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Abstract

It has been argued that the adverse impact of skilled versus unskilled labor migration can be mitigated or even offset by the fact that skilled migrants remit more than unskilled ones. This paper contributes to the much debated and so far unresolved related issue of whether remittances actually increase with migrants' level of education. The determinants of remittances considered include migration levels and rates; migrants' education level; and source countries' income, financial sector development, and expected growth rate. The estimation takes potential endogeneity into account, an issue not considered in the few existing studies on this topic. Our main finding is that remittances *decrease* for migrants with tertiary education. This provides an additional reason for source countries to prefer unskilled to skilled labor migration. Moreover, as predicted by our model, remittances increase with source countries' level and rate of migration, financial sector development and population, and decrease in per capita income and expected growth rate.

I. Introduction

Remittances and the brain drain, i.e., the migration of highly educated workers, have occupied the center of attention in the migration literature and policy debates in recent years. Numerous studies have focused on their determinants and on the social and economic development implications for sending countries, while others have examined the implications for receiving countries as well as for the migrants themselves.[1] However, there has not been much research on the relationship *between* migrants' education level and the remittances they send. This issue is paramount to the policy debates about the development implications of migration. As Docquier and Sekkat (2006, 20) state: "Migrants' remittances constitute an important channel through which the brain drain may generate positive indirect effects for source countries." A related argument is that the negative development impact of skilled labor migration relative to unskilled can be mitigated or even offset by the fact that skilled migrants might remit more than unskilled ones.[2]

This paper aims to answer the fundamental question as to whether remittances to origin countries increase with migrants' education level. It is not clear, *a priori*, whether an upward change in the educational composition of migrants should result in an increase in the level of remittances they send. Skilled migrants tend to have higher incomes and can afford to send more remittances to their families back home. On the other hand, they tend to come from better off families whose demand for remittances is lower relative to poorer ones. Furthermore, skilled migrants are able to bring their families along with them as they tend to enjoy more secure legal status. All of these factors reduce the incentives to send remittances. Thus, the net impact of an increase in migrants' level of education on remittances is ambiguous *a priori* (see Rapoport and Docquier 2006 for further details). Empirical studies have so far been unable to resolve the debate on this issue. This paper's main contribution is to show that remittances actually decrease with an increase in migrants' overall level of education.

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[1] See Ozden and Schiff (2006 and 2007) and references therein for a recent collection of papers addressing these issues (e.g., impact on poverty; labor market participation; fertility; and investments in education, health, land, and farm and nonfarm assets).

[2] Other studies have claimed that the brain drain can generate benefits for source countries. For instance, it has been argued that they benefit from the return of skilled migrants because of the increased knowledge and experience migrants bring with them, as reflected in the higher income earned (Wahba 2007). Second, Beine et al. (2001 and 2008) have shown that skilled migration promotes further investments in human capital in source countries, resulting in a smaller human capital loss. Source countries may also benefit from skilled migrants' contribution to technology transfer to the home country (Burns and Mohapatra 2008, Docquier and Sekkat 2006). On the other hand, Schiff and Wang (2008) find that foreign technology absorption and productivity growth are likely to decline with skilled migration.

The main reason for the growing attention on remittances in the migration and development literature is their dramatic increase. Officially recorded remittances—measured as the sum of workers' remittances, compensation of employees, and migrant transfers—are estimated to have increased from $58 billion in 1995 to $167 billion in 2005, with recent estimates putting their level at over $200 billion. This growth rate has outpaced that of private capital flows and official development assistance over the last decade, making remittances the second largest source of external funding for developing countries after foreign direct investment (World Bank 2005).

The recent increase in formal remittance flows can be explained by the increase in the number and income of migrants, the greater number of remittance providers and wider networks in the global financial services industry, and government policies that improve financial market access, all of which have reduced remittance costs and promoted the use of official remittance channels (Freund and Spatafora 2005, World Bank 2005). Whatever the reasons behind this surge, the growing importance of remittances as a source of foreign exchange and their contribution to economic development have attracted increasing attention from policy makers and academics alike.

Similarly, the brain drain has once again become central to the migration and development debate. As evidence has mounted on the positive externalities generated by a highly educated labor force and on the importance of human capital for economic development, so has sending countries' concern over the negative effects of the brain drain. Another reason for their mounting concern is rising skilled migration flows, a trend that is at least partly due to receiving countries' bias in favor of skilled immigrants.[3]

In addition to showing that remittances decline with an increase in the overall education level of migrants, this paper makes several other contributions to the literature on remittances and brain drain. First, it presents a richer analytical model than previous studies and derives additional testable hypotheses that are supported by the empirical findings. Second, it estimates the relationship between remittances and a number of additional variables of interest, such as home countries' expected economic growth and their level of financial development. Third, the empirical analysis accounts for the endogeneity of the level of migration and migrants' education level, something previous studies abstracted from. This is a critical empirical issue as sending remittances is among the main reasons why people migrate and, as is argued in the brain gain literature, the possibility of migration influences incentives to acquire human capital. Thus, there is an endogenous relationship between remittances, migration flows, and migrant skills, which is accounted for in this paper.

[3] The extensive theoretical literature on the topic has been supplemented by recent databases on the brain drain (e.g., Docquier and Marfouk 2006). These have enabled hypotheses on the causes and implications of the brain drain to be examined, including the linkages between the brain drain and economic growth, poverty and institutional development (e.g., Beine et al. 2001, Bhagwati and Hamada 1974, Haque and Kim 1995, Miyagiwa 1991, and Mountford 1997).

The rest of the paper is structured as follows. Section II provides a selective review of the existing work on the determinants of remittances. Section III introduces a model of the relationship between the brain drain and remittance flows, and derives testable implications from it. Most derivations are provided in the Appendix. Section IV examines some of the major variables of interest and Section V specifies the econometric model. Section VI provides a brief description of the data and Section VII presents the estimation results. Section VIII concludes.

II. Studies on Determinants of Remittances

The existing literature on the determinants of remittances is based for the most part on microeconometric studies. Some of these examine migrants' motives to remit, an issue examined in great detail in Rapoport and Docquier (2006). For example, McGarry and Shoeni (1995) find for the United States, and Aggarwal and Horowitz (2002) for Guyana, that there is negative relationship between recipients' income and remittances sent home. Migrants' altruism can explain such a relationship, while self-interest might imply a positive relationship.[4]

Given that developed countries' immigration policies increasingly favor skilled migrants, whether they remit more or less than unskilled migrants has important implications for migrants' home countries. Unfortunately, the findings obtained so far are inconclusive. Faini (2007) obtains a negative impact of migrants' education on remittances while Naufal (2007) obtains a positive impact for Nicaragua. However, neither Faini's nor Naufal's results are statistically significant. Another study by Rodriguez and Horton (1994) finds no impact for the Philippines. Thus, the empirical results on the relationship between migrants' education level and the remittances they send home are so far inconclusive. Moreover, the studies do not take the endogeneity of migration and migrants' education into account.[5]

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[4] A number of cross-country studies have also examined the relationship between remittance flows and a number of macroeconomic variables (e.g., Straubhaar 1986, El-Sakka and McNabb 1999, Chami et al. 2003, Freund and Spatafora 2005, Gupta 2005), and the empirical evidence regarding the remittance impact of changes in exchange rates, interest rate differentials, or other variables is inconclusive. For instance, Straubhaar (1986) for Turkey and Gupta (2005) for India find that remittance flows are not affected by changes in exchange rates or in the real rate of return on investment. In contrast, El-Sakka and McNabb (1999) find that exchange rate and interest rate differentials are important in attracting remittances to Egypt.

[5] Faini concludes that "...this result suggests that the negative impact of the brain drain cannot be counterbalanced by higher remittances." However, this inference does not follow from his findings because, even though skilled migrants remit less than unskilled ones, the former's remittances might still be large enough to counterbalance the negative impact of the brain drain. A correct inference would be that "The negative impact of skilled relative to unskilled migration cannot be counterbalanced by the difference in remittances since skilled migrants remit less than unskilled ones." Note also that his education variable, the share of skilled migrants in the population, does not necessarily increase with migrants' education level.

Another factor that may affect formal remittance flows is home countries' financial sector development. Few studies have looked at this issue. A notable exception is Freund and Spatafora (2005). They show, first, that home countries' financial development has a significantly positive impact on formal remittance flows, mainly because it reduces the cost of sending remittances through formal channels, and second, that the increase in formal remittances is essentially due to the reduction in informal remittances associated with the decline in formal remitting costs rather than to an increase in the total amount of remittances.

The following section introduces a model in order to examine the issues described above.

III. Model

The model presented in this section extends Faini's (2007) remittance model by incorporating an analysis of the impact on remittances of source country income, financial development, expected economic growth, and population size. As shown in Section VII, the model's main predictions are supported by the empirical analysis.[6]

Migrants M derive utility from their own and their family members' consumption in the host (N) and in the home (S) countries, as well as from the presence of family members living with them in N. Migrants' utility function U is given by:

$$U(c_M, f_N, c_N, c_S,) = u(c_M) + W(Lf_N) + L\left[f_N V(c_N) + (1-f_N)V(c_S)\right], \quad (1)$$

where U increases at a decreasing rate in all its arguments; c_i is individual consumption in family group i ($i = M, N, S$); L is total family size (exclusive of migrants) and $0 \leq f_N \leq 1$ is the share of family members that migrants bring over to the host country N. The components $u(c_M)$, $W(Lf_N)$, $V(c_N)$ and $V(c_S)$ are, respectively, the utility migrants derive from their own consumption, from the presence of family members who live with them in N, and from the consumption by family members living in the host and home countries. Separability is assumed for simplicity and clarity of exposition but has no impact on the qualitative results. We assume Inada conditions are satisfied, which ensures that internal solutions are obtained.

Rapoport and Docquier (2006) also model remittances under altruism. They assume that migrants benefit from family members' consumption but not from their presence in the host country. Thus, migrants have no incentive to bring family members over to the host country. This implies that the direction of the impact of parameter changes is identical for individual remittances (r) and total remittances (R). This is not necessarily the case in our model.

[6] The model developed here also simplifies Faini's model by reducing the number of categories of family members used to derive the hypotheses examined in Section VII.

Migrants maximize *U* subject to three budget constraints (for family groups *M*, *N*, and *S*), i.e., $c_M = y_M - L\left[f_N(t+\theta)+(1-f_N)r\right]$, $c_N = y_N + t$ and $c_S = y_S + r$, where y_i is individual income in group *i*, *t* (*r*) = non-negative transfer (remittances) to each family member in the host (home) country, and θ is the cost of bringing a family member over.

Inserting the constraints for c_N and c_S into that for c_M and rearranging terms, we obtain the consolidated budget constraint:

$$y \equiv y_M + L\left[f_N y_N + (1-f_N)y_S\right] = c_M + L\left[f_N(c_N+\theta)+(1-f_N)c_S\right], \tag{2}$$

Total transfers to family members who are living with migrants in host country *N* are given by $T = Lf_N t$. Total remittances sent to family members who remained in source country *S* are given by $R = L(1-f_N)r$.

The solution to equation (1) subject to the budget constraint (2) is:

$$u'\left(c_M^*\right) = V'\left(c_N^*\right) = V'\left(c_S^*\right) = \frac{W'(Lf_N^*)}{t^*+\theta-r^*} > 0, r^* < t^*+\theta,^{7,\,8} \tag{3}$$

where asterisks denote optimum values. Since $V'\left(c_N^*\right) = V'\left(c_S^*\right)$, we have $c_N^* = c_S^*$.

We now turn to the impact on remittances of changes in migrants' education level (Section IIIA), income of family members in the home country (Section IIIB), home country financial development (Section IIIC), population size (Section IIID), and expected growth of home country family members' income (Section IIIE). Section IIIF summarizes the main findings.

A. Migrants' Education Level

Migrants' income y_M tends to increase with their education level. The equality of marginal utilities in equation (3) implies that the increase in c_M^* is smaller than the increase in y_M since part of the increase in migrants' income is spent on $c_N^* = c_S^*$ and on f_N^*. Total remittances R^* are thus subject to two opposing forces. First, since part of the increase in migrants' income is spent on c_S, per capita remittances r^* increase. On the other hand, the share of remittance recipients $(1-f_N^*)$ falls. Thus, the impact on $R^* = (1-f_N^*)r^*L$ is ambiguous.[9]

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[7] Note that if $r^* \geq t^*+\theta, f_N^* = 1$ and $R^* = 0$ because bringing family members over and giving them transfers is cheaper than or equally costly as sending them remittances, and their presence also raises migrants' utility.

[8] Faini's (2007) solution is different from equation (3) in that $W'\left(Lf_N^*\right)$ is divided by θ rather than $t^*+\theta-r^*$. The reason is that the cost migrants consider in determining f_N^* is assumed to be the real resource cost θ of bringing family members over. However, the cost migrants are concerned with is the economic or opportunity cost $t^*+\theta-r^*$, i.e., the real resource cost θ plus the difference between the transfers migrants make to each family member in the host and in the home country $\left(t^*-r^*\right)$.

[9] The functional form of *u*, *V*, and *W* must be specified in order to determine the impact on R^*. Note also that migrants' and family members' education may be positively correlated because educated migrants are more likely to come from better-educated families, particularly in the case of developing countries. It is easy to show that the impact on R^* is also ambiguous in this case.

B. Source Country Family Members' Income

From equation (3), an increase in y_S results in a smaller increase in c_S^* because c_N^*, c_M^* and f_N^* also increase. Thus, $r^* = c_S^* - y_S$ and $(1-f_N^*)$ fall, implying that $R^* = (1-f_N^*)r^*L$ falls as well.

C. Financial Sector Development in the Source Country

This section assumes positive remitting costs in source countries that decline with these countries' level of financial development (Freund and Spatafora 2005). It examines the impact of a change in remitting costs in the absence of informal remittance channels as well as in the presence of such channels. The main findings are as follows: (i) in the absence of informal remittance channels, the impact of financial development on remittances is ambiguous; and (ii) in the presence of informal remittances, formal remittances are likely to increase with the level of financial development because the reduction in remitting costs leads to a shift from informal to formal remitting channels. Freund and Spatafora (2005) have found this to be the case, suggesting that R^* increases with source countries' level of financial development. Derivation of these results is provided in Appendix 2.

D. Increase in Population

Another key issue is the impact on remittance flows of an increase in the overall family size, which is a proxy for the home country population that is dependent on remittances. The analysis provided in Appendix 2 shows that per capita remittances r^* fall and total remittances R^* increase as family size L increases.[10]

E. Expected Economic Growth

Appendix 2 presents a two-period version of the model in order to derive the impact of expected economic growth. The model shows that remittances fall with increases in source country current income, expected income, and expected economic growth.

F. Testable Implications

Based on analyses provided in Sections IIIA to IIIE, we list the main predictions about the impact of the variables of interest on remittances. The main predictions are:

[10] Population may also increase because the number of families N increases. In that case, r^* and R^* remain unchanged and total remittances NR^* increase.

(i) An increase in migrants' education level has an ambiguous impact on remittances.

(ii) An increase in current income in the home country has a negative impact on remittances.

(iii) An increase in expected economic growth in the home country has a negative impact on remittances.

(iv) An increase in financial development in the home country has a positive impact on remittances.

(v) An increase in population in the home country has a positive impact on remittances

These predictions are tested in Section VII, with special attention paid to endogeneity issues.

IV. Education and Remittances: What Do Regional Aggregates Show?

The mean values of some of the key country-level variables are presented in Table 1 for the year 2000. The first column shows that the ratio of remittances to GDP is equal to 2.95% in Sub-Saharan Africa (SSA), 3.38% in the Middle East and North Africa (MENA), and 2.47% in South Asia. Countries with smaller ratios of remittances to GDP are Latin America and the Caribbean (LAC) at 1.31%, Eastern and Central Europe at 0.88%, East Asia and Pacific (EAP) at 0.58%, and Western Europe at 0.48%. Thus, poorer regions (see last column of Table 1) have higher remittance-to-GDP ratios than richer ones.

The second column shows a high degree of variation in the migrant-to-population ratio, from a low of 0.21% in South Asia to a high of 3.56% in Western Europe, with the latter mainly due to intra-European labor flows. It is clear that the size of the regions' population has an important impact on that ratio. For instance, the ratio for Western Europe would be substantially smaller if the region consisted of fewer countries.

Evidence on migrants' education level is from Docquier and Marfouk (2006). It shows that more than half of the migrants from SSA and South Asia have tertiary education, and that migrants are significantly more educated than the rest of the population for all the regions. The ratio of the share of the educated in total migrants divided by their share in the home country population (i.e., the third to the fourth columns), which Docquier and Marfouk (2006) refer to as the "schooling gap", is lowest in Western Europe (34.3/18.63 or about 1.8), followed by Eastern and Central Europe (2.6), MENA and LAC (3.2), and

substantially higher for EAP (7.6), South Asia (12.6), and SSA (15.9). Given these figures, it is no wonder that the brain drain has become an issue of great concern in developing regions, especially in South Asia and SSA—the poorest ones—where the problem is particularly acute.

Table 1: Summary Statistics by Geographic Region (mean values)

	Rem/GDP (percent) (1)	Mig/Pop (percent) (2)	Ratio of University-Educated Migrants (3)	Ratio of University-Educated Population (4)	GDP Per Capita, PPP (2000 constant, international $)
Latin America and Caribbean	1.31	2.39	37.61	11.69	7,378
Western Europe	0.48	3.56	34.30	18.63	24,569
Eastern and Central Europe	0.88	1.55	44.98	17.45	7,798
Middle East and North Africa	3.38	2.09	30.34	9.37	5,396
Sub-Saharan Africa	2.95	0.39	55.37	3.48	2,282
South Asia	2.47	0.21	55.34	4.38	2,203
East Asia and Pacific	0.58	0.36	49.86	6.59	5,827
Sample average	1.44	0.91	48.26	7.92	6,386

Note: Sample size = 82 countries. Figures are weighted by population. Figures in columns (1) and (4) are the mean values for the period 1998–2002; figures in columns (2) and (3) are for the year 2000.

Sources: *Balance of Payments Statistics* (IMF, various years); *World Development Indicators* (World Bank 2006); Docquier and Marfouk (2006).

V. Econometric Specification

We estimate the following equation that captures the variables identified in the analytical model from the previous section:

$$\log REM_i = \alpha + \beta_1 MIG_i + \beta_2 FD_i + \beta_3 \log GDP_i + \beta_4 \log PCGDP_i + \beta_5 GDPgrowth_i^e + \beta_6 Edu_i + \varepsilon_i, \quad (4)$$

where REM_i denotes remittances (or per capita remittances, depending on the specification); MIG_i is the log of migrants (or the ratio of migrants to population, again depending on the specification); FD_i is the level of financial sector development (measured as the ratio of bank deposits to GDP); GDP_i and $PCGDP_i$ (per capita GDP) are measured in purchasing power parity (PPP) terms; $GDPgrowth_i^e$ is the expected growth rate of GDP; Edu_i is the ratio of migrants with tertiary education to the total number of migrants, and ε_i is an error term.

Table 2 provides summary statistics for the variables used in the estimation. A few observations stand out. First, the per capita remittances, most of the instruments, and over half of the independent variables exhibit high coefficients of variation, a desirable

feature for estimation purposes. Second, the average share of migrants with tertiary education is large at close to 40%, and so is the tertiary school enrollment rate at close to 25%.

The migration level and migrants' education variables are likely to be endogenous. The reason is that sending remittances is a major motivation for migration, and a number of microeconometric studies have shown that remittances have a positive impact on education (Cox-Edwards and Ureta 2003, Duryea et al. 2005, Yang and Martinez 2006, Mansuri 2007).

Table 2: List of Dependent and Explanatory Variables

	Mean	Standard Deviation
Dependent variables		
Log of remittances	19.53	1.98
Log of remittances per capita	3.23	1.61
Independent variables		
Log of migrants abroad	12.20	1.64
Ratio of migrants abroad to population size (percent)	4.59	7.36
Ratio of bank deposit to GDP	0.46	0.28
Log of GDP	24.22	2.25
Log of GDP per capita (in PPP)	8.73	1.09
Expected GDP growth rate (1995–1999 annual growth rate, in percent)	3.78	2.25
Ratio of migrants with tertiary education to total number of migrants (percent)	39.58	14.06
Instrumental variables		
Log of distance (kilometers)	1.17	0.97
Dummy for English language	0.32	
Island dummy	0.16	
Landlock dummy	0.16	
Labor market participation rate (percent)	68.94	7.73
Tertiary school enrollment rate (percent)	24.67	19.56
Ratio of tertiary educated migrants in the United States to the origin country's population in 1970 (percent)	0.06	0.09

Note: All the variables are the mean values for the period between 1998–2002 except for the logarithm of migrants abroad, the ratio of migrants to population, and the ratio of migrants with tertiary education, which are the figures for the year 2000. Tertiary school enrollment rate are the (unweighted) mean values for the period between 1990 to 2000.

We control for the potential endogeneity of migration and migrants' education by instrumental variables (IV) estimation. The instruments used for migration are: great-circle distance between home and host countries; labor market participation rate in home countries; and dummy variables for home countries that are landlocked, are islands, and where English is spoken. Distance raises costs and has a significant and robust negative impact on remittances and migration (Mayda 2006). The same holds for the two location dummies—being an island and landlocked—as they also raise migration costs, while the opposite holds where English is spoken. The labor market participation rate reflects the

availability of labor market opportunities in home countries and we would expect it to have a negative relationship with the migration variables.

The migrant education variable is the share of tertiary-educated migrants among total migrants. As mentioned above, a number of studies have shown that remittances have a positive impact on school attainment in home countries (Cox-Edwards and Ureta 2003, Duryea et al. 2005, Yang and Martinez 2006, Mansuri 2007). This reverse causality suggests that accounting for potential endogeneity bias is likely to be important. Instruments used for migrants' education level in the IV estimation are the tertiary school enrollment rate, and the number of tertiary educated migrants in the US relative to the population size of their origin country in 1970, all of which should (and actually do) raise migrants' education level.

VI. Data

The data cover 82 countries for which we have observations on all the variables for the year 2000. Aggregate data on remittances are from the International Monetary Fund's *Balance of Payments* statistics, and consist—according to the standard definition—of the sum of workers' remittances, compensation of employees, and migrant transfers. Data on the number of migrants in OECD countries, and on migrants with tertiary education relative to all migrants, are from Docquier and Marfouk (2006). The ratio of bank deposits to GDP, our financial sector development variable, is from the *International Financial Statistics*. Most of the other variables are from the *World Development Indicators*. Appendix 1 provides a description of the variables and their sources in more details.

VII. Estimation Results

Equation (4) is estimated by ordinary least squares (OLS) in Section VIIA and by IV method in Section VIIB.

A. Ordinary Least Squares Estimation

We estimate three regressions, with remittances measured either as the log of remittances or of remittances per capita. OLS results are shown in columns 1 to 3 of Table 3. As expected, we obtain positive semi-elasticities of remittances and per capita remittances with respect to the ratio of migration to population in columns (1) and (2), significant at the 1% and 5% level, respectively. We also obtain a positive elasticity of remittances with respect to the number of migrants, with a value of 0.361 and significant at the 10% level (column 3).

Table 3: OLS and IV Regression Results for Determinants of Remittances

	OLS			IV (1)			IV (2)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log of Rem per capita	Log of Rem	Log of Rem	Log of Rem per capita	Log of Rem	Log of Rem	Log of Rem per capita	Log of Rem	Log of Rem
Migrants/population	0.073***	0.050**		0.140***	0.136**		0.155***	0.183**	
	[0.020]	[0.022]		[0.039]	[0.062]		[0.041]	[0.085]	
Log of migrants			0.361*			0.800**			0.514**
			[0.183]			[0.324]			[0.237]
Ratio of migrants with tertiary edu.	-0.022**	−0.024**	−0.012	−0.014	−0.020*	0.005	−0.028*	−0.033*	−0.028*
	[0.010]	[0.011]	[0.012]	[0.011]	[0.011]	[0.017]	[0.016]	[0.019]	[0.017]
Bank deposit/GDP	0.784	1.028	1.110	0.615	0.486	0.830	0.776	0.330	1.209*
	[0.887]	[0.692]	[0.675]	[0.825]	[0.828]	[0.695]	[0.828]	[0.959]	[0.666]
Log of GDP		0.860***	0.531***		1.054***	0.269		1.190***	0.482***
		[0.121]	[0.113]		[0.179]	[0.204]		[0.261]	[0.146]
Log of GDP per capita	0.399**	-0.792***	−0.562***	0.383**	−1.003***	−0.431*	0.321*	−1.202***	−0.634***
	[0.183]	[0.223]	[0.203]	[0.174]	[0.257]	[0.232]	[0.180]	[0.351]	[0.215]
Expected GDP growth	−0.128*	−0.107	−0.111*	−0.124**	-0.084	−0.100*	−0.129**	-0.074	-0.110*
	[0.067]	[0.070]	[0.065]	[0.062]	[0.069]	[0.057]	[0.061]	[0.074]	[0.060]
Constant	0.392	6.274***	7.550***	0.017	3.002	6.810***	0.974	1.790	8.091***
	[1.375]	[2.297]	[1.987]	[1.372]	[3.237]	[2.207]	[1.551]	[4.022]	[2.086]
Observations	82	82	82	82	82	82	82	82	82
R2	0.41	0.62	0.64	0.33	0.57	0.59	0.28	0.48	0.61
F-statistic (p-value)	12.33 (0.00)	18.69 (0.00)	18.30 (0.00)	13.09 (0.00)	12.85 (0.00)	15.29 (0.00)	13.44 (0.00)	10.67 (0.00)	17.25 (0.00)
Overidentification χ2 (p-value)				3.26 (0.20)	1.49 (0.47)	2.88 (0.24)	2.03 (0.36)	0.63 (0.73)	2.00 (0.57)

* means significant at the 10% level; ** means significant at the 5% level; *** means significant at the 1% level.

Note: Robust standard errors in brackets. In the case of IV(1) i.e., column 4–6, the only variable instrumented is migration, while in the case of IV(2), i.e., column 7–9, both the migration and education variables are instrumented.

The impact of migrants' education level on remittances is negative in all specifications and significant at the 5% level in two of the three specifications (columns 1 and 2). The negative sign of the coefficients implies that as migrants' level of education increases, remittance flows—whether measured as total remittances or remittance per capita—decline. The impact of home countries' financial sector development, measured as the bank deposits/GDP ratio, is positive, though not significant. As predicted by the model, the elasticity of total remittances with respect to per capita GDP is negative and significant, as reported in columns (2) and (3), with values of –0.792 and –0.562, respectively. Interestingly, the elasticity of per capita remittances with respect to per capita GDP is positive in column (1). This might be due to the fact that the correlation coefficient between these two variables is 0.81, i.e., they are highly correlated.

The elasticity of remittances with respect to GDP in columns (2) and (3) is 0.860 and 0.531, respectively, and is significant at the 1% level. This may reflect the fact that, for a given per capita income level, a larger economy offers greater investment opportunities, resulting in an increase in remittances.

The 2000 per capita GDP already captures the economic growth over the 1995–1999 period, suggesting that the latter can be interpreted as the expectation in 2000 of the future rate of growth. As predicted by the model, the expected growth variable has a negative impact on remittances, significant at the 10% level in two of the three regressions (columns 1 and 3).

Finally, the model predicts a positive (negative) impact of population on total (per capita) remittances R^* (r^*). These results are confirmed in the empirical analysis. Keeping GDP constant, the elasticity of remittances with respect to population is found to be 0.792 in column (2) and 0.562 in column (3), significant at the 1% level, and the elasticity of per capita remittances with respect to population is –0.399, significant at the 5% level (column 1).

B. Instrumental Variables Estimation

As argued earlier, both the level of migration and the educational composition of migrants are likely to be influenced by the desire and opportunities to send remittances. In order to address the endogeneity problem, both the migration and migrants' education variables are instrumented in this case, with the instruments described in Section V. Results for IV(1) where migration variables are instrumented are reported in columns (4) to (6) of Table 3, while those for IV(2) where both migration and migrants' educational composition are instrumented are reported in columns (7) to (9). The Hansen J-statistics for overidentification are reported at the bottom of Table 3. The results support the validity of our instruments.

The first-stage regression results are summarized in Table 4. Columns (1) to (3) [(4) to (6)] report the results for the migration variables under IV(1) [IV(2)], while columns (7) to (9) report the results for the educational composition of migrants. The coefficients on the instruments are highlighted by the shaded areas in the table. Most of them are statistically significant and have expected signs. The distance between destination and home countries as well as home countries being landlocked are likely to raise migration costs and reduce the level of migration. Contrary to our expectation, the coefficient on the island dummy is positive. Since economic opportunities tend to be relatively limited in island countries, being an island might act as a push factor and raise migration flows. The labor market participation ratio, which also indicates the availability of labor market opportunities, has a negative and significant coefficient as expected. As for the results for the education variables (columns 7 to 9), both the tertiary school enrollment rate and the ratio of tertiary educated migrants in the US in 1970 have statistically significant and expected positive signs.

The second-stage estimation results for IV(1) and IV(2) are presented in columns (4) to (6) and columns (7) to (9) of Table 3, respectively. We first examine the differences between the OLS and IV(1) results and then those between OLS and IV(2).

1. Comparison of OLS and IV(1)

First, the ratio of migrants to population has a positive and significant impact on remittances per capita and on total remittances in both the OLS and IV(1) specifications for columns (1) and (2), and columns (4) and (5), respectively. Total migration has a positive and significant impact on total remittances (columns 3 and 6). It should be noted that these coefficients are substantially greater under IV(1) than under OLS, indicating the importance of the endogeneity concerns. Moreover, the coefficients of the two migration variables in the total remittances regressions have a higher degree of significance under IV(1) than under OLS. The ratio of bank deposits to GDP is not significant in any of the OLS or IV(1) regressions. The GDP variable is positive and significant in both OLS regressions (2) and (3), but only in one IV(1) regression, i.e., column (5) but not column (6). Results for GDP per capita and expected GDP growth are similar under OLS and IV(1). Note that all coefficients have the sign predicted by the model.

The main variable of interest is the ratio of migrants with tertiary education. It has a negative and significant sign (5% level) in two of the three OLS regressions but only in one IV(1) regression (at the 10% level). Thus, the OLS estimation provides a stronger and more convincing result of a negative impact of migrants' education level on per capita and total remittances than obtained under IV(1). In fact, OLS estimation seems to generally perform better than IV(1).

Table 4: First-Stage Regression Results for IV Estimation

	Migration (IV (1))			Migration (IV (2))			Education Composition of Migrants (IV (3))		
	Mig/Pop		Log of Mig	Mig/Pop		Log of Mig	Ratio of migrants with tertiary		
	(1) Log of Rem per capita	(2) Log of Rem	(3) Log of Rem	(4) Log of Rem per capita	(5) Log of Rem	(6) Log of Rem	(7) Log of Rem per capita	(8) Log of Rem	(9) Log of Rem
Ratio of migrants with tertiary edu.	−0.196***	−0.141***	−0.030***						
	[0.053]	[0.050]	[0.009]						
Bank deposit/GDP	1.703	4.490*	0.949*	0.026	3.841	0.802	8.215	5.054	3.304
	[2.820]	[2.663]	[0.507]	[2.999]	[2.817]	[0.534]	[5.650]	[5.853]	[6.051]
Log of GDP		−1.564***	0.536***		−1.787***	0.585***		1.480*	1.701*
		[0.390]	[0.067]		[0.404]	[0.079]		[0.840]	[0.893]
Log of GDP per capita	0.208	2.039**	−0.367**	1.342	2.715**	−0.532**	−4.455*	−5.593**	−4.245
	[0.915]	[0.951]	[0.172]	[1.321]	[1.222]	[0.237]	[2.489]	[2.538]	[2.683]
Expected GDP growth	−0.112	−0.259	−0.002	−0.098	−0.256	−0.014	−0.124	0.007	-0.120
	[0.283]	[0.261]	[0.049]	[0.304]	[0.274]	[0.051]	[0.573]	[0.570]	[0.580]
Log of distance	-0.171	0.345	−0.113	−1.914**	−0.724	−0.363**	8.745***	7.759***	10.151***
	[0.939]	[0.865]	[0.165]	[0.902]	[0.851]	[0.151]	[1.700]	[1.768]	[1.715]
English language dummy	5.159***	4.038***		3.321**	2.673*		9.224***	9.761***	
	[1.572]	[1.460]		[1.614]	[1.451]		[3.042]	[3.015]	
Island dummy	6.779***	3.890**		6.722***	3.572*		−0.209	2.400	
	[2.006]	[1.965]		[2.164]	[2.062]		[4.076]	[4.283]	
Landlock dummy			−0.987***			−1.015***			4.453
			[0.315]			[0.325]			[3.684]
Labor market participation rate			−0.037**			−0.053***			0.366**
			[0.015]			[0.015]			[0.168]
Tertiary school enrollment rate				−0.108*	−0.049	−0.006	0.460***	0.411***	0.317**
				[0.063]	[0.058]	[0.011]	[0.118]	[0.120]	[0.125]
Ratio f tertiary educated migrants in the US to the origin country's population in 1970						3.861**			35.006*
						[1.582]			[17.928]
Constant	7.428	26.811***	6.066***	−4.222	23.971**	6.483**	50.837**	27.482	−13.499
	[8.147]	[8.862]	[2.121]	[10.451]	[11.315]	[2.620]	[19.690]	[23.507]	[29.686]
Observations	82	82	82	82	82	82	82	82	82
R2	0.39	0.50	0.69	0.30	0.45	0.67	0.28	0.47	0.45
Shea Partial R2	0.34	0.19	0.19	0.30	0.11	0.31	0.45	0.35	0.36
F-statistic (p-value)	12.48 (0.00)	5.84 (0.00)	5.64 (0.00)	7.40 (0.00)	2.70 (0.04)	7.19 (0.00)	12.98 (0.00)	12.36 (0.00)	9.05 (0.00)

* means significant at the 10% level; ** means significant at the 5% level; *** means significant at the 1% level.

Note: Robust standard errors in brackets. Columns 1–3 show the first stage regression results for the migration variable equation when instrumenting only the migration variable, i.e., IV(1); columns 4–6 and columns 7–9 report the results for the migration and education variables, respectively, when instrumenting both variables, i.e., IV(2).

2. Comparison of OLS and IV(2)

In general, estimation under IV(2) seems to perform better than that under OLS. Regression (9) provides the best results and is our preferred regression. It should be noted that the results are similar under OLS and IV(2) estimation for the variables migrants over population, total migrants, GDP, GDP per capita, and expected GDP growth.

The main differences between OLS and IV(2) relate to the findings for our main variable, the ratio of migrants with tertiary education, as well as for the financial sector development variable (ratio of bank deposits to GDP). The latter's impact on total remittance flows is now significant under IV(2) in our preferred regression. That impact is positive, as predicted by the model (column 9).

The ratio of migrants with tertiary education has a negative impact on total and per capita remittances in all three regressions under IV(2) but only in two of the three regressions under OLS. Specifically, the variable has a negative and significant impact in our preferred regression in column (9) but not in the corresponding OLS regression (3).[11] A closer examination of the results indicates that the coefficients are actually more negative under IV(2), once again indicating the importance of correcting for the endogeneity problems. For instance, a 1 percentage point increase in the ratio of university educated migrants leads to a 2.8% decline in total remittances. Faini (2007) also found a negative impact of migrants' education on remittances in various regressions but none of them were significant, Naufal (2007) obtained a positive non-significant impact for Nicaragua, and Rodriguez and Horton (1994) found no impact for the Philippines.

VIII. Conclusion

Contrary to previous analyses, this study obtains unambiguous results regarding the relationship between migrants' education level and remittance flows. The findings clearly indicate that remittances decline with migrants' education level. Consequently, the claim that the negative impact for sending countries of skilled relative to unskilled labor migration is mitigated or even offset by the fact that skilled migrants remit more than unskilled ones is not supported by the evidence.

This paper makes several additional contributions to the literature on remittances and migrants' education. First, it presents a richer analytical model and derives additional testable hypotheses with respect to several important variables such as expected economic growth and financial development in the sending country, in addition to more

[11] This result also obtains in IV(2) regressions (7) and (8) and in OLS regressions (1) and (2), with a somewhat higher degree of significance in the latter case.

standard variables such as migration levels and GDP per capita. The paper shows that per capita income and expected economic growth have a negative impact on total and per capita remittances, while the size of the population, national income, and level of financial sector development have a positive impact. Second, it accounts for the endogeneity of migration and migrants' education level, a critical issue that previous studies abstracted from.

These findings provide an additional source of concern about the brain drain for source countries, especially those with low levels of human capital and high rates of skilled labor migration. The results should raise the urgency of finding (non-distortive) ways to reinforce skilled migrants' links with their country of origin. Such an outcome might possibly be achieved as part of a cooperative arrangement between source and (their principal) host countries and would likely include return and circular migration policies (Schiff 2007).

Appendix 1: Variable Definitions and Sources

Variable name	Description	Source
Remittances (R) to GDP	R/GDP (%), R = workers' remittances + compensation of employees + migrants' transfers (Appendix A in Freund-Spatafora 2005)	*Balance of Payments Statistics* (IMF)
Log of remittances	Log of remittances (constant 2000 US$), which are calculated by multiplying the ratio of remittances to GDP by GDP figures	Remittances: *Balance of Payments Statistics* (IMF) GDP: *World Development Indicators*
Log of remittance per capita	Log of remittances per capita (constant 2000 US$)	Remittances: *Balance of Payments Statistics* (IMF) Population: *World Development Indicators*
Log of migrants	Log of total number of migrants in OECD countries	Docquier and Marfouk (2006)
Migrants/ population	Ratio of migrants in OECD to population size of home countries (percent)	Docquier and Marfouk (2006)
University-educated to total migrants	Ratio of tertiary educated to total number of migrants (percent)	Docquier and Marfouk (2006)
Bank deposits to GDP	Bank deposit to GDP = {(0.5)*[F(t)/Pe(t)+ F(t-1)/Pe(t-1)]}/[GDP(t)/Pa(t)], F = demand + time + saving deposits	*International Financial Statistics* (IMF)
Log GDP	Log of GDP (constant 2000 US$)	*World Development Indicators*
LogGDP per capita	Log of GDP per capita, PPP-adjusted (constant 2000 int'l)	*World Development Indicators*
Expected GDP growth	Average GDP growth rates for 1995–1999 (annual percent)	*World Development Indicators*
English language dummy	Equal to 1 = countries where English commonly spoken	Docquier (2006), *World Factbook* (CIA 2006)

continued.

Appendix 1. *continued.*

Variable name	Description	Source
Log of distance	Log of host to home country great-circle distance. For Australia, Canada, EU, New Zealand, US: zero distance; Eastern and Central Europe, Middle East, Africa: average distance to EU countries weighted by number of migrants; Central America, Mexico, Caribbean, South America: distance to US; South Asia, East Asia and Pacific: distance to US/Canada and EU countries weighted by number of migrants	Authors' calculations based on data from *World Factbook* (CIA 2006)
Island dummy	Country being an island (1= home country is an island)	Docquier (2006) and *World Factbook* (CIA 2006)
Landlock dummy	Country being landlocked (1 = home country being landlocked)	Docquier (2006) and *World Factbook* (CIA 2006)
Labor market participation rate	Labor market participation rate—percentage of population aged 15–64 who are in the labor market	*World Development Indicators*
Tertiary enrollment rate	Rate of tertiary school enrollment (percent)	*World Development Indicators*
Tertiary-educated migrants in the US to the origin country's population in 1970	Ratio of tertiary educated migrants in the US to the origin country's population in 1970 (percent)	Migrants: US Census (2000) Population: *World Development Indicators*

Appendix 2: Derivation of Results

This Appendix provides derivations of the main findings presented in Sections IIIC, IIID, and IIIE.

Financial Sector Development in the Source Country

This section assumes positive remitting costs in source countries that decline with their level of financial development. It examines the impact of a change in remitting costs, first, in the absence of informal remittance channels, then second, in the presence of such channels.

Formal Remittances

With a positive remittance cost $0 < \Phi < 1$, the home-country family members' budget constraint is now $c_S^* = y_S + r^*(1-\phi)$, and the budget constraint (equation 2) and optimum (equation 3) become:

$$y \equiv y_M + L\left[f_N y_N + (1-f_N)(y_S - r\phi)\right] = c_M + L\left[f_N(c_N + \theta) + (1-f_N)c_S\right] \quad \text{(A1)}$$

$$u'(c_M^*) = V'(c_N^*) = (1-\phi)V'(c_S^*) = \frac{W'(Lf_N^*)}{t^* + \theta - r^*} > 0. \quad \text{(A2)}$$

Note that $c_N^* > c_S^*$ in this case. An increase in source countries' financial development reduces remittance costs Φ,[12] implying that $u'(c_M^*) = V'(c_N^*) = \frac{W'(Lf_N^*)}{t^* + \theta - r^*} < (1-\phi)V'(c_S^*)$ at the original values of c_M^*, c_N^* and c_S^*. Thus, $V'(c_S^*)$ must fall and c_S^* must increase in order to restore the equality (equation A1). Thus, $dc_S^*/d\phi = (1-\phi)(dr^*/d\phi) - r^* < 0$ (since Φ increases in this case) and $(1-\phi)dr^*/d\phi < r^*$. Thus, the impact of a decrease in Φ on r^* is ambiguous and so is the impact on R^*.[13]

Formal and Informal Remittances

We now add informal remittance channels to the analysis, with costs such that both formal and informal remittance channels coexist. The level of per capita remittances r in the home country is $r = r_F + r_I$, where r_F (r_I) is the formal (informal) remittance level. As is implicitly assumed in the debate on ways to reduce formal remitting costs, Freund and Spatafora (2005) find that formal and informal remittance channels are substitutes, i.e., $dr_I/d\phi > 0$. Thus, r_I falls with the decrease in Φ, implying that the change suggesting that implying that the change in r_F^* associated with a decrease in Φ is larger and more likely to be positive than the change in r^*. This is supported by Freund and Spatafora (2005) who find in their empirical study of informal remittances that "… the

[12] These include the explicit fees charged by these institutions, the exchange rate premium they obtain in the conversion of foreign currency remittances into local currency, and the time and other costs incurred.

[13] This result can be explained by the fact that a decline in remitting costs Φ leads to opposite income and substitution effects on r^*. First, the reduction in Φ implies an increase in y (equation A1) that is spent in part on c_M, c_N, and f_N (equation A2), implying that r^* falls. On the other hand, the reduction in Φ means that migrants' marginal cost of c_S declines relative to that of c_M, c_N, and f_N, providing an incentive to increase r^* at the expense of c_M, c_N, and f_N. Consequently, the net effects on r^* and R^* are ambiguous, though the fact that f_N^* increases makes a decline in R^* more likely.

cost of sending remittances primarily affects the channel by which money is sent home and not the amount" (Freund and Spatafora 2005, 9). From our analysis and Freund and Spatafora's findings, we conclude that formal remittances are likely to increase with the level of financial development.

Increase in Population

Another key issue is the impact on remittance flows of an increase in the overall family size, which is a proxy for the home country population that is dependent on remittances. From the budget constraint (2) and the optimum (3), c_M falls and $L\left[f_N c_N + \left(1-f_N\right)c_S\right]$ increases at the original values for t^* and r^*. Thus, $u'(c_M)$ increases and, by equation (3), $V'(c_N) = V'(c_S)$ and $W'(Lf_N)/(t+\theta-r)$ increase as well. Thus, $c_N^* = c_S^*$ fall.

How does the portion of the family living with the migrant, Lf_N^*, change? Since $t = c_N - y_N$ and $r = c_S - y_S$, y_S and y_N do not change, and $c_N^* = c_S^*$ fall, it follows that t^* and r^* fall by the same amount. Thus, $t^* + \theta - r^*$ remains unchanged and $W'(Lf_N)$ increases. Hence, Lf_N^* falls and, since r^* falls, total transfers $T^* = Lf_N^* t^*$ falls as well. Since c_M^*, T^* and Lf_N^* fall, R^* increases. Thus, as family size increases, migrants spend less on themselves and on their family members living in the host country, and spend more on family members in the home country, though less on each one of them. In conclusion, r^* falls and R^* increases as family size L increases.[14]

Expected Economic Growth

The model is modified in order to incorporate economic growth. Assume individuals are risk-neutral and live for two periods, with all decisions made in period 1. Define $c_i \equiv (c_i^1, c_i^2)$ and $y_i \equiv (y_i^1, y_i^2)$, where c_i^t denotes consumption (or expected consumption) in period t, and similarly for income (i = M, N, S). Then, migrants' utility is the same as in equation (1).[15]

The optimum conditions are $\frac{\partial u}{\partial c_M^1} = \frac{\partial u}{\partial c_M^2} = \frac{W'(Lf_N)}{t+\theta-r} = \frac{\partial V_N}{\partial c_N^1} = \frac{\partial V_N}{\partial c_N^2} = \frac{\partial V_S}{\partial c_S^1} = \frac{\partial V_S}{\partial c_S^2}$. The budget constraint is as in equation (2), with c_i and y_i replaced by $C_i \equiv c_i^1 + c_i^2$ and $Y_i \equiv y_i^1 + y_i^2$, the (present value of) lifetime consumption and income, respectively. We showed in Section IIIC that r^* and R^* fall with y_S^1. It is easy to show that the same result obtains for an increase in y_S^2 since migrants' decisions depend on Y_S and not on its separate components y_S^1 and y_S^2. Thus, remittances decline with increases in both current and expected income. Moreover, for a given current income y_S^1, remittances fall with expected economic growth.

[14] Population may also increase because the number of families F increases. In that case, r^* and R^* increases remains unchanged and R^* increases.

[15] The budget constraint is as in equation (2), with c_i (y_i) replaced by $C_i \equiv c_i^1 + c_i^2, Y_i \equiv y_i^1 + y_i^2$, which represent the (present value of) lifetime consumption and income, respectively.

References

Aggarwal, R., and A. Horowitz. 2002. "Are International Remittances Altruism or Insurance? Evidence from Guyana Using Multiple-Migrant Households." *World Development* 30:2033–44.

Beine, M., F. Docquier, and H. Rapoport. 2001. "Brain Drain and Economic Growth: Theory and Evidence." *Journal of Development Economics* 64:275–89.

———. 2008. "Brain Drain and Human Capital Formation in Developing Countries: Winners and Losers." *Economic Journal* 118(528):631–52.

Bhagwati, J., and K. Hamada. 1974. "The Brain Drain, International Integration of Markets for Professionals and Unemployment." *Journal of Development Economics* 1:19–42.

Burns, A., and S. Mohapatra. 2008. "International Migration and Technological Progress." *Migration and Development Brief* 4(February 1). DECPG, World Bank.

CIA. 2006. *The World Factbook.* Central Intelligence Agency, Washington, DC. Available: cia.gov/library/publications/the-world-factbook/index.html.

Chami, R., F. Fullenkamp, and S. Jahjah. 2003. Are Immigrant Remittance Flows a Source of Capital for Development? IMF Working Paper WP/03/189, International Monetary Fund, Washington, DC.

Cox-Edwards, A., and M. Ureta. 2003. "International Migration, Remittances and Schooling: Evidence from El Salvador." *Journal of Development Economics* 72:429–61.

Docquier, F., and A. Marfouk. 2006. "International Migration by Educational Attainment, 1990-2000." In C. Ozden and M. Schiff, eds., *International Migration, Remittances and the Brain Drain*. New York: Palgrave MacMillan.

Docquier, F., and K. Sekkat. 2006. Brain Drain, What Do We Know? Working Paper No. 31, Agence Française de Développement, Paris, France.

Duryea, S., E. Lopez Cordova, and A. Olmedo. 2005. "Migrant Remittances and Infant Mortality: Evidence from Mexico." Inter-American Development Bank, Washington, DC. Mimeo.

El-Sakka, M. I. T., and R. McNabb. 1999. "The Macroeconomic Determinants of Emigrant Remittances." *World Development* 27(8):1493–502.

Faini, R. 2007. "Remittances and the Brain Drain: Do More Skilled Migrants Remit More?" *World Bank Economic Review* 21(2):177–91.

Freund, C., and N. Spatafora. 2005. Remittances: Transaction Costs, Determinants, and Informal Flows. Policy Research Working Paper 3704, World Bank, Washington, DC.

Gupta, P. 2005. Macroeconomic Determinants of Remittances: Evidence from India. IMF Working Paper WP/05/224, International Monetary Fund, Washington, DC.

Haque, N. U., and S. J. Kim. 1995. Human Capital Flight: Impact of Migration on Income and Growth. IMF Staff Papers 42(3):577–607.

Mansuri, G. 2007. "Does Work Migration Spur Investment in Origin Communities? Entrepreneurship, Schooling, and Child Health in Rural Pakistan." In C. Ozden and M. Schiff, eds., *International Migration, Economic Development and Policy.* Washington, DC: Palgrave Macmillan for the World Bank.

Mayda, A. M. 2006. "International Migration: A Panel Data Analysis of the Determinants of Bilateral Flows." Georgetown University, Washington, DC. Mimeo.

McGarry, K., and R. Schoeni. 1995. "Transfer Behaviour in the Health and Retirement Study: Measurement and Redistribution of Resources within the Family." *Journal of Human Resources* 30(Supplement):S184–S226.

Miyagiwa, K. 1991. "Scale Economies in Education and the Brain Drain Problem." *International Economic Review* 32(2):743–59.

Mountford, A. 1997. "Can a Brain Drain be Good for Growth in the Source Country." *Journal of Development Economics* 53:287–303.

Naufal, G. 2007. Who Remits? The Case of Nicaragua. IZA Discussion Paper No. 3081, Institute for Study of Labor, Bonn.

Ozden, C., and M. Schiff, eds. 2006. *International Migration, Remittances and the Brain Drain*. Washington, DC: Palgrave Macmillan for The World Bank.

———. 2007. *International Migration, Economic Development and Policy.* Washington, DC: Palgrave Macmillan for The World Bank.

Rapoport, H., and F. Docquier. 2006. "The Economics of Migrants' Remittances." In S. C. Kolm and J. Mercier-Ythier, eds., *Handbook of the Economics of Giving, Altruism and Reciprocity.* Vol. 2. Amsterdam: Elsevier-North Holland.

Rodriguez, E., and S. Horton. 1994. "International Return Migration and Remittances in the Philippines." In D. O'Connor and L. Farsakh, eds., *Development Strategy, Employment and Migration: Country Experiences.* OECD Development Centre, Paris.

Schiff, M. 2007. Optimal Immigration Policy: Permanent, Guest-Worker, or Mode IV? IZA Discussion Paper No. 3083. Available: ftp.iza.org/dp3083.pdf.

Schiff, M., and Y. Wang. 2008. "Brain Drain and Productivity Growth: Are Small States Different?" DECRG-Trade, World Bank. Mimeo.

Straubhaar, T. 1986. "The Determinants of Workers' Remittances: The Case of Turkey, *Weltwirtschaftliches Archiv* 122(4):728–40.

Wahba, J. 2007. "Return to Overseas Work Experience: The Case of Egypt." In C. Ozden and M. Schiff, eds., *International Migration, Economic Development and Policy.* Washington, DC: Palgrave Macmillan for The World Bank. .

World Bank. 2005. *Global Economic Prospects: Economic Implications of Remittances and Migration.* Washington, DC.

Yang, D., and C. A. Martinez. 2006. "Remittances and Poverty in Migrants' Home Areas: Evidence from the Philippines." In C. Ozden and M. Schiff, eds., *International Migration, Remittances and the Brain Drain*. Washington, DC: Palgrave Macmillan for The World Bank.

About the Paper

Yoko Niimi, Caglar Ozden, and Maurice Schiff examine whether remittances to origin countries increase with migrants' education level—one of the fundamental questions in the brain drain and remittances-related policy debate in recent years. Contrary to the frequently made claim that the adverse impact of the brain drain is mitigated or even offset by the fact that skilled migrants remit more than unskilled ones, the findings clearly indicate that remittances decline with migrants' education level.

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