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Globalization, Migration and Development: The Role of Mexican Migrant Remittances

Ernesto López-Córdova

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GLOBALIZATION, MIGRATION AND DEVELOPMENT: THE ROLE OF MEXICAN MIGRANT REMITTANCES

Ernesto López-Córdova^{*}

In this paper we present evidence suggesting that international migrant remittances generally lead to improved developmental outcomes. Using a cross-section of Mexican municipalities in the year 2000, we show that increases in the fraction of households receiving international remittances are generally correlated with better schooling and health outcomes and with reductions in some dimensions of poverty. Our results take into account the likely endogeneity between migration, remittances and developmental outcome variables, and they suggest that measures to facilitate remittance flows are desirable.

I. INTRODUCTION

Ongoing debates on the merits and shortcomings of globalization have mainly focused on the consequences of increased capital and goods flows on economic development. Until recently, international migration has received relatively little attention in such discussions.¹ This is somewhat surprising, since accounts of the first wave of globalization, toward the end of the nineteenth century, highlight the impressive movements of people around the world (O'Rourke and Williamson [1999]). In part, the oversight reflects the paucity of reliable data on migration.

This paper contributes toward filling this gap. It explores whether the movement of people across borders fosters development, just as capital and trade flows might too. In particular, the paper focuses on the role played by migrants' remittances to families in their countries of origin.

The substantial magnitude of remittance flows has become clear recently. For instance, MIF [2005] uses careful household surveys to measure remittance flows to Latin America and the Caribbean. Its results indicate that in 2004, these exceeded 45 billion dollars, more than the combined flows of foreign direct investment and development assistance, making the region the largest remittance recipient in the world. Further, existing statistics suggest that remittance flows

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¹ For an example, see the articles in (Harrison [2005]), which focus only on trade and financial liberalization.

to developing countries have grown from 31 billion dollars in 1990 to an estimated 126 billion in 2004 (World Bank [2005] p. 28).²

There is also an emerging consensus that beyond having grown rapidly, remittances are less volatile than other private capital flows, are less pro-cyclical -and might even be countercyclicaland that they partially accrue to households with dire needs. All this makes them a potentially important tool for promoting development in recipient nations.

To test some of these notions, this paper analyzes the case of Mexico, a country that has not only experienced a fast integration to the global economy through trade and capital flows, but through migration as well. International data indicate Mexico is the second largest remittance recipient in the world, after India, followed by China, Pakistan and the Philippines.

Specifically, the paper looks at a cross-section of Mexican municipalities and analyzes whether, as the fraction of remittance-receiving households in a municipality rises, development indicators improve.³ We pay particular attention to schooling and health status, as well as to poverty and a marginalization index that summarizes several welfare measures. The results suggest that an increase in the fraction of households receiving remittances reduces infant mortality and illiteracy among children 6 to 14 years of age, while at the same time alleviating some dimensions of poverty and improving living conditions. Remittances seem to improve school attendance among young children, although we find the opposite seems to be the case among teenagers.

To address the potential endogeneity of remittances, we estimate two-stage least-squares models using municipal rainfall patterns and the distance to Guadalajara as instrumental variables. Because these instruments may not be ideal, we also incorporate a rich set of controls that are potentially interesting.

In addition, the results on the impact of remittances hold even after we account for migration more broadly. This is relevant because remittances and migration may affect development outcomes in independently and possibly conflicting directions. For example, migration may disrupt family life and have a negative impact on child schooling, while, remittances may relax income constraints and allow households to invest in education (Hanson and Woodruff [2003]). In contrast, migration may allow household access to better healthcare information (Hildebrandt and McKenzie [2004]), and that positive impact may be reinforced by health expenditures financed by remittance income.

² It is important to acknowledge from the outset, that most data on remittances are fraught with problems. The figures usually cited in international reports rely on balance of payment statistics that likely underestimate true remittance flows, as migrants often rely on informal channels to make transfers. National data are most likely subject to similar shortcomings.

³ There are 32 states in Mexico, including the Federal District, which encompasses most of Mexico City. States are subdivided in municipalities (or *delegaciones*, for the Federal District) and there are in all 2,443 municipalities in the country. A small number of them (as many as 2%) were dropped from our nation-wide regressions due to missing data. As explained below, we report regression results for rural municipalities only (around 1,750). The results using the full sample are qualitatively similar.

Unfortunately, it is very hard to isolate the impact of remittances from that of migration, particularly if one wants to identify arguably exogenous variation in both. In order to control, to some extent, for the separate impact of migration, we use state dummies that capture the existence of historical migration networks, and in some specifications, we also use a proxy for historical migration at the municipal level. The latter is defined as the sum of the distance from the municipality to the 1920s railroad network plus the distance from that point to the US-Mexico border. Despite these efforts, the results below are best interpreted as "reduced form" estimates that capture both the effects of migration and remittance flows.

The research presented here contributes to an incipient literature that finds evidence of a causal impact of remittances on development outcomes. Our findings, which are based on aggregate data, should be viewed as complementary to recent micro-level studies using household level information.

The rest of the paper is organized as follows. Section II provides an overview of the importance of international migration and remittances for Mexico. Section III discusses how remittances and migration might affect developmental outcomes and reviews the incipient empirical literature on the subject. The next section delineates the empirical strategy and presents results. Section V concludes and contains recommendations for future research.

II. MIGRATION, REMITTANCES AND GLOBALIZATION IN MEXICO

During the last decade and a half Mexico experienced a rapid shift from an inward-looking, closed economy, to one with tight global links. Table 1 shows that standard globalization indicators changed drastically between 1970 and 2000. Trade in goods and services jumped from 17% of Gross Domestic Product (GDP) in 1970 to 64% in 2000, with a 26-percentage point leap from 1990 to 2000; Foreign Direct Investment (FDI) remained under 1% of GDP through 1990, reaching 2.4% in 2000.

(Percent of GDP unless otherwise noted)											
Variable	1970	1980	1990	2000							
Trade in goods and services	17.4	23.7	38.3	64.0							
Foreign direct investment	0.9	1.0									
Tourism receipts	-	2.4	1.0	2.4							
Mexican-born U.S. population (million)	0.8	2.2									
As % of foreign-born population	8.2	16.7	2.1	1.4							
As % of Mexico's labor force	3.0	-									
Remittances (million current USD)	-	698.0	4.3	7.8							
As % of GDP	-	0.3	22.7	27.6							

TABLE 1 MEXICO'S GLOBAL LINKS, 1970-2000

Sources: World Bank, World Development Indicators, Schmidley [2001]; Mishra [2003].

Simultaneously, international migration-which for Mexico is essentially equivalent to migration to the U.S.-continued to gain importance. Using U.S. Census figures, Schmidley [2001] shows that in 1970 Mexican-born individuals amounted to less than 800 thousand, or 8.2% of the total U.S. foreign-born population. This share climbed to 16.7 in 1980, 22.7 in 1990, and 27.6 (7.8 million people) in 2000. Schmidley (*Ibid.* p. 12) points out that "Mexico's proportion in 2000 is the largest recorded share any country has held since the decennial census in 1890 when about 30% of the foreign-born population was from Germany".

Additionally, an increasing fraction of Mexico's population now lives and works in the U.S. Prachi Mishra [2003] estimates that, as a percentage of Mexico's labor force, Mexican workers in the U.S. increased fivefold, from 3% in 1970 to 16% in 2000. Further, Mexico's 2000 Census shows that between 1995 and 2000, 4.1% of all households saw at least one member migrate to the U.S., while an additional 1.8% had family members migrating back and forth or returning to Mexico (CONAPO [2002] Cuadro A).

Not surprisingly, remittance flows to Mexico have also grown rapidly. While in 1980 they were less than 700 million dollars, or 0.3% of GDP, by 2000 they surpassed 6.5 billion dollars, and were equal to 1.1% of GDP. Moreover, official estimates set 2004 remittances at 16.6 billion dollars, 24% more than in 2003 and equal to 2.5% of GDP. In 2004, remittances slightly exceeded FDI inflows and were equal to about 80% of crude oil exports (Banco de México [2004]).

A substantial and rising number of Mexican households benefit from these. According to Census figures, 4.4% (out of approximately 22.6 million) households received remittances in 2000.⁴ Moreover, household surveys show that the fraction of families receiving remittances rose steadily through the 1990s, from 3.7% in 1992 to 5.7% in 2002. The increase was particularly striking for rural households, as the fraction of recipients roughly doubled, from 6.2 to 12.6%. Remittances also grew in importance relative to total household income. For the country as a whole, they went from 0.9 to 1.7% of total household income from 1992 to 2002; as a share of rural household income, they went from 2.7 to 6.5%.

While migration and remittance flows are important for the country as a whole, Map 1 shows that there is substantial variation across states. In 2003, five Mexican states received almost 45% of all remittances (see Table 2). As a percent of State GDP, these represented 8.3, 5.6 and 5.2% in Michoacán, Guerrero and Nayarit, respectively. This is relative to 1.6% for the country as a whole, and a mere 0.4% in Mexico City or Nuevo León. Not surprinsingly, as Figure 1 indicates, states with high migration rates have the highest number of remittance-receiving households.



MAP 1 REMITTANCE-RECEIVING HOUSEHOLDS ACROSS MEXICAN MUNICIPALITIES, 2000

⁴ Data on remittances reflected in existing household surveys must be handled with care. Combining the fraction of remittance-receiving households reflected in Mexican household-survey data with Banco de México statistics would suggest that migrants send around US\$ 700 a month. The latter figure is at odds with surveys that indicate that migrants send around US\$ 300 a month.

	Percer household	nt of ds 2000									
State	Millio	on US\$	Annual Real %	Distribu	ition (%)	As % o Gl	of State OP	Per d (U	<i>capita</i> S\$)	Receiving	With migrants
	1995	2004	Growth	1995	2004	1995	2003	1995	2004	remittances	in the US
Aguascalientes	114		8.6	3.1	1.8	4.0	3.3	133	274	11.4	10.4
Baja California	31	149	16.2	0.8	0.9	0.4	0.6	15	57	9.2	9.6
Baja California Sur	4	17	13.2	0.1	0.1	0.3	0.5	12	39	7.7	6.5
Campeche	4	37	26.4	0.1	0.2	0.1	0.6	6	49	2.1	2.6
Chiapas	68	155	7.1	1.8	0.9	0.8	0.7	31	62	7.9	6.8
Chihuahua	22	127	18.6	0.6	0.8	1.6	3.3	45	214	2.7	3.2
Coahuila	20	500	39.9	0.5	3.0	0.4	3.9	5	117	1.7	1.6
Colima	64	220	11.9	1.8	1.3	0.6	0.8	23	67	4.1	4.8
D.F.	196	954	16.4	5.3	5.7	0.3	0.7	23	107	3.3	4.0
Durango	77	278	12.7	2.1	1.7	2.2	3.0	53	175	5.1	7.1
Estado de México	376	1.532	14.1	10.2	9.2	4.3	6.3	84	294	6.4	7.5
Guanajuato	224	826	12.9	6.1	5.0	4.8	6.9	76	247	8.2	7.4
Guerrero	72	615	24.0	1.9	3.7	2.1	6.9	33	253	3.6	3.0
Hidalgo	467	1.419	10.5	12.7	8.5	2.9	3.5	77	207	4.6	3.6
Jalisco	161	1.385	24.0	4.4	8.3	0.6	1.8	14	98	0.8	0.8
Michoacán	597	2.196	12.8	16.2	13.2	9.7	13.6	152	492	9.7	7.3
Morelos	131	400	10.6	3.6	2.4	3.7	4.3	91	234	13.0	12.2
Nayarit	58	238	14.3	1.6	1.4	3.9	6.1	64	238	4.3	3.7
Nuevo León	38	282	21.8	1.0	1.7	0.2	0.4	11	69	9.6	6.8
Oaxaca	159	804	16.9	4.3	4.8	3.8	7.6	47	215	3.7	4.8
Puebla	178	956	17.7	4.8	5.8	2.0	3.7	38	175	3.4	2.2
Querétaro	71	337	16.1	1.9	2.0	1.7	2.3	57	218	3.2	1.6
Quintana Roo	3	72	37.6	0.1	0.4	0.1	0.8	5	79	4.0	2.4
San Luis Potosí	120	393	11.4	3.3	2.4	2.5	3.5	54	154	2.5	1.9
Sinaloa	110	315	9.8	3.0	1.9	2.0	2.4	45	124	6.7	6.7
Sonora	28	147	17.5	0.8	0.9	0.4	0.7	13	62	7.3	5.6
Tabasco	5	95	35.8	0.1	0.6	0.1	1.0	3	46	2.2	2.7
Tamaulipas	47	241	17.2	1.3	1.5	0.6	1.1	18	83	0.6	0.6
Tlaxcala	27	174	19.9	0.7	1.0	2.1	4.3	31	164	1.4	1.0
Veracruz	76	950	29.2	2.1	5.7	0.6	3.4	11	130	1.0	0.7
Yucatán	11	80	21.2	0.3	0.5	0.4	0.6	7	45	1.0	0.9
Zacatecas	114	422	12.9	3.1	2.5	5.2	8.3	84	279	1.1	1.0
Total	3.673	16.613	15.5	100.0	100.0	1.4	2.4	40	158	4.4	4.1

TABLE 2INTERNATIONAL REMITTANCES TO MEXICO, BY STATE, 1995 AND 2004

Sources: Based on Banco de México, INEGI, and CONAPO data.

Moreover, Table 2 show that whereas in the central states of Zacatecas and Michoacán more than 10% of households sent migrants to the U.S. between 1995 and 2000, fewer than 1% did so in Campeche and Chiapas. Zacatecas, Michoacán and Guanajuato exhibit the highest historical rates of migration. Woodruff and Zenteno [2001] indicate that between 1955 and 1959, 6, 4 and 3%, respectively, of these states' population migrated to the U.S. They argue that these migration patterns have their origins in the early part of the twentieth century, as U.S. recruiters traveled by rail to Guadalajara, Jalisco, in order to hire Mexican workers residing in the surrounding areas (see Map 1). Past migration gives rise to networks of migrants that make it easier for future generations to emigrate and is, therefore, highly correlated with current migration; see Figures 2 to 4. Munshi [2003], for example, shows that Mexican migrants from communities with historically high rates of emigration have better labor market outcomes than migrants from other regions.

Despite the persistence of historical migration patterns, remittances have been flowing fast to states that traditionally did not send many migrants to the U.S. (Table 2). For instance, Veracruz, on the Gulf of Mexico, and Chiapas, along the Guatemalan border, saw remittances rise at an annual rate of 35 and 46%, respectively, in contrast to an average national rate of only 13%.

In sum, during the last three decades millions of Mexican nationals have migrated to the United States. They have not only become the largest immigrant group in the United States, but represent an increasingly large share of the Mexican labor force. Their remittances have grown rapidly and have surpassed FDI in magnitude. Further, close to a million Mexican households benefit directly from U.S.-based remittances (figures for 2000, Banco de México [2004]). As we discuss further on, while not the poorest of the poor, many of these households are concentrated in municipalities with dismal welfare indicators. To the extent that the additional income allows them to improve their living conditions, international migration may turn out to be an important development tool in Mexico.

FIGURE 1 REMITTANCES AND CURRENT MIGRATION



Source: CONAPO.



FIGURE 2 CURRENT MIGRATION AND MIGRATION IN THE 1950s

Source: CONAPO; Woodruff and Zenteno [2003].

FIGURE 3 CURRENT MIGRATION AND MIGRATION IN THE 1920s



Source: CONAPO; Foerster [1925].



FIGURE 4 HISTORICAL PERSISTENCE OF MIGRATION

Source: Woodruff and Zenteno [2003]; Foerster [1925].

III. REMITTANCES AND DEVELOPMENT: EXISTING LITERATURE

Interest in the impact of remittances has grown rapidly in the past few years. This might reflect their rapid growth, or the increased availability of household level data that contain information on overseas transfers. Rapoport and Docquier [2003] provide an extensive survey of the motivations to remit and of some of the implications regarding human capital formation, entrepreneurship, and inequality.

There is less work concerning the empirical effects of remittances on development.⁵ A few recent papers look at whether remittances, by relaxing households' liquidity constraints, allow investment in education. Cox Edwards and Ureta [2003] look at household schooling decisions in El Salvador, and conclude that receiving remittances reduces the likelihood of quitting school among individuals aged 6 to 24 years old. Yang [2003] considers money sent by Filipino workers and finds that a rise in remittances of 10-% of initial income increases the fraction of 17-21 year old children attending school by more than 10 percentage points; he also finds that child labor hours decline by almost 3 hours a week. Hanson and Woodruff [2003] use Mexico's 2000 Census data and conclude that "children in migrant sending households complete significantly more years of schooling".

There is a small number of studies on the link between remittances and health outcomes. Kanaiaupuni and Donato [1999] suggest that infant mortality is more acute in communities with historically -high migration rates. Nonetheless, they argue that the disruptive effect of migration is offset by household- level remittance flows. A drawback is that their paper works only 27 communities in five Mexican states. In the same vein, Frank and Hummer [2002] show that membership in a migrant household reduces the risk of low-birth weight. Neither of these papers addresses the potential endogeneity of remittances.

Hildebrandt and McKenzie's [2004] do so by instrumenting current migration levels with the interaction of historic migration networks and the pattern of development of the railroad system in the early 1990s. They investigate indirect channels between migration and infant health, for example, in the form of health knowledge information that can be passed on from migrants to their family in the origin country. They find that in migrant households children have lower mortality rates and higher birth weight, mainly thanks to remittances. Using a large cross-section of Mexican households and controlling for a number of individual and community characteristics, Duryea *et al.* [2005] suggest remittances have a positive effect on infant survival through improvements in living conditions (e.g., better housing).

Regarding entrepreneurship, Woodruff and Zenteno [2001] look at a sample of small Mexican firms and conclude that "remittances are responsible for almost 27% of the capital invested in microenterprises" in Mexican cities, and that this share reaches 40% in states with high emigration rates to the United States.⁶

⁵ For a more detailed description of the discussion that follows, see López Córdova and Olmedo [2005].

⁶ Rapoport and Docquier [2003] cite works on Tunisia, Turkey and Pakistan with related findings.

On poverty, Adams and Page [2003] analyze a cross-section of 74 low- and middle-countries and find that a 10% increase in the number of international migrants, or in the amount of remittances received, reduces by 1.9 and 1.6%, respectively, the fraction of people living on less than a dollar per day. Mckenzie and Rapoport [2004] present a model suggesting that international migration initially deepens inequality, as the poor cannot afford to cover the cost of migration. However, as migration networks grow, the costs of migration fall for future migrants, and inequality is reduced. They find empirical support for these predictions in Mexico.

IV. REMITTANCES AND DEVELOPMENT IN MEXICO

This section addresses issues discussed in the previous section using a detailed municipal-level database for Mexico; the data are described in Appendix A. We begin by describing some welfare indicators and other relevant characteristics to get a first glance at how remittances may affect living conditions.

A. Municipal Welfare and Remittances

Table 3 explores which types of municipalities receive more remittance income, focusing on three important correlates -GDP per capita, indigenous population, and urban/rural status. It classifies all municipalities by quintiles of GDP per capita and of the fraction of non-indigenous population, as well as whether they are rural or urban. The table shows that the share of remittance-receiving household rises with the fraction of non-indigenous people, and that it is higher in rural municipalities. Moreover, the share of remittance receipients exhibits an inverted U-shape relative to GDP per capita.

Urban Municipalities												
			Quintiles of	municipal Gl	DP per capita							
		1	2	3	4	5	All					
	1	1.6	2.6	1.9	1.8	0.9	1.8					
	2	n.a.	2.5	4.3	3.4	3.5	3.6					
Quintiles of fraction of non- indigenous population	3	n.a.	8.4	3.0	4.5	3.5	3.9					
	4	n.a.	2.0	8.1	7.9	5.2	6.3					
	5	4.9	12.5	12.2	12.8	7.0	9.6					
	All	2.3	4.4	6.5	6.6	4.7	5.5					
Rural Municipalities												
		Quintiles of municipal GDP per capita										
		1	2	3	4	5	All					
	1	3.4	3.0	3.1	2.5	2.3	3.3					
	2	4.0	5.0	5.9	3.9	3.1	4.7					
Quintiles of fraction of non-	3	5.9	7.5	9.6	6.9	5.5	7.5					
indigenous population	4	6.5	10.7	6.6	8.5	8.2	8.1					
	5	10.5	15.8	13.0	12.0	7.2	12.4					
	All	4.7	7.7	8.3	7.8	6.6	6.9					
All Municipalities												
			Quintiles of	municipal Gl	DP per capita							
		1	2	3	4	5	All					
	1	3.4	3.0	2.9	2.2	1.2	3.1					
	2	4.0	4.9	5.5	3.7	3.4	4.4					
Quintiles of fraction of non-	3	5.9	7.6	9.0	5.6	3.9	6.0					
indigenous population	4	6.5	10.1	6.9	8.2	6.2	7.5					
	5	10.3	15.8	12.9	12.3	7.1	11.6					
	All	4.7	7.5	7.9	7.3	5.2	6.5					

 TABLE 3

 MUNICIPAL CHARACTERISTICS AND REMITTANCES, 2000

(Percent of remittance-receiving households by per capita GDP, indigenous population and rural status)

As shown below, GDP per capita, and the shares of indigenous and rural populations are strong predictors of poor living conditions. It is not surprising then that, as shown in Table 4, infant mortality, illiteracy and poverty levels are inversely correlated with the percent of households receiving remittances.

(Contention Coefficients)												
	Remittance- receiving households (%)	State migration rate, 1955- 1959	Infant mortality	Child illiteracy	Child school attendance	Extreme poverty	Poverty	Marginal. index				
Remittance-receiving households (%)	1.0000											
State migration rate, 1955-1959	0.3761*	1.0000										
Infant mortality	-0.2544*	-0.2319*	1.0000									
Child illiteracy	-0.2967*	-0.2289*	0.7714*	1.0000								
Child school attendance	0.0373	-0.0131	-0.5127*	-0.6622*	1.0000							
Extreme poverty	-0.3989*	-0.3970*	0.6493*	0.5447*	-0.2702*	1.0000						
Poverty	-0.2101*	-0.3881*	0.7312*	0.5298*	-0.3042*	0.7812*	1.0000					
Marginalization index	-0.2488*	-0.3337*	0.9533*	0.7722*	-0.5002*	0.7149*	0.8342*	1.0000				

TABLE 4
MUNICIPAL WELFARE AND REMITTANCES, 2000
(Correlation coefficients)

Note: * significant at 5%.

This evidence has important implications for the econometric exercises below. First, while municipalities for which remittances are important have substandard welfare indicators, they also exhibit some characteristics -low income per capita, large rural and indigenous populations- that have a strong impact on those indicators and on the propensity to migrate. Therefore, empirical analyses should incorporate as many controls as possible, ideally using instrumental variables to isolate the causal effects of remittances.

B. Econometric Strategy

To address these challenges, we estimate equations of the form:

(1)
$$Y_{ij} = \gamma \ln \left(RRH_{ij} \right) + \mathbf{X}'_{ij} \Psi + \varepsilon_{ij},$$

where Y_{ij} represents an outcome Y (e.g., infant mortality) in municipality *i* and state *j*; *RRH*_{*ij*} is the fraction of remittance-receiving households (RRH) in municipality *i*; and X_{ij} is a vector of additional variables that might explain Y_{ij} , with a corresponding vector of coefficients Ψ .

In some specifications X_{ij} includes a proxy for historical migration at the municipal level. We use a measure of the cost of emigrating from a given municipality during the 1920s, proxied by the distance from the municipality to the railroad network in existence during the 1920s plus the distance from that point to the US-Mexico border. As argued, migration is highly persistent, and it is likely to affect long-term development prospects. Using historical data to measure the propensity to emigrate seeks to capture both the impact of current migration flows and migration's long-term effects.⁷ The estimated coefficient on the migration proxy ideally captures migration's impact on Y other than through remittances (e.g., disruption of family life, local labor market effects, etc.); the effect of remittances on the outcome of interest is then captured by γ .

A key concern is that remittances could be correlated with the error term. First, there may be unobserved variables that affect both the number of households receiving remittances and the outcome variable of interest. For example, adverse shocks to the local economy may increase migration while simultaneously having a deleterious impact on, say, school attendance. Due to factors such as these, OLS estimates of equation (1) may be biased.

In order to deal with this, we also estimate equation (1) using instrumental variables (IVs) and two-stage least-squares (2SLS). A first candidate IV comes from rainfall patterns at the municipal level.⁸ Using monthly data for most of the 20th century, we calculated the coefficient of variation in rainfall for each weather station in Mexico, assigning to each municipality the coefficient of the weather station closest to it. This measure captures the concentration of rainfall within a calendar year: a low coefficient means that rainfall is relatively constant throughout the year; whereas a high one means it is concentrated in a short time period, typically during the summer. In states where rainfall is concentrated, most agricultural income would be derived from spring/summer crops and accrue in a limited time period.

In such settings, there may exist an incentive to smooth consumption by looking for alternative sources of income, such a remittance transfers. The incentive to complement agricultural income would have probably been higher in the past, when a larger fraction of the population lived in the countryside and relied on agriculture, and when irrigation infrastructure was more scarce. As Figures 5 and 6 illustrate, both the rate of migration during the 1920s and the percent of households receiving remittances in 2000 are positively correlated with the coefficient of variation of rainfall at the state level.⁹ Validity of our instrument relies on the assumption that rainfall concentration affects the outcomes of interest only through remittances and other included control variables. In particular, the above discussion establishes a link between rainfall concentration and municipal income; another variable that is closely correlated with rainfall concentration in our data is the fraction of the population in housing with tap water. Including these and several other controls in our regressions ameliorates the concern that the exclusion restriction may not hold.¹⁰

⁷ There are problems in using the 2000 Census data on migration (Banco de México [2004].

⁸ Munshi [2003] also uses rainfall patterns to instrument for emigration from a number of Mexican communities. However, he focuses on lower -than- average rainfall as a determinant of migration. Instead, we focus on the concentration of rainfall throughout the year, as explained next.

⁹ We exclude Baja California and Baja California Sur, which are outliers in both measures.

¹⁰ Of course, as it is often the case, one can never be certain that there may not be other variables omitted from our regressions that are correlated with the instrument, hence invalidating our results.

FIGURE 5 HISTORICAL MIGRATION AND RAINFALL PATTERNS



Source: CONAPO.



FIGURE 6

Source: CONAPO and own calculations using data from Mexico's Servicio Meteorológico Nacional.

Unfortunately, although this IV performs well when we include region dummies, the introduction of state dummies reduces its power considerably. State dummies are important, and therefore we include them in all reported regressions, because they capture unobserved state-level factors that may affect both the outcome of interest and the likelihood of receiving remittances, such as historical migration from the given state or public spending by state authorities (e.g., on schooling or health programs). In light of this, we use distance to Guadalajara as an additional IV. As we have seen, there are historical reasons why communities in central Mexico, where Guadalajara lies, have high migration rates and hence receive remittances.¹¹

Table 6 presents the first-stage results for both IVs. They are always statistically significant and tests of excluded instrument show F-statistics greater than 11. Sargan-Hansen tests for overidentification are rejected in all regressions dealing with infant mortality, schooling and marginalization. However, over-identification may be an issue in regressions on poverty, which casts doubt on the validity of the instruments in the latter regressions; see (Baum *et al* [2003]).

C. Econometric Results

Aside from using these IVs, we incorporate a set of controls that includes an estimate of the municipal GDP per capita, the percent of the population in rural communities (those with less than 2,500 inhabitants), the fraction of indigenous people, an estimate of the Gini coefficient, the percent of female-headed households, average years of schooling among people 15 years and older; the share of employment in agriculture and government, the unemployment and homicide rates, a measure of governance quality, the fraction of the population in poverty (in the infant mortality and schooling regressions only), the percent of the population without piped potable water inside the dwelling, the availability of banking services and water facilities, and state and border dummies. Table 5 provides summary statistics.

In general, the econometric estimates discussed below confirm our prior beliefs about the impact of these controls. For instance, infant mortality is higher in low-income municipalities, and rises with inequality and the fraction of rural and indigenous inhabitants. In contrast, it is inversely related to adult schooling.

¹¹ One of the discussants has rightly pointed that using the distance to Guadalajara as an instrument may fail to meet the exclusion restriction when we include a municipal migration proxy as a control variable. We draw comfort in that our 2SLS regression results remain unchanged whether we include or not the migration proxy.

		Тс	otal Sampl	е		Rural sample (Population < 15,000)				
Variable	Obs	Mean	St Dev	Min	Мах	Obs	Mean	St Dev	Min	Max
Remittance-receiving households (%)	2277	1.232	1.360	-3.912	3.984	1774	1.270	1.415	-3.912	3.984
Historical municipal migration proxy	2271	0.123	0.209	-0.436	1.089	1772	0.120	0.195	-0.375	1.054
Infant mortality	2277	29.822	6.712	17.200	66.900	1774	31.525	6.390	19.700	66.900
Child illiteracy	2277	15.165	7.344	0.000	69.014	1774	16.127	7.668	0.000	69.014
Child school attendance (5 yr olds)	2277	71.463	13.611	0.000	100.000	1774	70.365	14.251	0.000	100.000
Child school attendance (6- 14 yr olds)	2277	90.089	4.938	47.894	100.000	1774	89.587	5.103	47.894	100.000
Child school attendance (15- 17 yr olds)	2277	44.491	14.774	4.000	96.774	1774	42.106	14.357	4.000	96.774
Extreme poverty	2277	29.383	18.892	1.897	94.456	1774	32.987	19.064	2.275	94.456
Population in poverty (%)	2277	71.842	16.499	18.410	98.880	1774	76.750	13.514	25.650	98.880
Marginalization index	2277	-0.083	0.963	-2.449	3.390	1774	0.183	0.861	-1.814	3.390
Rural (<2500) population (%)	2277	60.527	35.708	0.000	100.000	1774	71.149	31.830	0.000	100.000
Indigenous population (%)	2277	16.938	29.205	0.000	99.762	1774	20.223	31.639	0.000	99.762
Schooling	2277	5.504	1.528	1.000	12.000	1774	5.041	1.221	1.000	10.000
Female-headed households (%)	2277	19.543	5.171	2.510	46.094	1774	19.405	5.468	2.510	46.094
Agricultural employment (%)	2265	41.766	23.187	0.117	98.283	1763	48.836	20.181	2.753	98.283
Public sector employment (%)	2265	3.074	1.974	0.000	21.104	1763	2.853	1.867	0.000	21.104
Unemployment rate	2265	0.997	1.204	0.000	37.234	1763	0.935	1.331	0.000	37.234
Homicide rate	2277	2.880	8.178	0.000	119.000	1774	1.020	1.790	0.000	29.750
Border state dummy	2277	0.120	0.325	0.000	1.000	1774	0.111	0.314	0.000	1.000
Income per capita (log)	2277	7.953	0.717	5.004	10.480	1774	7.762	0.651	5.004	9.935
Municipal Income Gini Coefficient	2277	0.573	0.103	0.291	0.964	1774	0.583	0.109	0.291	0.964
Population in housing w/o tap water	2247	18.604	20.175	0.020	100.000	1745	20.752	21.204	0.020	100.000
Water-delivery infrastructure	2277	1.011	1.835	0.000	31.564	1774	1.080	1.923	0.000	28.436
Bank branches per 1000 people	2277	0.023	0.056	0.000	1.138	1774	0.012	0.052	0.000	1.138
Coefficient of variation of monthly rainfall	2260	1.251	0.258	0.641	2.792	1762	1.257	0.261	0.641	2.792
Distance to Guadalajara (kms, logs)	2277	6.303	0.720	0.000	7.536	1774	6.344	0.668	2.859	7.459

TABLE 5 DESCRIPTIVE STATISTICS

TABLE 6 FIRST-STAGE REGRESSION RESULTS FOR TABLE 7-13 DEPENDENT VARIABLE: REMITTANCE-RECEIVING HOUSEHOLDS (%, LOGS) (Sample: Rural municipalities)

		Т	ables 7-11	l		т	ables 12-1	3	Tables 14		
	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	(Reg. 8)	(Reg. 9)	(Reg. 10)	(Reg. 9)	(Reg. 10)	
Monthly rainfall (coefficient of variation)	0.7738	0.2266	0.2408	0.3043	0.3066	0.2339	0.3044	0.3069	0.2258	0.2313	
	(0.1413)***	(0.1306)*	(0.1296)*	(0.1363)**	(0.1358)**	(0.1304)*	(0.1368)**	(0.1364)**	(0.1314)*	(0.1312)*	
Distance to Guadalajara (kms, logs)	-0.6301	-0.4244	-0.3824	-0.3555	-0.3780	-0.4286	-0.4045	-0.4269	-0.4216	-0.4433	
	(0.1027)***	(0.0818)***	(0.0836)***	(0.0834)***	(0.0827)***	(0.0819)***	(0.0813)***	(0.0806)***	(0.0817)***	(0.0810)***	
Rural (<2500) population (%)		0.0010	0.0016	0.0014	0.0013	0.0012	0.0010	0.0009	0.0010	0.0009	
		(0.0010)	(0.0010)	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0011)	(0.0011)	(0.0011)	
Indigenous population (%)		-0.0095	-0.0095	-0.0095	-0.0094	-0.0093	-0.0093	-0.0092	-0.0093	-0.0092	
		(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	(0.0013)***	
Schooling		-0.0298	-0.0746	-0.0835	-0.0830	-0.0454	-0.0520	-0.0506	-0.0489	-0.0466	
		(0.0349)	(0.0392)*	(0.0396)**	(0.0395)**	(0.0393)	(0.0396)	(0.0396)	(0.0392)	(0.0393)	
Female-headed households (%)		0.0916	0.0921	0.0917	0.0907	0.0915	0.0912	0.0903	0.0911	0.0905	
		(0.0067)***	(0.0067)***	(0.0069)***	(0.0069)***	(0.0068)***	(0.0069)***	(0.0069)***	(0.0068)***	(0.0068)***	
Agricultural employment (%)		-0.0049	-0.0441	-0.0396	0.0005	-0.0381	-0.0335	-0.0036	-0.0041	-0.0042	
		(0.0021)**	(0.0145)***	(0.0024)	(0.0024)	(0.0022)*	(0.0022)	(0.0022)	(0.0022)*	(0.0022)*	
Public sector employment (%)		-0.0373	-0.0005	0.0005	-0.0422	-0.0042	-0.0034	-0.0355	-0.0376	-0.0396	
		(0.0147)**	(0.0023)	(0.0149)***	(0.0148)***	(0.0146)***	(0.0150)**	(0.0150)**	(0.0147)**	(0.0147)***	
Unemployment rate		0.0041	0.0013	0.0053	0.0045	0.0069	0.0111	0.0106	0.0086	0.0079	
		(0.0272)	(0.0253)	(0.0271)	(0.0267)	(0.0274)	(0.0292)	(0.0289)	(0.0284)	(0.0280)	
Homicide rate		-0.0821	-0.0873	-0.0802	-0.0795	-0.0849	-0.0785	-0.0778	-0.0834	-0.0832	
		(0.0174)***	(0.0169)***	(0.0174)***	(0.0176)***	(0.0171)***	(0.0176)***	(0.0178)***	(0.0174)***	(0.0176)***	
Border state dummy		-0.5301	-0.4643	-0.4766	-0.5142	-0.1639	-0.5424	-0.5767	-0.1860	-0.1464	
		(0.1746)***	(0.1711)***	(0.1702)***	(0.1685)***	(0.2193)	(0.1706)***	(0.1685)***	(0.2194)	(0.2143)	
Income per capita (log)			-0.0193	-0.0351	-0.0303	0.0937	0.0881	0.0965	0.0977	0.1068	
			(0.0767)	(0.0785)	(0.0781)	(0.0702)	(0.0713)	(0.0710)	(0.0701)	(0.0699)	
Municipal Income Gini Coefficient			0.2064	0.3174	0.2978	0.1649	0.2554	0.2337	0.1646	0.1369	
			(0.2867)	(0.2921)	(0.2911)	(0.2898)	(0.2954)	(0.2947)	(0.2901)	(0.2897)	
Population in poverty (%)			-0.0183	-0.0195	-0.0202						
			(0.0043)***	(0.0045)***	(0.0045)***						

		•	Tables 7-11	1		Та	ables 12-1	3	Table	es 14
	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	(Reg. 8)	(Reg. 9)	(Reg. 10)	(Reg. 9)	(Reg. 10)
Population in housing w/o tap water				-0.0031	-0.0035		-0.0027	-0.0031		
				(0.0017)*	(0.0017)**		(0.0017)	(0.0017)*		
Water-delivery infrastructure				0.0063	0.0066		0.0055	0.0058	0.0156	0.0165
				(0.0198)	(0.0199)		(0.0196)	(0.0197)	(0.0182)	(0.0183)
Bank branches per 1000 people				-0.0712	-0.0792		0.1100	0.1092	0.1041	0.1053
				(0.3167)	(0.3143)		(0.2975)	(0.2958)	(0.2936)	(0.2909)
Historical municipal migration proxy					0.0661			0.0585		0.0546
					(0.0192)***			(0.0186)***		(0.0181)***
Constant	4.8902	3.4585	4.5270	4.4729	4.3857	2.6731	2.4657	2.3279	2.6275	2.4813
	(0.5935)***	*(0.5709)***	*(0.8877)***	(0.9107)***	(0.9003)***	(0.7432)***	(0.7548)***	(0.7464)***	(0.7453)***	(0.7379)***
Observations	1762	2 1751	1751	1722	1720	1751	1722	1720	1751	1749
R-squared	0.3619	0.5043	0.5104	0.5205	0.5230	0.5051	0.5146	0.5167	0.5055	0.5073
Test of excluded instruments (F- statistic)	34,29) 14,82	2 12,11	11,35	12,72	15,17	14,59	16,25	14,73	16,41

TABLE 6 (CONTINUED)

Notes: Only non-redundant regression results are reported.

State dummies included.

Robust standard errors in parentheses.

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

Tables 7 to 14 present estimates of equation (1) using as dependent variables infant mortality, child illiteracy and school attendance, two poverty measures and a broad marginalization index. We report results using a sample consisting of municipalities with no localities greater than 15,000 inhabitants (henceforth, rural municipalities).¹² We focus on these because they are less likely to bring up sample selection issues -rural household members are less likely than urban ones to join their migrant members in the U.S., and of course surveys do not capture households who have emigrated in their entirety.¹³ In any case, results obtained using the full sample do not differ qualitatively from those based on this rural sample.¹⁴

¹² We exclude from the latter municipalities that are part of metropolitan areas with more than 100,000 inhabitants, even though by themselves they may meet the criteria defining the sample.

¹³ I thank Gordon Hanson for this insight.

¹⁴ Unreported results are available from the author upon request.

Infant mortality (Table 7)

We first consider remittances' impact on municipal-level infant mortality, defined as the number of children, out of every 1,000 live births, who die within the first year of life. Remittances have a statistically significant negative impact on this measure in both the OLS and 2SLS specifications. Despite the fact that in both cases their impact decreases as we include additional controls, our preferred specification (10) suggests that an increase in the fraction of remittance-receiving households of 1% reduces infant deaths by 1.2 lives.

To put this into perspective, the World Development Indicators show that infant mortality in Mexico fell by 20% from 1990 to 2000. Moreover, the figures presented in section 2 above show that the fraction of households with remittance income increased by 54% from 1992 to 2002, or by more than 100% for rural households. Therefore, the point estimates reported in Table 7 might seem a bit high and warrant some caution. Nonetheless, the direction of the effect appears robust.

TABLE 7 MIGRATION, REMITTANCES, AND INFANT MORTALITY. DEPENDENT VARIABLE: INFANT MORTALITY (CHILDREN UNDER 1) PER 1000 LIVE-BIRTHS, IN NATURAL LOGARITHMS

			(Ourn		i mainoipi	undoo)				
		OLS 2SLS								
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Remittance-receiving households (%)	-1.7548	-0.7535	-0.7252	-0.5704	-0.5794	-3.9343	-2.6610	-3.1316	-1.1847	-1.1701
	(0.1326)***	(0.0826)***	(0.0821)***	(0.0664)***	(0.0675)***	(0.6154)***	(0.7751)***	(0.9096)***	(0.6025)**	(0.5734)**
Rural (<2500) population (%)		0.0160	0.0103	0.0098	0.0097		0.0179	0.0140	0.0104	0.0102
		(0.0028)***	(0.0027)***	(0.0023)***	(0.0024)***		(0.0036)***	(0.0042)***	(0.0026)***	(0.0025)***
Indigenous population (%)		0.0402	0.0382	0.0385	0.0386		0.0210	0.0138	0.0322	0.0325
		(0.0037)***	(0.0037)***	(0.0030)***	(0.0030)***		(0.0088)**	(0.0102)	(0.0068)***	(0.0065)***
Schooling		-3.2607	-2.8530	-2.4940	-2.4870		-3.3330	-3.0495	-2.5476	-2.5383
		(0.1108)***	(0.1162)***	(0.0990)***	(0.0999)***		(0.1274)***	(0.1599)***	(0.1156)***	(0.1137)***
Female-headed households (%)		-0.0994	-0.1166	-0.0689	-0.0693		0.0809	0.1115	-0.0109	-0.0139
		(0.0198)***	(0.0200)***	(0.0160)***	(0.0161)***		(0.0751)	(0.0876)	(0.0581)	(0.0551)
Agricultural employment (%)		0.0374	0.1837	0.0114	0.0113		0.0785	0.0713	0.0117	0.0116
		(0.0062)***	(0.0501)***	(0.0058)*	(0.0059)*		(0.0085)***	(0.0768)	(0.0060)*	(0.0460)
Public sector employment (%)		0.1561	0.0146	0.1061	0.0964		0.0275	0.0129	0.0792	0.0691
		(0.0499)***	(0.0073)**	(0.0385)***	(0.0390)**		(0.0659)	(0.0092)	(0.0460)*	(0.0060)*
Unemployment rate		0.1585	0.0905	0.0056	0.0048		0.1684	0.0935	0.0098	0.0086
		(0.0666)**	(0.0718)	(0.0430)	(0.0435)		(0.1093)	(0.1200)	(0.0470)	(0.0464)
Homicide rate		0.4803	0.5026	0.3611	0.3609		0.3160	0.2827	0.3088	0.3109

(Sample: Rural municipalities)

(0.1033)*** (0.1204)** (0.0755)*** (0.0734)***

(0.0599)*** (0.0618)*** (0.0498)*** (0.0502)***

			OLS					2SLS		
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Border state dummy		-0.4810	0.8963	0.0944	0.1279		-0.4875	-1.1948	-0.0524	-0.2402
		(0.8667)	(0.7188)	(0.7371)	(0.7701)		(1.0975)	(1.0726)	(0.8270)	(0.8442)
Income per capita (log)			-1.3582	-1.0253	-1.0210			-1.4566	-1.0550	-1.0479
			(0.2518)***	(0.1968)***	(0.1992)***			(0.3092)***	(0.2034)***	(0.2023)***
Municipal Income Gini Coefficient			3.3948	1.0732	1.1040			3.9871	1.2989	1.3148
			(0.8625)***	(0.7269)	(0.7376)			(1.0667)***	(0.7605)*	(0.7567)*
Population in poverty (%)			0.0302	0.0491	0.0468			-0.0169	0.0370	0.0348
			(0.0145)**	(0.0114)***	(0.0116)***			(0.0267)	(0.0173)**	(0.0173)**
Population in housing w/o tap water				0.0861	0.0854				0.0844	0.0834
				(0.0040)***	(0.0041)***				(0.0047)***	(0.0048)***
Water-delivery infrastructure				-0.1994	-0.1974				-0.1924	-0.1904
				(0.0326)***	(0.0329)***				(0.0340)***	(0.0339)***
Bank branches per 1000 people				-2.5507	-2.5843				-2.5899	-2.6231
				(1.1113)**	(1.1227)**				(1.1999)**	(1.1894)**
Historical municipal migration proxy					0.1765					0.2105
					(0.0532)***					(0.0640)***
Constant	30.1233	47.0424	53.6219	47.9413	47.4162	35.7829	49.9624	61.0207	49.8533	49.1542
	(0.7000)***	(1.1482)***	(2.7670)***	(2.2621)***	(2.2945)***	(1.7416)***	(1.7112)***	(4.4544)***	(3.0141)***	(2.8936)***
Observations	1774	1763	1763	1734	1732	1762	1751	1751	1722	1720
R-squared	0.2675	0.7699	0.7803	0.8510	0.8518	0.1150	0.6803	0.6394	0.8420	0.8436

TABLE 7 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Educational outcomes (Tables 8 to 11)

On educational outcomes, we focus on illiteracy among children 6 to 14 years of age (Table 8), as well as on school attendance at different age ranges: among 5 -year olds (Table 9), among children 6 to 14 years old (Table 10), and among teenagers aged 15 to 17 (Table 11). The latter variables are always expressed as fractions of the relevant population.

Remittances appear to have a significant effect in reducing illiteracy, irrespective of the estimation technique, although under 2SLS the point estimates are larger in absolute terms. In our preferred specification (regression 10, Table 8) a one-percent increase in the fraction of households receiving remittances reduces illiteracy among children by almost 3 percentage points.

The results on school attendance are more complex and depend on the age group one considers. Remittances have a substantial and statistically significant impact on the proportion of 5 year olds attending school. In the 2SLS results, attendance rises by 11% in response to a 1% increase in remittance-reception. However, the impact becomes insignificant among 6-to-14 year olds, and negative among teenagers between the ages of 15 and 17. For the latter group, school attendance drops by more than 7 percentage points.

The previous two results are at odds with findings in the existing literature. Data limitations do not allow further exploration on the reasons behind the low or even negative impact among older children. This could be due to insufficient educational infrastructure in remittance-receiving communities for that age group. Another possibility is that the results are an indication of the complex interaction between remittances and migration. In high-migration communities, remittances may create disincentives to investment in schooling and may be used to cover other expenses, including, potentially, defraying the cost of emigration. That would be in line with McKenzie and Rapoport's [2005] finding that boys aged 16 to 18 years in migrant households have lower schooling levels. The authors argue their results are consistent with those in (Chiquiar and Hanson [2005]), who show that the returns to schooling in Mexico are larger than in the U.S., and hence potential migrants might see reduced incentives to stay in school.

			· ·		•	,					
			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Remittance-receiving households (%)	-1.9466	-0.8836	-0.9256	-0.8431	-0.8455	-4.4424	-3.6951	-4.0999	-2.9513	-2.8830	
	(0.1506)***	(0.1237)***	(0.1248)***	(0.1209)***	(0.1228)***	(0.7666)***	(1.1562)***	(1.3393)***	(1.1423)***	(1.0824)***	
Rural (<2500) population (%)		-0.0159	-0.0136	-0.0072	-0.0072		-0.0131	-0.0087	-0.0047	-0.0048	
		(0.0044)***	(0.0044)***	(0.0045)	(0.0045)		(0.0052)**	(0.0057)	(0.0050)	(0.0050)	
Indigenous population (%)		0.0384	0.0378	0.0421	0.0421		0.0098	0.0054	0.0203	0.0212	
		(0.0064)***	(0.0064)***	(0.0062)***	(0.0063)***		(0.0129)	(0.0145)	(0.0130)	(0.0123)*	
Schooling		-3.4621	-3.6216	-3.4640	-3.4658		-3.5620	-3.8739	-3.6538	-3.6482	
		(0.2013)***	(0.2072)***	(0.2030)***	(0.2058)***		(0.2197)***	(0.2513)***	(0.2332)***	(0.2295)***	
Female-headed households (%)		-0.1933	-0.1855	-0.1639	-0.1642		0.0700	0.1132	0.0327	0.0242	
		(0.0403)***	(0.0413)***	(0.0401)***	(0.0407)***		(0.1182)	(0.1357)	(0.1191)	(0.1132)	

TABLE 8 MIGRATION, REMITTANCES, AND CHILD ILLITERACY DEPENDENT VARIABLE: ILLITERACY AMONG CHILDREN 6 TO 14 YEARS OLD

(Sample: Rural municipalities)

	OLS						2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)		
Agricultural employment (%)		-0.0058	0.0098	0.0752	0.0051		0.0006	-0.0603	0.0070	0.0069		
		(0.0131)	(0.0161)	(0.0652)	(0.0160)		(0.0151)	(0.1047)	(0.0172)	(0.0862)		
Public sector employment (%)		0.1124	0.0877	0.0051	0.0748		-0.0192	0.0088	-0.0137	-0.0163		
		(0.0686)	(0.0671)	(0.0158)	(0.0662)		(0.0943)	(0.0180)	(0.0865)	(0.0171)		
Unemployment rate		0.1112	0.1033	0.0407	0.0400		0.1269	0.1081	0.0545	0.0519		
		(0.0965)	(0.0944)	(0.0721)	(0.0730)		(0.1595)	(0.1585)	(0.1113)	(0.1089)		
Homicide rate		0.5458	0.5313	0.4631	0.4633		0.3008	0.2382	0.2837	0.2909		
		(0.0779)***	(0.0773)***	(0.0723)***	(0.0733)***		(0.1483)**	(0.1660)	(0.1317)**	(0.1272)**		
Border state dummy		-0.6386	-1.0167	-0.5362	-0.5348		-4.0045	-3.6397	-2.6271	-2.6965		
		(0.8163)	(0.9064)	(0.9724)	(0.9865)		(1.3978)***	(1.4575)**	(1.3792)*	(1.3938)*		
Income per capita (log)			-0.1532	-0.1473	-0.1450			-0.2820	-0.2662	-0.2532		
			(0.4055)	(0.3947)	(0.3999)			(0.4744)	(0.4325)	(0.4291)		
Municipal Income Gini Coefficient			-0.3033	-0.5493	-0.5717			0.4652	0.2066	0.1295		
			(1.3629)	(1.3657)	(1.3869)			(1.5890)	(1.5048)	(1.4929)		
Population in poverty (%)			-0.0648	-0.0534	-0.0537			-0.1271	-0.0972	-0.0976		
			(0.0242)***	(0.0235)**	(0.0240)**			(0.0411)***	(0.0371)***	(0.0368)***		
Population in housing w/o tap water				0.0066	0.0064				-0.0007	-0.0015		
				(0.0087)	(0.0089)				(0.0107)	(0.0109)		
Water-delivery infrastructure				-0.5232	-0.5232				-0.5023	-0.5021		
				(0.0941)***	(0.0954)***				(0.0970)***	(0.0968)***		
Bank branches per 1000 people				-1.8415	-1.8386				-1.9895	-1.9912		
				(1.7762)	(1.7999)				(2.2254)	(2.2019)		
Historical municipal migration proxy					0.0198					0.1422		
					(0.0717)					(0.0996)		
Constant	14.2476	36.9863	42.8443	41.1327	41.0948	20.7285	41.2537	52.5727	47.9907	47.3653		
	(0.5765)***	(1.9854)***	(4.5011)***	(4.4169)***	(4.4513)***	(2.0718)***	(2.5660)***	(6.5478)***	(5.9491)***	(5.6671)***		
Observations	1774	1763	1763	1734	1732	1762	1751	1751	1722	1720		
R-squared	0.3490	0.6310	0.6334	0.6594	0.6593	0.2098	0.4950	0.4625	0.5853	0.5903		

TABLE 8 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 9 MIGRATION, REMITTANCES, AND SCHOOL ATTENDANCE AMONG 5 YEAR OLDS DEPENDENT VARIABLE: SCHOOL ATTENDANCE AMONG CHILDREN 5 YEARS OLD (Sample: Rural municipalities)

			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Remittance- receiving households (%)	1.3981	0.3625	0.5094	0.2946	0.3088	7.2302	13.7069	14.7596	11.0454	10.4821	
	(0.3068)***	(0.3084)	(0.3083)*	(0.3061)	(0.3110)	(1.8072)***	(3.8238)***	(4.3836)***	(3.7395)***	(3.4780)***	
Rural (<2500) population (%)		0.0912	0.0746	0.0669	0.0667		0.0782	0.0526	0.0538	0.0544	
		(0.0111)***	(0.0115)***	(0.0118)***	(0.0120)***		(0.0175)***	(0.0199)***	(0.0171)***	(0.0165)***	
Indigenous population (%)		0.0406	0.0376	0.0434	0.0433		0.1755	0.1823	0.1537	0.1469	
		(0.0145)***	(0.0144)***	(0.0141)***	(0.0143)***		(0.0419)***	(0.0478)***	(0.0416)***	(0.0387)***	
Schooling		6.6994	7.8771	7.3859	7.3966		7.2253	9.0561	8.4106	8.3638	
		(0.4290)***	(0.4588)***	(0.4471)***	(0.4532)***		(0.6424)***	(0.8025)***	(0.7144)***	(0.6886)***	
Female-headed households (%)		0.2639	0.2123	0.1612	0.1629		-0.9921	-1.1354	-0.8474	-0.7835	
		(0.0866)***	(0.0863)**	(0.0837)*	(0.0849)*		(0.3697)***	(0.4242)***	(0.3599)**	(0.3336)**	
Agricultural employment (%)		0.0400	-0.0396	-0.0236	-0.0239		0.3916	0.6368	0.6000	0.6047	
		(0.0250)	(0.0295)	(0.0280)	(0.0284)		(0.0428)**	(0.3550)*	(0.0383)	(0.0374)	
Public sector employment (%)		-0.1352	-0.0265	0.1483	0.1514		0.1097	-0.0290	-0.0271	-0.0266	
		(0.2095)	(0.2052)	(0.2066)	(0.2103)		(0.3234)	(0.0440)	(0.2995)**	(0.2945)**	
Unemployment rate		-0.4141	-0.5379	-0.3476	-0.3413		-0.4723	-0.5440	-0.4006	-0.3838	
		(0.4102)	(0.4041)	(0.3218)	(0.3243)		(0.7360)	(0.7212)	(0.5817)	(0.5610)	
Homicide rate		-1.0988	-1.0212	-0.8058	-0.8070		0.0544	0.2848	0.0970	0.0419	
		(0.1797)***	(0.1716)***	(0.1602)***	(0.1623)***		(0.4657)	(0.5127)	(0.4036)	(0.3817)	
Border state dummy		-12.8195	-9.1980	-11.3875	-11.3913		6.1892	3.7506	0.5458	0.7239	
		(2.5371)***	(2.9925)***	(2.8934)***	(2.9192)***		(4.8331)	(5.1172)	(4.5492)	(4.5524)	

			OLS			2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Income per capita (log)			-2.5015	-2.4539	-2.4692			-1.9283	-1.8486	-1.9314
		(0.9080)***	(0.8725)***	(0.8844)***			(1.5021)	(1.2987)	(1.2590)
Municipal Income Gini Coefficient			7.5386	10.0027	10.1243			4.1230	6.1344	6.6133
			(3.2706)**	(3.2624)***	(3.3125)***			(5.4730)	(4.8697)	(4.7172)
Population in poverty (%)			0.1980	0.1807	0.1831			0.4765	0.4030	0.4010
		(0.0573)***	(0.0554)***	(0.0562)***			(0.1300)***	(0.1154)***	(0.1120)***
Population in housing w/o tap water				-0.0851	-0.0836				-0.0462	-0.0426
				(0.0180)***	(0.0184)***				(0.0285)	(0.0283)
Water-delivery infrastructure				0.7709	0.7718				0.6660	0.6677
				(0.2444)***	(0.2479)***				(0.3408)*	(0.3337)**
Bank branches per 1000 people				10.6961	10.6771				11.5594	11.5473
				(4.4331)**	(4.4903)**				(6.7468)*	(6.5610)*
Historical municipal migration proxy					-0.1181					-0.7386
					(0.2464)					(0.3996)*
Constant	76.3593	27.0602	28.5671	30.9338	31.1590	61.2153	6.4365	-15.3663	-4.4005	-0.4776
	(2.1350)***	(4.0662)*** (9.9782)***	(9.6723)***	(9.8286)***	(5.2128)***	(8.1323)	(20.9990)	(18.6540)	(17.3871)
Observations	1774	1763	1763	1734	1732	1762	1751	1751	1722	1720
R-squared	0.1334	0.3265	0.3435	0.3745	0.3745	-0.0906	-0.5525	-0.6448	-0.1902	-0.1295

TABLE 9 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 10 MIGRATION, REMITTANCES, AND SCHOOL ATTENDANCE AMONG 6 TO 14 YEAR OLDS DEPENDENT VARIABLE: SCHOOL ATTENDANCE AMONG CHILDREN 6 TO 14 YEARS OLD (Sample: Rural municipalities)

			OLS			2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Remittance- receiving households (%)	0.4346	0.0530	0.1070	0.0842	0.0859	0.3717	-0.4994	-0.4430	-0.8430	-0.8805
	(0.1122)***	(0.0947)	(0.0944)	(0.0944)	(0.0958)	(0.4680)	(0.7748)	(0.8269)	(0.8367)	(0.8072)
Rural (<2500) population (%)		0.0316	0.0262	0.0249	0.0248		0.0322	0.0271	0.0260	0.0260
		(0.0035)***	(0.0034)***	(0.0034)***	(0.0035)***		(0.0036)***	(0.0037)***	(0.0037)***	(0.0037)***
Indigenous population (%)		0.0172	0.0164	0.0166	0.0166		0.0117	0.0108	0.0071	0.0068
		(0.0045)***	(0.0045)***	(0.0044)***	(0.0045)***		(0.0092)	(0.0097)	(0.0101)	(0.0097)
Schooling		2.8589	3.2465	3.1933	3.1972		2.8481	3.2129	3.1182	3.1189
		(0.1645)***	(0.1610)***	(0.1609)***	(0.1631)***		(0.1642)***	(0.1695)***	(0.1785)***	(0.1772)***
Female-headed households (%)		0.0995	0.0830	0.0729	0.0732		0.1514	0.1348	0.1597	0.1630
		(0.0318)***	(0.0328)**	(0.0326)**	(0.0330)**		(0.0839)*	(0.0901)	(0.0904)*	(0.0874)*
Agricultural employment (%)		0.0328	0.2199	0.2084	0.0101		0.0304	0.0058	0.1685	0.1632
		(0.0114)***	(0.0606)***	(0.0137)	(0.0139)		(0.0693)**	(0.0705)***	(0.0139)	(0.0677)**
Public sector employment (%)		0.1820	0.0058	0.0101	0.2071		0.1583	0.1937	0.0110	0.0109
		(0.0635)***	(0.0135)	(0.0597)***	(0.0608)***		(0.0116)***	(0.0135)	(0.0671)**	(0.0139)
Unemployment rate		-0.1123	-0.1473	-0.1240	-0.1232		-0.1079	-0.1450	-0.1172	-0.1169
		(0.0762)	(0.0754)*	(0.0687)*	(0.0694)*		(0.0671)	(0.0673)**	(0.0582)**	(0.0578)**
Homicide rate		-0.2777	-0.2485	-0.2316	-0.2320		-0.3260	-0.2992	-0.3101	-0.3132
		(0.0616)***	(0.0615)***	(0.0627)***	(0.0636)***		(0.0910)***	(0.0981)***	(0.0953)***	(0.0936)***
Border state dummy		0.0736	1.1484	0.5724	0.5766		1.1983	0.6673	0.4060	0.3099
		(0.8511)	(0.9758)	(1.0138)	(1.0274)		(1.2007)	(1.2579)	(1.2930)	(1.3066)

			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Income per capita (log)			-0.7556	-0.6917	-0.6940			-0.7809	-0.7458	-0.7476	
			(0.3052)**	(0.3093)**	(0.3135)**			(0.3097)**	(0.3234)**	(0.3234)**	
Municipal Income Gini Coefficient			1.9432	1.4684	1.5061			2.0879	1.8084	1.8471	
			(1.0779)*	(1.0603)	(1.0762)			(1.0919)*	(1.1187)	(1.1181)*	
Population in poverty (%)			0.0729	0.0615	0.0614			0.0623	0.0424	0.0409	
		(0.0201)***	(0.0203)***	(0.0206)***			(0.0268)**	(0.0283)	(0.0283)	
Population in housing w/o tap water				0.0010	0.0012				-0.0022	-0.0026	
				(0.0068)	(0.0070)				(0.0082)	(0.0084)	
Water-delivery infrastructure				0.1925	0.1928				0.2011	0.2023	
				(0.0619)***	(0.0627)***				(0.0638)***	(0.0641)***	
Bank branches per 1000 people				0.9351	0.9247				0.8602	0.8422	
				(1.3443)	(1.3638)				(1.4928)	(1.4987)	
Historical municipal migration proxy					0.0063					0.0646	
					(0.0839)					(0.0981)	
Constant	90.0503	68.1503	67.8541	68.5383	68.4904	90.2137	68.9255	69.4750	71.4951	71.4076	
	(0.4494)*** (1.7165)*** (3.6479)***	(3.6697)***	(3.7205)***	(1.2617)*** ((1.9076)***	(4.3218)***	(4.5893)***	(4.4502)***	
Observations	1774	1763	1763	1734	1732	1762	1751	1751	1722	1720	
R-squared	0.2338	0.4950	0.5099	0.5236	0.5237	0.2328	0.4829	0.4981	0.4905	0.4879	

TABLE 10 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 11 MIGRATION, REMITTANCES, AND SCHOOL ATTENDANCE AMONG 15 TO 17 YEAR OLDS DEPENDENT VARIABLE: SCHOOL ATTENDANCE AMONG CHILDREN 15 TO 17 YEARS OLD

(Sample: Rural municipalities)

			OLS			2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Remittance- receiving households (%)	-1.0231	-1.6011	-1.6266	-1.5469	-1.5998	-4.7113	-8.0367	-8.3968	-6.8103	-6.5473
	(0.2829)***	(0.3029)***	(0.3045)***	(0.3089)***	(0.3130)***	(1.5123)***	(2.8023)***	(3.1301)***	(3.0509)**	(2.9115)**
Rural (<2500) population (%)		0.0432	0.0435	0.0428	0.0422		0.0490	0.0534	0.0485	0.0475
		(0.0114)***	(0.0117)***	(0.0121)***	(0.0123)***		(0.0134)***	(0.0145)***	(0.0138)***	(0.0136)***
Indigenous population (%)		0.1019	0.1016	0.1046	0.1051		0.0369	0.0330	0.0507	0.0548
		(0.0146)***	(0.0149)***	(0.0150)***	(0.0151)***		(0.0326)	(0.0359)	(0.0354)	(0.0339)
Schooling		7.2508	7.1973	7.3494	7.3751		7.0616	6.7017	6.9232	6.9797
		(0.3744)***	(0.4093)***	(0.4255)***	(0.4286)***		(0.4472)***	(0.5527)***	(0.5608)***	(0.5448)***
Female-headed households (%)		0.2938	0.2921	0.3123	0.3091		0.8991	0.9318	0.8074	0.7710
		(0.0846)***	(0.0851)***	(0.0869)***	(0.0878)***		(0.2786)***	(0.3106)***	(0.2985)***	(0.2836)***
Agricultural employment (%)		0.0437	0.0487	0.7629	0.0483		0.0137	0.0467	0.0540	0.4813
		(0.0238)*	(0.2275)***	(0.2220)***	(0.0291)*		(0.2841)**	(0.0313)	(0.0304)*	(0.2825)*
Public sector employment (%)		0.8794	0.8682	0.0488	0.7150		0.6120	0.5421	0.5277	0.0531
		(0.2270)***	(0.0283)*	(0.0288)*	(0.2243)***		(0.0301)	(0.3070)*	(0.2847)*	(0.0301)*
Unemployment rate		-0.1375	-0.1491	-0.1615	-0.1685		-0.1089	-0.1437	-0.1337	-0.1457
		(0.1588)	(0.1668)	(0.1689)	(0.1727)		(0.1896)	(0.1900)	(0.1642)	(0.1595)
Homicide rate		0.4279	0.4032	0.3380	0.3377		-0.1323	-0.2207	-0.1125	-0.0836
		(0.1394)***	(0.1403)***	(0.1403)**	(0.1413)**		(0.3023)	(0.3410)	(0.3042)	(0.2916)
Border state dummy		-4.7993	11.7971	-5.3942	-5.2306		4.9310	5.3803	6.8690	5.9614
		(2.8509)*	(2.5321)***	(2.8513)*	(2.7781)*		(4.0221)	(3.9433)	(3.8319)*	(3.8149)

			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Income per capita (log)			0.0843	0.5429	0.5728			-0.1637	0.2970	0.3597	
			(0.9069)	(0.9081)	(0.9203)			(1.0582)	(1.0268)	(1.0138)	
Municipal Income Gini Coefficient			2.6379	0.1943	0.2515			4.1989	1.9120	1.7954	
			(3.0895)	(3.1209)	(3.1621)			(3.7684)	(3.6916)	(3.6252)	
Population in poverty (%)			-0.0279	-0.0318	-0.0442			-0.1575	-0.1373	-0.1467	
			(0.0497)	(0.0504)	(0.0516)			(0.0885)*	(0.0881)	(0.0874)*	
Population in housing w/o tap water				0.0581	0.0534				0.0427	0.0371	
				(0.0181)***	(0.0184)***				(0.0230)*	(0.0232)	
Water-delivery infrastructure				0.1773	0.1865				0.2372	0.2455	
				(0.2962)	(0.2996)				(0.3029)	(0.3015)	
Bank branches per 1000 people				-6.0507	-6.1984				-6.2736	-6.4142	
				(5.2014)	(5.3160)				(6.3158)	(6.2741)	
Historical municipal migration proxy					0.9178					1.2077	
					(0.2666)***					(0.3380)***	
Constant	39.0680	-16.8667	-16.8484	-20.6834	-23.3290	48.6454	-7.3292	3.2873	-4.4342	-8.9471	
	(1.8806)***	(3.6942)***	(9.2702)*	(9.4464)**	(9.5811)**	(4.2456)***	* (6.1346)	(14.8100)	(15.0053)	(14.2521)	
Observations	1774	1763	1763	1734	1732	1762	2 1751	1751	1722	1720	
R-squared	0.1160	0.3479	0.3484	0.3616	0.3656	0.0305	0.1484	0.1302	0.2315	0.2514	

TABLE 11 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Poverty and marginalization (Tables 12 to 14)

In order to assess whether remittances reduce poverty, we use as dependent variables the fraction of the population whose income is equivalent to at most the minimum wage, which we label "extreme poverty"; and, the fraction whose income is at most two minimum wages, which we label "poverty". Nationally, roughly 17% of the population lives in extreme poverty, while around 53% lives in poverty. While these are not the standard definitions, the poverty rates they produce are actually close to official statistics. For instance, 24.2% of all Mexicans do not earn enough income to cover their food requirements satisfactorily; and, in addition to food, 53.7% cannot cover their needs regarding health, clothing, transportation, housing, and education.¹⁵

Table 12 shows that remittances do not seem to dent the incidence of extreme poverty in a statistically significant way. This might reflect that migration is a costly endeavor and households at very low-income levels might not be able to defray its costs, i.e., only households with income above some given level might be able to emigrate and remit; this is consistent with the evidence presented in Tables 3 and 4.

Table 13 supports this line of reasoning. When we consider the fraction with income equivalent at most to two times the minimum wage -that is, those in poverty according to our definition- we do find negative effects, although the 2SLS results are not always significant.

In addition, for the year 2000 we use a "marginalization index" which Mexico's *Consejo Nacional de Población* (CONAPO [2001]) calculates using a principal components method. This index summarizes municipal schooling, housing, demographic, and income characteristics. As such, it captures some of the dimensions already considered piecemeal. Table 14 suggests that remittances indeed reduce average municipal marginalization.

TABLE 12: MIGRATION, REMITTANCES, AND EXTREME POVERTY. DEPENDENT VARIABLE: POPULATION WITH INCOME EQUIVALENT TO LESS THAN THE MINIMUM WAGE (%) (Sample: Rural municipalities)

(• • • · • · • • • • • • • • • • • • •										
			OLS			2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Remittance- receiving households (%)	-3.9735	-2.9279	-2.8730	-2.8456	-2.8224	-4.5919	0.3316	-0.6089	-1.7053	-1.8780
	(0.3170)***	(0.3153)***	(0.3159)***	(0.3168)***	(0.3206)***	(1.5951)***	(2.3481)	(2.1482)	(2.2459)	(2.1394)
Rural (<2500) population (%)		0.0410	0.0305	0.0213	0.0216		0.0384	0.0287	0.0211	0.0216
		(0.0113)***	(0.0110)***	(0.0111)*	(0.0113)*		(0.0117)***	(0.0113)**	(0.0113)*	(0.0113)*
Indigenous population (%)		0.1076	0.1009	0.1022	0.1019		0.1407	0.1237	0.1139	0.1115
		(0.0158)***	(0.0159)***	(0.0161)***	(0.0163)***		(0.0269)***	(0.0255)***	(0.0264)***	(0.0255)***

¹⁵ Figures from Comité Técnico para la Medición de la Pobreza [2002] and Cortés Cáceres *et al.* [2002].

			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Schooling		-2.6547	-1.7562	-1.7783	-1.7796		-2.5212	-1.6404	-1.7111	-1.7253	
		(0.4150)***	(0.4407)***	(0.4396)***	(0.4449)***		(0.4342)***	(0.4623)***	(0.4646)***	(0.4604)***	
Female-headed households (%)		0.2595	0.2410	0.2303	0.2327		-0.0520	0.0235	0.1178	0.1391	
		(0.0924)***	(0.0928)***	(0.0937)**	(0.0950)**		(0.2438)	(0.2259)	(0.2326)	(0.2227)	
Agricultural employment (%)		0.1829	-0.3851	-0.3285	0.1525		-0.3170	0.1543	-0.2964	0.1549	
		(0.0308)***	(0.0327)***	(0.1900)*	(0.0332)***		(0.0335)***	(0.2065)	(0.2029)	(0.2037)	
Public sector employment (%)		-0.4337	0.1452	0.1509	-0.3184		0.1978	-0.3031	0.1540	-0.2914	
		(0.1935)**	(0.1898)**	(0.0327)***	(0.1933)*		(0.2112)	(0.0344)***	(0.0338)***	(0.0337)***	
Unemployment rate		-0.2513	-0.4246	-0.3668	-0.3688		-0.2639	-0.4358	-0.3754	-0.3749	
		(0.2412)	(0.2368)*	(0.2220)*	(0.2254)		(0.2862)	(0.2661)	(0.2354)	(0.2332)	
Homicide rate		-0.6522	-0.5324	-0.4842	-0.4858		-0.3705	-0.3309	-0.3892	-0.4075	
		(0.1326)***	(0.1321)***	(0.1388)***	(0.1400)***		(0.2437)	(0.2307)	(0.2254)*	(0.2171)*	
Border state dummy		-0.4995	1.4013	0.7872	0.7185		8.2608	2.9970	5.3288	5.4851	
		(1.4958)	(1.2901)	(1.2391)	(1.2794)		(3.0932)***	(2.0259)	(2.7842)*	(2.7937)**	
Income per capita			-4.7275	-4.7214	-4.7499			-4.8702	-4.7761	-4.7975	
(3)			(0.9598)***	(0.9736)***	(0.9853)***			(1.0199)***	(1.0182)***	(1.0167)***	
Municipal Income Gini Coefficient			-1.8885	-1.3334	-1.1905			-2.3739	-1.6619	-1.4493	
			(3.4064)	(3.3685)	(3.4071)			(3.5880)	(3.5298)	(3.4925)	
Population in				0.0208	0.0229				0.0228	0.0246	
poverty (76)				(0.0207)	(0.0211)				(0.0231)	(0.0234)	
Population in housing w/o tap water				0.5558	0.5512				0.5409	0.5377	
				(0.2123)***	(0.2148)**				(0.2149)**	(0.2144)**	
Water-delivery				5.6104	5.6091				5.4354	5.4555	
Innastructure				(3.4149)	(3.4571)				(3.4902)	(3.4699)	
Bank branches per					-0.2932					-0.3459	
1000 people					(0.1893)					(0.2224)	
Historical municipal migration proxy	19.7683	24.8491	61.8274	61.2042	62.2691	21.3741	19.9134	59.7392	60.0860	61.5520	
3	(1.0184)***	(3.8504)***	(8.4420)***	(8.5767)***	(8.6707)***	(4.1890)**	* (5.0938)***	(8.5794)***	(8.6304)***	(8.5577)***	
Constant	-3.9735	-2.9279	-2.8730	-2.8456	-2.8224	-4.5919	0.3316	-0.6089	-1.7053	-1.8780	
	(0.3170)***	(0.3153)***	(0.3159)***	(0.3168)***	(0.3206)***	(1.5951)**	* (2,3481)	(2,1482)	(2,2459)	(2,1394)	
Observations	1774	1763	1763	1734	1732	1762	2 1751	1751	1722	1720	
R-squared	0 4829	0.6365	0 6454	0 6549	0.6555	0 4826	6073	0 6312	0.6513	0.6530	
n-squareu	0.4629	0.0305	0.0454	0.0549	0.0000	0.4620	0.0073	0.0512	0.0013	0.0030	

TABLE 12 (CONTINUED)

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

 * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 13

MIGRATION, REMITTANCES, AND POVERTY. DEPENDENT VARIABLE: POPULATION WITH INCOME EQUIVALENT TO LESS THAN TWO TIMES THE MINIMUM WAGE (%)

(Sample: Rural municipalities)

			OLS			2SLS					
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)	
Remittance- receiving households (%)	-1.4465	-0.6838	-0.6229	-0.6626	-0.6855	-1.6831	-2.8836	-4.0983	-4.0084	-3.7816	
	(0.1781)***	* (0.1379)***	* (0.1296)***	(0.1332)***	(0.1351)***	(1.0399)	(1.6116)*	(1.5411)***	(1.5089)***	(1.4330)***	
Rural (<2500) population (%)		0.0393	0.0240	0.0208	0.0206		0.0414	0.0277	0.0237	0.0231	
		(0.0060)***	[*] (0.0057)***	(0.0057)***	(0.0058)***		(0.0068)***	* (0.0071)***	(0.0070)***	(0.0068)***	
Indigenous population (%)		-0.0058	-0.0148	-0.0171	-0.0168		-0.0281	-0.0496	-0.0508	-0.0477	
		(0.0059)	(0.0057)***	(0.0058)***	(0.0059)***		(0.0175)	(0.0170)***	(0.0167)***	(0.0158)***	
Schooling		-2.8503	-1.6219	-1.6407	-1.6224		-2.9368	-1.8007	-1.8500	-1.8132	
		(0.1931)***	[*] (0.1978)***	(0.1972)***	(0.1995)***		(0.2222)***	* (0.2586)***	(0.2617)***	(0.2541)***	
Female-headed households (%)		0.1216	0.0882	0.0810	0.0786		0.3290	0.4147	0.3932	0.3652	
		(0.0343)***	* (0.0330)***	(0.0334)**	(0.0338)**		(0.1574)**	(0.1517)***	(0.1481)***	(0.1398)***	
Agricultural employment (%)		0.2550	-0.3391	0.2015	0.2002		-0.4931	0.1858	0.1891	0.1882	
		(0.0132)***	* (0.1143)***	(0.0130)***	(0.0132)***		(0.1344)***	* (0.1343)***	(0.1311)***	(0.0156)***	
Public sector employment (%)		-0.4033	0.2015	-0.3327	-0.3525		0.2441	-0.4772	-0.4483	-0.4654	
		(0.1196)***	* (0.0128)***	(0.1139)***	(0.1144)***		(0.0164)***	* (0.0163)***	(0.0159)***	(0.1286)***	
Unemployment rate		-0.0548	-0.3007	-0.2925	-0.2962		-0.0455	-0.2781	-0.2542	-0.2622	
		(0.1314)	(0.1248)**	(0.1190)**	(0.1220)**		(0.0992)	(0.0777)***	(0.0744)***	(0.0745)***	
Homicide rate		-0.3045	-0.1759	-0.1312	-0.1302		-0.4969	-0.4880	-0.4075	-0.3841	
		(0.0899)***	* (0.0711)**	(0.0698)*	(0.0705)*		(0.1674)***	* (0.1645)***	(0.1525)***	(0.1462)***	
Border state dummy		-6.7020	-4.3690	-4.1511	-4.0543		3.5914	-6.8232	1.9804	1.5949	
		(2.4731)***	(2.1733)**	(2.1244)*	(2.0858)*		(2.2948)	(2.5090)***	(1.9251)	(1.9346)	

	OLS					2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Income per capita (log)			-6.0674	-6.2140	-6.1570			-5.7948	-5.9762	-5.9146
			(0.3972)***	* (0.3993)***	(0.4044)***			(0.4715)***	* (0.4622)***	(0.4541)***
Municipal Income Gini Coefficient			2.2350	3.1811	3.1546			2.9059	4.1763	4.0247
			(1.5375)	(1.5309)**	(1.5482)**			(1.8063)	(1.8113)**	(1.7599)**
Population in poverty (%)				-0.0185	-0.0209				-0.0302	-0.0329
				(0.0081)**	(0.0083)**				(0.0112)***	(0.0112)***
Population in housing w/o tap water				0.0341	0.0373				0.0627	0.0649
				(0.0874)	(0.0887)				(0.1191)	(0.1165)
Water-delivery infrastructure				-9.7434	-9.7404				-9.2522	-9.2702
				(3.4042)***	(3.3959)***				(3.7230)**	(3.6159)**
Bank branches per 1000 people					0.4347					0.6053
					(0.1772)**					(0.1975)***
Historical municipal migration proxy	62.8329	70.0733	115.2498	116.5227	114.5741	63.4472	73.4663	118.1821	119.5387	116.6394
	(1.6080)***	* (2.0976)***	* (3.6237)***	* (3.6555)***	(3.8046)***	(3.1018)***	(3.2928)***	* (4.2679)***	* (4.3130)***	(4.2399)***
Constant	-1.4465	-0.6838	-0.6229	-0.6626	-0.6855	-1.6831	-2.8836	-4.0983	-4.0084	-3.7816
	(0.1781)***	[*] (0.1379)***	* (0.1296)***	* (0.1332)***	(0.1351)***	(1.0399)	(1.6116)*	(1.5411)***	* (1.5089)***	(1.4330)***
Observations	1774	1763	1763	1734	1732	1762	1751	1751	1722	1720
R-squared	0.5113	0.8005	0.8281	0.8300	0.8310	0.5116	0.7740	0.7618	0.7694	0.7793

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported.

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE 14 MIGRATION, REMITTANCES, AND MARGINALIZATION. DEPENDENT VARIABLE: MARGINALIZATION INDEX (Sample: Rural municipalities)

	OLS					2SLS				
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Remittance- receiving households (%)	-0.1923	-0.0793	-0.0782	-0.0751	-0.0771	-0.4482	-0.3718	-0.4185	-0.3558	-0.3233
	(0.0144)***	* (0.0087)***	(0.0086)***	(0.0082)***	(0.0082)***	(0.0751)***	(0.0999)***	(0.1042)***	(0.0914)***	(0.0820)***
Rural (<2500) population (%)		0.0025	0.0018	0.0023	0.0023		0.0028	0.0022	0.0026	0.0025
		(0.0003)***	(0.0003)***	(0.0003)***	(0.0003)***		(0.0005)***	(0.0005)***	(0.0005)***	(0.0004)***
Indigenous population (%)		0.0040	0.0037	0.0036	0.0037		0.0011	0.0003	0.0009	0.0013
		(0.0004)***	(0.0004)***	(0.0004)***	(0.0004)***		(0.0011)	(0.0012)	(0.0010)	(0.0009)
Schooling		-0.3982	-0.3528	-0.3408	-0.3386		-0.4091	-0.3698	-0.3560	-0.3514
		(0.0115)***	(0.0122)***	(0.0115)***	(0.0115)***		(0.0150)***	(0.0177)***	(0.0160)***	(0.0149)***
Female-headed households (%)		-0.0090	-0.0109	-0.0094	-0.0096		0.0187	0.0212	0.0168	0.0134
		(0.0021)***	(0.0021)***	(0.0020)***	(0.0020)***		(0.0096)*	(0.0100)**	(0.0088)*	(0.0079)*
Agricultural employment (%)		0.0055	0.0034	0.0175	0.0028		0.0040	0.0018	0.0016	0.0052
		(0.0007)***	(0.0007)***	(0.0052)***	(0.0007)***		(0.0082)	(0.0011)	(0.0077)	(0.0072)
Public sector employment (%)		0.0176	0.0198	0.0029	0.0156		0.0056	0.0058	0.0062	0.0016
		(0.0056)***	(0.0056)***	(0.0007)***	(0.0051)***		(0.0011)***	(0.0089)	(0.0010)	(0.0009)*
Unemployment rate		0.0217	0.0118	0.0059	0.0055		0.0232	0.0143	0.0086	0.0078
		(0.0076)***	(0.0077)	(0.0060)	(0.0059)		(0.0145)	(0.0156)	(0.0119)	(0.0108)
Homicide rate		0.0543	0.0562	0.0511	0.0509		0.0291	0.0258	0.0267	0.0295
		(0.0060)***	(0.0062)***	(0.0058)***	(0.0059)***		(0.0126)**	(0.0138)*	(0.0119)**	(0.0111)***
Border state dummy		-0.3819	-0.3175	-0.2664	-0.2585		-0.4685	-0.5569	-0.4687	-0.4334
		(0.0942)***	(0.0769)***	(0.0853)***	(0.0917)***		(0.1334)***	(0.1150)***	(0.1124)***	(0.1094)***

TABLE 14 (C	ONTINUED)
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			OLS					2SLS		
	(Reg. 1)	(Reg. 2)	(Reg. 3)	(Reg. 4)	(Reg. 5)	(Reg. 6)	(Reg. 7)	(Reg. 8)	(Reg. 9)	(Reg. 10)
Income per capita (log)			-0.1918	-0.2063	-0.2004			-0.1647	-0.1827	-0.1778
			(0.0242)***	(0.0221)***	(0.0222)***			(0.0345)***	(0.0300)***	(0.0284)***
Municipal Income Gini Coefficient			0.4804	0.4864	0.4769			0.5497	0.5437	0.5221
			(0.0892)***	(0.0843)***	(0.0855)***			(0.1270)***	(0.1122)***	(0.1056)***
Population in poverty (%)				-0.0518	-0.0510				-0.0462	-0.0459
				(0.0053)***	(0.0053)***				(0.0066)***	(0.0063)***
Population in housing w/o tap water				-0.5543	-0.5534				-0.5128	-0.5157
				(0.2022)***	(0.2018)***				(0.2451)**	(0.2346)**
Water-delivery infrastructure					0.0413					0.0533
					(0.0078)***					(0.0103)***
Bank branches per 1000 people	-0.2290	1.7599	2.9872	3.0562	2.8656	0.4355	2.2072	3.2674	3.2805	3.0068
	(0.0839)***	(0.1257)***	(0.2170)***	(0.2029)***	(0.2070)***	(0.2126)**	(0.2146)***	(0.3021)***	(0.2661)***	(0.2514)***
Historical municipal migration proxy	-0.1923	-0.0793	-0.0782	-0.0751	-0.0771	-0.4482	-0.3718	-0.4185	-0.3558	-0.3233
	(0.0144)***	(0.0087)***	(0.0086)***	(0.0082)***	(0.0082)***	(0.0751)***	(0.0999)***	(0.1042)***	(0.0914)***	(0.0820)***
Constant		0.0025	0.0018	0.0023	0.0023		0.0028	0.0022	0.0026	0.0025
		(0.0003)***	(0.0003)***	(0.0003)***	(0.0003)***		(0.0005)***	(0.0005)***	(0.0005)***	(0.0004)***
Observations	1774	1763	1763	1763	1761	1762	1751	1751	1751	1749
R-squared	0.4370	0.8535	0.8622	0.8737	0.8759	0.3219	0.7376	0.7052	0.7669	0.7940

Notes: Two-stage least-squares estimation results.

Remittance-receiving households (%, in logs) instrumented with the coefficient of variation of monthly rainfall and distance to Guadalajara (km, in logs).

State dummies included but not reported. - Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

V. FINAL REMARKS

In this paper we present evidence that international migration, through the flow of remittances, may well play an important role in improving living conditions in migrant-sending regions. Using a large cross-section of Mexican municipalities, we find evidence suggesting that as the proportion of households receiving remittances rises, development outcomes improve. Specifically, as the fraction of remittance-receiving households increases, infant mortality, child illiteracy, and some attendance and poverty measures tend to improve.

While we do not have truly exogenous variation in the extent of remittances, the econometric exercises we implement include a substantial number of controls and use two candidate instrumental variables. Moreover, our results complement and confirm some of the findings of an incipient literature based on detailed household data that explores how remittance income results in improved welfare indicators.

The findings in this paper and in the related literature lend support to the notion that international migration is an important dimension of global economic integration that deserves further study. Discussions regarding the virtues and vices of globalization should focus not only on the role of trade and capital flows, but should explicitly incorporate migration.

Perhaps more importantly, policy makers in both sending and receiving countries must understand migration in order to harness its potential as a development tool. It may not be realistic to propose easing restrictions on the international movement of people since migration is a thorny political issue in both host and sending countries. Nevertheless, the fact is that it takes place despite legal restrictions and open opposition in some quarters, and understanding its consequences is important.

Therefore, the issue is how countries, within their political constraints, regulate migration flows in a way that acknowledges the root causes of their existence and promotes development in the sending regions as a long-term solution. This is another reason why understanding the developmental impact of remittances is important –if remittances, by allowing for better educational opportunities and healthier lives, break the cycle of poverty and social exclusion that forces people to look for opportunities abroad, they may reduce misapprehensions toward and pressures for future migration. In addition, policies that facilitate cross-border income transfers should be a politically-palatable channel for exploiting the development potential of migration.

In recent years there has been a significant drop in transfer fees, by as much as 50% in some cases. This is partially the result of entry and competition in the remittances marketplace. At the same time, financial institutions increasingly rely on new technologies and provide migrant families with a greater array of financial instruments to carry out international transfers. They include, for example, access to mortgage credit backed by remittance income. In addition, there are ongoing efforts to establish automated clearing houses that would allow cross-border bank transfers at a fraction of current costs. Mexico and the United States have recently established such a scheme. Host countries should also consider ways to ease immigrants' access to the financial sector, while at the same time reducing the room for illicit operations. For their part, migrant-sending countries should avoid the temptation to sap the large inflows of remittances and

should instead consider ways in which these may further promote development. In sum, national policy makers and international organizations will need to devote considerable energy to harness the potential of remittances.¹⁶

¹⁶ López Córdova and Olmedo [2005] summarize some of the existing recommendations regarding policies to facilitate remittance flows and to take advantage of their development potential.

APPENDIX A: DATA

Data is collected from a number sources. Most of those sources use Mexico's 2000 Population and Housing Census as a basis. The 2000 Census applied an extended questionnaire to a 10-% sample of all Mexican households, compromising more than 2 million observations. The extended questionnaire collected data on schooling, housing conditions, income, migration, and vital statistics, among others. Next is a summary of the variables we use and their source. Unless otherwise noted, all data are at the municipal level.

Variable	Description	Source(s)	
State migration rate, 1955- 1959	Migration rate, 1955-1959, by state.	Woodruff and Zenteno [2001]	
State migration rate, 1924	Migration rate, 1924, by state.	Foerster [1925] and INEGI's population data.	
Remittance-receiving households (%)	Percent of all households reporting remittance income during 1999	CONAPO [2002]	
Infant mortality	Number of deaths during the first year of life per 1000 live births.	CONAPO [2001]	
Marginalization index	Index summarizing municipal performance regarding schooling, housing quality, and demographic and income characteristics, using a principal component method.	Idem	
GDP (Income) per capita (log)	Municipal income per capita as estimated by CONAPO.	ldem	
Child illiteracy	Percent of children 6-14 years old who cannot read	Author's calculation based on data from INEGI, Sistema Municipal de Bases de Datos (SIMBAD).	
Child school attendance	Percent of children 5 , 6-14, or 15-17 years old who attend school.	Idem	
Schooling	Average years of school in the population 15 years or older	Idem	
Extreme poverty	Percent of population with income equivalent to at most one times the minimum the wage.	Idem	
Population in Poverty	Percent of population with income equivalent to at most two times the minimum the wage.	Idem	
Female-headed households (%)	Percent of households headed by women.	Idem	
Population in housing w/o tap water	Percent of all dwellings lacking access to tap water.	Idem	
Agricultural employment (%)	Percent of employment in the agricultural sector.	Idem	

TABLE A1: VARIABLE DESCRIPTION AND SOURCES

TABLE A1 (CONTINUED)

Variable	Description	Source(s)		
Public sector employment (%)	Percent of public sector employment.	Idem		
Rural (<2500) population (%)	Percent of the municipality's population living in communities with 2,500 or less inhabitants.	ldem		
Indigenous population (%)	Percent of population belonging to an indigenous group.	Idem		
Homicide rate	Number of homicides (average from 1998-2000) divided by population	Idem		
Bank branches per 1000 people	Bank branches per 1000 people	Based on data provided by Soledad Martínez Peria, World Bank		
Water delivery infrastructure	Number of workers on water treatment and supply facilities at the municipality as a fraction of the population	Based on data from INEGI's Censos Económicos 1999		
Municipal Income Gini Coefficient	Gini coefficient.	Author's calculation based on data from INEGI, XII Censo General de Población y Vivienda 2000, Cuestionario Ampliado		
Historical Municipal Migration Proxy	Measure of the cost of emigrating from a given municipality during the 1920s, proxied by the distance from the municipality to the railroad network in existence during the 1920s plus the distance from that point to the US-Mexico border	Author's calculation using geographical coordinates and historical railroad maps		
Monthly Rainfall (Coefficient of variation)	Coefficient of variation of monthly rainfall for each weather station in Mexico since c. 1913 to 1994	Author's calculation using data from Servicio Meteorológico Nacional		
Unemployment rate	Fraction of the economically active population that is unemployed	Author's calculation based on data from INEGI, Sistema Municipal de Bases de Datos (SIMBAD).		

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