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**Remittances and Labor Participation in a Developing Country**

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Remittances and labor participation in a Developing Country  
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**Abstract:** This article discusses the effects of remittances on the labor force participation. The remittances reduce the probability of participation in labor market because increase the relative price of the leisure. Using the 2008 National Household Survey of Colombia, we found that remittances reduce the probability of participation in the Colombian labor market. We also consider the possibility of that the remittances received by households are potentially endogenous to labor participation and make a IVProbit and FIML estimates and discuss the effects of censored remittances.

**Keywords:** Colombia, Labor force participation, remittances, endogeneity, censored variables.  
**Classification JEL:** J21, C33.

## Introduction

Colombia is the third country in Latin America (preceded by Brazil and Mexico) in total remittances received (Vargas-Silva 2009). In the first half of 2008 the amount of remittances was approximately 2% of the GDP (from January to March 2008 this amount doubled the exports of coffee, coal, and iron-nickel). In addition to the drop in the second half of 2008 because of the effects of the global economic crisis, the future now looks less promising for Colombia where remittances went down by 31% with respect to the same period in 2007.

Colombian households spend a little more than 60% of the funds from these remittances in groceries and utilities. They spend the remaining 40% in education, healthcare, rent payments, or installments to pay for their own homes and, to a lesser extent, in leisure, entertainment, home appliances, and furniture (Garay and Rodríguez, 2005). In 2008, a little more than 37% of the remittances came from Spain followed by United States (36%), and to a lesser extent from Venezuela (9.1%) [Banco de la Republica 2008].

The literature available reports that remittances have an effect on economic growth (Catrinescu et-al 2009), human capital (Adams 2009, Acosta 2006, Cox Edwards and Ureta 2003), poverty (Gupta et-al 2009, Adams 2006), criminality (Vargas-Silva 2009), and labor force participation (Funkhouser 1995, Rodriguez and Tiongson 2001, Kim 2007, Bussolo and Medvedev 2008).

Although there are few studies that explicitly analyze the relationship between labor supply and remittances (Kim 2007), the main results show that remittances reduce labor force participation by increasing the reservation wages of recipients (Kim 2007, Bussolo and Medvedev 2008). In fact, the results of a survey conducted among beneficiaries of remittances from workers at exchange agencies in Colombia in 2004, together with a high percentage of funds allocated to

cover recurring home expenses, revealed that there is a lesser participation of beneficiaries in the labor market - only 44% is active in the labor market, while the remaining 56% is inactive (Garay and Rodríguez 2005, Asobancaria 2005).

Other than quantifying the impact of remittances on the labor participation rate, none of the studies conducted in Colombia has discussed to what extent remittances reduce the likelihood of participating in the labor market in Colombia. This is the purpose of this article which is based on information about thirteen metropolitan areas from the National Household Survey (NHS) conducted by the Departamento Nacional de Estadística (National Department of Statistics). Information was taken from the year 2008 regarding whether the families in Colombia have permanently received remittances from individuals who live abroad. According to the survey, the percentage of individuals who receive these kinds of remittances is 1.4%. With 28.6% Valle del Cauca is the department that receives the most remittances followed by Antioquia (16.6%) and Bogota (15%).

The rest of this article is organized in the following manner. The second section presents the standard labor participation model and discusses the effects of remittances on labor participation. The third section explains the data and the construction of the variables. The fourth section discusses the econometric approach in which the endogeneity of remittances is considered. We present two approaches: a linear (IVProbit) approach, and a censored (FIML) approach for the endogeneity of remittances. The last section presents the conclusions. The findings of this study are consistent with the theory and show that receiving remittances decreases the probability of participating in the labor force in Colombia.

## 2.- Theoretical approach

There is extensive literature available on the participation in the labor market, i.e. about the decision of seeking employment or being occupied. Typical individuals maximize their utility over consumption and leisure, subject to budget constraints and dependent upon the time available for these activities (Gronau 1973, Deaton and Muellbauer 1980, Pencavel 1986, Killingsworth 1986 and Brue and Macpherson 2003). The maximization problem is defined as,

$$\begin{aligned} \text{Max } U(C,L) & \quad (1) \\ \text{Subject to } P_c C & \leq W(T - L) + \eta + r \quad (2) \end{aligned}$$

Whereas, C stands for consumption; L stands for leisure; W is the salary rate; T means total time, and  $P_c$  is the price of consumer goods. Labor income is  $WH_w$ , whereas  $H_w$  is the number of working hours of an individual ( $T - L$ ), non-labor income will be equal to  $\eta$ , and remittances is r.

The solution to this problem shows the number of hours allocated by an individual to work and leisure. Point  $C_0$  in Figure 1 implies actual consumption when a given non-labor income is available. On the right hand of  $H'_w$  an individual does not offer hours of work, and on the left hand of  $H'_w$  an individual will offer a positive number of hours of work. At this point, the market salary (W) equals the reserve salary ( $W^r$ ), and that individual will be indifferent about whether or not participating in the labor market. Let us now assume that an individual who participates in the labor market with  $H_w$  hours, consume  $C_1$  and receives remittances from an emigrant who continuously sends money from abroad. It is clear that this not only changes the budget

constraints because non-labor income increases, but also has an impact over decision of participating in the labor market.

The actual consumption associated with new non-labor earnings will be greater than at the baseline. Hence, common conjecture shows that remittances reduce the labor force participation (Funkhouser 1995, Rodriguez and Tiongson 2001, Kim 2007, Bussolo and Medvedev 2008). Similar results were obtained by Holtz-Eakin, D., D. Joulfaian, H.S. Rosen. (1993) and Mora (2007) with regards to inheritances, gifts, and lottery winnings.

Figure 1. Remittances effects over labor force participation

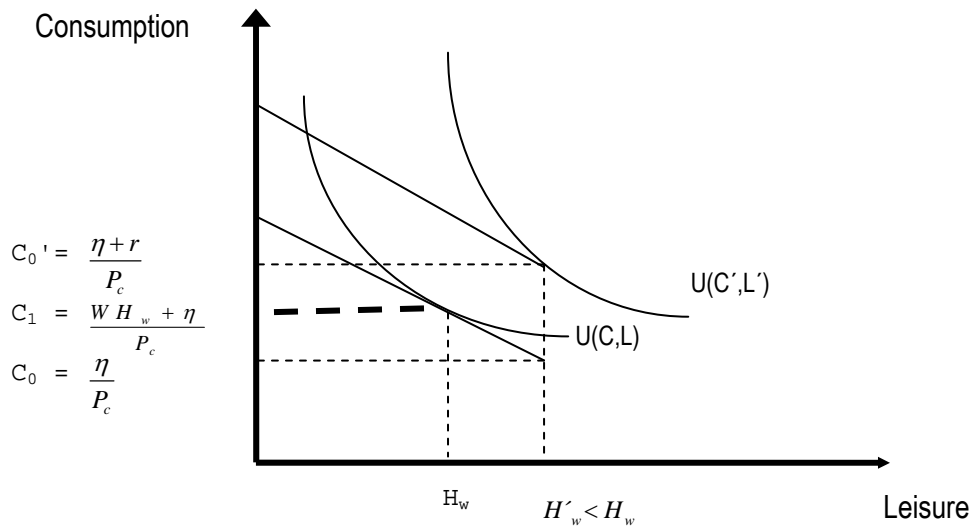


Figure 1 above shows that receiving remittances modifies the allocation of time to leisure and work. The number of hours allocated to leisure increases while the amount of time allocated to work decreases modifying the decision of participating in the labor market. The consumption which can be associated with non-labor earnings will increase from  $C_0$  to  $C_0'$ . Figure 1 also shows that the existence of remittances does not change the slope of the budget restraint.

Let us now assume that there are random differences in the market salaries ( $W$ ) and reserve salaries ( $W^*$ ) of individuals with the same characteristics of age and education. The reserve salary is determined by a mean reserve salary for all individuals with similar non-market characteristics (head of household, sex, etc.),  $x_i$ , the existence of remittances,  $r_i$ , and a random component,  $e_i$  (Gronau 1973, 1977):

$$W^* = x_i + r_i + e_i \tag{3}$$

An individual decides to participate only if  $W > W^*$  or  $W - x_i - r_i > e_i$ . If the standard deviation of  $W^*$  is now defined as  $\hat{\sigma}_e$ , then this individual will decide to participate if:

$$\frac{1}{\hat{\sigma}_e} [\hat{\beta}_0 - (\hat{\beta}_i x_i + \hat{\alpha}_1 r_i)] > \hat{e} \quad (4)$$

Whereas,  $\hat{e}$  equals  $\frac{e}{\hat{\sigma}_e}$ . Assuming that there is a normal distribution, the following probit model is achieved:

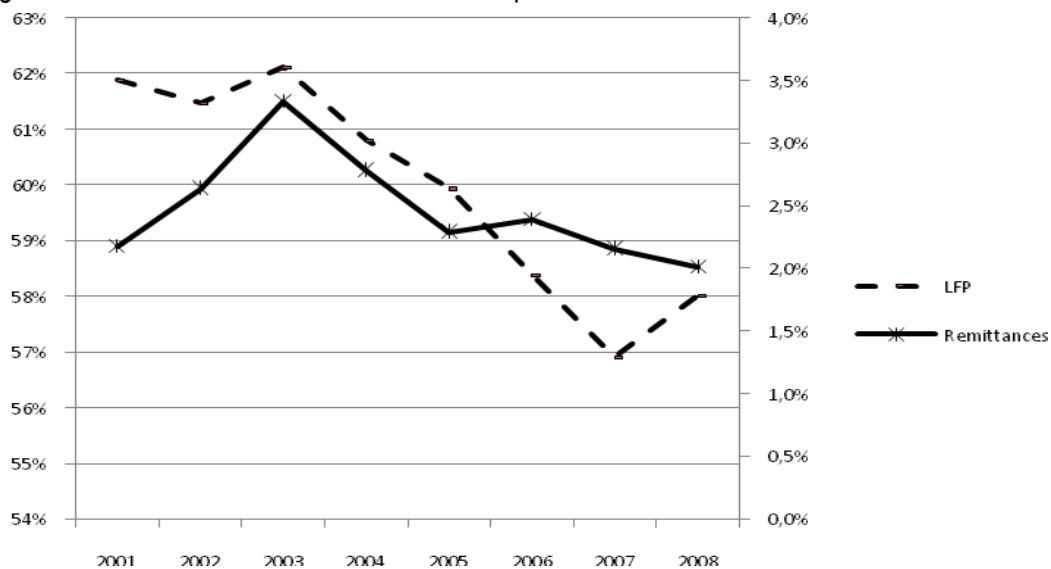
$$\begin{aligned} \text{Prob (participates =1)} &= \Phi(x_i, r_i; \beta, \alpha) \\ \text{Prob (participates =0)} &= 1 - \Phi(x_i, r_i; \beta, \alpha) \end{aligned} \quad (5)$$

The estimates are made based on the maximum likelihood, and an individual will participate if he/she is a member of the economically active population. He/she will not participate otherwise.

### 3.- Data

Remittances in Colombia totaled USD 4,842 million in 2008, which represents a 7.8% increase vs. 2007. With the increasing number of Colombians abroad, the declining in the cost of transferring money, the modernization of the telecommunications and the bank system is reasonable to think that there is a permanent flow of the remittances to Colombia; affected only by an exogenous shock such as the recent world crisis.

Figure 2. Remittances and Labor Force Participation in Colombia



Source: Author's calculations using the NHS and DNP.

Figure 2 above shows labor force participation (LFP) in Colombia in thirteen major cities and remittances as a percentage of the GDP in the period from 2002 to 2008. Last year there was a clear negative relationship between LFP and remittances.

In order to analyze the effect of remittances on the labor market participation in Colombia, it is necessary to define the variables that account for labor participation. Education, sex, and head of household (Castañeda 1981, Macnac 1991, Uribe, Ortiz and Correa 2006, Arango and Posada 2007, Aldana and Arango 2008), age (Castañeda 1981, Arango and Posada 2007, Aldana and Arango 2008), experience and experience square (Macnac 1991, Uribe, Ortiz and Correa 2006), and wealth (Arango y Posada 2007) have been the variables used to account for labor participation in Colombia.

This study selected education, sex, experience and experience square, position in the household, wealth, and remittances to be the variables that account for labor participation. Education becomes a continuous variable and we consider the years of education. Sex is constructed as a dummy variable which equals one if the individual is a male or zero otherwise. Experience is constructed as potential experience ( $age - S - 6$ ). The wealth of the family is set as a dummy variable that takes the value of 1 if the family owns a house, lives in a middle-class or higher class neighborhood<sup>1</sup>, or owns a vehicle; otherwise it takes the value of 0. Remittances are a continuous variable, and individuals report the value in Colombian pesos of 2008. Finally, labor participation is constructed as a dummy variable that equals one if an individual is working or seeking employment, or otherwise zero.

The data were taken from the NHS in 2008. 71,696 individuals in the age range from 12 to 65 years were selected for the survey, i.e. individuals who are part of the population at working age. The means of the variables were as follows:

Table 1. Means of the variables for labor participation

Variable	Means	Don't Receive	Receive
Education	9.60	9.58	10.60
Remittances	1.439%	0	1
Sex	45.63%	45.85%	30.91%
Head of Household	31.26%	31.04%	46.41%
Experience	18.49	18.44	22.14
Squared to experience	590.28	587.80	759.8
Wealth	33.03%	32.76%	51.64%
Labor force participation	64.24%	64.36%	56%
Internet	18.04%	17.86%	30.62%
N	71,696	70,664	1,032

Source: Author's calculations using the NHS.

Table 1 shows that mean education is 9.6 years, and the number of years of education is higher in the households that receive remittances on a regular basis. Garay and Rodríguez

<sup>1</sup> According to the official urban classification system.

(2005) established that recipients of remittances have a lower educational level than those who send them.

The percentage of men is lower than that of women, and it is smaller in the case of families who receive remittances. 31% of these individuals are heads of households, and this percentage slightly increases in the families who receive remittances. The mean potential experience is close to 19 years, and it is slightly higher in the families who receive remittances (this can be accounted for by the lower educational level if the age profiles of both kinds of individuals are similar). Finally, 35% of the families have some wealth, and this percentage is fairly higher in the families who receive remittances than in those who do not receive any remittances at all.

The labor participation rate of those who are beneficiaries of remittances is 56%. Meanwhile, the labor participation of those who do not receive remittances is 64%, which is consistent with the results obtained by Garay and Rodríguez (2005) in that the labor participation of beneficiaries of remittances is low, and when compared to individuals who do not receive remittances is 8% lower. The percentage of received remittances is 1.4% and the mean value is \$59,000 Colombian pesos; i.e. USD 29 (average \$1,968 per USD 1 in 2008).

#### 4.-Econometric Approach

Remittances received by households are potentially endogenous to labor participation. For example, it is more likely to remit to someone who is unemployed. Many articles discuss the endogenous nature of remittances. Migration variables (Hanson and Woodruff 2003, Acosta et.al. 2006), transaction cost of intermediate transfer (Amuedo-Dorantes and Pozo 2006, Calero et.al 2009), geographic distances from the household to the United States (Barraz 2005), Rainfall shocks (Choi and Yang 2007); and perceive safety to instrument crime-remittances model (Vargas-Silva 2009).

This article is aimed at identifying the causal effects of remittances by instrument with information about the use of internet in the household. Colombia ranks sixty-two (upper) on the list of telecommunications users (International Communications Union 2008). International connectivity had a higher increase in 2008 (93.5%) with the operation of SAM-1 and CFX submarine cable, and the numbers of Internet users increased by 7% in 2008(CRT 2009).

In this way, we suppose that the use of Internet is correlated with remittances but not with labor participation. Internet in the house reduces the cost of communication; i.e. SKYPE. It increases the transfer amount, and assigns remittances via the bank system more efficiently. 31% of the individuals who receive remittances have internet access in the household meanwhile 18% of the individuals who do not receive remittances have internet access.

The econometric model is defined as follows,

$$Pea^*_i = Remittances_i + Sex_i + Education + Experience_i + Experiene^2_i + Wealth_i + \varepsilon_{i1} \quad (6.1)$$

$$Remittances_i^* = Internet_i + \varepsilon_{i2} \quad (6.2)$$

Where,

$$Pea_i = 1 \quad \text{if } Pea^*_i > 0$$

Pea<sub>i</sub> = 0            Otherwise

In order to consider the censored nature of remittances, we modified equation 6.1 as follows:

$$\text{Remittances}_i^* = \text{Internet}_i + \xi_{i2} \quad (6.3)$$

Where,

$$\begin{aligned} \text{Remittances}_i &= \text{Remittances}_i^* && \text{if } \text{Remittances}_i^* > 0 \\ \text{Remittances}_i &= 0 && \text{Otherwise} \end{aligned}$$

In this way, equation (6.3) considers the censored nature of remittances.

Table 2 shows the results of the IVProbit by maximum likelihood with linear and censored approach of the remittances,

Table 2. Marginal Effects for Labor Participation in Colombia

Variable	IVProbit	(Stand errs.)	FIML	(Stand errs.)	FIML	(Stand errs.)
Remittances	-0.0007621**	0.0000997	-0.0000111**	0.00000	-9.68e-06 **	0.00000
Wealth	-0.0261967*	0.010731			-0.0861694**	0.00444
Education	0.0302523**	0.0008865	0.0248163**	0.00048	0.0279206**	0.00051
Sex	0.1431668**	0.0093703	0.190888**	0.00385	0.1929952**	0.00386
Head of Household	0.2550827**	0.0105244	0.1966406**	0.00444	0.1918062**	0.00448
Experience	0.0394476**	0.0007056	0.0397314**	0.00041	0.0398048**	0.00041
Squared to experience	-0.0007232**	0.0000145	-0.000743**	0.00001	-0.0007346**	0.00001
$\rho$	0.887189	0.0240343	-0.0865011	0.021171	-0.0873398	0.02127
F	88.58		75.98		33.65	
Exogeneity test (OLS)	0.002111**	0.0001694				
Exogeneity test (Tobit)	0.0000852**	6.83e-06				
Exogeneity test (Smith-Blundell)	155.3764**					
Wald $\chi^2$	7,651.11					
Probability predicted at mean	68.79%		68.78%		68.88%	
Percentage of Hits	76.92%		76.39%		76.41%	
N	71,696		71,696		71,696	

Source: Author's calculations using the NHS.

\*\* p<0.01.

\*p<0.05 .

These results of labor participation are consistent with the theory and the previous work in Colombia. Hence, an increase in the number of years of education, potential experience or being the household head will be increase the likelihood of participation in the labor market. Meanwhile, wealth reduces this probability. A USD29 increase in remittances per month leads to a 0.076 percentage decrease in labor participation.

The results also show evidence of endogeneity of remittances. The coefficient of correlation ( $\rho$  in Table 2) between 6.1 and 6.2 is positive and highly significant. We explored for the potential endogeneity of remittances over labor participation added to the probit estimation of residuals from an OLS regression of remittances over internet, sex, education, head of household, wealth, and potential experience (Rivers and Young 1998, Wooldridge 2002). We



also modeled remittances as a censored variable and added the tobit residuals in the probit. All of the results reject the exogeneity of remittances. Finally we presented a Wald test and corroborated the below results.

To test the weakness of remittances as instruments, we use F-test. For the case of one instrument and one endogenous variable, the results suggest that the instrument is not weak with a 5% confidence level and a relative bias greater than 10% (Stock et al. 2002).<sup>2</sup>

Finally, Conditional Mixed Program (Roodman 2009)<sup>3</sup> is used to estimate endogenous and censored nature of the remittances. The results are shown in the third and fourth column of the table 2. Table 2 shows the marginal effects for FIML estimation when we considered the remittances as a censored and endogenous variable.

The results do not change the sign of the parameters. With respect to endogeneity, the results show that the coefficient of correlation ( $\rho$  in Table 2) between 6.1 and 6.3 is negative and highly significant. With respect to weakness, the F-test shows that the instruments are not weak. We consider two ways to model the remittances effects: First we don't include the wealth as a non-labor income,  $\eta$  in the figure 1, and the sign of the remittances is negative. Later, we include the wealth in the regression and the results of the sign neither change. In the last regression the magnitude is small due we separate the non labor income from remittances and for these reason the magnitude of the remittances is small.

However, although the sign is correct, the magnitude of the effects of the remittances on labor participation changes dramatically when we compare marginal effects for the IVProbit with to respect the marginal effects in the FIML estimation.<sup>45</sup>

## 5.- Conclusions

The findings of this article are consistent with those of previous papers about labor force participation in Colombia with regard to the positive effect of education, experience, and heads of household. On other hand, we found that experience square and wealth have a negative effect on labor participation in Colombia.

These findings also show that remittances decrease the probability of participating in the labor market. The expectation of greater economic deceleration in the United States and Spain in 2009 will substantially reduce the amount of remittances to beneficiary families - the Colombian government expects to receive USD 700 million less in 2009 - which could translate into an increase in labor participation in 2009 as a consequence of lower labor earnings.

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<sup>2</sup> To test the robustness we added the percentage of remittances in each department to the Internet instrument. The results of the F-Test for weakness did not fail (F-Test = 85.96), but the overidentification J-Test is equal to 48.64 and the Sargan test is equal to 4,891.8511. It is clear that there is overidentification with one endogenous variable and two instruments.

<sup>3</sup> I appreciate the suggestions made by David Rodman about the CMP program in STATA.

<sup>4</sup> Carter (2009) also found that the marginal effects with censored endogenous variables are smaller than with continuous endogenous variables.

<sup>5</sup> We conducted an LR-Test for overidentification and obtained similar results with respect to IVProbit.

With respect to the above results, we also found that the consideration about the linear or censored nature of the remittances have a great impact on the probability of labor participation. Unfortunately, there are no reliable tests that apply to this situation [Carter 2009]. However, if labor participation and remittances are negatively correlated, it is clear that the IVProbit does not meet this condition ( $\rho$  in Table 2). Thus, we chose an FIML over IVProbit estimation.

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