of UBN. The results of these estimates are presented in tables 4 and 5, which show that as in the case of primary education, the probability that individuals complete secondary education increases depending on

the schooling of the head of the household, living in urban areas, and having access to sewage and drainage systems. On the contrary, it decreases with age, with a greater number of members in the home, and when the floor of the house is dirt.

Once the propensity scores were estimated, we proceeded to apply the technique of propensity score matching. To make the sample even more reliable, as in the case of primary education, the analysis was restricted to units with probabilities that are located in the area of common support. In this case it was restricted to only the population over 19 years of age that has completed a secondary education or lower. Then the models are estimated separately for each region.

The results of the effect completing secondary education has on poverty reduction in the seven planning regions are presented in Table 5 (Appendix B). All coefficients (other than UBN in health or hygiene) are statistically significant. Thus, we conclude that finishing secondary education has an important effect on reducing poverty in shelter by 0.85% to 4.06%. For consumption poverty, the effect is between 1.33% and 4.29%. Meanwhile, in knowledge the effect is between 3.48% and 5.62%. Thus the estimated effect on poverty reduction that completing secondary education has on individuals, compared to those with a lower education level, is as follows: in shelter the reduction is between 5.0% and 33.0%, in consumption it is between 27.0% and 44.0%, and in knowledge, it is between 12.0% and 30%.

Figure 4 (Appendix B) allows us to observe, in a summarized manner, the importance of finishing secondary education on the reduction of multidimensional poverty in different regions of the country. In this case, it can be seen how in the Greater Metropolitan Area (GMA), when an average individual has finished high school, his or her chances of being in poverty are reduced by 3.0% in shelter, 5.1% in knowledge, and 1.3% in consumption capacity. The impact on the basic needs of hygiene and health were not significant. Therefore, the estimated effect completing secondary education has on individuals compared to those with a lower education level is represented by poverty reduction rates in the GMA of 33.3% in UBN shelter, 44.3% in knowledge, and 20.0% in consumption. As Figure 4 (Appendix B) illustrates, the impact completing secondary education has on poverty reduction is significant in all regions of the country. With the exception of the basic need for health, in all other dimensions the result in all regions (including the outermost) is significant, reinforcing the empirical evidence that the completion of secondary education is a determining factor in poverty reduction in the medium and the long term.

**Effect of having a university degree.** In order to estimate the impact of technical college and college education, the procedure was similar to the cases for primary and secondary education. The first step was to estimate the propensity scores for each type of UBN in each of the seven planning regions. The results of these estimates are presented in Tables 6 and 7, in which one can see that, as in the case of primary and secondary education, the probability that individuals will have a college education increases with the education level of the head of household, living in urban areas, and having access to sewage and drainage systems. On the contrary, it decreases with age, with a greater number of members per household, and when the house has only dirt floors.

Once the propensity scores were estimated, propensity score matching was applied. To make the sample even more reliable, as in the case of primary and secondary education, the analysis was restricted to the units with probabilities that were located in the common support

zone. That is, in this case it was restricted to only the population over 25 years of age with some college (including technical college) education. The models were estimated separately for each region.

The results of the effect of higher education on poverty reduction in the seven regions are presented in Table 7 (Appendix B). In this table, it is also noted that all coefficients except the UBN in health for some regions, are statistically significant. It is noteworthy that the effects are cumulative; that is, individuals with college have completed primary and secondary education. That is why the impact of higher education is lower in some dimensions of poverty. Therefore, higher education has an effect on poverty in shelter ranging between 1.86% and 4.23%. Findings showed in poverty of consumption, the effect is between 0.87% and 2.29%. The effects on poverty in access to knowledge range between 4.15% and 6.03%. Thus the estimated effect of having some college education on individuals compared to those with a lower education level is represented by a reduction in poverty rates by region ranging between 17.0% and 30.0% in shelter, from 40.0% to 55.0% in access to knowledge, and from 14% to 25% in consumption.

Figure 5 (Appendix B) illustrates the impact of having a college education on the reduction of poverty in its various dimensions and for each of the planning regions. For example, for the Greater Metropolitan Area (GMA), we conclude that when the average person has some college education, his or her chance of living in conditions of poverty is reduced by 2.4% in shelter, 0.5% in health, 4.2% in knowledge, and 0.9% in consumption capacity. Thus, having a college education compared to a lower education level shows an effect in the reduction in poverty. For instance, having a college education in the GMA will reduce poverty of shelter by 30.6%, poverty of health by 13.0%, poverty of knowledge by 53.6%, and poverty of basic consumption by 14.4%. As can be seen, the greatest effects in all dimensions are in the GMA, as well as in the rest of the Central Region, where more productive activities (industrial and services) and the government sector are concentrated. However, levels of significance on reducing poverty in most basic needs are very relevant in other regions, particularly with respect to shelter needs and knowledge, but not so much so in access to health, where the results are not significant for some regions.

### Urban-Rural Analysis of the Results

As can be seen in Table 8 (Appendix B), the probability that individuals have primary, secondary or university education, in urban as well as in rural areas, increases with the level of schooling of the head of the household, and also when the household has access to sewage and drainage systems. On the contrary, it decreases with age, when a household has more members, and when the floor of the house is unpaved.

**Effect of completing primary education.** Table 9 (Appendix B) shows that when an average person in the urban area has finished primary education (and in comparison with individuals with similar characteristics but without having completed primary education), the probability of being in a condition of poverty of shelter is reduced by 4.32%, restricted access to knowledge is reduced by 2.32%, and restricted access to other goods and services (consumption capacity) is reduced by 5.32%. The impact on access to health or healthy living is not significant. Thus, as can be seen in Figure 4 (Appendix B), the estimated effect of having finished primary education shows a reduction in the levels of poverty as measured by a 29.1% increase in access to shelter, a 16.3% increase in access to knowledge, and a 29.8% increase in consumption capacity.

Meanwhile, in rural areas, the impact of completing primary education is a 5.12% increase in access to decent shelter, a 1.39% increase in access to healthy living, a 3.11% increase in access to knowledge, and a 4.82% increase in consumption capacity. In Figure 4 (Appendix B) we can see that for individuals living in rural areas with primary education completed, with respect to individuals with primary education incomplete, the levels of poverty are reduced in 16.8% in access to decent shelter, 10.37% in healthy living, 11.2% in access to knowledge, and 16.5% in consumption capacity.

**Effect of completing secondary education.** Based on the results shown in Table 9 (Appendix B), we can argue that completing secondary education in urban areas would have a significant impact on reducing poverty of shelter in about 36.0%, poverty of access to knowledge in 48.0%, and in 22.0% regarding access to other goods and services (consumption capacity). On the other hand, completing secondary education in rural areas would also have a significant impact on reducing poverty of shelter in 18.0%, poverty related to access to knowledge in 30.0%, and poverty in consumption capacity in 32.0%. In Figure 4 (Appendix B), we can see that finishing secondary education is a determining factor in reducing poverty by UBN in urban as well as in rural areas.

**Effect of having a university degree.** According to Table 9 and Figure 4 (Appendix B), when individuals in urban and rural areas have some university studies or a university degree, their chances of reducing poverty levels in all basic needs are higher compared to those who do not have university studies. For instance, those individuals living in urban areas who have university studies could reduce the levels of poverty in access to shelter in 33.0%, access to healthy living in 15.0%, access to better consumption capacity in 17.0%, and access to knowledge in 55.0%.

In the case of rural areas, individuals with university studies would experience a significant reduction of poverty levels in practically all UBN. For instance, the reduction of poverty accounting for access to decent shelter would be reduced in 21.0%, for access to knowledge in 43.0%, and for access to other goods and services (consumption capacity) in 16.0%.

## Conclusions

Combating poverty is one of the most important challenges facing Costa Rica's society and economy today. Despite high levels of investment, the levels of incidence of poverty seem stagnant and continue to affect significantly the peripheral regions and rural areas of the country. According to Moya de Lozano (2008), understanding the importance of education and other social policies to promoting development and reducing poverty and social exclusion requires a more complex and multidimensional approach regarding the meaning of the "social" as a subject of intervention of social workers and the discipline.

In terms of education, peripheral regions and rural areas show some disadvantages in comparison with the GMA. Their education levels are generally lower and there is no consistent information regarding the quality of education they receive, although it can be inferred that this is of lower quality with respect to that in the GMA. For social workers and related disciplines, education and its universal access is a determining factor for human development and wellbeing at the individual, family, group and community level. In other words, education is a social

phenomenon, crucial for the construction of social space. Education is a tool for social reproduction and a basic necessity for the development of opportunities (Concha Toro, 2012).

This study analyzes whether education, as stated in the census of population and housing, can help people from different regions to escape poverty caused by unsatisfied basic needs (UBN). The results show that education is an effective mechanism to help people overcome poverty. Poor shelter, poor levels of hygiene, and poor levels of knowledge and consumption poverty are the four levels of poverty analyzed in this study. Specifically, the study estimated the impact of primary, secondary and university education on these four levels for different planning regions of the country and also according to urban and rural areas.

The results are striking, with the exception of the UBN in health that shows low significance in most cases. In the other cases, having higher educational levels consistently improves the likelihood of reducing poverty, although the effects vary among regions and particularly among urban and rural areas as seen in Figure 4 (Appendix B). It is clear that the impacts of increasing levels of schooling are significant to reducing poverty in all regions and also in urban and rural areas; however, it is clear that the impacts in urban areas are greater in access to decent shelter and access to knowledge. Likewise, it is important to see the positive impact that completing secondary education has in rural areas in terms of reducing poverty in access to decent shelter, access to knowledge, and access to other goods and services (consumption capacity). With the exception of access to health, the impact of completing levels of education is significant in reducing poverty of shelter, knowledge, and consumption capacity.

Outcomes for the regional analysis show a greater impact of finishing levels of schooling on poverty reduction by UBN in the Great Metropolitan Area, where population, economic activities, government institutions, and the formal labor market are highly concentrated. The results for the rest of the regions, which are considered mostly rural (low population density, agriculture-based dependence, incipient labor market), show a positive effect of levels of schooling on poverty reduction in most UBN's; however, we can see differences when we compare the results of the most peripheral or rural regions with those for the GMA. This is also consistent with the analysis done for urban and rural areas; as we can see in Figure 4 (Appendix B), there are important differences in the impact of levels of schooling on poverty reduction when we compare the impact on urban areas with those in rural areas.

Using the propensity score matching methodology, it is demonstrated that with higher levels of education, there will be lower levels of poverty by type of UBN. In analyzing each separate region, it is also shown that education alone becomes an effective instrument to help overcome multidimensional poverty. This is also consistent with the results obtained for urban and rural areas.

Promoting and helping people to progress in the completion of primary, secondary and university education is guaranteed to improve their socioeconomic conditions. For example, for populations who finish secondary education, it could reduce poverty in shelter by between 8.0 and 33.0%, poverty in knowledge by between 26.0% and 44.0%, and poverty in consumption by between 12.0% and 30.0%. Even successful completion of primary education allows people to reduce poverty in shelter by between 12.0% and 28.0%, poverty in hygiene can be reduced up to 10.0%, poverty in knowledge up to 15.0%, and poverty in consumption between 15.0% and 30.0%.

These results reveal that there is a great potential for action in the field of social work. Social workers have a tradition of promoting change in society, social inclusion and citizenship participation, collective action, greater levels of equality and social justice along gender, racial and ethnic lines. Public social policy, such as public education, has been of great importance for social mobility and the reduction of poverty in Costa Rica, as well as in most developed and developing countries.

We hope this study helps to inform the intervention of social workers in Costa Rica through the design, recommendation, and implementation of social policies able to reduce poverty and social exclusion, taking into account geographic barriers impeding a better distribution and accessibility to public education in the country.

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### Appendix A

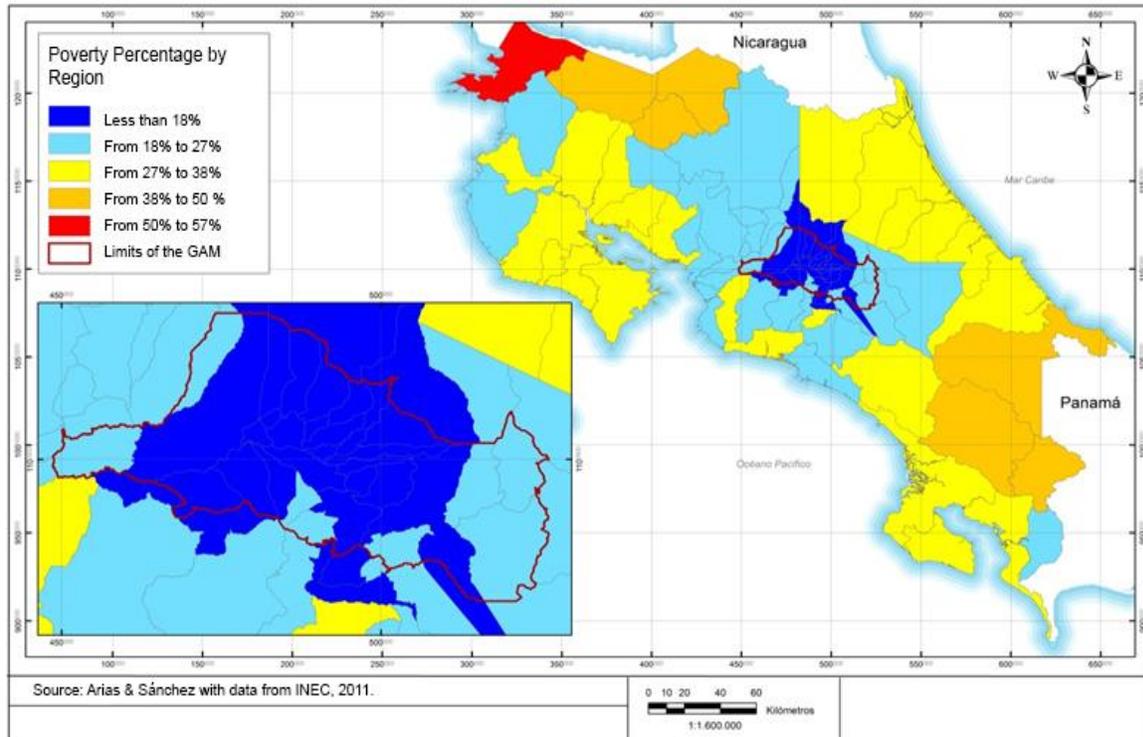


Figure 1. Percentage of households in poverty by county, 2011

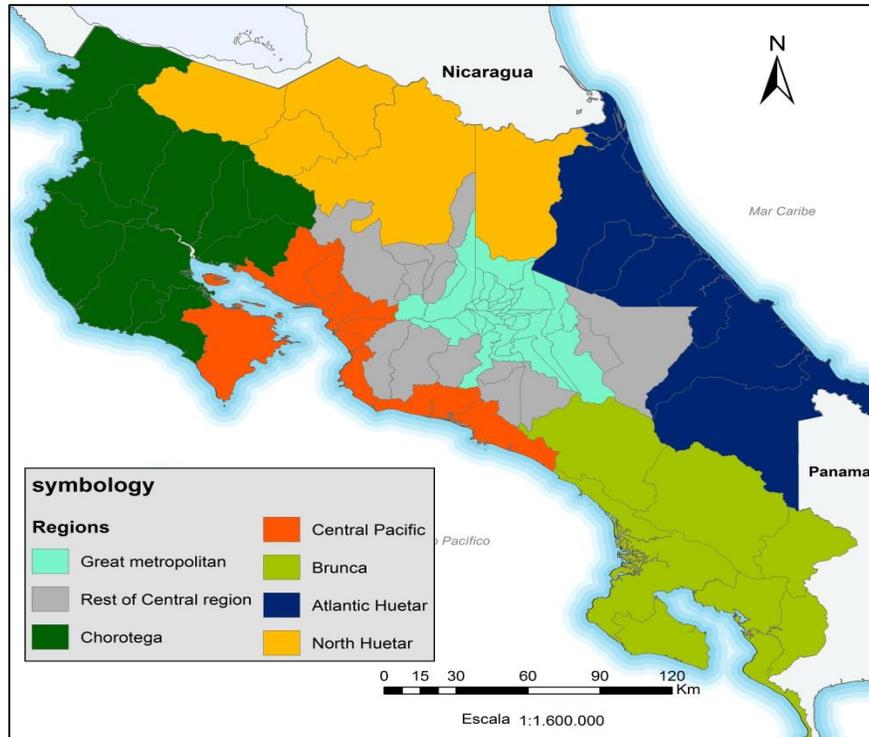


Figure 2. Distribution of Regions in Costa Rica Note. Arias & Sanchez (2015).

## Appendix B

Table 1

*Percentage of Population with one or more Unsatisfied Basic Needs According to Planning Regions in Costa Rica, 2011.*

| Regions                   | Shelter | Hygiene | Knowledge | Consumption | Total Population | % of population with one or more basic needs |
|---------------------------|---------|---------|-----------|-------------|------------------|--|
| Costa Rica                | 10.4%   | 6.5%    | 11.9%     | 7.8%        | 4,275,670        | 27.4%  |
| Great metropolitan region | 7.8%    | 3.2%    | 9.6%      | 4.8%        | 2,192,893        | 20.4%  |
| Rest of Central region    | 7.0%    | 7.0%    | 10.5%     | 8.0%        | 477,476          | 25.5%  |
| Chorotega Region          | 13.9%   | 7.5%    | 13.4%     | 10.2%       | 325,570          | 33.1%  |
| Central Pacific Region    | 13.9%   | 6.1%    | 12.4%     | 9.8%        | 242,223          | 31.9%  |
| Brunca Region             | 14.0%   | 15.6%   | 14.9%     | 11.8%       | 327,423          | 39.9%  |
| Atlantic Huetar Region    | 16.4%   | 14.2%   | 17.4%     | 12.5%       | 384,432          | 41.1%  |
| North Huetar Region       | 16.7%   | 8.6%    | 17.4%     | 13.9%       | 324,653          | 39.2%  |

*Note.* Based on data from INEC, 2011.

Table 2

*Costa Rica: Estimate of the Probit Model for Primary Education*

| Variable                          | GMA   |          | Rest of the Central Region |          | Chorotoga |          | Central Pacific Region |          | Brunca Region |          | Atlantic Huetar Region |          | Northern Huetar Region |          |
|-----------------------------------|-------|----------|----------------------------|----------|-----------|----------|------------------------|----------|---------------|----------|------------------------|----------|------------------------|----------|
|                                   | Score | Pr(> z ) | Score                      | Pr(> z ) | Score     | Pr(> z ) | Score                  | Pr(> z ) | Score         | Pr(> z ) | Score                  | Pr(> z ) | Score                  | Pr(> z ) |
| (Intercept)                       | .342  | 2E-10    | .088                       | .4329    | -.092     | .4106    | -.002                  | .9885    | .186          | .1519    | .042                   | .6563    | .122                   | .268     |
| Education of the household        | .026  | <2E-16   | .051                       | <2E-16   | .041      | 2E-14    | .062                   | <2E-16   | .050          | <2E-16   | .046                   | <2E-16   | .060                   | <2E-16   |
| Age                               | .008  | <2E-16   | .011                       | <2E-16   | .007      | 7E-07    | .008                   | 2E-07    | .008          | 5E-09    | -.008                  | 2E-10    | .005                   | 7E-05    |
| Household size                    | .007  | 7E-05    | .024                       | .0027    | .001      | .4205    | .040                   | .0001    | .029          | .0009    | -.002                  | .0861    | .021                   | .0035    |
| Rural                             | 0.032 | 0.2131   | 0.042                      | 0.1563   | .095      | 2E-02    | .041                   | .3351    | .114          | .0049    | -.023                  | .4796    | .032                   | .3792    |
| Physical state of the housing     | 0.587 | <2E-16   | 0.218                      | 0.1494   | -.133     | 1E-01    | .330                   | 4E-03    | -.161         | 1E-01    | -.027                  | 1E-02    | .265                   | 1E-03    |
| Access to sewage or a septic tank | 0.310 | 7E-16    | 0.479                      | 4E-10    | .261      | .0001    | .348                   | 4E-04    | .344          | 2E-07    | .188                   | 2E-03    | .328                   | 1E-09    |
| Age*sex                           | 0.001 | 0.0829   | 0.000                      | 7E-01    | .002      | .0706    | .003                   | .0263    | -.002         | .0968    | .001                   | .4637    | -.003                  | .0104    |

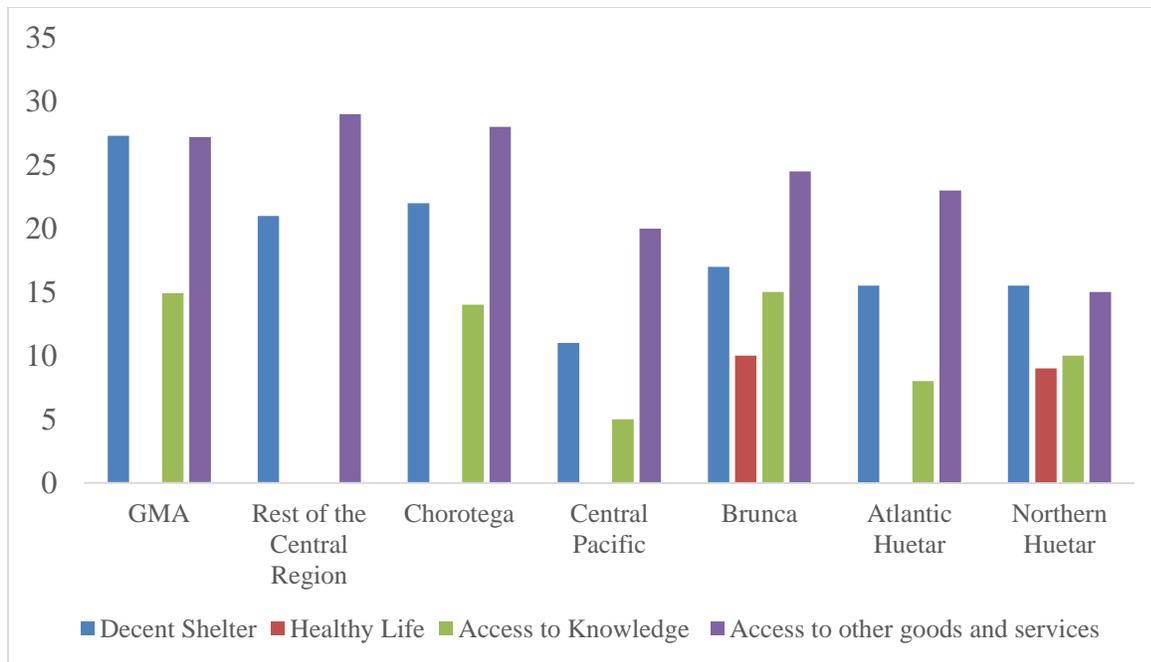
*Note.* Based on the data from the Institute of National Statistics and Census (INEC), 2011

Table 3

*Costa Rica: ATT, Impact of Primary Education on Poverty*

| Region | Decent shelter    |           |                 | Healthy life |           |         | Access to knowledge |           |         | Access to other goods and services |           |               |
|--------|-------------------|-----------|-----------------|--------------|-----------|---------|---------------------|-----------|---------|------------------------------------|-----------|---------------|
|        | Co-efficient      | t student | P value         | Co-efficient | t student | P value | Co-efficient        | t student | P value | Co-efficient                       | t student | P value       |
| GMA    | -<br><b>4.00%</b> | -14.02    | <2.22e-<br>16   | 0.05%        | 0.32      | 0.75    | <b>-1.89%</b>       | -6.12     | 0.00    | <b>-4.64%</b>                      | -19.66    | <2.22e-<br>16 |
| RCR    | -<br><b>2.86%</b> | -5.82     | 0.00006         | -.61%        | -1.17     | 0.24    | <b>-0.90%</b>       | -1.45     | 0.15    | <b>-5.59%</b>                      | -10.17    | <2.22e-<br>16 |
| CH     | -<br><b>4.93%</b> | -4.91     | 0.009           | .925%        | 12.84     | 0.20    | <b>-2.51%</b>       | -2.33     | 0.02    | <b>-7.44%</b>                      | -8.07     | 0.00          |
| CPR    | -<br><b>2.53%</b> | -2.52     | 0.01            | .81%         | 1.25      | 0.21    | <b>0.09%</b>        | 0.08      | 0.93    | <b>-4.72%</b>                      | -5.19     | 0.002         |
| BR     | -<br><b>3.89%</b> | -4.13     | <3.6587e-<br>15 | <b>2.24%</b> | 2.19      | 0.03    | <b>2.79%</b>        | 0.283     | 0.00    | <b>-6.32%</b>                      | -6.70     | 0.00          |
| AHR    | -<br><b>3.96%</b> | -4.73     | 0.02257         | -1.19%       | -1.56     | 0.12    | <b>-2.01%</b>       | -2.19     | 0.03    | <b>-6.02%</b>                      | -7.84     | 0.00          |
| NHR    | -<br><b>4.00%</b> | -4.87     | 0.011           | -1.20%       | -1.93     | 0.05    | <b>2.38%</b>        | 2.64      | 0.01    | <b>-4.17%</b>                      | -5.21     | 0.00          |

*Note.* Bold coefficients are significant to 5%. Based on data from the INEC, 2011.



*Figure 3.* Percentage reduction of poverty rates by type of UBN and the region as a result of completing primary education. Note. For some regions there may be one or more than one UBN which is not significant, thus it is not listed on the chart. Based on data from the INEC, 2011.

Table 4

*Costa Rica: Estimate Probit Model for Secondary Education*

| Variable                          | GMA    |          | Rest of the Central Region |          | Chorotoga |          | Central Pacific Region |          | Brunca Region |          | Atlantic Huetar Region |          | Northern Huetar Region |          |
|-----------------------------------|--------|----------|----------------------------|----------|-----------|----------|------------------------|----------|---------------|----------|------------------------|----------|------------------------|----------|
|                                   | Score  | Pr(> z ) | Score                      | Pr(> z ) | Score     | Pr(> z ) | Score                  | Pr(> z ) | Score         | Pr(> z ) | Score                  | Pr(> z ) | Score                  | Pr(> z ) |
| (Intercept)                       | - .889 | <2E-16   | -                          | <2E-16   | -         | <2E-16   | -                      | 8.74E-12 | -.842         | 4.9E-09  | -.670                  | 2.6E-09  | -                      | <2E-16   |
| Education of the household        | .051   | <2E-16   | .045                       | <2E-16   | .044      | <2E-16   | .060                   | <2E-16   | .046          | <2E-16   | -.044                  | <2E-16   | .052                   | <2E-16   |
| Age                               | -.007  | <2E-16   | .008                       | 6.15E-16 | -.009     | 3.82E-12 | -.009                  | 1.08E-11 | -.009         | 9.08E-10 | -.010                  | <2E-16   | .008                   | 8.28E-09 |
| Household size                    | -.010  | 5.82E-09 | .028                       | .00      | -.001     | .63      | -.047                  | .00      | -.064         | 2.34E-09 | -.062                  | 8.58E-14 | .046                   | .00      |
| Rural                             | -.360  | <2E-16   | .143                       | 1.12E-08 | -.126     | 2E-04    | -.102                  | .0079    | -.210         | 1.65E-08 | -.243                  | 8.36E-15 | .164                   | .00      |
| Physical state of the housing     | -.426  | .00      | .508                       | .04      | -.546     | 23-05    | -.384                  | 1E-02    | -.147         | 4E-01    | -.350                  | 3E-02    | .173                   | 2E-01    |
| Access to sewage or a septic tank | .330   | <2E-16   | .303                       | .00      | .362      | .00      | .311                   | 1E-02    | 0.345         | .00      | .288                   | 2E-04    | .273                   | .00      |
| Age*sex                           | .002   | 1.17E-12 | .001                       | 1E-01    | .001      | .45      | -.001                  | .36      | .001          | .64      | .000                   | 0.64     | .003                   | .02      |

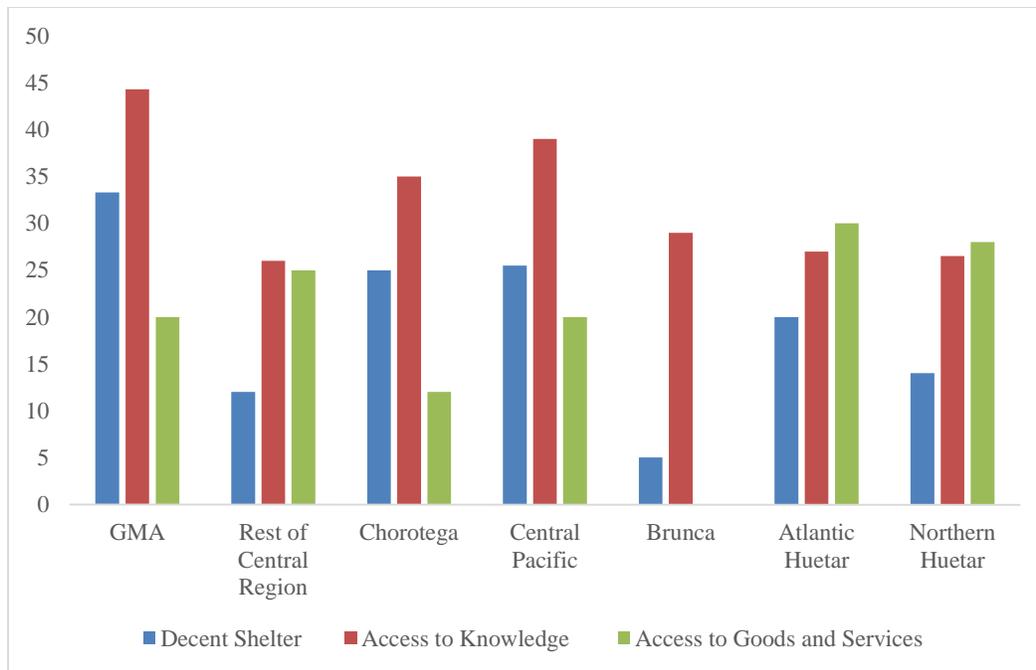
Note. Based on the data from the INEC, 2011

Table 5

*Costa Rica: ATT, Impact of Secondary Education on Poverty*

| Region | Decent shelter |           |           | Healthy life |           |         | Access to knowledge |           |           | Access to other goods and services |           |           |
|--------|----------------|-----------|-----------|--------------|-----------|---------|---------------------|-----------|-----------|------------------------------------|-----------|-----------|
|        | Coefficient    | t student | P value   | Coefficient  | t student | P value | Coefficient         | t student | P value   | Coefficient                        | t student | P value   |
| GMA    | <b>-3.09%</b>  | -12.93    | <2.22e-16 | -0.22%       | -1.53     | 0.13    | <b>-5.07%</b>       | -19.38    | <2.22e-16 | <b>-1.33%</b>                      | -8.51     | <2.22e-16 |
| RCR    | <b>-1.58%</b>  | -2.99     | .00278    | -0.91%       | -1.59     | 0.11    | <b>-3.48%</b>       | -5.05     | 0.00      | <b>-1.95%</b>                      | -3.60     | 0.00      |
| CH     | <b>-4.03%</b>  | -4.37     | .126      | -0.06%       | -0.10     | 0.92    | <b>-5.58%</b>       | -5.65     | 0.00      | <b>-1.56%</b>                      | -1.85     | 0.064     |
| CPR    | <b>-3.99%</b>  | -3.78     | 0.00      | -0.30%       | -0.50     | 0.62    | <b>-5.62%</b>       | -5.10     | 0.00      | <b>-2.44%</b>                      | -3.01     | 0.003     |
| BR     | <b>-0.85%</b>  | -0.77     | 0.44      | -0.56%       | -0.44     | 0.66    | <b>-4.88%</b>       | -4.28     | 0.00      | -1.31%                             | -1.27     | 0.2046    |
| AHR    | <b>-3.61%</b>  | -3.87     | .00011    | 0.74%        | 0.89      | 0.38    | <b>-5.27%</b>       | -5.43     | 0.00      | <b>-4.29%</b>                      | -5.06     | 0.00      |
| NHR    | <b>-2.36%</b>  | -2.17     | 0.030     | -0.31%       | -0.40     | 0.69    | <b>-4.72%</b>       | -4.41     | 0.00      | <b>-3.30%</b>                      | -3.49     | 0.00      |

*Note.* Bold coefficients are significant to 5%. Based on data from the INEC, 2011.



*Figure 4.* Percentage reduction of poverty rates by type of UBN and the region as a result of finishing secondary education. The results for the dimension of Healthy Living did not yield significant results, for that reason they are not presented in the graph. Based on data from the INEC, 2011.

Table 6

*Costa Rica: Estimate Probit Model for University Education*

| Variable                          | GMA    |          | Rest of the Central Region |          | Chorotoga |           | Central Pacific Region |          | Brunca Region |          | Atlantic Huetar Region |          | Northern Huetar Region |          |
|-----------------------------------|--------|----------|----------------------------|----------|-----------|-----------|------------------------|----------|---------------|----------|------------------------|----------|------------------------|----------|
|                                   | Score  | Pr(> z ) | Score                      | Pr(> z ) | Score     | Pr(> z )  | Score                  | Pr(> z ) | Score         | Pr(> z ) | Score                  | Pr(> z ) | Score                  | Pr(> z ) |
| (Intercept)                       | -1.559 | <2E-16   | -1.666                     | <2E-16   | -1.463    | <2E-16    | -1.237                 | 2.37E-15 | -1.379        | <2E-16   | -1.418                 | <2E-16   | -1.310                 | <2E-16   |
| Education of the household        | .099   | <2E-16   | 0.092                      | <2E-16   | 0.085     | <2E-16    | 0.079                  | <2E-16   | 0.082         | <2E-16   | 0.081                  | <2E-16   | 0.086                  | <2E-16   |
| Age                               | -.002  | 3.36E-14 | -0.003                     | 0.00     | -0.001    | 0.59766   | -0.003                 | .009811  | -0.003        | 5.45E-09 | -0.003                 | 0.01     | -0.006                 | 0.00     |
| Household size                    | -.056  | <2E-16   | 0.003                      | 0.28249  | -0.086    | <2E-16    | -0.094                 | <2E-16   | -0.105        | 2.97E-14 | -0.105                 | <2E-16   | -0.083                 | <2E-16   |
| Rural                             | -.175  | 8.03E-16 | -0.225                     | <2E-16   | -0.169    | 9E-08     | -0.173                 | 0.00     | -0.241        | 0.00     | -0.241                 | 6.39E-13 | -0.221                 | 3.24E-12 |
| Physical state of the housing     | -.745  | 7.73E-12 | -1.082                     | 0.01     | -0.374    | 5E-03     | -0.792                 | 7E-04    | -0.510        | 1E-02    | -0.510                 | 3E-02    | -0.412                 | 2E-02    |
| Access to sewage or a septic tank | .494   | <2E-16   | 0.520                      | 0.00     | 0.492     | .00000028 | 0.255                  | 5E-02    | 0.430         | 0.00     | 0.430                  | 3E-05    | 0.446                  | 0.00     |
| Age*sex                           | .002   | 1.44E-13 | 0.001                      | 5E-02    | 0.001     | .56875    | 0.002                  | 0.04     | 0.002         | 0.71042  | 0.002                  | 0.05     | 0.001                  | 0.56     |

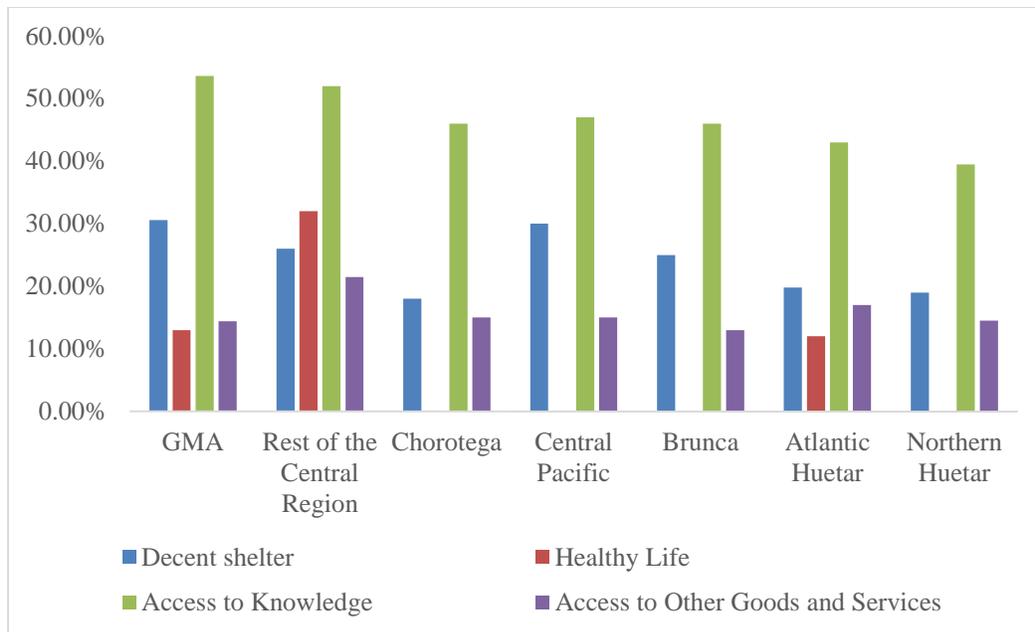
*Note.* Based on the data from the INEC, 2011

Table 7

*Costa Rica: ATT, The Impact of Having a University Education on Poverty*

| Region | Decent shelter |           |           | Healthy life  |           |         | Access to knowledge |           |           | Access to other goods and services |           |           |
|--------|----------------|-----------|-----------|---------------|-----------|---------|---------------------|-----------|-----------|------------------------------------|-----------|-----------|
|        | Coefficient    | t student | P value   | Coefficient   | t student | P Value | Coefficient         | t student | P value   | Coefficient                        | t student | P Value   |
| GMA    | <b>-2.39%</b>  | -17.94    | <2.22e-16 | <b>-0.50%</b> | -5.54     | 0.00    | <b>-4.15%</b>       | -26.39    | <2.22e-16 | <b>-0.87%</b>                      | -9.94     | <2.22e-16 |
| RCR    | <b>-1.86%</b>  | -5.64     | 0.00      | <b>-1.63%</b> | -4.31     | 0.00    | <b>-4.73%</b>       | -9.76     | <2.22e-16 | <b>-1.53%</b>                      | -4.30     | 0.00      |
| CH     | <b>-2.46%</b>  | -3.68     | 0.00      | -0.69%        | -1.67     | 0.09    | <b>-4.87%</b>       | -6.73     | 0.00      | <b>-1.92%</b>                      | -3.47     | 0.00      |
| CPR    | <b>-4.23%</b>  | -4.91     | 0.01      | -0.69%        | -1.13     | 0.26    | <b>-4.58%</b>       | -5.41     | 0.00      | <b>-2.29%</b>                      | -3.20     | 0.00      |
| BR     | <b>-3.47%</b>  | -4.04     | 0.00      | -1.83%        | -1.56     | 0.12    | <b>-5.39%</b>       | -5.58     | 0.00      | <b>-2.01%</b>                      | -2.35     | 0.02      |
| AHR    | <b>-3.08%</b>  | -4.10     | 0.00      | <b>-2.03%</b> | -2.58     | 0.01    | <b>-6.03%</b>       | -7.05     | 0.00      | <b>-1.90%</b>                      | -2.66     | 0.01      |
| NHR    | <b>-2.97%</b>  | -3.89     | 0.99      | -0.66%        | 0.99      | 0.32    | <b>-5.35%</b>       | -6.24     | 0.00      | <b>-1.45%</b>                      | -2.18     | 0.03      |

*Note.* Bold coefficients are significant to 5%. Based on data from the INEC, 2011.



*Figure 5.* Percentage reduction in poverty rates by type and region UBN effect of having some degree of university education. Note. For some regions results did not yield significant in the dimension of health, thus they are not reported in the graph. Based on data from the INEC, 2011.

Table 8

*Costa Rica: Estimate Probit Model for Primary, Secondary and University Education According to Urban and Rural Areas*

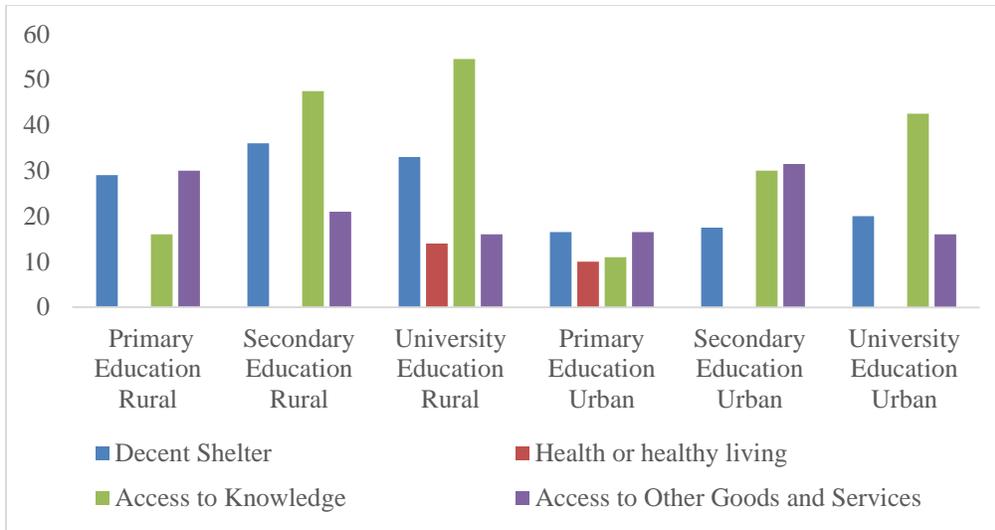
| Variable                          | Primary education |         |       |         | Secondary education |         |       |         | University education |         |       |         |
|-----------------------------------|-------------------|---------|-------|---------|---------------------|---------|-------|---------|----------------------|---------|-------|---------|
|                                   | Urban             |         | Rural |         | Urban               |         | Rural |         | Urban                |         | Rural |         |
|                                   | Score             | Pr(> z) | Score | Pr(> z) | Score               | Pr(> z) | Score | Pr(> z) | Score                | Pr(> z) | Score | Pr(> z) |
| (Intercept)                       | 0.35              | 0.00*** | -0.13 | 0.25    | -0.94               | 0.00*** | -1.08 | 0.00*** | -1.62                | 0.00*** | -1.38 | 0.00*** |
| Education of head of household    | 0.03              | 0.00*** | 0.06  | 0.00*** | 0.05                | 0.00*** | 0.06  | 0.00*** | 0.10                 | 0.00*** | 0.09  | 0.00*** |
| Age                               | -0.01             | 0.00*** | -0.03 | 0.00*** | -0.01               | 0.00*** | -0.02 | 0.00*** | 0.00                 | 0.00*** | -0.01 | 0.00*** |
| Household size                    | -0.04             | 0.00*** | -0.02 | 0.00*** | -0.03               | 0.00*** | -0.05 | 0.00*** | -0.06                | 0.00*** | -0.09 | 0.00*** |
| Physical state of housing         | -0.60             | 0.00*** | -0.28 | 0.00*** | -0.45               | 0.00*** | -0.18 | 0.00*** | -0.77                | 0.00*** | -0.43 | 0.00*** |
| Access to sewage or a septic tank | 0.32              | 0.00*** | 0.35  | 0.00*** | 0.35                | 0.00*** | 0.28  | 0.00*** | 0.51                 | 0.00*** | 0.47  | 0.00*** |
| Age*sex                           | 0.00              | 0.08*   | 0.00  | 0.01**  | 0.00                | 0.00*** | 0.00  | 0.00*** | 0.00                 | 0.00*** | 0.00  | 0.50    |

Table 9

*Costa Rica: ATT, The Impact of Having Primary Secondary and University Education According to Urban and Rural Areas*

| Variable                           | Primary education |         |        |         | Secondary education |         |        |         | University education |         |        |         |
|------------------------------------|-------------------|---------|--------|---------|---------------------|---------|--------|---------|----------------------|---------|--------|---------|
|                                    | Urban             |         | Rural  |         | Urban               |         | Rural  |         | Urban                |         | Rural  |         |
|                                    | Score             | Pr(> z) | Score  | Pr(> z) | Score               | Pr(> z) | Score  | Pr(> z) | Score                | Pr(> z) | Score  | Pr(> z) |
| Access to adequate shelter         | -4.32%            | 0.00*** | -5.12% | 0.02**  | -3.87%              | 0.00*** | -2.75% | 0.03**  | -2.86%               | 0.00*** | -3.15% | 0.04**  |
| Access to health or healthy living | -0.09%            | 0.63    | -1.39% | 0.04**  | -0.17%              | 0.11    | -0.34% | 0.62    | -0.61%               | 0.00*** | -0.71% | 0.18    |
| Access to knowledge                | -2.32%            | 0.00*** | -3.11% | 0.02**  | -5.96%              | 0.00*** | -4.96% | 0.00*** | -5.03%               | 0.00*** | -5.82% | 0.00*** |
| Access to other goods and services | -5.32%            | 0.00*** | -4.82% | 0.00*** | -1.87%              | 0.00*** | -3.56% | 0.00*** | -1.10%               | 0.00*** | -1.73% | 0.02**  |

*Note.* Based on data from the INEC, 2011



*Figure 6.* Percentage reduction in poverty rates by type UBN and according to urban and rural areas as the effect of having completed primary, secondary or university education. Based on data from the INEC, 2011.