LUND UNIVERSITY
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An Analysis of the Factors that Affect Human Capital Accumulation in Nicaragua: Evidence from Household Surveys

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Abstract: This paper argues that the process of human capital accumulation in Nicaragua, as measured by school enrollment, is influenced by a combination of supply and demand factors that can be traced to households' characteristics and the government's educational agenda. By performing a probit estimation to analyze how the interaction of such factors affects the decision of the household to invest in education between 2005 and 2009 when the Nicaraguan educational system was severely transformed, this paper finds that demand variables are more likely to stimulate school enrollment and supply side variables are only significant for primary education, which might suggest that changes in the government's agenda, as a result of changes in administration, have not drastically change the perception of the households towards education. Nicaraguan households are still reluctant at making investments in education given the high opportunity costs faced by individuals; this has great policy implications in terms of stimulating school enrollment.

Key words: Human capital, Nicaragua, school enrollment, probit

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Any mistakes and inaccuracies are my sole responsibility.

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1 Introduction

"In a poor primary education lies the origin of all evil."

Rubén Darío, 1898

Certainly Ruben Dario knew was he was talking about when he said that back in 1898. Education is a weapon of mass destruction when it comes to fighting the evil that is poverty. Although it is easy to say, it is one of the hardest tasks of development. It is even harder when the educational system has been constantly wracked by political and social instability. Such is the case of Nicaragua, the second poorest country in the Western Hemisphere (The World Bank, 2014).

Nicaragua made substantial improvement in school enrollment starting in the 90s and entering the new Millennium. From the 90's to the present, the Nicaraguan population aged between 15 and 30 years with less than 5 years of education, went from 49% to 37%. The enrollment rate went from 58% in 1993 to almost 70% in 2001 for the poor. By the year 2001, the non-schooling gap narrowed to 5% points only. This progress demonstrated that education policy was not only successful at increasing the number of children attending school, but also reduced repeaters' rates (Regalia et al.).

Despite such progress, Nicaragua's educational indicators are still below the regional average (see figure 1). Additionally, data from 2001 still showed high inequality levels of education access; enrollment rates from the poor and rural population are below the national average.[1] This could be a mere reflection of the

[1] This is also true for 2005 and 2009, the years used for the present analysis.

lack of consensus as to what educational policy has referred in the last ten years. Even though there is already a shared conviction that education is a key factor for development, there is not yet a long-term educational strategy, but rather only diversified sectorial policies that change with every new government and every new Minister of Education.

From centralization in the 80's to participatory decentralization in the 90's, and back to centralization more recently, the absence of an educational consensus, that is able to generate national policies that will survive government changes, exposes the educational system to dangerous continuity issues. Issues which cannot be afforded by a country that has for so long struggle with poverty and inequality. The concern for an educational consensus raises the need of a bottom-up educational strategy that meets the private and public sector halfway into a unified national strategy that will effectively tackle the educational issue in Nicaragua.

It is fundamental then, to understand the driving factors behind the process of human capital accumulation in Nicaragua, as measured by school enrollment. This, with the purpose of creating effective educational policies that will function in accordance of those factors, and that will survive political and social changes. In this sense, this papers attempts to answer the following question: what are the factors that influence human capital accumulation in Nicaragua and to what extent have they changed in response to changes in the educational agenda?

The process of human capital accumulation in Nicaragua is influenced by a combination of supply and demand factors that can be traced to households' characteristics and the government's educational agenda. Among the demand factors, the literature identifies those characteristics that are specific to the

individual, such as gender and age. Household characteristics such as household size, head of household literacy, educational spending and number of children under 12 years old, are also identified as important influencing factors in the decision of school enrollment. As to the supply factors, the literature identifies those characteristics specific to school and educational quality, including the provision of school supplies, infrastructure and food programs for children to incentivize enrollment and attendance.[2] In this sense, this paper will perform an empirical exercise to analyze how the interaction of such factors affects the decision of the household to invest in education. This will allow us to find out how changes in households conditions and educational policies have influenced enrollment decisions between 2005 and 2009 when the Nicaraguan educational system was severely transformed.

Studies on this topic for the case of Nicaragua are scarce. De Jong et al., (2006)[3], analyzed supply and demand factors influencing enrollment decision in 2001 for Nicaragua, but only for primary education. A probit estimation with enrollment as the dependent variable showed that demand variables such as education spending, the presence of children under seven and years of education of the head of household, were significant factors influencing the decision of households to invest in education. On the supply side, they find that factors such as the average time to travel to school and the student per teacher ratio were significant as well (De Jong et al., 2006).

[2] See Simmons & Alexander, 1975; Vos & Ponce, 2004; Glewwe & Jacoby, 2000.

[3] The authors utilized a utility maximizing model of attendance and then estimate a probability model to estimate the probability of enrollment given the demand and supply factors specified, see De Jong et al 2006.

Other studies for Central America, such as that of Bedi and Marshall (2002) analyze the factors influencing school attendance for the case of Honduras. Once again they find that human capital gains have a greater influence in enrollment, even greater than the opportunity costs, as measured by wage premium. Furthermore, studies in general on this topic utilize similar supply and demand probability model specifications, and find that factors involving personal and household characteristics as well as supply side factors are very important in influencing the decision to invest in education[4] (Bedi & Marshall, 2002).

In this sense, this paper will contribute to the scarce literature on human capital accumulation in Nicaragua, by extending the analysis to a more recent period, 2005 and 2009, when the country's educational system went through severe transformations, product of a new political agenda. Additionally, this paper will contribute to the understanding of the factors influencing school enrollment decisions for each educational level: primary, secondary and superior. This will hopefully shed light on important policy implications for each educational cohort, making it easier to identify and correct weaknesses in the educational system.

This rest of this paper is organized as follows. Section 2 discusses some of the scholarly contributions related to the theory of human capital accumulation, as measured by school enrollment. Section 3 discusses the theoretical framework. Section 4 presents the data and methodology used. Section 5 discusses the results of a probit estimation, section 6 discusses some policy implications and section 7 concludes.

[4] See: Funk Hooser (1999), Handa (2002), Holmes (2003), Connely & Zheng (2003) and Deininger (2003).

Figure 1: School Enrollment (% gross)

Source: World Bank

Primary Education **Secondary Education**

2 Literature Review

The literature on human capital accumulation is extensive and broad. A large share of this literature has focused on the importance of human capital accumulation for economic development (see e.g. Benhabib & Spiegel 1994; Becker et al 1994; Gemmell 1996; Mathur 1999; Galor & Moav 2004; Tudorescu et al., 2010). This literature has found evidence on the positive influence of human capital in economic development, arguing that a more qualified labor force increases the opportunities to attract more profitable industries and more technological advancements. Departing from this, many scholarly contributions have extended the analysis to the factors that influence human capital accumulation, using school enrollment as a measure of human capital.

In this context, the contributions focus on providing evidence on the factors influencing households' decision to invest in human capital. Such factors vary according to the country being analyzed; in this sense, some authors analyze factors

specific to the household characteristics, which might be attributed to demand factors, while others analyze government policies which might be attributed to supply factors. Only a few contributions manage to combine all of these factors into the analysis, here we will briefly look at these two trends of analysis.

2.1 Demand factors influencing human capital accumulation

Low enrollment rates are often associated with child labor, especially in developing countries, which is why some scholarly contributions focus on analyzing the relationship between the two. Using an instrumental variable approach with a three year household panel data set for Nicaragua, Buonomo (2008) analyzes the effects of child labor on education attainments. In Nicaragua, the alternative to education is work, given the high opportunity cost to attend school. The author finds that the working time has a detrimental effect on educational achievements, especially working more than three hours a day, implying that the opportunity cost of working has great implications for the accumulation of human capital since the early ages (Buonomo, 2008).

Rosati & Rossi (2003) analyze the determinants of school attendance in Nicaragua and Pakistan. Using a full maximum likelihood estimation, the authors explore the relationship between the child's working hours on the household decision to send the child to school. They derived a simultaneous equation system to estimate the decision of the household in relation to school enrollment relative to the hours worked by the child. Their results suggest that a working child is less likely to enroll in school, given the high opportunity cost of such decision. Additionally, they argue that there needs to be more incentives from the supply

side in order to reduce child labor and incentivize households to invest in human capital (Rosati & Rossi, 2003).

Using a panel of 35 countries from six different regions, Filmer and Pritchett (1999) analyze the effects of household wealth on educational attainment. The authors use the Demographic and Health Surveys that contain information on school enrollment and educational attainment and from which they construct an attainment profile with the percentage of people who have completed any level of education. Additionally, they construct an asset index, which they use as a proxy for household wealth to explore the relationship between the two measures (school enrollment and household wealth). Their results suggest that the deficit in primary education enrollment comes mostly from the poor, and that the gap between rich and poor in school enrollment can be closed through the use of actions that increase the demand for education from the poor, in other words, an increase in the supply factors (Filmer & Prichett, 1999).

Following the same line of analysis, Gonsch (2010) looks at the determinants of primary school enrollment in Haiti and the Dominican Republic. Additionally, the author analyzes the extent to which individual, household and even community factors affect school enrollment in both countries. Using the Demographic and Health Surveys from both countries, the author employs logistic multilevel regression methods combined with descriptive analysis, and finds results that support earlier studies. In this sense, personal characteristics such as the age of the child and the wealth of the family are found to be the most significant explanatory variables. Furthermore, she employs the median odds ratio and finds that enrollment is influenced to a certain extent by household and community characteristics (Gonsch, 2010).

2.2 Supply factors influencing human capital accumulation

On the supply side, studies focus on government actions to stimulate enrollment, increase access to school and promote human capital accumulation. Bassi et al., 2013, use 113 household surveys from 18 countries in Latin America to analyze enrollment patterns in secondary school, as well as graduation rates, for the 1990-2010 period. Using a probability function, the authors find that enrollment and graduation rates have increased during the period analyzed. They provide three main explanations for such increase: the first is that governments implemented improvements on the educational system to increase access through a higher allocation of resources to the sector. Second, the returns to education increased during the period and third, there was an increase in the efficacy of schooling (Bassi et al., 2013).

Similarly, Sanchez and Sbrava, analyze the determinants of education attainment in Yemen in the context of attaining the Millennium Development Goal of universal primary education. Using the Household Budget Survey of 2005, the authors specify a MAMS model of student behavior and a probit estimation. The authors find that the enrollment ratio in the primary cohort is still far from being satisfactory, especially in the case of females. Their results suggest that the development and improvement of rural infrastructure, the construction of more schools and a higher quality of teachers would increase school enrollment at all levels. Additionally, improvements in children health and better economic conditions would also increase enrollment rates (Sachez & Sbrava).

In the case of Nicaragua, the studies on Human Capital accumulation are very limited. De Jong et al., 2006, provide an empirical analysis of the factors that influence school enrollment in Bolivia, Honduras and Nicaragua, focusing on

primary education only. The authors employ a probit estimation with demand and supply factors as explanatory variables. They find that the factors vary from country to country, meaning that the determinants of access to education are specific in each context. Their results suggest that a subsidy program on the supply side, to improve primary enrollment, would increase school attendance. An additional simulation analysis suggests that it is also necessary to reduce poverty rates to be able to achieve universal coverage. Furthermore, institutional weaknesses, a lack of coordination between public entities and political pressures need to be improved in order to implement better anti-poverty strategies that increase school enrollment (De Jong et al., 2006).

As mentioned earlier, the studies on Nicaragua are very few and only provide suggestive evidence on the determinants of human capital accumulation. For this reason, this paper goes beyond the literature by performing a detailed analysis of the factors that influence human capital accumulation in Nicaragua, as well as analyzing the extent to which such factors have changed in response to changing educational reforms between 2005 and 2009. Therefore, this paper is an initial attempt to empirically explore how and to what extent the social and political context of the country has influenced the process of human capital accumulation.

3 Theoretical Background

3.1 Educational Reforms in Nicaragua

Nicaragua is one of the poorest countries in Latin America, the second after Haiti. Almost half of the population is poor. For this reason, it is imperative to turn the

attention at improving educational attainment rates, given the great importance of Human Capital for development identified in the literature. Nicaragua's educational system has gone through severe transformations, product of changes in political leadership. It would be very difficult trying to understand the current context of Nicaragua's educational system without a glance of the country's evolution throughout the years. There is after all, a historical legacy embedded in the country's institutions that is still present today (McNamara, 2007).

For this reason, this section will briefly discuss the most important turning points in the history of Nicaragua that directly impacted educational outcomes. The first big transformation took place in 1979 with the Sandinista National Liberal Front (FSLN) Revolution. During this period, the educational system was very centralized and utilized as a means to spread the revolutionary sentiment developed with the Revolution (Gershberg, 2002). In Nicaragua, the Revolutionary period was a big deal in terms of education, the biggest sign was the literacy campaign conducted by the Sandinistas. The campaign reduced illiteracy rates from 50.3% to approximately 13% in only five months. This had long-term effects on a nation that joined forces to end with the biggest obstacle of development: illiteracy. Whether it was for political ends or not, the campaign represents a turning point in the country's educational system (Hanemann, 2005).

After the Revolution, and with the change in government in 1990, the educational system was massively decentralized, thus until this period, one could see that the ideological component was set to be a feature of a very volatile educational system. This time, however, the purpose was to remove the revolutionary sentiment from people and adopt a more hands-on perspective in which schools, both private and public, were more independent from state control.

So, the second transformation of the educational system came with the Autonomous Schools Program under the New Law of Education Participation introduced in 1993. The initiative was meant to insert a democratic perspective in the system, by empowering people through the delegation of important decision making processes (McNamara, 2007).

In this sense, the autonomous reforms aimed at improving educational outcomes through decentralization, accountability and participation.[5] Additionally, the Autonomous School reform was implemented on a voluntary basis and it was continued by the two governments preceding.[6] By 2002, the program was extended to more public schools under the neoliberal leadership of Arnoldo Aleman. During this period, educational policies were materialized under a new and improved National education Plan under the same Education Participation Law, which was extended to the year 2015. The National Education Plan had five main action lines: the first one was to increase coverage, the second to improve education quality, the third was to modernize education through technological innovation, the fourth was to enhance the status of teachers and the last was to decentralize school management (Jane, 2008).

Following up the National Education Plan, the government achieved that by 2005 almost 72% of public schools in the country were successfully incorporated in the autonomous program. Additionally, there were external cooperation committees established in order to work closely with donors and NGO's, to improve

[5] The government based its strategy on the New Public Management theory, which is an organization and model based on the ideas of market efficiency.

[6] The Autonomy School Reform was implemented under the conservative leadership of Violeta Barrios de Chamorro, the first Nicaraguan female President, preceded by the neoliberal administration of Arnoldo Aleman.

educational attainment rates. Since the schools were partially autonomous, fundraising could be done independently from the government, which raised concerns regarding inequality in educational access (Jane, 2008)

It is worth noting, that the Educational Participation Law was only legally backed until 2005, when it was officially voted and approved by the Nicaraguan Parliament. In this sense, 2005 was a fundamental turning point for the educational system, since it brought to surface more substantive educational strategies, such as universal free primary education for instance (Gershberg, 2002).

The continuity of policies, especially in such a key sector as education, is fundamental for the success of development goals. Whether such policies are successful or not so much, the important thing is that continuity must be pursued, whether in the form of improvements or modifications. This has not been the case for Nicaragua, in 2007, the Sandinistas returned to power. One of the first government's measures was to remove the autonomy of schools in the country, in other words, the educational system was centralized again after more than a decade of decentralization. The objective of the new government was to guarantee free enrollment, in the context of the Millennium Development Goals. In this sense, the newly elected government started a transition process with similar goals from past administrations, except for one: to rescue public schooling from being influenced by market forces, re-imposing the ideological component to the educational system once again.

The big transition of Nicaragua's educational system can be summarized by looking at more than a decade of autonomy and decentralization that comes to a boiling point in 2005 with the incorporation of 72% of national schools into the

autonomous system, a process which is abruptly interrupted by a change in administration in 2007. In this sense, these two turning points need to be analyzed with respect to the influence these had on educational improvement and therefore on the process of Human Capital accumulation.

3.2 Factors that Influence Human Capital Accumulation in Nicaragua

The legacy of Nicaragua's political and social history lives at the core of its institutions and it is reflected in every aspect of everyday life. Despite the fact that the educational system has been wracked by political and social polarization, Nicaragua has made substantial achievements in school enrollment rates, especially in the 90s and entering the new Millennium. More recently, in the light of the present analysis, in 2004, enrollment rates for primary and secondary education were about 83% and 40% respectively. However, educational indicators are still below the regional average as mentioned earlier (De Jong et al., 2006).

Additionally, the poor quality of education is also a reflection of the unstable policies that characterize the educational system. Achievement test results in Spanish and Mathematics in 2002 show that only 8% of third grade students are competent in Spanish and 14% in Mathematics. The majority of the students showed only basic knowledge of both subjects. On the other hand, public expenditure on education increased during the second half of the 90s and it recently accounts for 4.6% of GDP (UNESCO, 2014). This number seems very small compared to the significant portion of youthful population in the country.

In Nicaragua, over half of the population is under 20 years of age, a great portion do not have access to education, thus, the great availability of unskilled

labor is not necessarily a comparative advantage, which suggests that in terms of competitiveness, the country's economic poor performance could be the product of an uneducated workforce (Regalia et al.).

In this sense, the great challenge that the Nicaraguan government currently faces is to provide universal basic education for over half of the population under 20 years old, as well as to retain those students from dropping out. The out-of-school population is large and is even larger in rural areas. This makes the dropout rates to be of great concern if the government plans to achieve universal free primary education by 2015, yet there seems to be no concrete explanations as to which factors influence the decision of households to either stop or to start investing in education.

There seems to be evidence that people, especially in rural areas, face very high opportunity costs of education, which keeps them away from the classrooms and out in the work field. Does this imply that if the government were to cover such opportunity cost, the classrooms would be full? There is no certain answer to such question; however, research suggests that the low enrollment rates among Nicaraguan youth are the product of a dynamic combination of factors, both in the supply and the demand side (Regalia et al.).

3.2.1 Demand Factors

As to the demand factors, almost more than half of the population in rural areas, for instance, report not being enrolled in the formal educational system given the fact that they perform some kind of labor. This increases the opportunity cost of enrolling in school, a cost that is higher in rural areas where children have to bear the burden of working. Government programs such as the Social Safety Net

Program have demonstrated that this opportunity cost can be easily subsidized, thus promoting school attendance in rural areas. Progress has been made by the government starting in 2007 with several projects improving the supply side through the support of International Organizations including the World Bank, USAID and UNICEF. This means that with a massive educational campaign and a sector wide approach[7], Nicaragua might have started a battle against illiteracy and drop-out rates. However, the cost of education is not the only factor affecting enrollment. As mentioned before, children in rural areas are the least favored when it comes to educational coverage. Factors such as infrastructure and lack of educational centers impede rural children from getting an education.

Individual characteristics play an important role in the decision to invest in education. Factors such as household characteristics and composition are relevant to the analysis of individuals' decision with respect to education. In this sense, the composition of the household and the characteristics of the individual are important factors affecting Human Capital Accumulation. Households with heads with more years of education present higher preferences for their children's education (Duryea & Pages, 2002). At the same time, the children of more educated parents and therefore higher salaries are more likely to create higher expectations about the returns to education and more likely to positively influence in their children's decision to pursue education.

As to the region that the household belongs to, urban vs. rural areas, as mentioned before, this might be a supply variable related to the conditions of roads and how these connect the rural population with educational centers. However, it is

[7] It is a development approach that brings together cooperation between the government, donors and International Organizations to tackle development issues such as health and education.

also an individual decision, given the fact that rural children are more likely to work with their parents in agricultural activities, which provide more fluctuating monetary resources.

Finally, intra-family resource allocation[8] might also affect the household decision to invest in human capital. In this sense, a higher number of children under 12 years old in the household might imply fewer resources for education and a higher need for income, which at the same time implies that the probability of the child entering the labor market will be higher than that of enrolling in the educational system[9] (Escudero & Marchionni, 1999).

3.2.2 Supply Factors

A good quality educational service, which directly affects the decision of households to invest in education, is affected by infrastructure and school supplies, such as books, desks and even boards, all basic materials that make the difference when it comes to a high quality education. According to FUNIDES (Nicaraguan Foundation for Economic and Social Development), only 48.5% of educational centers have drinkable water, 52.6% of them require remodeling or repair and for the past two decades, secondary students have lacked basic school supplies such as books (Belli & Flores, 2011).

The lack of attention paid to these issues affects the decision of individuals to invest their time and monetary resources in education. In other words, when the time comes to choose between a long-term investment and providing food in the

[8] In the empirical analysis, this is proxy as the number of children in the household under 12 years old.

[9] This is more likely to be the case of poor households.

short term, people choose the latter because there are no incentives to do otherwise. Education has not been made attractive enough to invest in it.

Besides infrastructure and school supplies, enrollment might be affected by factors related to the quality of education offered. This involves the quality of teachers. In Nicaragua, to be a primary teacher, the individual only needs to have basic teacher formation, which is approximately 9 years of education. The teaching profession is not very attractive in the country and it certainly does not make the decision to enroll attractive either. The educational sector in Nicaragua is underfunded, which determines the fact that Nicaraguan teachers earn the lowest average monthly wages in the region.[10] Paying so little to the teachers, who are the most important component of quality education, negatively affects the quality of teaching and makes it very difficult to attract and retain better and more qualified professionals (Belli & Flores, 2011).

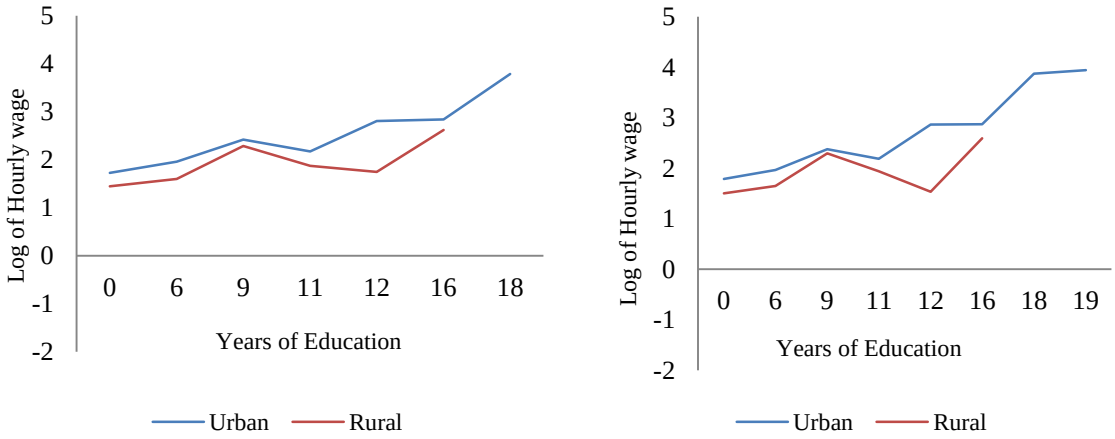
On the other hand, monetary factors directly affecting the decision to invest in education, such as the expected returns to education, also play an important role. Between 2005 and 2009, the expected returns from tertiary education decreased (See Figure 2: Returns to Schooling), probably because of the transition to a new government and the adoption of a centralization strategy. Still, whether the expected returns are high or low, the average Nicaraguan individual who lives at 2$ per day can still not afford to make the decision to invest in education.

In this sense, it is important to analyze how the influence of these factors on the probability of enrollment has changed from 2005, when almost 72% of schools

[10] According to the Nicaraguan Ministry of Education, for 2009, a kinder teacher earned 201$ monthly, a primary 203$ and a secondary teacher earned 228$.

were incorporated in the autonomous system, to 2009, when the educational system was completely centralized. This implies that there is not yet a national policy that counts with the support of the main stakeholders of the country; from centralization of the sector during the 80's to participatory decentralization in the transition period of the 90's, to the present period, in which fundamental decisions are concentrated in central authorities. It is such set of volatile and changing policies that might be impeding to have a substantial and sustainable improvement in educational outcomes. For this reason, the rest of this paper will analyze the behavior of such educational outcomes between two important transition points in the educational system: 2005 and 2009.

Figure 2: Returns to Schooling



2005 **2009**

Source: Author's calculations based on EMNV 2005 & 2009

4 Methodology & Data

4.1 Data

In order to empirically explore how the process of Human Capital Accumulation in Nicaragua is influenced by a combination of supply and demand factors related to household characteristics and the government's educational agenda, this paper utilizes data from the National Household Survey on Living Standards (EMNV) conducted by the National Institute for Development (INIDE) for 2005 and 2009. The surveys were conducted on the basis of the methodology developed by the World Bank.[11] The usage of both surveys serves the purpose of analyzing the chosen variables in two important periods of time. So, we do not compare the individuals over time but only the behavior of the independent and dependent variables, and how these might have responded to changes in educational policies.

Both surveys contain information on relevant topics including participation in development programs, demographic characteristics, health, fertility, education (educational attainment, attendance, education spending, drop-out information and school programs), labor, income, household spending, among others. The datasets contain information for 36,612 individuals from 6,859 households for the year 2005 and 30,432 individuals from 6,515 households for 2009.

Tables 1 and 2 show some descriptive statistics that characterized the Nicaraguan population in 2005 and 2009. As seen from both tables, almost 45% of the Nicaraguan population is under 25, which has great implications when it comes

[11] The methodology is based on the Living Standard Measurement Study (LSMS), which is based on the study of households' consumption and spending levels, access to basic services and other variables related to living conditions. The Study is applied to a national representative sample.

to educational policies targeting educational coverage. Furthermore, this represents a challenge for the government, since most of these people are old enough to enter the labor market, meaning that labor demand might be as representative as educational demand; in sum, the percentage of people under 23 decreased from 43% in 2005 to 41% in 2009, still a very significant figure.

When it comes to the female population, there is a tendency for a higher percentage of women in the urban area and at a national level, but not at the rural level. Almost 48% of the population in the rural area is composed by women in both years. The number of members in the household under 12 years old decreased from 2005 to 2009 by a modest percentage point. The average years of education of the head of household is higher in 2009, probably due to the free education policy introduced in 2007 by Ortega's administration. Interestingly, the percentage of female heads of households decreased dramatically between the two periods, from 31% in 2005 to 13% in 2009. This might imply that more women are now working or enrolling in school.

Average education spending has also slightly increased between 2005 and 2009, given the volatile prices and inflation rates of the economy. On the other hand, one way to measure access to education is by using the distance the child has to travel to get to the educational center. This information is available only for 2005; the numbers indicate that on average, students travel 2.8 km in urban areas and 3.6 km in rural areas. In terms of levels of education, children attending secondary education travel greater distances (3.7 km's) than those who attend primary (0.9).[12]

[12] General Report of the National Household Survey on Living Standards 2005.

When it comes to enrollment rates, there were modest increases between 2005 and 2009. In the case of primary education, the enrollment rate was 79% for both years with a higher percentage of female population enrolled in 2005. In the case of secondary education, there was a slightly decrease from 68% in 2005 to 67% in 2009, and finally there was a modest increase of 2% in enrollment in superior education, with a higher rate in 2009.

The sample utilized for this analysis comprehends those individuals between the ages of 6 and 23. According to the Ministry of Education, the legal ages to attend primary education are between 6 and 12, 13 and 17 for secondary, and 18 and 23 for superior education. It is interesting and important to distinguish the effects of the independent variables on the different educational levels. For this reason, this paper works with three different age cohorts, which are the dependent variables. In the case of primary education, we include those children between 6 and 12 who have not completed the primary level, giving place to a total of 6,205 and 3,974 observations for 2005 and 2009 respectively. In the case of secondary education, we consider those children between the ages of 13 and 17 who have completed primary but not secondary education, giving place to a total of 4,839 and 3,622 for 2005 and 2009 respectively. Finally, for superior education, we consider those individuals between the ages of 18 and 23 years old, who have not completed superior education, giving place to 4,503 and 3,836 observations for 2005 and 2009 respectively. In all cases, we work with those individuals who are not the head of the household.[13]

[13] Given the fact that one of the explanatory variables includes personal characteristics of the head of household, those children who reported to be the head of the household at the time of the survey were not included in the sample.

Education spending was specified as the aggregate of enrollment fees and school expenses such as uniforms.[14] Education spending increases between the primary and the secondary level, and then decreases in the superior level, given the small percentage of people in this group (see table 2). For this reason, the expected sign of this coefficient is ambiguous (see table 3). Additionally, a key issue that arises in estimating these models is that the information on school fees is only observed in the case of those that are actually enrolled. Treating school attendance as a basis of actual expenditure would be incorrect because households may choose how much they spend on education and, thus, educational spending would be endogenous, which would lead to a biased estimate of the enrollment equation. To overcome this problem, this paper limits the analysis only to those components of education spending that are less susceptible to control by the home, such as enrollment fees and uniforms (De Jong et al., 2006).

As mentioned before, an important factor that might influence enrollment decision is the opportunity cost of education, which is represented in this analysis by the wage premium. In this context, the wage premium is a variable that measures the additional returns, in terms of wages, that the individual can expect if they pursue an extra year of education. In this sense, the wage premium variable was calculated for each education cohort: primary, secondary and superior, using an extended version of the Mincer equation for individuals in the surveys for 2005 and 2009.[15] The expected coefficient of this variable is positive.

[14] It was specified for each level of education as these expenses vary according to the school supplies required for each level of education. The variable was then transformed to its natural logarithm, eliminating outliers.

[15] More on the methodology used to calculate the wage premium can be found in the empirical approach section.

The remaining demand variables including age, gender, years of education of Head of Household, number of members under 12 years old, and region, are specified as dummy variables, as it can be seen in table 3, which shows the specification of each variable as well as the expected effect. Variables on the supply side[16] were not all available for 2009, so these are omitted from the model and instead a type of school (public or private) variable is added to represent the supply side. This, as a measure of school quality, the logic behind is that public schools in Nicaragua are supposed to provide higher-quality education, so the expected effect is positive.

The lack of supply variables for 2009 represents a problem for this analysis. For this reason we execute a set of regressions with only demand variables for 2005 and 2009 and supply variables as measured by the type of school and the wage premium; this, with the purpose of testing the robustness of the results with and without the available supply variables. Furthermore, we perform the analysis with the supply variables available only for 2005 in order to analyze the extent to which these factors influence school enrollment. By performing this exercise, the results will show whether or not the same factors are consistent over time in terms of the effect on the dependent variable.

Departing from this context, the decision to enroll in the educational system will be treated as a function of the costs and expected benefits derived from the variables described above. The next section will describe the empirical approach followed to analyze such decision.

[16] School variables are municipal averages.

Table 1: Descriptive Statistics Total Population - Nicaragua 2005			
Variable	**Urban**	**Rural**	**Total**
Population Structure			
Population (Millions)			
% Population between 6 & 12 years old	8.7	9.1	18
% Population between 13 & 17 years old	6.46	6.06	12.5
% Population between 18 & 23 years old	8	5.3	13.2
% Female Population	52.76	48.61	50.9
% Male Population	47.26	51.39	49.07
Household Characteristics			
No. Of Members under 12 years old	2.7	3.4	3.15
Average years of education of Head of Household	7.04	3.6	5.3
% of Female Head of Household	39	20	31
% of Male Head of Household	60	79	68
Average Age	26	23	25
Education Indicators			
Average Education Spending (Cordobas 2005)	782	384	590
Average Distance to Educational Center (km)	2.8	3.6	3
% of Individuals benefiting from Food Program	8	17	12
% of Individuals benefiting from School supplies	0.7	2.4	1.4
% of Individuals attending Private Educational Centers	5.9	0.74	3.6
% of Individuals attending Public Educational Centers	11.1	20	15.1
Enrollment Rates			
Primary Education (between 6 & 12 years old)	82	75	79
Enrollment rate in Households with Female Head	91	88	90.6
Female	83	77	80
Male	81	73	77
Secondary Education (between 13 & 17 years old)	78	58	68
Enrollment rate in Households with Female Head	71	64	69
Female	79	61	71
Male	76	56	66
Superior Education (between 18 & 23 years old)	33	18	27
Enrollment rate in Households with Female Head	29	25	28
Female	36	19	30
Male	30	18	25

Source: Author's Calculations based on EMNV 2005

Table 2: Descriptive Statistics Total Population - Nicaragua 2009			
Variable	**Urban**	**Rural**	**Total**
Population Structure			
Population (Millions)			
% Population between 6 & 12 years old	8	8	16
% Population between 13 & 17 years old	6.6	6	12.7
% Population between 18 & 23 years old	7.2	5.2	12.5
% Female Population	52.61	48.51	50.85
% Male Population	47.39	51.49	49.15
Household Characteristics			
No. Of Members under 12 years old	2.4	3.1	2.6
Average years of education of Head of Household	8.5	4.8	7.6
% of Female Head of Household	13	14	13
% of Male Head of Household	86	85	86
Average Age	21	24	26
Education Indicators			
Average Education Spending (Cordobas)	1362	782	1218
Average Distance to Educational Center	N/A*	N/A*	N/A*
% of Individuals benefiting from Food Program	N/A*	N/A*	N/A*
% of Individuals benefiting from School supplies	N/A*	N/A*	N/A*
% of Individuals attending Private Educational Centers	4.6	0.62	3
% of Individuals attending Public Educational Centers	19	24	21
Enrollment Rates			
Primary Education (between 6 & 12 years old)	82	75	79
Enrollment rate in Households with Female Head	95	90	94
Female	82	76	79
Male	83	74	78
Secondary Education (between 13 & 17 years old)	77	55	67
Enrollment rate in Households with Female Head	72	66	71
Female	79	60	71
Male	75	51	63
Superior Education (between 18 & 23 years old)	38	18	29
Enrollment rate in Households with Female Head	32	29	31
Female	38	19	30
Male	38	17	28

Source: Author's Calculations based on EMNV 2009

*Information not Available for EMNV 2009

Table 3: Expected Impact of the Factors that Influence Human Capital Accumulation in Nicaragua

Variable	Specified	Expected Sign
Demand Side		
Education Spending	Log of Education Spending	(+/-)
Number of Years of Education of Head of Household	Years of Education of Head of Household	(+)
Number of Household Members under 12	Number of persons in the Household under 12	(-)
Age	Age Cohort (=1 if person belongs to a specific age cohort, 0 otherwise)	(+/-)
Household Size	# of Individuals in the Household	(-)
Gender	Dummy (=1 if Man, 0=Woman)	(+/-)
Region*	Dummy (=1 if Managua 0=other region)	(+)
Supply Side		
Average Time to travel to School	Average distance in Kilometers to get to the Educational Center	(-)
School Recipient of Food Program	Dummy (=1 if yes, 0=No)	(+)
School Recipient of School Supply Program	Dummy (=1 if yes, 0=No)	(+)
Multigrade School	Dummy (=1 if yes, 0=No)	(-)
Type of School	Dummy (=1 if Public School, 0=Private)	(+)
Wage Premium*	Wage Premium for Primary, Secondary and Tertiary Education	(+)

*Calculations for the Wage Premium can be found in the Empirical Approach Section

* The model controls for the Atlantic, Central and Managua region

*School variables are municipal averages

4.2 Empirical Approach

To empirically address the hypothesis that the decision to enroll in the educational system is influenced by the interaction of supply and demand factors related to Household and school characteristics, this paper bases the empirical approach on the theoretical models developed by Bedir (2004), Vos & Ponce (2004), and De Jong et al (2006). These models are based on the premise that the household decision to invest in Human Capital is a function of the expected benefits drawn from education, against the monetary and opportunity costs of attending school. In this sense, it is assumed that a reduction of the costs or an increase of the expected benefits will increase the probability of enrollment. This can be represented by the following utility function[17]:

$$U1 = U\,(b, C_1) \qquad (1)$$

Where U_1 is the household utility, which is conditioned by enrollment, b is a vector of associated benefits derived from school enrollment and C_1 is the household consumption, which is also conditioned by enrollment.

At the same time, b is also a function of other factors represented by the following function:

$$b = B(h, w, z) \qquad (2)$$

Where h is a vector of personal characteristics from the individual, w is a vector of household characteristics and z is a vector of school characteristics.

[17] This section is based on De Jong, 2006.

In this sense, the household maximizes utility conditioned on the following Budget Constraint:

$$y = C_1 + p \qquad (3)$$

Where y is household income and p is the total cost, which includes the direct and the opportunity costs, associated with enrollment. On the other hand, the function associated with the decision of not enrolling is:

$$U_0 = U(Co) \qquad (4)$$

The budget constraint then is $y = Co$. The household chooses the option that derives the biggest utility:

$$U* = \max(U_1, Uo) \qquad (5)$$

Where $U*$ is the maximum utility; in this case, the solution to the maximization problem is the probability of choosing an option.

In this sense, to derive the empirical model, the utility associated with enrolling is treated as a linear function of the costs and benefits associated with attending school:

$$U_1 = \beta_1 b + \beta_2 C_1 + \varepsilon_1 \qquad (6)$$

Where the β's are the coefficients to be estimated and ε is assumed to have zero mean and be normally distributed. From equation (3), the utility function can then be expressed as:

$$U_1 = \beta_1 \mathrm{b} + \beta_2(\mathrm{y} - \mathrm{p}) + \varepsilon_1 \qquad (7)$$

And the utility associated with not enrolling is:

$$Uo = \beta 2 + \varepsilon o \qquad (8)$$

Departing from this, the individual will enroll in school if the associated utility with it is greater than that of not enrolling, in other words, the individual enrolls if U1-Uo is a positive value.

$$\beta_1 b - \beta_2 p + \varepsilon_1 - \varepsilon o > 0 \qquad (9)$$

The probability of enrolling thus can be specified as a function of socio-demographic, individual and household characteristics, as well as the direct and indirect costs of being enrolled. This linear function can be specified as a linear probability model:

$$\Pr[e = 1] = \Pr[\beta_1 B(h, w, z) - \beta_2 p + \varepsilon e > 0] \qquad (10)$$

Where e is a binary variable that takes the value 1 when the individual is enrolled and 0 otherwise, the β's are the coefficients to be estimated through a vector of individual, household and school characteristics which will influence the decision of the household to invest in education.

The probability specification stated above, treats utility as a linear function of the benefits, the costs and household consumption. However, in equation 10, neither consumption nor income influence in the household's decision to invest in education because when deriving the function, these were left out, making the probability to enroll independent from these variables. In this sense, including the expected benefits of education in the utility function directly, might create an alarm in terms of marginal utility (CEPAL 2011).

For this reason, some theoretical models (see Gertler & Glewwe, 1990), leave utility as a function of consumption and income, rather than just the benefits and

costs. However, doing so would make the function a non-linear one, making it more difficult to interpret the effects of the independent variables. To address this issue, the model specified in this paper includes variables such as the years of education of the head of the household, which is correlated with income and consumption, making the model relatively stable (De Jong et al 2006).

4.2.1 Shortcomings

The availability of the data in the supply side, only allows us to look at school variables for the year 2005, making it difficult to draw substantial conclusions in terms of the progress that has been made on education supply between the two periods. For these reasons, the empirical approach adopted in this study is an imperfect one for the objective of this paper. However, an attempt to overcome this issue has been made by performing an empirical exercise using identical variables for both years. In this sense, in the first phase we performed the analysis using wage premium and type of school as supply variables for both years, with identical demand variables. In a second phase, we add the school variables (school supplies, food program, distance to school, and multigrade schools) available only for 2005; this, with the purpose of analyzing the consistency of the results.

Furthermore, the analysis presents other limitations as well. For instance, the supply variables for 2005 are municipal averages, which reduce the sample variation, especially in the urban sample where municipalities are bigger. Second, the study does not consider educational achievements as a measure of quality and it does not differentiate private education from public education either. For this

reason, it is important to carefully interpret the results from the analysis given the limitations, data restrictions and weaknesses in the models.

It is also important to address the issue of possible endogeneity, given the fact that different educational levels may be determinants of some of the explanatory variables, especially in the case of the wage premium. This issue of endogeneity cannot be directly addressed in these models, which is why we justify the estimation following the rationale that endogeneity is more likely to appear over time, at least in the case of the wage premium, which is based on differences on skill levels in the labor market and has a direct effect on the enrollment decision in the short term. This is from the perspective of the individual who is trying to maximize his utility. In this sense, as the amount of individuals in the labor market changes as each educational level changes, the decision of the individual will have feedback effects that will also change the wage premium. This argument might also apply to other variables such as household size. Departing from this, the effects of the independent variables can be interpreted as contemporaneous, with an endogenous feedback that is dynamic in nature; however, this is not empirically tested due to data restrictions, which is why the variables in the model are considered as exogenous (CEPAL, 2009).

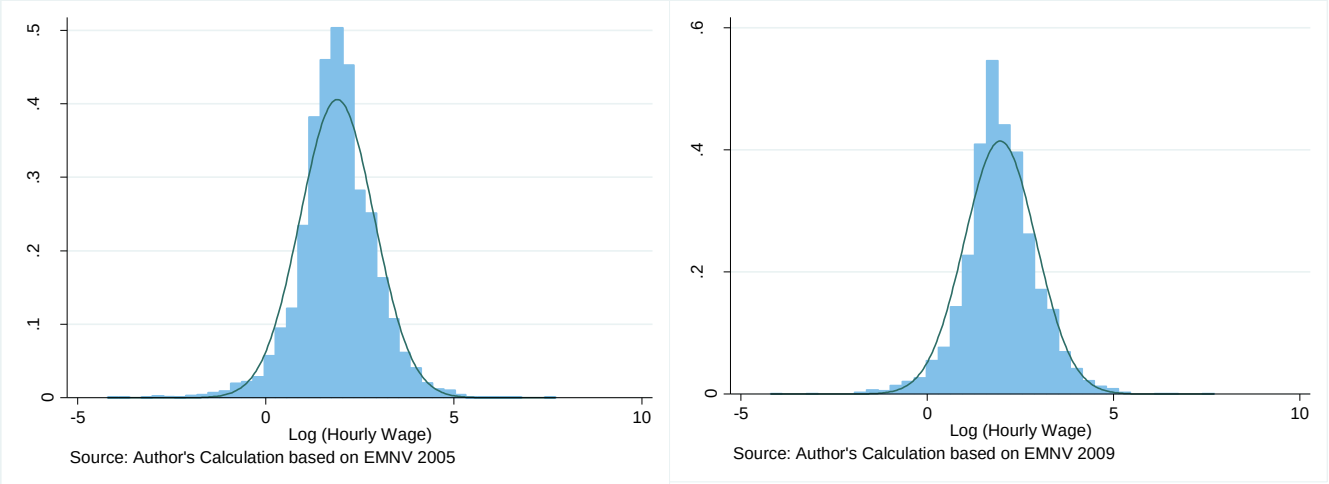
4.2.2 Mincer Estimation

As to the empirical approach adopted to estimate the wage premium variable, an extended Mincer equation was estimated in order to obtain the predicted wages for each educational level for both years. The sample for this purpose was established based on this criterion: those individuals above 15 years

old, who declared to have worked during the last week before the survey was conducted, who worked at least one hour per week and earned wages above zero.[18]

Two main models were estimated, the basic Mincer equation to obtain the average return of an additional year of education, and a second model to estimate the returns to education for each level: primary, secondary, and superior. The independent variable corresponds to the natural logarithm of the hourly wage[19] obtained from the primary occupation of the individual. The independent variables include the same variables specified in the basic Mincer equation and they include years of education, potential experience and potential experience squared.

Figure 3: Log of Hourly Wage



2005 **2009**

The first model is specified as follows:

$$In\, w = \propto o + \beta 1E + \gamma 1Exp + \gamma 2Exp^2 + \mu \qquad (1)$$

[18] The sample was restricted to individuals no older than 70.

[19] Those observations with zero wage and outliers were excluded from the analysis.

Where w is the log of hourly wage, E is the years of education of each individual, Exp is potential experience, a proxy for work experience, and μ is the error term.

The second model is the extended Mincer equation, which considers smooth changes for every educational level:

$$In\, w = \propto o + \beta_1 E + \beta_2 D\mathrm{b}(E-6) + \beta_3 D\mathrm{m}(E-11) + \gamma_1 Exp + \gamma_2 Exp^2 + \mu \quad (2)$$

To estimate this model, four dummy variables were constructed, one for those individuals with zero years of education, another for primary, secondary and superior education. By omitting the first variable we can take the coefficients of the remaining variables as differential effects with respect to that omitted variable.

In equation (2), 6 is the number of years for basic education, 11 represents the number of years for middle education. $D\mathrm{b}$ is a dummy variable, which equals 1 if the individual has 6 or more years of education: $D\mathrm{b}$ =1 if $E \geq 6$, $D\mathrm{m}$ is a dummy variable, which equals 1 if the individual has 11 or more years of education: $D\mathrm{m}$ =1 if $E \geq 11$. Given this definition, β1 indicates the return of primary education, $\beta_1 + \beta_2$ the return of secondary education and $\beta_1 + \beta_2 + \beta_3$ the return of superior education[20] (Mincer 1974).

Experience was constructed in the traditional way: Age – years of education – 6. Years of education were not reported in the surveys, so the variable was estimated using the number of years corresponding to each educational level.[21] In the surveys, individuals were asked what the last level of education competed was,

[20] The models were estimated by OLS and corrected for selection bias using the two step Heckman procedure. The estimations can be found in the Appendix.

[21] Reported by the Ministry of Education.

based on this, the number of years were assigned to each level of education (i.e. primary= 6 years, secondary 11, university 16, and so on).

Once the coefficients for the educational levels were estimated, the fitted values were applied to individuals in the sample given the educational level. The wage premium was calculated following CEPAL's 2009 methodology: for primary/secondary, the wage premium is the result of:

$$\frac{\text{Fitted Wage Value (Secondary)}}{\text{Fitted Wage Value (Primary)}}$$

The wage premium for secondary/tertiary:

$$\frac{\text{Fitted Wage Value (Tertiary)}}{\text{Fitted Wage Value (Secondary)}}$$

The next section will present the results from the probit estimation.

5 Results

The results of the probit estimation for the effect of supply and demand variables on human capital accumulation, as measured by school enrollment, are presented in tables 4-6. Four models (total, poor, rural and urban) were estimated for each educational level: primary, secondary, and superior. Estimation results for each educational level can be found in tables 11-19 in the Appendix. Tables 4-6 show the estimation results for all levels of education for 2005 and 2009 respectively. The tables report the marginal effects on the probability of an individual between the

ages of 6 and 23 to enroll in the formal educational system, given the different factors influencing such decision. The interest is to find out whether the decision of a household to enroll or invest in Human Capital, is influenced by factors deriving from the supply side, or if its more influenced by demand factors associated with the individuals' personal characteristics; this with the purpose of identifying effective policies that will promote school enrollment.

The results in tables 4-6 show that overall, rural areas are more influenced by both sets of factors in both years. Education spending has a stronger negative effect in 2005, but equally significant in both years. This is consistent with De Jong, 2006, who find a negative and significant effect of education spending on the school enrollment probability in rural areas and the poor. In this sense, a one percent increase in education costs reduces the probability of enrollment by 11% in 2005 and 12% in 2009. This small change from 2005 to 2009 might be the result of a more focused educational campaign. The results are similar for 2005 when we take into consideration all the supply variables (as shown in table 4).

On the other hand, the education of the head of household appears to be positive and significant in both years, as expected, which is consistent with most of the literature on Human Capital.[22] A more educated head of Household increases the probability of enrollment among the poor and the rural population. In the urban population, it appears to be negative but not significant, which could imply that literacy rates are more likely to be higher among the poor and the rural population.

[22] See: De Jong (2005); Rossati & Rossi (2003); Handa (1999).

In the case of gender, it seems that males are less likely to enroll in the formal educational system than girls. This is true for both years where the coefficient appears to be negative and significant. This is consistent with Handa (1999), who finds a positive effect when gender equals 1 if female, not only in the probability of enrollment but also on student performance. De Jong (2006), find the opposite, women are less likely to enroll than men[23]. This negative effect might be capturing the opportunity cost related to the decision of the individual to work or study. In the case of males in the household, they are more likely to work to provide for their families.

On the other hand, the number of children under 12 years old appears to have a positive and significant effect on the probability to enroll in both years. This is not the expected sign; however, in the case of disaggregated educational levels, the effect appears as expected, negative and significant. The number of people in the household appears to be negative and significant through all regressions for both years, which supports the hypothesis, that more people in the household, the less likely is the individual to enroll in school due to the problem of resource allocation; this coefficient shows the expected sign.

The region dummies appear to have no significant effect on the probability of enrollment, except in the case of rural Managua and the central region for both years. When it comes to supply variables in table 4, they appear to have no significant effect except for multigrade schools. It appears that in 2005, attending a multigrade school reduced the probability of enrollment throughout all regressions. The distance to school is only positive and significant among the rural population.

[23] Their study was performed for 2005 as well but only for primary education.

As to the wage premium, it appears that it has a negative and significant effect on the probability of enrolling for both years, as opposed to the expected positive sign; this is the case except for 2009 where the coefficients appear to be positive and significant. This ambiguity might be related to the lack of information of education consumers, as households might not be aware of future expected earnings, which implies that households might not take this into consideration when making the decision to invest in Human Capital, especially in rural areas.

Overall, it seems that the decision to enroll in school is more influenced by demand side variables rather than supply side variables. However, before drawing further conclusions, the rest of this section will analyze the estimation results for each level of education: primary, secondary and superior.

In the case of primary education, the results show that a 1% increase in education spending decreases the probability to enroll in school by 7 for the whole sample in 2005 and 2 in 2009 for the poor. The gender of the individual and the head of household's literacy appear to have a stable effect in all regressions for both years. Being a male, decreases the probability of enrollment at all levels of education, and having a more educated head of household appears to have a positive effect on such probability. This is consistent with Handa (1999), De Jong (2006) and Cepal (2009). The policy implications of these results are fundamental to increase school enrollment through the empowerment of literate heads of households in the rural area, and among the poor, but more on this in the next section.

As to household size, it has a negative effect on the probability of educating among all regressions for both years, although it is only significant for 2005 for the

total and urban sample. Also, as expected, a higher number of children under 12 decreases the probability of the individual to enroll in the educational system, which is consistent with Escudero & Marchioni (1999), who find that when faced with this situation, households have fewer resources to allocate to education. The wage premium appears to have a negative effect on the probability of enrollment for both years. Finally, it appears that attending a public school increases the probability of an individual to enroll in the formal educational system, implying a good perception from individuals in terms of school quality in favor of public educational centers.

In the case of secondary education, the influence of the factors does not change a lot. Education spending appears to be negative and significant for the poor and the urban sample in 2005 and for the urban sample in 2009. Individuals between the ages of 13 and 17 are more likely to enroll in the formal educational system for both years. Household size appears to have no significant effect throughout all regressions for neither year. The wage premium appears to be negative and significant for the poor and the rural sample for 2005 and not significant for 2009. In the case of secondary education, demand side variables appear to have a stronger and more significant effect over the influence of school enrollment.

In the case of superior education, the most significant factors influencing the decision to enroll in the educational system are the number of children under 12 in the household and the household size. The number of children under 12 years old appears to have a positive influence on the probability of enrollment for both years, which might imply that individuals in this education cohort tend to be more independent in terms of household decisions. On the other hand, household size

appears to have a negative and significant influence on school enrollment, more individuals in the households might imply a higher opportunity cost of attending school.

When it comes to supply variables for 2005 in tables 11-13, attending a school where there is a food program increases the probability of enrolling in school by 0.7 for the total population, the poor and the rural sample. In the case of secondary and superior education, the coefficient is not significant. School supplies appear to have a negative and significant effect in primary and secondary education. As to distance, there seems to be no significant effect on the probability of enrollment.

In the case of the wage premium, it appears to have a negative and significant effect in primary education for 2005, probably due to the lack of information on future expected earnings from this education cohort. This is consistent with Glewwe & Jacoby (2000), who find that changes in returns to education do not play a major role in promoting enrollment in the period they analyze. The authors argue that it might be attributed to the fact that change in education returns do not vary a lot across municipalities but rather across households, which implies that the effect of the coefficient is confounded with that of household wealth. Additionally, since changes in education returns might not vary a lot in their sample, the effect might end up in the constant term. They also suggest that households simply had not reacted to higher returns during the period studied, which could be the case for this analysis (Glewwe & Jacoby, 2000).

Overall, the results suggest that demand side variables are more likely to influence the decision to invest in human capital through school enrollment, which

is consistent with Handa (1999), who finds that overall, the head of the household's education is the most important factor stimulating enrollment (Handa, 1999). The supply side variables were not as significant as expected, which implies that school enrollment could be promoted by stimulating the demand side, which directly relates to household characteristics. In this sense, further analysis needs to be performed on the supply side to find out whether or not cash transfer programs and government school improvement strategies are in fact making a difference in the improvement of school attainment. Due to availability of data at school level, a deeper analysis could not be performed; however, these results make room for important policy recommendations directed towards improving the process of Human Capital accumulation in Nicaragua.

Table 4: **Supply and Demand Factors Influencing School Enrollment (All Supply Variables)** - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0296	-.1046***	-.1377***	.0416
	(.0220)	(.0304)	(.0313)	(.0325)
Gender (=1 if Male)	-.0485***	-.0598***	-.0464***	-.0422***
	(.0082)	(.0114)	(.0121)	(.0110)
Education of Head of HH	.0178***	.0159**	.0358***	-.0032
	(.0051)	(.0073)	(.0077)	(.0070)
# of Children < 12 in the HH	.04313***	.0518***	.0615***	.0307***
	(.0034)	(.0044)	(.0049)	(.0049)
HH size	-.0279***	-.0267***	-.0314***	-.0215***
	(.0019)	(.0026)	(.0028)	(.0026)
Managua	.0042	.0202	.1321**	-.0240
	(.0194)	(.0350)	(.0504)	(.0228)
Central	.0414***	.0195	.0077	.0272
	(.0121)	(.0171)	(.0181)	(.0176)
Atlantic	.0171	.0052	-.0256	.0075
	(.0136)	(.0186)	(.0195)	(.0202)
Supply Variables				
School Supplies	-.0890	-.0882	-.0602	-.1249
	(.0625)	(.0794)	(.0806)	(.1059)
Multigrade School	-.0803***	-.0859**	-.0415	.1530***
	(.0278)	(.0374)	(.0377)	(.0492)
Food Program	.0387	.0314	.0582	-.0365
	(.0279)	(.0385)	(.0416)	(.0407)
Wage Premium for Secondary/Superior	-.0569***	-.0513**	-.0704***	.0025
	(.0169)	(.0216)	(.0216)	(.0303)
Distance to School	.0031	.0010	.0086**	-.0027
	(.0025)	(.0035)	(.0036)	(.0036)
Observed Value	0.63	0.57	0.57	0.70
Predicted Value	0.64	0.57	0.58	0.71
Obs.	13675	7566	6806	6869

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 5: **Supply and Demand Factors Influencing School Enrollment** - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0149	-.1018***	-.1176***	.0699**
	(.0247)	(.0339)	(.0351)	(.0350)
Gender (=1 if Male)	-.0494***	-.0609***	-.0473***	-.0422***
	(.0082)	(.0114)	(.0121)	(.0110)
Education of Head of HH	.0258***	.0239***	.0372***	-.0115*
	(.0046)	(.0065)	(.0070)	(.0065)
# of Children < 12 in the HH	.0422***	.0509***	.0605***	.0306***
	(.0034)	(.0044)	(.0049)	(.0049)
HH size	-.0275***	-.0262***	-.0308***	-.0218***
	(.0019)	(.0026)	(.0028)	(.0026)
Managua	-.0003	.0190	.1597***	-.0134
	(.0196)	(.0352)	(.0474)	(.0218)
Central	.0254**	.0043	-.0018	.0455***
	(.0115)	(.0166)	(.0178)	(.0145)
Atlantic	-.0033	-.0113	-.0487***	.0285*
	(.0124)	(.0173)	(.0182)	(.0170)
Supply Variables				
Wage Premium for Secondary/Superior	-.0783***	-.0678***	-.0943***	.0163
	(.0154)	(.0193)	(.0188)	(.0293)
Type of School (=1 if Public, 0= Private)	.0865*	.0402	.0657	.0213
	(.0521)	(.0718)	(.0774)	(.0702)
Observed Value	0.64	0.57	0.57	0.70
Predicted Value	0.65	0.58	0.58	0.71
Obs.	13675	7566	6806	6869

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 6: **Supply and Demand Factors Influencing School Enrollment** - 2009

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0359	-.0490	-.1241***	.0549
	(.0297)	(.0592)	(.0406)	(.0437)
Gender (=1 if Male)	-.0521***	-.0376**	-.0564***	-.0411***
	(.0109)	(.0207)	(.0160)	(.0147)
Education of Head of HH	.0216***	.0349***	.0306***	-.0052
	(.0063)	(.0126)	(.0090)	(.0092)
# of Children < 12 in the HH	.0410***	.0449***	.0593***	.0311***
	(.0045)	(.0089)	(.0063)	(.0065)
HH size	-.0276***	-.0296***	-.0322***	-.0219***
	(.0026)	(.0051)	(.0038)	(.0035)
Managua	.0039	-.0528	.1716***	-.0122
	(.0217)	(.0396)	(.0503)	(.0253)
Central	.0299*	-.0528	.0186	.0376*
	(.0158)	(.0346)	(.0242)	(.0205)
Atlantic	-.0011	-.0350	-.0505**	.0369
	(.0158)	(.0322)	(.0231)	(.0231)
Supply Variables				
Type of School (=1 if Public, 0=Private)	-.0079	.1649**	.0214	.0358
	(.0398)	(.0762)	(.0677)	(.0520)
Wage Premium for Secondary/Superior	.0701***	-.0371	-.0885***	-.0033
	(.0200)	(.0385)	(.0242)	(.0402)
Observed Value	0.63	0.64	0.58	0.69
Predicted Value	0.64	0.65	0.59	0.69
Obs.	7819	2167	3852	3967

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2009.

6 Policy Implications

The strategies directed towards improving educational outcomes, depart from the knowledge of those factors that are more likely to influence its functioning and quality. The quote mentioned in the introduction provides a clue as to what is the most basic and efficient short term solution for improving the process of Human Capital accumulation in the long-run: prioritize primary education. In this sense, the policy recommendations can be summarized as follows:

1. Improve, universalize permanent coverage and high quality primary education:

The results from this study suggest that primary education is the sector that is more influenced by both, demand and supply variables. For this reason, it is fundamental to prioritize this sector. Furthermore, it is during the first years of education where the child develops social and intellectual skills that define living conditions at later stages of his life. The first four years of primary education are the base of learning in terms of basic mathematical and reading knowledge. Experts agree that the knowledge acquired during these years remains for long. The remaining two years of primary education consolidate basic literacy and give place to more capabilities that support the absorption of more complex knowledge.

2. Improve School and Roads Infrastructure

Within the investment plans in infrastructure, improve and rehabilitate the physical conditions, incorporate technological features and create better access to schools, must be a priority for the government and international agencies. The private sector has already step up on this issue by introducing in Nicaragua the One Laptop per Child program (OLPC). The ambitious program plans to equip

every Nicaraguan child with a laptop XO to improve his/her educational experience. However, such program will not be fully successful as long as it is not accompanied by additional programs that fulfill the basic needs of children in rural and poor households, i.e. the glass of milk program which is no longer in force. Without such programs, the OLPC might just be a waste of valuable resources that could be destined to improve basic school needs such as better transportation systems to increase access to educational centers.

3. Empowering Head of Households

One of the most influential positive factors of school enrollment found in this paper is the education of the head of the household. This result sheds light on the importance of the presence of an educated individual in the household that motivates the child to pursue education. In this sense, it is imperative that there is cooperation between the government and the parents, whether it is through a government program or through the re-incorporation of parents into the educational sphere. The massive decentralization that the educational system experienced in 2007 with Ortega's administration might have destabilized educational outcomes, suggesting that a more stable and sustainable educational strategy must be in place to achieve the ambitious educational goals of the present government.

4. Subsidize Educational Costs

The burden of educational costs represents one of the most influential factors negatively affecting the decision of the individual to invest in education. It has been proven, that the government with the help of international organizations, can reduce such burden by effectively subsidizing the costs related to education among

households. Investment programs financed by the World Bank and the United States Agency for International Development (USAID) have proven to be very successful in reducing the burden of educational costs to households. However, the government's reluctance to accept external funding is jeopardizing the achievement of educational goals.

5. Education: everybody's business

In Brazil, an alliance was created, led by entrepreneurs with a lot of participation from the public sector, who decided that education was too important to be taken care just by the government. The entire society mobilized to set educational goals, monitor them and publicize the results of performance tests of each school in the country , so that the press and other non-governmental organizations could promote accountability of the state on the fulfillment of these objectives. This alliance was a social mobilization campaign led by entrepreneurs whose main goal was to create awareness in the country of the importance of improving education.

It seems that governments throughout the years have not been able to make a sustainable improvement in the education sector, so it might be time for the private sector to step up and mobilize its resources just as Brazil did. Brazilian entrepreneurs recognized that education is everybody's business, a consciousness and awareness that is not yet present in Nicaragua, at least not at the extent that is required to make such achievements. The results in this study suggest that education is not an attractive investment to pursue, as it is reflected by the negative coefficient of the wage premium. People are not aware of the benefits they

can draw from pursuing education, so it is time for the private sector to take matters into their own hands and sell education as the best investment there is.

7 Conclusion

A probit estimation of the factors influencing the decision of Human Capital accumulation, as measured by school enrollment, showed that demand side variables such as the cost of education, head of household literacy, gender of the individual, and other related household characteristics, are significant factors stimulating school enrollment in Nicaragua. The results suggest that supply side variables are only significant for primary education, both in 2005 and 2009, which might suggest that changes in the government's agenda, as a result of changes in administration, have not drastically change the perception of the households towards education.

Overall, the results from this analysis have shed some light as to which factors influenced the decision of households to invest in human capital as well as the urgent need of a policy consensus that brings together the public and private sector through the development of a bottom-up strategy that raises awareness of the importance of education. So far, in Nicaragua, educational policies have been characterized by being volatile and unstable, changing with every government and in accordance to the interest of political stakeholders.

For this reason, Nicaraguan households might still be reluctant at making investments in education, given the high opportunity costs faced by individuals; this has great policy implications in terms of stimulating school enrollment. In this sense, the biggest weakness that characterizes the Nicaraguan educational structure

is the lack of coverage and stimulating enrollment incentives as well as the lack of consensus in the educational agenda. Increasing financing at any educational level is a hard task, but it can be done with the will and interest of a nation to place the poorest above the individual interests. A better administration of this sector will require many sacrifices, but they will all be worth, given what is at stake: overcoming poverty and re-assuring the sustainable development of a nation that has for so long struggle to escape the harmful vicious cycle that is poverty.

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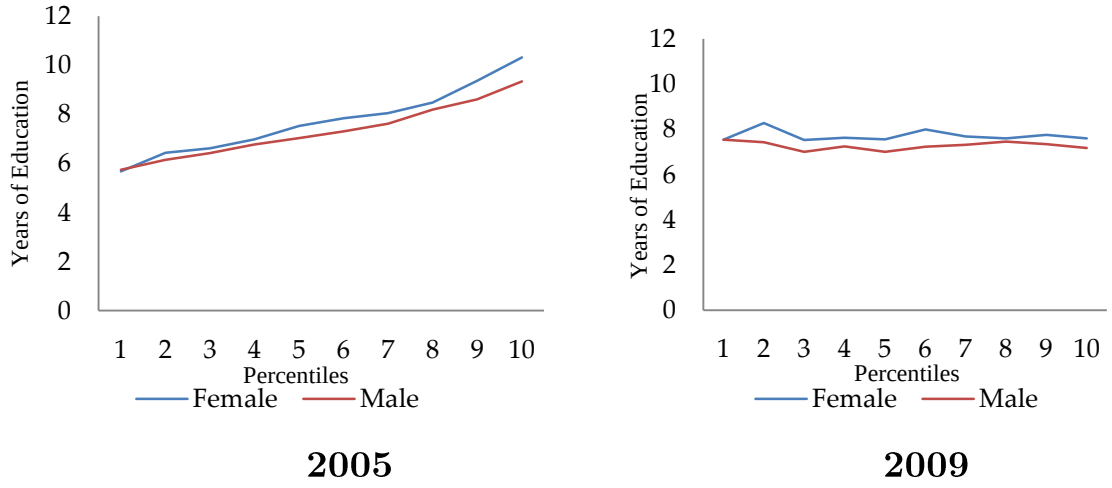
APPENDICES

Figure 4: Average Years of Education



2005 **2009**

Source: Author's calculations based on EMNV 2005 & 2009

Table 7: Mincer Extension 2005 (Heckman & OLS)

	Heckman Two-Step		OLS	
Years of Education	0.0742***	.1160***	.0524***	.0919***
	(.0084)	(.0076)	(.0042)	(.0021)
Basic Education	0.0535***		.0520***	
	(.0077)		(.0068)	
Middle Education	0.0500***		.0438***	
	(.0108)		(.0085)	
Experience	0.0748***	.0720***	.0364***	.0332***
	(.0123)	(.0124)	(.0019)	(.0019)
Experience^2	-.0010***	-.0009***	-.0004***	-.0004***
	(.0001)	(.000)	(.000)	(.0000)
Selection				
Works				
Married	-.1394***	-.1394***		
	(.0302)	(.0302)		
Household Size	-.0200***	-.0200***		
	(.0041)	(.0041)		
Children under 12	.06482**	.06482**		
	(.0288)	(.0288)		
Years of Education	.0505***	.0505***		
	(.002)	(.0028)		
Experience	.0837***	.08375***		
	(.002)	(.0026)		
Experience^2	-.0011***	-.0011***		
	(.000)	(.000)		
_cons	-.9349***	-.3111	.9425***	.8191***
	(.0472)	(.3699)	(.0322)	(.0305)
R-squared			0.1686	0.1564
Prob > chi2	0.000	0.000		
Obs.	8555	8555	8859	8859
Mills – Lambda	.7700***	.78196**		
	(.2613)	(.2637)		

*Note: Dependent Variable is the logarithm of hourly wage

*** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

Robust standard errors are in parentheses.

Basic & Middle education are education dummies specified in the Empirical Section (D_b &D_m)

Source: Author's calculations based on EMNV 2005.

Table 8: Mincer Extension 2009 (Heckman & OLS)

	Heckman Two-Step		OLS	
Years of Education	.01785	.0943***	.0430***	.0892***
	(.0121)	(.0094)	(.0051)	(.0020)
Basic Education	0.0310***		.0234***	
	(.0080)		(.0071)	
Middle Education	0.0757***		.0768***	
	(.0069)		(.0064)	
Experience	0.0047	.0393***	.0325***	.0301***
	(.0146)	(.0139)	(.0017)	(.0017)
Experience^2	-.0004	-.0005***	-.0004***	-.0003***
	(.0002)	(.0002)	(.000)	(.0000)
Selection				
Works				
Married	-.0870***	.0870***		
	(.0306)	(.0306)		
Household Size	-.00319	-.0031		
	(.0041)	(.0041)		
Children under 12	.01547	.0154		
	(.0283)	(.0283)		
Years of Education	.0612***	.0612***		
	(.0031)	(.0031)		
Experience	.08342***	.0834***		
	(.0028)	(.0028)		
Experience^2	-.0015***	-.0015***		
	(.000)	(.000)		
_cons	-1.373***	-1.373***	1.758***	1.484***
	(.0520)	(.0520)	(.0343)	(.0301)
R-squared			0.3048	0.2737
Prob > chi2	0.000	0.000		
Obs.	5272	5272	6349	6349
Mills – Lambda	.50368**	.1323		
	(.2500)	(.2383)		

*Note: Dependent Variable is the logarithm of hourly wage

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

Robust standard errors are in parentheses.

Basic & Middle education are education dummies specified in the Empirical Section (Db & Dm)

Source: Author's calculations based on EMNV 2009.

Table 9: Returns to Education by Educational Levels (Primary Occupation) - 2005

	Primary	Secondary	Tertiary
Total	7.42%	12.70%	17.70%
Men	5.90%	11.50%	15.22%
Women	2.07%	5.30%	12.17%
Urban	3.49%	7.60%	13.71%
Rural	5.10%	10.74%	16.60%

Source: Author's Calculations based on EMNV 2005

Table 10: Returns to Education by Educational Levels (Primary Occupation) - 2009

	Primary	Secondary	Tertiary
Total	1.78%	5.00%	12.40%
Men	3.77%	6.28%	13.00%
Women	7.00%	10.30%	18.00%
Urban	2.50%	5.10%	13.00%
Rural	5.44%	8.30%	17.00%

Source: Author's Calculations based on EMNV 2009

Table 11: **Primary Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0530***	-.1104***	-.0921***	-.0149
	(.0215)	(.0331)	(.0331)	(.0263)
Gender (=1 if Male)	-.0397***	-.0514***	-.0426***	-.0357***
	(.0079)	(.0125)	(.0126)	(.0091)
Education of Head of HH	.0245***	.0257***	.0361***	.0133**
	(.0050)	(.0082)	(.0082)	(.0053)
# of Children < 12 in the HH	-.0069**	-.0023	-.0072	-.0031
	(.0033)	(.0050)	(.0052)	(.0040)
HH size	-.0055***	-.0032	-.0046	-.0050**
	(.0019)	(.0029)	(.0031)	(.0021)
Managua	-.0003	-.0384	-.0077	-.0080
	(.0244)	(.0514)	(.0817)	(.0217)
Central	.0095	-.0004	.0077	-.0286**
	(.0131)	(.0218)	(.0226)	(.0177)
Atlantic	-.0184	-.0436**	-.0373**	-.0402**
	(.0142)	(.0223)	(.0224)	(.0204)
Supply Variables				
School Supplies	-.1689***	-.2554***	-.2260***	-.1897**
	(.0524)	(.0778)	(.0774)	(.0764)
Multigrade School	-.0737***	-.1359***	-.0940**	.1335***
	(.0263)	(.0410)	(.0402)	(.0408)
Food Program	.0715***	.0750*	.0962**	-.0143
	(.0266)	(.0422)	(.0423)	(.0337)
Wage Premium for Secondary/Superior	-.0265**	-.0279	-.0461**	.0301
	(.0151)	(.0229)	(.0223)	(.0229)
Distance to School	.0003	-.0009	-.0009	.0027
	(.0026)	(.0042)	(.0041)	(.0033)
Observed Value	0.88	0.83	0.84	0.93
Predicted Value	0.9	0.84	0.86	0.94
Obs.	5548	2215	2983	2565

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005

Table 12: **Secondary Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0030	-.0959***	-.0762**	.0438
	(.0312)	(.0347)	(.0365)	(.0412)
Gender (=1 if Male)	-.1191***	-.1095***	-.0893***	-.1018***
	(.0168)	(.0195)	(.0209)	(.0207)
Education of Head of HH	.0265***	.0175	.0125	.0067
	(.0098)	(.0109)	(.0113)	(.0128)
# of Children < 12 in the HH	-.0862***	-.0577***	-.0522***	-.0815***
	(.0081)	(.0085)	(.0096)	(.0099)
Age (=1 if between 13 & 17)	.2140***	.2321***	.2023***	.1547***
	(.0198)	(.0190)	(.0213)	(.0280)
HH size	.0012	.0154***	.0080	.0048
	(.0043)	(.0047)	(.0052)	(.0053)
Managua	.1105***	.1200*	.1916	.0735*
	(.0407)	(.0689)	(.1295)	(.0382)
Central	.0082	.0014	-.0825***	-.0107
	(.0252)	(.0285)	(.0267)	(.0336)
Atlantic	-.0374	-.0042	-.1688***	-.0105
	(.0295)	(.0336)	(.0327)	(.0384)
Supply Variables				
School Supplies	-.3992***	-.3180**	-.1579	-.4871***
	(.1332)	(.1604)	(.1449)	(.1810)
Multigrade School	-.2568***	-.2022***	-.1837***	.3312***
	(.0588)	(.0666)	(.0663)	(.0928)
Food Program	-.0186	.0427	-.0486	-.0496
	(.0600)	(.0718)	(.0779)	(.0725)
Wage Premium for Secondary/Superior	-.1017***	-.1150***	-.0714*	-.0906
	(.0351)	(.0376)	(.0371)	(.0584)
Distance to School	.0079	.0065	.0116*	.0031
	(.0052)	(.0059)	(.0063)	(.0068)
Observed Value	0.50	0.30	0.29	0.70
Predicted Value	0.49	0.26	0.25	0.71
Obs.	4003	2220	1962	2041

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 13: **Superior Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0162*	-.0050	-.0177**	-.0258
	(.0083)	(.0081)	(.0079)	(.0240)
Gender (=1 if Male)	-.0545***	-.0076	-.0146	-.0930***
	(.0104)	(.0106)	(.0123)	(.0169)
Education of Head of HH	.0231***	.0068	.0153**	.0180*
	(.0056)	(.0058)	(.0068)	(.0093)
# of Children < 12 in the HH	.0140***	.0274***	.0338***	-.0218*
	(.0045)	(.0039)	(.0048)	(.0084)
Age (=1 if between 18 & 23)	-.0656***	-.1132***	-.0822***	-.0778***
	(.0109)	(.0107)	(.0122)	(.0195)
HH size	-.0182***	-.0130***	-.0206***	-.0096**
	(.0025)	(.0024)	(.0029)	(.0042)
Managua	.0367	.0005	.1934***	.0197
	(.0256)	(.0383)	(.0835)	(.0346)
Central	.0211	.0200	-.0021	.0222
	(.0162)	(.0178)	(.0187)	(.0281)
Atlantic	-.0268	.0019	-.0540**	-.0204
	(.0188)	(.0193)	(.0221)	(.0359)
Supply Variables				
School Supplies	.0134	-.0509	.0441	.0062
	(.0924)	(.0911)	(.0985)	(.1698)
Multigrade School	.0484	.0341	.0819**	.1926**
	(.0365)	(.0359)	(.0400)	(.0753)
Food Program	.0024	.0386	-.0371	.0188
	(.0392)	(.0424)	(.0494)	(.0647)
Wage Premium for Secondary/Superior	-.0214	-.0005	-.0098	-.0386
	(.0239)	(.0227)	(.0261)	(.0487)
Distance to School	.0113***	.0046	.0099***	.0105*
	(.0030)	(.0032)	(.0036)	(.0054)
Observed Value	0.19	0.12	0.14	0.24
Predicted Value	0.18	0.10	0.12	0.25
Obs.	5610	3357	2982	2628

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 14: **Primary Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0298	-.0736**	-.0447	-.0319
	(.0231)	(.0354)	(.0356)	(.0276)
Gender (=1 if Male)	-.0403***	-.0528***	-.0441***	-.0368***
	(.0080)	(.0125)	(.0127)	(.0094)
Education of Head of HH	.0312***	.0409***	.0478***	.0050
	(.0046)	(.0074)	(.0075)	(.0053)
# of Children < 12 in the HH	-.0081**	-.0039	-.0087	-.0031
	(.0034)	(.0050)	(.0052)	(.0041)
HH size	-.0048**	-.0021	-.0035	-.0052**
	(.0019)	(.0029)	(.0031)	(.0022)
Managua	-.0095	-.0394	.0182	-.0059
	(.0258)	(.0517)	(.0713)	(.0214)
Central	-.0135	-.0383*	-.0209	-.0106
	(.0138)	(.0227)	(.0236)	(.0144)
Atlantic	-.0490***	-.0852***	-.0772***	-.0230
	(.0141)	(.0212)	(.0217)	(.0170)
Supply Variables				
Wage Premium for Secondary/Superior	-.0477***	-.0542***	-.0735***	.0363
	(.0139)	(.0202)	(.0191)	(.0234)
Type of School (=1 if Public, 0= Private)	.1021**	.1510*	.2133***	-.0515
	(.0494)	(.0773)	(.0792)	(.0561)
Observed Value	0.88	0.83	0.84	0.93
Predicted Value	0.90	0.84	0.85	0.94
Obs.	5548	3333	2983	2565

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 15: **Secondary Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0011	-.0993***	-.0610	.0757*
	(.0341)	(.0366)	(.0371)	(.0450)
Gender (=1 if Male)	-.1198***	-.1135***	-.0899***	-.1058***
	(.0168)	(.0196)	(.0208)	(.0206)
Education of Head of HH	.0526***	.0331***	.0315***	-.0118
	(.0090)	(.0102)	(.0114)	(.0116)
# of Children < 12 in the HH	-.0873***	-.0595***	-.0530***	-.0831***
	(.0080)	(.0084)	(.0095)	(.0099)
Age (=1 if between 13 & 17)	.2144***	.2346***	.2054***	.1584***
	(.0197)	(.0190)	(.0211)	(.0282)
HH size	.0029	.0172	.0090*	.0040
	(.0043)	(.0047)	(.0051)	(.0053)
Managua	.0993**	.1092*	.2757**	.0759*
	(.0420)	(.0695)	(.1255)	(.0374)
Central	-.0192	-.0266	-.0968***	.0255
	(.0234)	(.0266)	(.0255)	(.0274)
Atlantic	-.0748**	-.0449	-.1964***	.0200
	(.0264)	(.0306)	(.0301)	(.0330)
Supply Variables				
Wage Premium for Secondary/Superior	-.1285***	-.1411***	-.0864**	-.0871
	(.0334)	(.0349)	(.0356)	(.0563)
Type of School (=1 if Public, 0= Private)	.0088	-.0200	.0012	-.0091
	(.1024)	(.1167)	(.1233)	(.1312)
Observed Value	0.50	0.30	0.29	0.70
Predicted Value	0.49	0.26	0.25	0.71
Obs.	4003	2220	1962	2041

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2005.

Table 16: **Superior Education** - Supply and Demand Factors Influencing School Enrollment - 2005

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0133	-.0068	-.0151*	-.0123
	(.0083)	(.0081)	(.0081)	(.0231)
Gender (=1 if Male)	-.0545***	-.0078	-.0153	-.0917***
	(.0104)	(.0106)	(.0124)	(.0168)
Education of Head of HH	.0183***	.0033	.0174***	-.0055
	(.0057)	(.0058)	(.0066)	(.0099)
# of Children < 12 in the HH	.0139***	.0273 ***	.0339***	-.0215**
	(.0045)	(.0039)	(.0048)	(.0083)
Age (=1 if between 18 & 23)	-.0648***	-.1127***	-.0825***	-.0726***
	(.0108)	(.0106)	(.0122)	(.0193)
HH size	-.0177***	-.0128***	-.0200***	-.0095**
	(.0025)	(.0024)	(.0029)	(.0042)
Managua	.0263	-.0046	.2474***	-.0190
	(.0247)	(.0362)	(.0889)	(.0308)
Central	.0301**	.0180	.0078	.0523**
	(.0150)	(.0166)	(.0185)	(.0236)
Atlantic	-.0320*	-.0089	-.0517***	-.0057
	(.0162)	(.0166)	(.0193)	(.0297)
Supply Variables				
Wage Premium for Secondary/Superior	-.0276	-.0040	-.0102	-.0293
	(.0234)	(.0216)	(.0250)	(.0469)
Type of School (=1 if Public, 0= Private)	-.0031	.0308	.1208*	-.1629*
	(.0557)	(.0583)	(.0640)	(.0967)
Observed Value	0.19	0.12	0.14	0.25
Predicted Value	0.18	0.10	0.12	0.24
Obs.	5610	3357	2982	2628

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise.
Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.
Source: Author's calculations based on EMNV 2005.

Table 17: **Primary Education** - Supply and Demand Factors Influencing School Enrollment - 2009

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0221	-.1924***	-.0495	-.0102
	(.0285)	(.0540)	(.0432)	(.0367)
Gender (=1 if Male)	-.0460***	-.0436**	-.0526***	-.0401**
	(.0111)	(.0208)	(.01769	(.0126)
Education of Head of HH	.0265***	.0556***	.0288***	.0122
	(.0063)	(.0124)	(.0102)	(.0080)
# of Children < 12 in the HH	-.0052	-.0083	-.0052	.0039
	(.0045)	(.0088)	(.0070)	(.0055)
HH size	-.0044	-.0069	-.0051	-.0045
	(.0027)	(.0054)	(.0045)	(.0027)
Managua	-.0047	.0436	.0191	.0029
	(.0309)	(.0427)	(.0801)	(.0226)
Central	-.0155	-.0787*	-.0009	-.0250
	(.0199)	(.0510)	(.0321)	(.0226)
Atlantic	-.0541***	-.0484	-.0713***	-.0323
	(.0173)	(0347)	(.0268)	(.0235)
Supply Variables				
Type of School (=1 if Public, 0=Private)	.0463	.1660**	.0012	.0794**
	(.0420)	(.0682)	(.0834)	(.0387)
Wage Premium for Secondary/Superior	-.0398**	.0106	-.0588**	.0345
	(.0178)	(.0348)	(.0246)	(.0311)
Observed Value	0.87	0.86	0.82	0.93
Predicted Value	0.89	0.89	0.84	0.94
Obs.	3110	889	1700	1410

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2009.

Table 18: **Secondary Education** - Supply and Demand Factors Influencing School Enrollment - 2009

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	.0459	-.1486	-.0393	.1575***
	(.0456)	(.1054)	(.0520)	(.0578)
Gender (=1 if Male)	-.1161***	-.1235***	-.1079***	-.0931***
	(.0222)	(.0444)	(.0280)	(.0276)
Education of Head of HH	.0376***	.0889***	.0242*	-.0067
	(.0112)	(.0243)	(.0131)	(.0152)
# of Children < 12 in the HH	-.0888***	-.0914***	-.0485***	-.0896***
	(.0107)	(.0201)	(.0126)	(.0132)
Age (=1 if between 13 & 17)	.2247	.2520***	.2299***	.1334***
	(.0257)	(.0484)	(.0271)	(.0377)
HH size	.0039	.0038	.0072	.0080
	(.0057)	(.0113)	(.0070)	(.0068)
Managua	.1521***	.2139**	.2032*	.1198***
	(.0449)	(.0855)	(.1298)	(.0403)
Central	-.0449	-.2054***	-.1046***	.0017
	(.0316)	(.0660)	(.0338)	(.0379)
Atlantic	-.1122***	-.0694	-.2565***	.0238
	(.0345)	(.0696)	(.0416)	(.0454)
Supply Variables				
Type of School (=1 if Public, 0=Private)	-.0174	.2404	.1008	.1678*
	(.0797)	(.1641)	(.1187)	(.0928)
Wage Premium for Secondary/Superior	-.0154	-.1074	-.0159	-.0415
	(.0446)	(.0873)	(.0498)	(.0765)
Observed Value	0.50	0.49	0.30	0.68
Predicted Value	0.49	0.48	0.25	0.7
Obs.	2304	628	1109	1195

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2009.

Table 19: **Superior Education** - Supply and Demand Factors Influencing School Enrollment - 2009

	Total	**Poor**	**Rural**	**Urban**
Marginal Effects				
Demand Variables				
Log of Education Spending	-.0028	.0770*	-.0061	.0232
	(.0197)	(.0415)	(.0196)	(.0383)
Gender (=1 if Male)	-.0333**	-.0271	.0112	-.0710***
	(.0137)	(.0268)	(.0165)	(.0214)
Education of Head of HH	.0159**	.0225*	.0144**	.0034
	(.0064)	(.0134)	(.0077)	(.0109)
# of Children < 12 in the HH	.0132**	.0188*	.0352***	-.0263**
	(.0061)	(.0112)	(.0062)	(.0109)
Age (=1 if between 18 & 23)	-.0534***	-.0670**	-.0861***	-.0370
	(.0143)	(.0287)	(.0162)	(.0243)
HH size	-.0219***	-.0197***	-.0241***	-.0116**
	(.0035)	(.0069)	(.0041)	(.0058)
Managua	.0426	-.0037	.2101***	.0053
	(.0274)	(.0466)	(.0953)	(.0342)
Central	.0301	-.0746*	.0114	.0453
	(.0212)	(.0377)	(.0262)	(.0330)
Atlantic	-.0322	-.0167	-.0601**	.0058
	(.0216)	(.0468)	(.0257)	(.0407)
Supply Variables				
Type of School (=1 if Public, 0=Private)	.0271	.2093**	.1707**	-.0003
	(.0501)	(.1004)	(.0778)	(.0735)
Wage Premium for Secondary/Superior	-.0190	.0309	-.0005	-.0699
	(.0304)	(0614)	(.0319)	(.0589)
Observed Value	0.19	0.19	0.14	0.24
Predicted Value	0.18	0.18	0.12	0.23
Obs.	3214	874	1625	1589

Note: Dependent variable =1 if individual is enrolled in the formal educational system and 0 otherwise. Robust Standard Errors in Parenthesis. ***significant at 1% level, **significant at 5% level, *significant at 10% level.

Source: Author's calculations based on EMNV 2009.