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The Impact of Remittances on Education Attainment: Evidence From Dominican Republic

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Abstract

This paper will examine the relationship between remittances and education attainment focusing on Dominican Republic in 2002. This study will focus on households in Dominican Republic using surveys from IPUMS international and the data is cross-sectional. Sending remittances increases the income for households, which in return, influences the spending on education. The study of remittances is analyzed in a more cultural and social value rather than entirely economic. The dynamic and structure of a family is crucial when studying the effects of remittances in a developing country. Key findings from this analysis is that the relationship between education attainment and remittances are positively related and it is statistically significant according to this model. This study examines the family structure as well as the economic and social structure of Dominican Republic to understand the relationship between remittances and education attainment.

Acknowledgments

I would like to express my sincere gratitude to the entire economics faculty at Pace University and my fellow peers for their encouragement throughout my college career. I would not have been able to make it this far without their knowledge, moral support and advice. I would also like to thank my parents and siblings, whose love and guidance are with me in whatever I pursue. Most importantly, I wish to thank my loving husband for being supportive and giving me unending inspiration.

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The Impact of Remittances on Education Attainment

Introduction

Throughout the years, remittances has been a vital source in contributing to external financing for families in developing countries. The World Bank estimates that in 2012 there was a total of $410 billion in remittances sent to developing countries from an estimated 200 million migrant workers. Many families in these countries rely on remittances to pay for school tuition, healthcare, food and clothes. One of the most important factors of growth in a country is the level of human capital which is attained by education. Education plays a critical role in economic growth and poverty reduction, which much of the literature aims to focus on.

From a macroeconomic perspective, education improves labor productivity and makes growth more sustainable, which, supports poverty reduction. From a microeconomic perspective, education increases the probability of being employed in the labor market and improves earnings capacity. Although developing countries have education institutions, many families do not have the financial capacity or incentive to send their children to school. They see it as an opportunity cost that is either send the children to school or use them to work and make more income. If a family member were to go abroad to send money home, giving the family extra income, would that impact the probability of sending the children to school?

The objective of this research will be to analyze the relationship and understand the magnitude that remittances would have on education the Dominican Republic in the year 2002.. I will analyze the different variables that relate to investing in education using remittances. To what extent do remittances have an impact on the accumulation on education attainment? Although

there is no specific economic theory regarding remittances, one theory regarding behavioral economics was intriguing because most of the research papers that I have read in the past have to do with how the families think about the money they receive from the remittances and the psychological factors that impact their decision to invest on certain parts of the household. The theory that I believe is appropriate for my research topic is called “prospect theory”. Prospect theory assumes that losses and gains are valued differently, and thus individuals make decisions based on perceived gains instead of perceived losses. Also known as "loss-aversion" theory, the general concept is that if two choices are put before an individual, both equal, with one presented in terms of potential gains and the other in terms of possible losses, the former option will be chosen. The impact that loss aversion, reference point and the framing of the decisions received from remittances, offer interesting points. Most of the literature speaks about the gender discrimination regarding education. A significant amount of the parent’s question if spending on the son is more beneficial than spending on the daughter? This is a problem many families face in third world countries, which causes a problem for education attainment. The decision to educate the daughter of the family would be more of a loss (in the family’s perspective) than educating the son because a son is able to earn income and give to the family but a daughter is supposed to do the housework and get married. This ideology is popular in Southern Asia and many parts of Latin America. Prospect theory also suggests that individuals adapt quickly to positive changes in their situation. If a family invested the remittances money into a land, which can give them faster return (lets say by renting the land out to someone) than in the education attainment in their own children (which can lead to higher returns in the near future), which investment would they choose?

Although education has a high return, there are some costs that the family would incur such as cost to pay for the material, clothing for school, lunch, bus ride, and many more along with tuition. On the other hand, buying a land or sending the children to work would generate income faster with less time and less costs. Although extra income is beneficial for families, in order to connect it to education, I need to understand the behavior of the families and take into account that families, especially since most remittance receiving families have lower income, depend on higher returns. Regardless of how beneficial education attainment may be for the long run, short run returns have a greater chance to be chosen.

Literature Review

Remittances and education attainment have been widely spoken about throughout many institutions and most of the focus is on developing countries. Many researches provide conclusive evidence that remittances have a positive relationship with education mostly because it provides extra funds to households, which enables the household to increase consumption and invest in the development of the family. Although difficult to measure, recent studies estimate that international remittances exceed US$100 billion per year, approximately twice the amount of official aid-related income to developing countries (International Monetary Fund, 2005). Emphasizing on the 'multiplier effects', Jennings & Clarke (2005) find a significant portion of remittances are saved, invested in family-business and agricultural inputs, education and health, all of which have profound influence on national development. This research will try to understand the magnitude that remittances have in terms of how much of the money the family receives is being implemented in the education sectors. I will try to understand other factors that may contribute to

education attainment amongst family members receiving remittances. De Haas (2005) argues that remittances contribute significantly to development and living conditions in sending countries. This contribution enables families to think about the future developments within the household and children are one of the most important investments. On the other hand, educating the household may be a burden due to extra costs they may incur and we want to investigate if receiving remittances relaxes budget constraint in the household or if there are other factors that play into this.

In several countries including Brazil, El Salvador and Turkey, remittances are one of the top sources of investment capital, which increases consumption and plays a vital role in reducing poverty (Landolt 2001). On the other hand, Acosta et al. examines remittances and the impact it has on poverty. They found that an increase in remittances increases a household's income, therefore increases consumption and enhances living standards but the magnitude of how much remittances reduces poverty is uncertain (Acosta et. al, 2008). This uncertainty may have been due to various factors that also play into reducing poverty and poverty reduction may not be solely dependent on remittances. This research will discuss more on forming human capital which starts from education rather than factoring in poverty.

Remittances also increase living standards in households because there is a certain amount of extra income that is available to spend. According to Chowdhury (2014), in Bangladesh, remittances leads to socio-economic development amongst family members and improves living standards compared to families who do not receive remittances. He believes the development of Bangladesh is one of the reasons why this has occurred. As countries are developing further,

families may have the need to consider education and build human capital in their own household. They want to have a better lifestyle and create a cushion to fall on when poverty comes in the way. With a future that is largely revolved around technological improvements and understanding new concepts, education plays a vital role for the future. Families in Bangladesh now depend on their children to form a new generation of leaders and achievers which motivates parents to provide valuable resources for their children with the extra income they have. On the other hand, this study may not be applicable amongst all regions. A village away from the capital city in Bangladesh may not be very concerned about technological improvements because most of their work is being completed through labor work. The opportunity cost of making the children go to work to earn more income is bigger than using that money for education, which may not benefit the family very much in a rural area.

The Refugee and Migratory Movements Research Unit, focused on Bangladesh, analyzed what remittances is invested in amongst the different households in the country. Bangladesh is known to be one of the highest remittances receiving countries in the world (World Bank, 2015). It is one of the poorest countries in the world but future prospects are looking bright for this country due to migrations and investments. A section of the study focused on Tangail, which is a city in Bangladesh, and it was found that most households receiving remittances use their funds to invest in housing, health, education and marriage (Bijoynagar, 2016). With a growing economy and having more access to technology and advancement, families are now taking priority in economic stability and to reduce the chances of falling into poverty

In another study by Gordon H. Hanson and Christopher Woodruff (2003), according to their model, remittances may have both positive and negative effects on the educational attainment of school-age children. Interestingly, there may be differential effects by gender of the children. Male students receive more opportunity to become educated further in their life compared to the female children in the family. This gender discrimination is not a surprise in developing countries. In the same study, Hanson and Woodruff believe a rise in extra income from remittances may actually change the gender discrimination. Even with an increase in remittances, in mostly developing countries, females are less likely to be educated than males. In an empirical study by Mansour et al., remittances is said to have a positive effect on Jordan's educational attainment per household. On the other hand, the positive relationship had a strong bias. Like the previous study, the data that was collected had more occurrence of males being sent to an educational institution. The culture becomes a barrier for using the remittances money for girls.

One interesting contrast to Monsour et al. was that in another study, remittances has a profound political impact within the family, one that empowers the wife of the migrants where women get direct power to make decisions about various matters. In many situations, the wife of the migrant can take decisions related to education and healthcare of children (Chowdhury, 2014). The study by Sabur and Mahmud (2008) also reveals that there is a positive correlation between the money received by the wives from their husbands and the capacity of the wives to make decision in the family. Moreover, with the power from remittances that the wives receive directly from their husbands working abroad, the traditionally dependent housewives effectively claim authority in the decision making process within the family and can have voice both in the family

and in the community. According to Sabur and Mahmud (2008), the women who receive remittances directly from their husbands can decide independently over many aspects, for example, education and healthcare of their children and enter public life by means of their ability to allocate money and other benefits and thus drawing assistance from others. However, education of these women plays the most decisive role in such empowerment. A mother who is highly educated has the tendency to use the extra money received from remittances as a source for funding the education for her children compared to a mother who may not be very educated.

Cynthia Bansak and Brian Chezum (2009) gathered data from households and each household is asked if they have received or sent remittances. In the sample, among 3,373 households, approximately 10 percent send remittances while 22.5 percent receive a remittances ; among these, 4 percent both send and receive. They also used data from the NLSS to construct a sample of 4,629 school-age children (5 to 16 years old). Interestingly, the results indicate that young girls benefit relatively less from remittances, but suffer less harm from household disruption, when examining the impact on human capital collection (Bansak & Chezum, 2009). The factor of gender discrimination will be analyzed in this research and we will check to see the difference between education attainment and remittances amongst men and females using sex as one of the independent variables.

Another interesting finding from Gordon H. Hanson and Christopher Woodruff (2003) is that in theory, the relationship between emigration and schooling is ambiguous. Sending migrants abroad may raise household income, allowing children to complete more schooling, but may also disrupt family life in a manner than hinders children scholastic progress. This research will focus

on developing countries, therefore this is an important aspect because family plays a key role in education attainment. Without the support of family, children have little to no support to provide for themselves. A model by Fajnzylber and Lopez (2008) plots the growth response of higher remittances as a function of the level of secondary schooling across all developing regions and across individual regions. It shows that, ceteris paribus, regions with higher rates of enrollment in secondary education display the largest potential growth benefits associated with surges in remittances (Fajnzylber & Lopez 2008).

In urban areas, the effect of remittances is, at its smallest, 10 times the size of the effect of other income. In rural areas, the effect of remittances is about 2.6 times that of other income. Alejandra Cox and Manuelita Ureta suggests that subsidizing school attendance, particularly in poor areas, may have a large impact on school attendance and retention, even if parents have low levels of schooling (Cox & Ureta 2003). In the study, this was suggested because in El Salvador, parents play a strong role by gathering associations of other parents to pay for schooling. Remittances in this study actually has a possible negative relationship with schooling in poor areas. Therefore, the study concluded that educating parents and relaxing the budget constraint on schooling in poor areas will enable children to go to school and become educated. A study by Köllner (2013) gives another perspective on using remittances for education attainment. As long as education is mandatory, remittances are partly used as investments including education. Individuals from households receiving remittances exhibit higher educational outcomes than those from households without remittances (Köllner 2013). For higher, non-mandatory levels of

education, however, remittances often hinder investments in education, leading to lower levels of educational attainment for individuals from remittances receiving households.

Migration is very controversial and the outcomes of whether it increases education or living standards is uncertain. When a family member migrates, that is depriving the domestic country of gaining valuable resource, such as having an additional human to invest in the economy (Du Has, 2011). When multiplying that by the many family members who migrate, it can take a toll on the country's human capital accumulation. Du Has completed a study which analyzed the costs and benefits of migration. Although migration may decrease human capital formation within the country, there is increasing evidence showing that migration and remittances might cause a 'brain gain' because the prospect of moving abroad can encourage stay-behinds to study. This motivational effect is additional to the role of remittances in potentially *enabling* family and community members of migrants to study.

Another interesting finding from Gordon H. Hanson and Christopher Woodruff (2003) is that in theory, the relationship between emigration and schooling is ambiguous. Sending migrants abroad may raise household income, allowing children to complete more schooling, but may also disrupt family life in a manner than hinders children scholastic progress. In the estimation, they treat household migration behavior as endogenous, using as instruments the interaction between historical state migration patterns and household characteristics. This research will focus on developing countries, therefore this is an important aspect because family plays a key role in education attainment. Without the support of family, children have little to no support to provide for themselves.

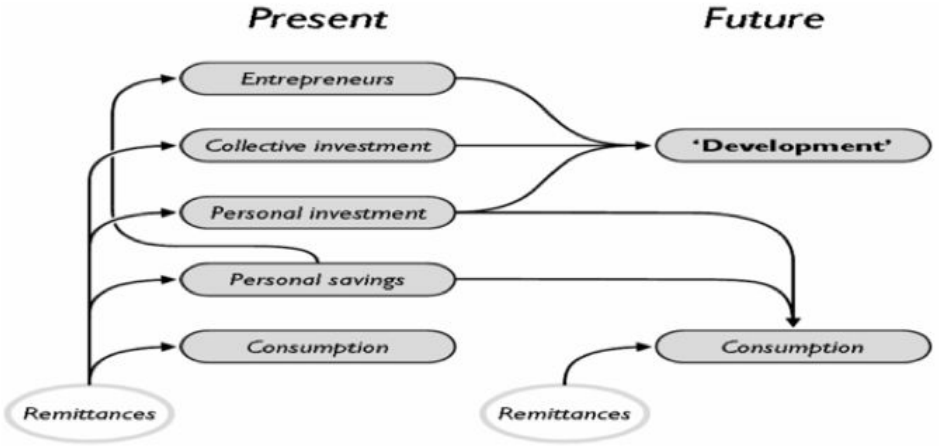

Figure 1 Remittances-development linkages

Much of the literature to date has focused on to what extent, and/or through which mechanisms remittances have positive or negative impacts on development using remittances but a paper by Jørgen Carling focuses on the policy options for increasing the benefits of remittances. Figure 1 is a diagram which illustrates the mechanism of remittances and how it impacts the present and the future. Carling (2004) recommended a policy that is informed by both the large issues of how identities, loyalties, and ambitions are discursively constructed, and embedded in socio-cultural contexts, and the outcomes of running a household. In order to understand remittances and its benefits, there needs to be an understanding how the household is functioning.

In regards to remittances in recent times, particularly this years, has been decreasing in southeast Asia such as Bangladesh and Pakistan (Alo, 2017). Bangladesh received US$13.6 billion remittances in 2016, which is far below from $15.3 billion in the year 2015, according to the Bangladesh Bank data. This was due to wide difference in exchange rate between institutions and

curb market amid falling oil price. According to Wall Street Journal (Harup, 2017), Remittances to Mexico, 95% of which come from the U.S., have overtaken oil as a source of foreign currency in recent years. Mexico's petroleum exports totaled $18.7 billion in 2016, while revenue from foreign visitors was $17.4 billion through November. The money that Mexicans send home also supports domestic consumption, which was the main driver of the country's 2.3% economic growth last year. Industrial production was virtually flat, and exports of manufactured goods fell 1.2% in the full year. With a decline in remittances, it will be interesting to see if there is any impact being made on the lifestyle of family households and education attainment in both regions of the world.

Background on Migration, Remittances, and Education System in Dominican Republic

According to Migration Policy Institute, large-scale migration from the Dominican Republic to the United States began in the 1960s, in the wake of economic and political turbulence that occurred after dictator Rafael Trujillo was killed by rebels in 1961 and the U.S. military and other government agencies intervened. The Dominican immigrant population in the United States, which stood at 12,000 in 1960, grew rapidly after that: reaching 350,000 in 1990 and 879,000 in 2010. Within the 20th century, over one-tenth of the Dominican population had emigrated, and according to the OECD (2010), 88 percent were residing in the U.S., and a smaller portion were residing in Italy and Spain. After the 1960's, the amount of remittances sent to Dominican Republic, increased substantially. According to World Bank data, total remittances sent to the Dominican Republic via formal channels equaled $3.6 billion in 2012, representing 6 percent of the country's gross domestic product (GDP).

The standard of education in the Dominican Republic is low. Despite the target set by law that 4% of GDP should be spent on public education, in reality the figure is only around 2%. Literacy, defined as the number of people aged 15 or over that are able to read and write, currently stands at 90%. The education system in Dominican Republic consists of three main levels which are primary, secondary and higher education. Education is free and mandatory for children ages 5-14. According to United Nations Educational, Scientific and Cultural Organization, in 1993, the Plan Decenal was presented as the major reform to the educational system since 1953. The Plan gathered the most relevant social actors and generated a national debate on different approaches to improve education. Main concerns dealt with:

i) increasing school access and improve learning for all children.
ii) improve the quality of education,
iii) improve teachers' status.
iv) improve the effectiveness of the Secretaría de Educacion (Ministry of Education) and its decentralized organizations,
v) engage in a participative and organized involvement of overall society in the educational process,
vi) improve the use of public expenditures assigned by the government for education and look for non traditional sources to improve educational investments

Gajardo found that only 40% of students in the primary level continue to secondary education and there is still a high percentage of youngsters (46.7%) over the expected age in this level in spite of improvements in the system's efficiency. This may be due to the costs for education which includes costs for supply, clothes, private tuition, exams fees and many more. Now we have a better idea about the system in Dominican Republic, we can have a better understanding of the empirical results that this research.

Methodology

Theoretical Model

In order to understand the impact that remittances have on education attainment, I built a model that would help me analyze the statistical input to determine whether there is a strong relationship between the two variables; also to look to see if there are statistical complications in the model. This model will be estimated using ordinary least square. Previous research had various amount of methods and model, in which data was derived manually in the specified country. On the other hand, due to the time constraint and availability of data, this was not possible for this research. The data in this model was derived from IPUMS International, which collects micro data from around the world and the remittances that was received is per household rather than the full economy. This was advantageous because looking at remittance and education through the entire economy would not be significant. This model will be a cross sectional model using the Dominican Republic in 2002 with 230,470 observations (using surveys).

First let us define what is education attainment. According to OECD, Educational attainment is defined as the highest grade completed within the most advanced level attended in the educational system of the country where the education was received. Some countries may also find it useful to present data on educational attainment in terms of t he highest grade attended. In order to represent the levels of education, categorical variables were created. 1 stands for less than primary completed, 2 stands for primary completed, 3 stands for secondary completed and 4 stands for university completed. Education attainment will be my dependent variable. The purpose of this

paper is to understand the impact that remittances have on education attainment but there are always other factors that can have an effect on the dependent variable.

One critical independent variable will be remittance, since this is what the model is testing for. Due to personal experiences and reading many literatures on this topic, remittances has a large impact on families who are in poverty in developing countries. Remittances enables family income to grow and standard of living improves for those families. There will be dummy variables where 1 represent households that receives remittances, and 0 for households that do not receive remittances. It is expected that remittances should have a positive relationship with education attainment.

Another important independent variable is number of children in the household. Most of the literature was based around children and this model will analyze how the effect of having few or more children in the household impacts educational attainment. This sign of this variable is uncertain but after reading the literature, a household that has more children may incur more costs, which may prevent education attainment. The independent variable female describes the gender of the respondent. The expected sign for this should be positive.

According to IPUMS international, the marital status is defined as describes the person's current marital status according to law or custom. This independent variable is crucial because the marital status plays a vital role to determine if the family is able to afford education. Many separated families have less income and more responsibilities, which may hamper the chances of educating their children. A widow may think of feeding her children first rather than educating them, but this all depends on the income and social status of the family. The expected sign for this

independent variable should be negative because a family where the parents are separated may have a negative relationship with education attainment. Lastly, the age is important to understand if the respondent is continuing his or her education. Age squared has been used in order to generate a quadratic curve. A positive effect of age and a negative effect of age squared that means that as people get older the effect of age is lessened. Income was used in the model and it was significant but the extremely low coefficient raised many questions. It was thought that income has an impact on education but the causation was confusing. After doing the regression with the dependent variable as income and independent variable as education attainment, the coefficient was very large and both statistically and economically significant. Therefore, the decision to take out this variable was made. After analyzing all the variables, the equation of interest will be:

Education Attainment = $\beta_0+\beta_1 remitt_i+ \beta_2 nchild_i + \beta_3 female_i + \beta_4 married_i + \beta_5 pernum_i + \beta_6 age_i + \beta_7 agesquared_i + \varepsilon$

Table 1. Variables

edattain	Education attainment per household
Remmitt	Remittances per household
nchild	Number of children per household
married	Dummy variable where 1=married and 0=anything else
age	Age of responded
female	Dummy variable where 1=female and 0=male
Pernum	Number of people per household

Therefore, after regressing my model in STATA, I will be able to analyze the relationships between each independent variable to the dependent variable as well as check for level of significance and other statistical complications.

Empirical Model

Table 2. regression model

educational attainment	*coefficient*	*t value*	*p>|t|*
remittances	.109*** (.005)	18.93	0.000
age	.059*** (.000)	106.13	0.000
age squared	-.0007*** (.000)	-125.17	
married	.059*** (.004)	12.92	0.000
female	.193*** (.003)	51.85	0.000
number of people in household	-.016*** (.002)	-11.12	0.000
number of children in household	-.056*** (.002)	-36.93	0.000
_cons	1.02*** (.011)	85.28	0.000
R squared	.089		
Adjusted R squared	.089		

*Notes:*p<.10; **p<.05; ***p<.01*

The expected coefficient and the hypothesis was correct according to this model. A one dollar increase in remittances is associated with a .108 level increase in education, holding age, marriage status, female, number of people per household, and number of children per household constant. Although it is statistically significant at the 1% level, the economic significance may be questionable because it is not very high. There are many factors that play into education, especially

in a developing countries such as the location of the respondent, there may be political turbulence and many other reasons. A .1 level increase in education can still be acknowledged because it shows that remittances does have a positive impact on education. The literature have similar results using various countries and times; this model tells the same story. Age has a positive coefficient and age squared has a negative coefficient, which means that an increase in one year is associated with a decrease in .0007 level of education. As the person ages more, the effect of receiving higher education lesses. This was expected because in the Dominican Republic, the maximum mandatory age to attend school is 15 and the legal age to work is above 15. Many students tend to stop their education career and participate in the labor force since the Dominican Republic economy is highly labor intensive. The coefficient for number of children was expected to be negative. This means that as a household has an increase of one child, that is associated with a decrease in .056 level of education, holding age, marriage status, female, number of people per household, and number of children per household constant. The same occurs with number of people in household, which means that a single person increase in a household is associated with a decrease in .016 level of education. This was expected because as number of children and number of people (including non family members) increase, this will likely lead to higher costs and that may hamper the respondents chances of spending on his or her education. In many developing countries, the cost of education is high due to private tuition, supplies, and traveling expenses. When there are more people in the household, this has a negative impact on education. Another independent variable that had the same sign as my expectation was sex. Female was created into a dummy variable and labeled as ‘1’, therefore male was 0. This means that if a person is female, this is

associated with a .193 increase in level of education, holding age, marriage status, female, number of people per household, and number of children per household constant. The last variable in this model was marriage status and surprisingly, the expected sign was incorrect. This may be positive because marriage also means support from spouse. This coefficient means that if a person is married, this is associated with .059 increase in level of education, holding age, marriage status, female, number of people per household, and number of children per household constant. Going back to Table 2, the t-values of all the independent variables are below 2 and the p values are all significant at 1% level, which means that all of my variables are statistically significant in this model.

My model has a low R-squared and adjusted R-squared at around 8 percent. This means that only 8 percent of the model explains the variability of remittances on education attainment. This is not very surprising because there are many errors that I did not take into account. For example, Dominican Republic is more of a labor intensive economy and education is not the highest priority for many families. We also do not know if the money spent using remittances is entirely going to education since many families would rather spend it on other investments. Although this is not the best scenario, I need more evidence to check if my model is significant or not. There were also many limitations such as availability of variables, which will be explained in further detail later on the paper. Although this is a sign of weakness, this paper is focusing more on understanding the significant relationship between remittances on education attainment and the relative importance between them rather than the variation. With a low R-squared and adjusted R-squared, I want to check for other statistical significances such as multicollinearity.

Table 4. VIF

Variable	*VIF*	*1/VIF*
married	1.61	.619
pernum	1.56	.640
nchild	1.54	.651
age	24.30	.041
age squared	21.78	.041
female	1.03	.975
remit	1.02	.985
Mean VIF	7.55	

A variance inflation factor(VIF) detects multicollinearity in regression analysis. Multicollinearity is when there's correlation between predictors (i.e. independent variables) in a model; it's presence can adversely affect regression results. The VIF estimates how much the variance of a regression coefficient is inflated due to multicollinearity in the model. All of my VIF's besides age and age squared are under 5, which shows that my model does not suffer from multicollinearity. Age and age squared is an obvious correlation since it is derived from the same source. Although I believed that number of children per household and number of people per household would have a high correlation, this was actually not the case. It may be though the number of people per household excludes the children and only takes into consideration of the non family members. Another way to check for multicollinearity would be to simply look at the correlation matrix.

Table 5. Correlation matrix

	edattain	*remitt*	*nchild*	*female*	*married*	*pernum*	*age*	*agesquared*
edattain	1							
remit	.019	1						
nchild	.019	-.059	1					
female	.079	.049	.039	1				
married	.062	-.069	.519	-.077	1			
pernum	-.044	.052	-.399	.074	-.454	1		
age	-.084	.039	.296	.017	.329	-.044	1	
agesquared	-.144	.056	.198	.031	.231	-.361	.969	1

The highest correlation between the variables would be age and age squared, which was explained as to why they are highly correlated. The rest of the variables are not highly correlated.

Heteroscedasticity occurs when variance for a random variable differs for some observations (Bailey, 2017). Heteroskedasticity is most frequently discussed in terms of the assumption of parametric analyses (e.g. linear regression). More specifically, it is assumed that the error (residual) of a regression model is homoscedastic across all values of the predicted value of the dependent variable. Put more simply, a test of homoscedasticity of error terms determines whether a regression model's ability to predict a dependent variable is consistent across all values of that dependent variable. After running the Breusch-Pagan test by using the hottest function, it can be concluded that this model does suffer from heteroskedasticity. To fix this, the regression was repeated using the robust regression. Robust regression is an alternative to least squares regression when data is contaminated with outliers or influential observations and it can also be used for the purpose of detecting influential observations.

Conclusion

This study finds that there is a positive relationship between remittances and education attainment. An increase of one dollar in remittances is associated with an increase of .108 level in education attainment holding the independent variables constant. Although the relationship was positive, in the Dominican Republic, the economy is dependent on labor. The impact of remittances in a western country may not be the same as the in other countries such as Asia or Middle East. Gender discrimination has been largely spoken about and many of the literature believe that parents play a big role in ending this discrimination. Migration plays a role when households decide how much education the family needs. In order to increase their own demand upon migrating, education is a strong factor. This study has found that age is important when understanding education attainment. The migration of males have a positive impact on females education attainment, which contradict many researches that show that being a woman has a negative relationship with education attainment in many developing countries. From a policy perspective, the results in this study underscore the relationship between education and the maximum age for schooling in the Dominican Republic. There is a positive relationship between remittances and education so we can see that a higher amount of remittances is associated with an increase in level of education attainment so if the age were to increase, this will have a positive impact on education attainment. The objective of raising the mandatory maximum age to be in school may provide benefits for the growing economy as people look more ahead into the future; which is highly based on education.

Limitations and Future Research

The year 2002 was used because that was the most recent census which included remittances. Therefore, this was a problem since the data was collected 15 years ago. Nevertheless, the economic structure of the Dominican Republic has been consistent throughout the years so it may not be a large change if a more recent year was used. I would like to conclude with some suggestions for future research. This study focused all throughout one country but if data is available, a comparison on the impact of remittances and education attainment throughout different countries would be interesting. Will countries in Asia have similar results to countries in South America or Europe? Also, the different regions on the Dominican Republic can also be compared. For example, does a family in urban parts of the country have more economic significance than a family in the rural parts? Finally, many literature spoke about the importance of a person's parents education. Education is something that needs incentive and pushes or there may not be enough hunger for education, It would be interesting to see if the education attainment increases substantially if the persons parents have a higher education compared to a person whose parents do not have an education. Better information on the frequency, levels, and history of education can help sharpen this studies estimates of remittances and education outcomes and on the overall well-being of households in the Dominican Republic.

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Appendix A

Regression (not robust)

```
. regress edattain remitt nchild female married pernum age agesquared
```

Source	SS	df	MS		
Model	18459.8552	7	2637.12218	Number of obs	= 239470
Residual	187934.023239462	.78481773		F(7,239462)	= 3360.17
				Prob > F	= 0.0000
Total	206393.878239469	.861881406		R-squared	= 0.0894
				Adj R-squared	= 0.0894
				Root MSE	= .8859

edattain	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
remitt	.1087829	.0057463	18.93	0.000	.0975204	.1200454
nchild	-.0556444	.0015454	-36.01	0.000	-.0586734	-.0526154
female	.1930357	.0037228	51.85	0.000	.1857392	.2003322
married	.0596187	.0046155	12.92	0.000	.0505724	.068665
pernum	-.0167366	.0015057	-11.12	0.000	-.0196877	-.0137856
age	.0595122	.0005607	106.13	0.000	.0584131	.0606112
agesquared	-.0007923	6.33e-06	-125.17	0.000	-.0008047	-.0007799
_cons	1.022105	.011985	85.28	0.000	.9986152	1.045596

In order to understand the impact that remittances have on education attainment, I built a model that would help me analyze the statistical input to determine whether there is a strong relationship between the two variables; also to look to see if there are statistical complications in the model. This model will be estimated using ordinary least square. The model shows statistical significance at the 1% level. On the other hand, the r-squared and adjusted r-squared a relatively very low.

Appendix B

Variance Inflation Factor

```
. vif
```

Variable	VIF	1/VIF
age	24.30	0.041156
agesquared	21.78	0.045905
married	1.61	0.619489
pernum	1.56	0.640832
nchild	1.54	0.651061
female	1.03	0.975277
remitt	1.02	0.985210
Mean VIF	7.55	

In statistics, the variance inflation factor (VIF) quantifies the severity of multicollinearity in an ordinary least squares regression analysis. It provides an index that measures how much the variance (the square of the estimate standard deviation) of an estimated regression coefficient is increased because of collinearity. This study used

A rule of thumb for interpreting the variance inflation factor:

- 1 = not correlated.
- Between 1 and 5 = moderately correlated.
- Greater than 5 = highly correlated.

In this study, I used a VIF of 5 to determine correlation. All of the independent variables are below

5 except the obvious variables.

Appendix C

Intercorrelation Matrix

```
. correlate edattain remitt nchild female married pernum age agesquared
(obs=239470)
```

	edattain	remitt	nchild	female	married	pernum	age	agesqu~d
edattain	1.0000							
remitt	0.0197	1.0000						
nchild	0.0191	-0.0591	1.0000					
female	0.0793	0.0490	0.0399	1.0000				
married	0.0615	-0.0696	0.5190	-0.0772	1.0000			
pernum	-0.0444	0.0523	-0.3997	0.0739	-0.4544	1.0000		
age	-0.0842	0.0385	0.2958	0.0178	0.3292	-0.4490	1.0000	
agesquared	-0.1448	0.0556	0.1975	0.0308	0.2309	-0.3608	0.9696	1.0000

The intercorrelation matrix is used to investigate the dependence between multiple variables at the same time. The result is a table containing the correlation coefficients between each variable and the others. There are no variables that are highly correlated except the obvious ones.

Appendix D

Heteroskedasticity

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of edattain

         chi2(1)      =  3730.62
         Prob > chi2  =   0.0000
```

Heteroscedasticity occurs when the variance of the error terms differ across observations. The model now becomes: $Yi = \beta0 + \beta1Xi + \varepsilon i$, where the variance of the errors is no longer assumed to be a constant. The hypotheses are:

- H0 : The residuals are homoscedastic
- Ha : The residuals are heteroskedastic

This model does suffer from heteroskedasticity. The p-value is less than the significance level of .05, therefore we can reject the null hypothesis and confirm that this model does suffer from heteroskedasticity. In order to adjust this, the robust regression was inputted.

Appendix E

Robust Regression

```
. regress edattain remitt nchild female married pernum age agesquared, robust

Linear regression                               Number of obs =  239470
                                                F(  7,239462) = 3118.73
                                                Prob > F      =  0.0000
                                                R-squared     =  0.0894
                                                Root MSE      =   .8859
```

edattain	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
remitt	.1087829	.0055496	19.60	0.000	.0979058	.11966
nchild	-.0556444	.0015643	-35.57	0.000	-.0587104	-.0525783
female	.1930357	.0037633	51.29	0.000	.1856597	.2004117
married	.0596187	.0047135	12.65	0.000	.0503804	.0688569
pernum	-.0167366	.0013925	-12.02	0.000	-.0194659	-.0140073
age	.0595122	.0005572	106.81	0.000	.0584201	.0606043
agesquared	-.0007923	6.47e-06	-122.37	0.000	-.000805	-.0007796
_cons	1.022105	.0110164	92.78	0.000	1.000514	1.043697

Robust regression is a technique to obtain unbiased standard errors of OLS coefficients under heteroscedasticity. Stata includes options for estimating robust standard errors. As noted above, heteroskedasticity causes standard errors to be biased. OLS assumes that errors are both independent and identically distributed; robust standard errors. Heteroskedasticity adjusts either or both of those assumptions. Hence, when heteroskedasticity is present, robust standard errors tend to be more trustworthy.