

Migrant Remittances and Human Capital Formation:

Evidence from Colombia

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The Issues

- Migration and brain drain: concern about human capital loss in developing countries.
- More recent literature on brain gain: migration prospects raise rate of return of education investment
- Is human capital scarcity in developing countries due to low rate of return or rather high costs of education investment?
- Migrant remittances can supply funds for education (important if lack of credit is binding constraint).

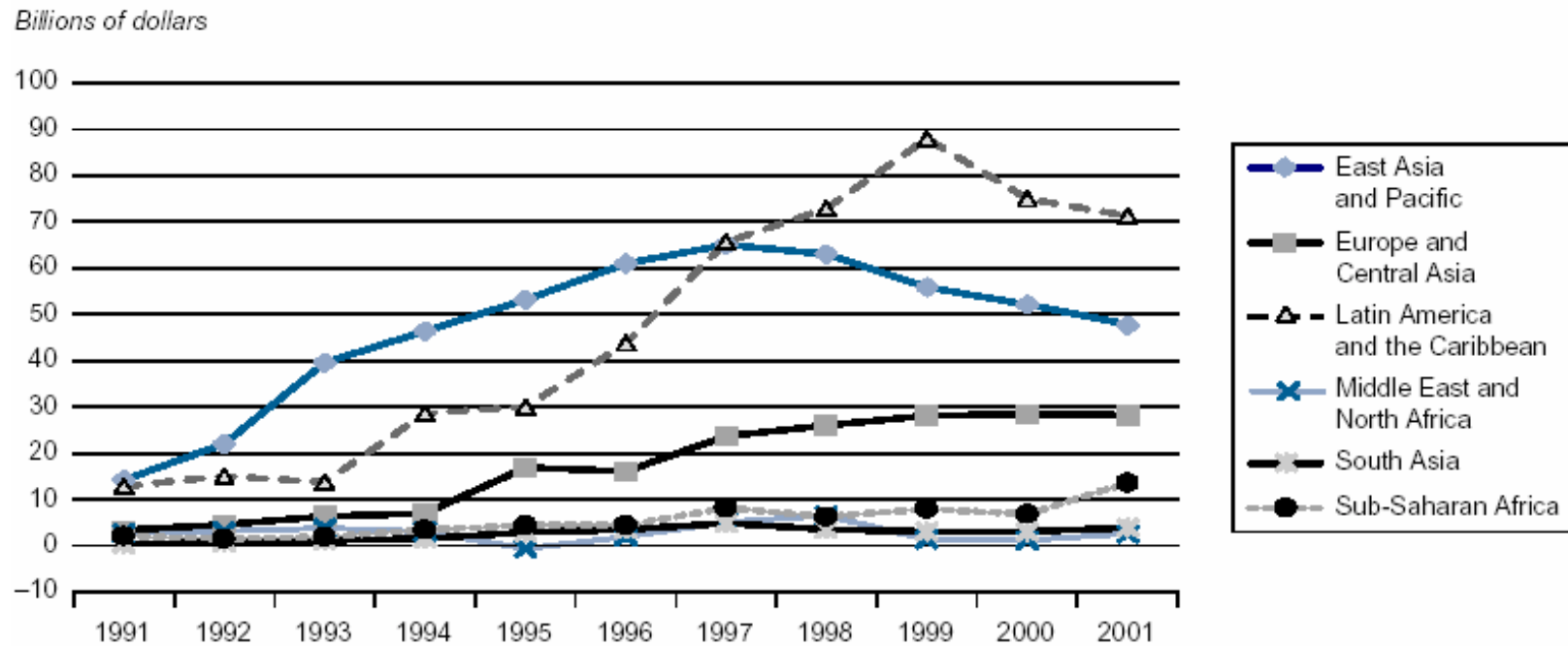
More Specifically

- Problems of imperfect capital market especially severe for education due to inalienability of human capital.
- Does migration relax borrowing constraints for remittance recipient households?
- Does human capital accumulation by recipient households generate spillovers for nonrecipient household?
- How does policy influence the net effect of migration (including above effects as well as brain drain and brain gain) on aggregate human capital?

Related literature

- Brain drain: contraction of human capital (static or short-run)
- Brain gain: expansion of human capital (dynamic or long-run)
- Remittances: evidence of use for education, and other investments
- Skilled migration and rising domestic demand for human capital: FDI (here thick skill market externalities)

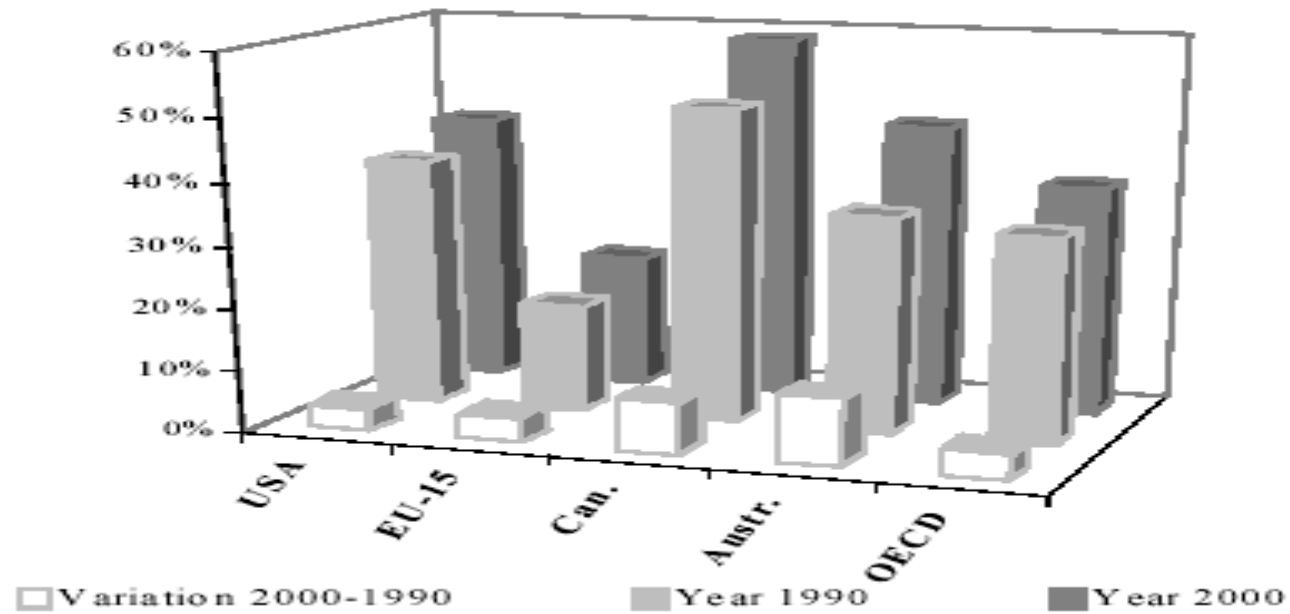
Figure 1 – Regional Trends of FDI Inflows in 1990's



Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years; World Bank staff estimates for 2001.

Figure 2 – Changes in migrant composition in 1990's

Skilled immigrants in percent of the immigration stock



Source: Docquier and Marfouk (2004)

COLOMBIA
INGRESOS POR REMESAS DE TRABAJADORES - BALANZA DE PAGOS
 Cifras en Millones de Dólares

	I TRIM	II TRIM	III TRIM	IV TRIM	ACUM
1994	nd	nd	nd	nd	966
1995	nd	nd	nd	nd	809
1996	163	163	202	217	745
1997	192	182	208	175	758
1998	186	162	198	241	788
1999	333	368	273	323	1,297
2000	375	379	389	435	1,578
2001	417	530	471	603	2,021
2002	499	584	692	679	2,454
2003	682	749	799	830	3,060
2004*	709	757	760	944	3,170
2005	752				

(*) Preliminar

Fuente: Balanza de Pagos- Banco de la República

The setup

- Dramatic growth of remittances as part of international capital flows in Latin America in general, and Colombia in particular
- In this paper, we analyze the impact of remittances on human capital in a general equilibrium framework

The basic idea of the model

- Remittances can have two opposing effects on human capital and employment for both recipient and nonrecipient households
- For recipient households, supply of funds that enhance schooling opportunities and potentially generate a brain gain ... but also potential future brain drain.
- For nonrecipient households, the job creation spillover from higher human capital, when there is net brain gain among recipient households, increases the rate of return to schooling.

The basic idea of the model

- But, the income effect of remittances could increase desired consumption and leisure, thereby reducing human capital investment.
- Net effect ambiguous: when households are financially constrained, under certain conditions remittances can increase the human capital supply, and thereby reduce the unemployment rate in the home labor market.

Building blocks

- Matching model with frictions in the labor market (giving rise to search) and capital market imperfections (giving rise to credit constraints)
- Allocation of remittances depends on incentives: If the net rate of return to human capital formation is high (low), additional remittances are likely to be allocated on the margin to schooling investments (consumption).
- Remittances augment the pool of funds for recipient households for schooling investment, relaxing credit constraints
- The effect of the rise in the human capital supply of households receiving remittances is to induce job creation, and to reduce the unemployment rate as nonrecipient households also increase schooling.

Preview of findings

- Substitution effect: away from consumption and leisure towards human capital investment.
- Income effect: rise in consumption and leisure, as they are normal goods.
- If the 'substitution effect' outweighs the 'income' effect arising from better opportunities, then remittances will increase human capital supply and reduce the unemployment rate.

Preview of findings

- The calibration and simulation analyses suggest that the net effect of remittances depends upon:
 - 1) the accessibility of education (provision and affordability)
 - 2) the degree of labor market frictions in the origin country
 - 3) the immigration policy in the destination country of migrants

Evidence on remittances and schooling

- Remittances appear to be associated with improved household schooling retention:
 - For Mexico, Hanson and Woodruff (2002)
 - For El Salvador, Cox Edwards and Ureta (2003)
- Cardona and Medina (2005) find that among Colombian households receiving remittances induces increases in education expenditures

Evidence on remittances and employment

- Funkhauser (1992): Using data from El Salvador finds that remittances have a negative and significant influence on the labor force participation of both males and females.
- Zachariah et al. (2001) find that in Kerala households with migrant members supply less labour: *“because unemployed persons belonging to emigrant households enjoy the financial support of the emigrant members, they are not in any hurry to get employed”* (p. 55).
- Remittances may lead to more leisure
- Remittances may also induce more search

Model

- Preferences: Each household has an utility function for the family of the form:

$$U(y, x, e) = ey + (1 - e)x \quad (1)$$

- Technology: Let us assume a Cobb-Douglas production function of the form:

$$y_c = A_c h_c^\alpha \quad (2)$$

Model

- Wages: $A_d > A_o$ so that migrants enjoy a wage premium which covers the costs of migration.
- Abundance of human capital in the destination country is assumed to be sufficiently low: $\frac{h_d}{h_o} < \left(\frac{A_d}{A_o + \zeta}\right)^{\frac{1}{1-\alpha}}$, where ζ is the cost of migrating.

Structure

- Analysis is consistent with other studies of determinants of remittances
- Gaviria and Mejia (2005) find among Colombian emigrants that the average amount of remittances is increasing in the years of schooling of the senders and only decreases very slightly over time.
- Among colombian remittance receivers, 13% of households report investing remittances in education as their primary use.

Structure

- Soto and Walker (2002), who analyze the motivations of Colombian migrants in the US, find that obtaining higher wages is the primary motivation.
- In fact, the evidence points to positive self-selection of migrants as their schooling years and wage before migration both exceed the national average.

Structure

- The calibration exercises indicate that higher remittances are associated with a macroeconomic equilibrium where human capital formation by recipient households increases.
- Consistent with evidence by Cardona and Medina (2005) who find for Colombian households that emigration and remittances help relax credit constraints on the financing of education.
- Remittance recipient households spend on average 11% more on education.

Structure

- Schooling investments financed with remittances not only enhance the earning prospects of recipients at home and abroad but can generate job creation spillovers as businesses post vacancies in reaction to the rise in the supply of human capital.
- This indirect effect of remittances can potentially increase both human capital and employment across all households as the labor market becomes thicker.

Human capital

- Since we assume risk neutrality and the utility function is linear, the education decision is taken to maximize consumption income net of schooling investments:

$$\begin{aligned} & \max_{h_i} \left\{ c - \frac{h_i^\Psi}{\Psi (\gamma + s\tau_i)} \right\} \\ \text{s.t. } c &= p_i \{ A_d h_d^\alpha + (1 - s) \tau_i \} + \\ & (1 - p_i) \{ q [A_o \beta h_o^\alpha + (1 - s_i) \tau_i] + (1 - q) \tau_i (1 - s) \} \end{aligned}$$

- where β is the labor share and $\tau_m \geq 0$, $\tau_{nm} = 0$, $p_{nm} = 0$ and $p_m = p$.

Human capital

- By solving the maximization problem we obtain:

$$h_m = \left\{ \left[\alpha p_i \left(A_d - \bar{q} A_o \beta \right) + \bar{q} \alpha A_o \beta \right] (\gamma + \tau s) \right\}^{\frac{1}{\Psi - \alpha}} \quad (3)$$

$$h_{nm} = \left\{ \bar{q} \alpha A_o \beta \gamma \right\}^{\frac{1}{\Psi - \alpha}} \quad (4)$$

- We can then determine the average level of education in the source economy after first wave migration and remittances (ambiguous effect):

$$E(h) = (1 - p)m h_m + (1 - m) h_{nm} \quad (5)$$

Labor market

- The matching technology is given by,

$$j = v^\phi L^{1-\phi}$$

where v is the number of vacancies and L is the labor force in the origin country.

- Upon finding a job, workers receive a fraction β of revenue,

$$w_i = \beta (A_o h_i^\alpha) \quad \text{with } i = nm, m \quad (6)$$

- Vacancy creation decision taken with respect to the expected average level of education.
- Firms create vacancies up to the point where the expected revenue generated by new workers is equal to the cost of hiring them,

$$(1 - \beta) A_o E(h^\alpha) = \frac{\Lambda}{q(\theta)} \quad (7)$$

where Λ is the cost of creating a vacancy and q is the probability that the vacancy will be found by a worker (whether or not it generates a match).

Labor market

- The definition $\theta = \frac{v}{u}$ (the 'labour market tightness' parameter) gives the vacancy rate and completes the description of the matching process.
- The probability of a vacancy being filled is the product of the vacancies per job searcher times the probability that a vacancy will be found:

$$\theta q(\theta) = \theta^\phi = \left[(1 - \beta) \frac{A_o E(h^\alpha)}{\Lambda} \right] \quad (8)$$

Numerical solutions

- The baseline model of the source economy is summarized as:

$$q(\theta) = \left[(1 - \beta) \frac{A_o E(h^\alpha)}{\Lambda} \right]^{\frac{1-\phi}{\phi}} \quad (9)$$

$$\theta q(\theta) = \theta^\phi = \left[(1 - \beta) \frac{A_o E(h^\alpha)}{\Lambda} \right] \quad (10)$$

$$E(h) = (1 - p)mh_m + (1 - m)h_{nm} \quad (11)$$

$$h_m = \left\{ \left[\alpha p \left(A_d - \bar{q} A_o \beta \right) + \bar{q} \alpha A_o \beta \right] (\gamma + \tau s) \right\}^{\frac{1}{\Psi - \alpha}} \quad (12)$$

$$h_{nm} = \left\{ \bar{q} \alpha A_o \beta \gamma \right\}^{\frac{1}{\Psi - \alpha}} \quad (13)$$

where \bar{q} is the probability of employment in the source economy.

- Remittance recipients always accumulate more human capital unless $p = 0$, as by assumption $A_d > A_o$, $\beta < 1$, and $\bar{q} < 1$. Hence, in a sense, brain drain facilitates a potential net brain gain from remittances.

Calibration Framework

The complete model, with remittances is summarized as:

$$BC : u = \frac{\lambda}{\lambda + \theta q(\theta)} \quad (14)$$

$$WC : w = (1 - \beta)z + \beta A_o + \Lambda\theta \text{ where} \quad (15)$$

$$z = \rho w + \tilde{z} \quad (16)$$

$$JC : A_o[f(h) - (r + \delta)h] - w - \frac{(r + \lambda)p\Lambda}{q(\theta)} = 0 \quad (17)$$

$$h^* : f'(h^*) = r + \delta \quad (18)$$

Functional forms and parameter values for $q(\theta)$ (from $m(u, v)$) and $f(h)$, and values for the following parameters in the model: $p, \delta, \lambda, \Lambda, \beta, \rho, \xi$ and η .

The functional form for the matching function, $m(u, v)$ is

$$m(u, v) = v \left[1 - \exp\left(-\frac{v}{u}\right) \right] \quad (19)$$

and hence

$$q(\theta) \equiv \frac{m(u, v)}{v} = [1 - \exp(-\theta)] \quad (20)$$

and for $f(h)$ we choose

$$f(h) = A_o h^\alpha \quad (21)$$

The Calibration of Aggregate Parameters

We calibrate λ to data observations of u , v (and hence $\theta = \frac{v}{u}$), denoted by \hat{u} , \hat{v} and $\hat{\theta}$, respectively:

$$\lambda = \frac{\hat{u}\hat{\theta}q(\hat{\theta})}{1 - \hat{u}} \quad (22)$$

To calibrate β , we use data on wages

$$f(h) = w + (r + \lambda)\frac{A_o\Lambda}{q(\theta)} \quad (23)$$

decomposing output into wages and residual firms' rents.

Put $z = \rho w$ in the pre-migration state and assume we have data $\hat{\rho}$ for ρ .

Let $y_n(h) = A_o(f(h) - (r + \delta)h)$.

Then from the definition of \hat{W} , we obtain the calibrated value of β as

$$\beta = \frac{(1 - \hat{\rho})\hat{W} A_o f(h^*)}{\left[y(h^*) + A_o \Lambda \hat{\theta} - \hat{\rho} \hat{W} A_o f(h^*) \right]} \quad (24)$$

We calibrate Λ from our definition of \hat{R} :

$$\Lambda = \frac{q(\hat{\theta})\hat{R}f(h^*)}{(\hat{r} + \lambda)} \quad (25)$$

For the calibration of the human capital formation parameters γ and Ψ :

$$E(h) = (1-p)m \left\{ \left[\alpha p \left(A_d - \bar{q} A_o \beta \right) + \bar{q} \alpha A_o \beta \right] (\gamma + \tau s) \right\}^{\frac{1}{\Psi - \alpha}} + \\ (1-m) \left\{ \bar{q} \alpha A_o \beta \gamma \right\}^{\frac{1}{\Psi - \alpha}}$$

γ is a shift parameter for the education cost function.

Ψ indicates how fast marginal education costs rise with schooling attainment.

Table 1

Household Parameters from AMCO

m	0.20
s	0.08
e	0.24
p	0.07
τ	\$293

Table 2
Effects of Remittance Funds for Schooling
under Different Domestic Education Policies

	Current	LA Average
Current ($s = 0.08$)	$h_m = 14.6573$ $h_{nm} = 3.8735$ $h^e = 5.0763$ $\theta = 0.5749$	$h_m = 16.4921$ $h_{nm} = 6.1840$ $h^e = 7.1628$ $\theta = 0.6522$
Double ($s = 0.16$)	$h_m = 15.4634$ $h_{nm} = 4.1509$ $h^e = 5.6185$ $\theta = 0.7764$	$h_m = 17.9574$ $h_{nm} = 6.5378$ $h^e = 7.8689$ $\theta = 0.8838$

Table 3
Effects of Remittance Funds for Schooling
under Different Domestic Payroll Tax Rates

	Current	LA Median
Current ($s = 0.08$)	$h_m = 14.6573$ $h_{nm} = 3.8735$ $h^e = 5.1763$ $\theta = 0.5149$	$h_m = 16.4830$ $h_{nm} = 5.2126$ $h^e = 7.0831$ $\theta = 0.7950$
Double ($s = 0.16$)	$h_m = 15.1331$ $h_{nm} = 4.0713$ $h^e = 5.4810$ $\theta = 0.5925$	$h_m = 17.0843$ $h_{nm} = 5.9571$ $h^e = 7.9826$ $\theta = 0.8271$

Table 4
Effects of Remittance Funds for Schooling
under Different U.S. Immigration Policies

	Sealed Border	Porous Border
Current ($s = 0.08$)	$h_m = 14.9113$	$h_m = 14.1479$
	$h_{nm} = 4.1260$	$h_{nm} = 3.9039$
	$h^e = 4.8947$	$h^e = 4.4451$
	$\theta = 0.6446$	$\theta = 0.6041$
Double ($s = 0.16$)	$h_m = 16.2361$	$h_m = 17.7450$
	$h_{nm} = 4.8632$	$h_{nm} = 5.0326$
	$h^e = 5.2571$	$h^e = 5.7246$
	$\theta = 0.6752$	$\theta = 0.7104$

Take aways

- Contribution is to consider the effects of remittances not only on recipient households but also the rest of the economy
- The model is calibrated to data from AMCO to conduct policy simulations.
- There are important potential gains from remittances on education and employment
- But they could be much larger with more access to schooling and less distortions in the labor market.

Take aways

- The simulation exercises illustrate the positive role of remittances on aggregate education and employment as a result of the decisions by recipient households.
- Remittance effect on net aggregate human capital formation in Colombia would be much larger if progress could be made in lowering the costs of education for households and the costs of job creation for businesses.
- As with other external capital inflows, the contribution of remittances to investment depends on the flexibility that workers and businesses have to adjust their skills and scale of operation to match each other in the market.