DO REMITTANCES BOOST ECONOMIC DEVELOPMENT? EVIDENCE FROM MEXICAN STATES

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Do Remittances Boost Economic Development? Evidence from Mexican States

Abstract: Remittances have been promoted as a development tool because they can raise incomes and reduce poverty rates in developing countries. Remittances may also promote development by providing funds that recipients can spend on education or health care or invest in entrepreneurial activities. From a macroeconomic perspective, remittances can boost aggregate demand and thereby GDP as well as spur economic growth. However, remittances may also have adverse macroeconomic impacts by increasing income inequality and reducing labor supply among recipients. We use state-level data from Mexico during 2003-2007 to examine the aggregate effect of remittances on employment, wages, unemployment rates, the wage distribution, and school enrollment rates. While employment, wages and school enrollment have risen over time in Mexican states, these trends are not accounted for by increasing remittances. However, two-stage least squares specifications among central Mexican states suggest that remittances shift the wage distribution to the right, reducing the fraction of workers earning the minimum wage or less.

Do Remittances Boost Economic Development? Evidence from Mexican States

The U.S. recession and housing bust that preceded it reduced migration flows from Mexico to the U.S. and remittance flows back to Mexico. Mexican policymakers grew concerned about the effects of a reduction in money transfers at a time when economic growth there was also slowing. Policymakers specifically worry that incomes and consumption will fall in the short run, and long-run economic development may be hampered if lower remittances reduce school enrollment. The large literature on remittances, however, may give Mexican policymakers less reason for concern about the falling remittances. The literature has reached mixed conclusions on the effect of remittances on economic development in receiving areas.

The remittances that migrants send back home create both costs and benefits for a country. On the positive side, remittances boost the incomes of recipients, enabling them to increase consumption or investment. Some of the income effect may be undone by exchange rate and price effects, leading to a smaller real aggregate impact. In addition, remittances can slow economic development by exacerbating income inequality and reducing labor supply among recipient families. This study examines the effect of remittances on economic development as measured by employment, unemployment, wages, wage inequality, and school enrollment in Mexican states during the period 2003-2007.

Since remittances have become a major source of income for many developing countries, there is a large and fast-growing economics literature on the effects of remittances on receiving countries. We focus here on studies specific to Mexico.[1] Previous research has reached mixed conclusions about the effects of remittances on labor force participation, inequality, poverty, schooling, and financial markets in Mexico.

[1] For recent surveys that are not specific to Mexico, see Rapoport and Docquier (2006) and Adams (2007).

Findings on the effect of remittances on labor supply in Mexico are mixed. Hanson (2007) finds that, after controlling for observable characteristics, individuals are less likely to participate in the labor force if their household has sent migrants abroad or has received remittances from abroad.[2] He also concludes that during the 1990s, a time of high migration, women from high-migration states became less likely to work outside the home than women from low-migration states. This suggests that remittances might reduce labor supply among those remaining in Mexico, although the effect could be due to migration instead. In contrast, Cox-Edwards and Rodriguez-Oreggia (2009) find no systematic difference in labor force behavior between households that receive remittances and those that do not.

Likewise, there is no clear consensus regarding the impact of remittances on income inequality. Some research suggests that the relationship between remittances (and migration) and inequality is an inverse-U shape, with inequality first increasing as migration and remittances rise from relatively low levels (Koechlin and León 2007; McKenzie and Rapoport 2007). Inequality eventually falls as higher levels of migration expand networks and drive down migration costs and as remittances rise, allowing lower-income families to migrate and share in the benefits. Other studies conclude that the net effect of migration and remittances is to exacerbate income inequality (e.g., Barham and Boucher 1998; Mora Rivera 2005) while some find evidence that remittances have no effect or reduce inequality (e.g., Acosta et al. 2006, 2007).

For the Mexican case, previous research suggests that remittances increase income inequality. For instance, Mora Rivera (2005) shows that international remittances increase the Gini coefficient—a measure of inequality—in rural Mexican communities. However, he concludes that domestic remittances, from workers moving within Mexico, reduce the Gini

[2] Amuedo-Dorantes and Pozo (2009) find that labor supply also responds to the volatility in remittances.

coefficient. These differing impacts could be driven by migrant selection. If domestic migrants are from the lower end of the income distribution, their migration should boost incomes among poor households, reducing income disparities rather than increasing them.

Previous studies have also addressed the question whether remittances reduce poverty. Most research concludes that remittances do reduce poverty rates, albeit perhaps modestly in some countries (Adams and Page 2005; Acosta et al. 2007). For the Mexican case, one study indicates that remittances reduce the likelihood of being in poverty by 10 to 14 percent (Esquivel and Huerta-Pineda 2007). López-Córdova (2005) shows that the fraction of households receiving remittances is negatively associated with the poverty rate across all Mexican municipalities in the year 2000.

The impact of remittances on education may be particularly important for economic development in the long run. Most Mexico-based research finds evidence of a positive effect of remittances on education outcomes. Hanson and Woodruff (2003) suggest that living in a household with a U.S. migrant increases years of schooling among girls whose parents have low education levels. Remittance inflows raise household income and relax credit constraints, which perhaps enables families to pay school fees and delay girls' entry into the labor force. Borraz (2005) finds a positive but small effect of remittances on schooling, with the impact only occurring for children living in cities with fewer than 2,500 inhabitants and whose mothers have a very low level of education. López-Córdova (2005) shows that the fraction of households receiving remittance income is positively associated with school attendance rates and negatively associated with child illiteracy rates across Mexican municipalities in year 2000.

Recent Trends in the Mexico Case

The effect of remittances on economic development at both the aggregate and the household level in Mexico is of particular interest because the country has experienced a staggering outflow of workers and large remittance inflows. About 8 million people—over 15 percent of the Mexican-born labor force—have migrated to the United States in recent years. There is considerable controversy about the relative skill level of these emigrants, with some studies contending that out-migrants are drawn from the bottom of the skill distribution (e.g., Ibarraran and Lubotsky 2007) and others suggesting that they are from the top half or middle of the skill distribution (e.g., Chiquiar and Hanson 2005; Orrenius and Zavodny 2005). Having grown at double-digit rates for many years, remittances to Mexico reached an all-time high of almost $24 billion in 2007, occupying third place as a foreign exchange generator for Mexico after oil and maquiladora exports.

The traditional migrant-sending regions of Mexico, primarily the central states, benefit disproportionately from remittances, as shown in Figure 1. The poorer central-western states attract most of the remittance flows, with Michoacán at the top with almost $2.5 billion in 2008 (or 10 percent of gross state product, or GSP), followed by Guanajuato with $2.3 billion (6.1 percent of GSP), Estado de México with $2.1 billion (2.2 percent of GSP) and Jalisco with $1.9 billion (3.0 percent of GSP). In richer regions, such as Distrito Federal or the northern Mexican states of Baja California, Sonora, Chihuahua, Nuevo León, Coahuila and Tamaulipas, remittances are less than 2 percent of GSP and play a much smaller role in the state economy.

This study examines the effect of remittance inflows on several indicators of economic development at the state level in Mexico and makes several important contributions that complement the existing literature. As discussed below, studying remittances and development at the state level captures the net effect of transfers across recipient and non-recipient households,

an aggregate average effect that micro studies do not capture. In addition, if remittances are better measured at more aggregate levels than at the household level, using state-level data reduces measurement error and enhances estimates of remittance effects. Using state-level data also reduces concerns about unobserved heterogeneity and selection bias, which are difficult problems to address at the household level. Despite this, we address any remaining endogeneity by instrumenting for remittances using migrant-weighted U.S. wages and unemployment rates. The two-stage least squares results suggest that remittances shift the wage distribution to the right, shrinking the share of lowest-wage workers, but do not boost school enrollment rates. Remittances also appear weakly related to lower unemployment rates, but we do not find significant effects on average wages or employment.

Theoretical Framework

Remittances are likely to affect wages and employment both at the household level and in the aggregate. If leisure is a normal good, remittances should reduce labor supply among recipient households by creating a pure income effect. Although this reduction in labor supply partially offsets the positive income impact of remittances, the increase in income should cause the aggregate demand curve to shift out, resulting in greater production of goods and services overall. The increase in aggregate demand and the reduction in labor supply from recipient families should both boost wages, which will lure some members of non-recipient families into the labor force. While remittances should cause wages to rise, the skill levels and hence the wages of recipient and non-recipients, could be very different. If so, compositional effects could mask the wage effect by causing the average wage to fall even though workers earn higher wages. Meanwhile, the net effect of higher remittances on employment and unemployment rates

is ambiguous—it depends on the relative magnitude of the changes in labor supply among recipient and non-recipient households and on labor demand.

Remittances are also likely to have distributional effects. The income distribution changes if there is selection in which households receive remittances or if remittances alter the wage distribution. Suppose, for example, that remittances are primarily received by households in the middle of the income distribution. Concomitant reductions in labor supply from these households should first and foremost raise wages for similar workers; *relative* wages at the bottom and top ends of the skill distribution could rise or fall, depending on the degree of substitutability of workers of different skill levels. If remittances help recipients invest in businesses, as might be the case in the presence of credit constraints, there might be further distributional effects vis-à-vis wages.

In addition, in a flexible exchange rate regime, remittances drive up the exchange rate and reallocate activity away from the tradable sector into non-tradables as home country exports become less competitive. Workers in the non-tradable sector thus may benefit at the expense of workers in the tradable sector. In sum, the net impact of remittances on the income and wage distributions is theoretically ambiguous.

All of these simple predictions—or lack thereof—ignore any direct effects of the out-migration that is a necessary precondition for remittances. Out-migration should boost wages and reduce employment rates as workers move abroad. Indeed, research finds a significant positive correlation between Mexican wages and out-migration (Hanson 2007; Mishra 2007). In addition, the distribution of wages may change, depending again on whether emigrants are drawn from a particular segment of the skill or wage distribution and on the degree of substitutability of workers of different skill levels. Some research suggests that relative wages for low-skilled

workers have fallen in Mexico as a result of out-migration (Aydemir and Borjas 2007). Unemployment rates may rise or fall, depending on whether out-migrants were unemployed, while employment rates almost surely rise since the population is falling.

If households face binding credit constraints, remittances may boost investment in both human and physical capital. Evidence for Mexico suggests that remittances may relax credit constraints for the very poor and can lead to more child schooling (Borraz 2005; Hanson and Woodruff 2003). However, migration may confound the positive effect of remittances on education (McKenzie and Rapoport 2006). Children who anticipate migrating to the U.S. in the future have less incentive to accumulate education given that the return to education is lower in the U.S. than in Mexico.

Advantages of State-Level Analysis

Remittances have been linked to a host of beneficial outcomes, such as lower poverty, greater investment in education and health, and increased entrepreneurial activity. Most of these linkages have been made by comparing recipient to non-recipient households in household-level data, although some studies also compare countries. This study takes a different approach by examining the effect of remittances over time at the state level.

The advantage of state-level analysis is first and foremost that all formal transfers are captured by the data.[3] Household surveys in Mexico typically capture only about one-third the official volume of international remittances.[4] The volume and growth rate of official remittances

[3] Note that we examine only remittances sent from abroad, not repatriated funds brought back by returning migrants or domestic remittances from rural-urban migration.

[4] Esquivel and Huerta-Pineda (2007) discuss recipient-based measures from a large nationally representative household survey in Mexico called ENIGH (Encuesta Nacional de Ingreso y Gasto de Hogares) and suggest that in 2002 there were 1.4 million recipient households who received $2,560 on average. Based on the household survey responses of recipients, remittances to Mexico totaled $3.6 billion in 2002, only 37 percent of official estimates for that year.

to Mexico are much higher than those implied by household survey data from senders and receivers and by other measures, such as U.S.-Mexico remittance estimates supplied by the U.S. Department of Commerce. Also, the remittance impact is not limited to recipients. When remittances are large, as is the case in some Mexican states, non-recipients are affected by ensuing changes in labor and capital markets. Aggregate analysis captures these indirect, general equilibrium effects.

An additional advantage of aggregate analysis is that concerns about endogeneity bias are smaller than in household-level studies because the remittance impact is measured across all households, not just recipient families. At the household level, both remittances and migration are likely to be endogenous with respect to outcomes of interest. Migration and remittances are often a response to household needs and priorities, so the causality runs both ways. For example, do remittances improve schooling outcomes, or are families who want to invest in schooling more likely to send a member abroad who will remit funds? McKenzie and Sasin (2007) note the "pervasive endogeneity" in such household-level decisions and urge using differences or instrumental variables techniques to control for bias arising from reverse causality, selection and omitted variables.

Moreover, at the household level at a single point in time, the confounding effects of migration make the remittance impact hard to study. Children may leave school to fill in for a father when he migrates. The remittances he eventually sends back may allow the children to return to school. On net, then, there might be no change in children's educational attainment. Time-varying data of the kind we use here can also better capture the effect of remittances than most household surveys, which tend to be cross-sectional.

In addition to the literature using household-level data to measure the impact of remittances, studies have also used cross-country data to examine the effect of remittances on economic variables like GDP, income inequality and poverty. Such studies typically pool cross-sectional or time-series data on a number of countries either around the world or in a certain geographic area, such as Latin America (e.g., Acosta et al. 2006, 2007). Using time-series data allows such studies to include country fixed effects in order to control for time-invariant, unobservable differences across countries. We implicitly take a similar approach by comparing states within a single country. The advantage here is that states are more economically, culturally, and geographically similar than different countries. Examining states within a single country gives the advantages of time-varying data in cross-national studies while removing potential problems arising from country-specific changes over time that are difficult to model empirically, such as changes in political regime or in enforcement of property rights.

Using aggregate data may lessen concerns about unobservable heterogeneity between recipient and non-recipient (or migrant and non-migrant) households but does not completely mitigate all endogeneity or selection problems. As in the household case, reverse causality may be a problem since both migration and remittances are likely to depend on macroeconomic conditions. Our use of state fixed effects reduces such concerns about endogeneity bias. In addition, we implement a two-stage least squares (2SLS) specification where we instrument for remittances using migrant-weighted measures of U.S. wages and unemployment rates from the Current Population Survey (CPS) and wages from the Covered Employment and Wages (CEW) data. Previous research has used U.S. earnings and unemployment to instrument for remittances (see, for example, Amuedo-Dorantes, Georges, and Pozo 2008).

Data and Methodology

Our measure of remittances is the state breakdown of Mexican remittances produced quarterly by the Banco de México since 2003. In 2000, Banco de México launched a major overhaul of the collection and recording of remittance data. Efforts initially focused on better recordkeeping within the central bank and then on better collection from sources outside the bank (Cervantes 2007). To this end, in October 2002, Banco de México issued rules under which all banks and money transfer companies had to register with the central bank and report monthly remittances by Mexican state of destination. Before 2003, state remittances were not available and aggregate monthly remittance levels were inferred from reporting based on a 1990 census of financial institutions, money exchange houses and wire transfer companies. The reporting requirement led to much improved data collection and a clear break with past trends in remittance numbers. Figure 2 shows remittances to Mexico (in real U.S. dollars, deflated using the CPI-W) on a quarterly basis during the period 2000-2007. After the reporting requirement begins in 2003, the data show more rapid growth and greater seasonality. Of course, despite the improved statistics, official remittance flows are still an undercount since unrecorded remittances continue to occur through informal channels.

We merge quarterly state-level remittances with quarterly state-level data on employment, unemployment, and median wages per hour from *Encuesta Nacional de Ocupacion y Empleo* or ENOE (in real pesos, deflated using regional Mexican CPI). ENOE captures all employment, both formal and informal. It is important to have a direct measure of employment and wages based on all workers, since research suggests that remittances have a large impact on the informal sector (Brambila 2008), and this impact may differ from the effect on the formal sector if formal sector workers are less likely to be migrants. In addition, the formal sector in

Mexico is less than half of total employment. We also include quarterly values of real state foreign direct investment (FDI) and state annual average labor force—formal plus informal—as control variables.

While our analysis of wages, employment, and unemployment is conducted at the quarterly level, we use annual data on school enrollment and the wage distribution. For that portion of the analysis, we merge annual remittances with enrollment rates and measures of the wage distribution. The enrollment rates are measured at the primary, secondary, tertiary, and vocational ('technical') school levels. The wage distribution measures are the fractions of workers earning less than or equal to the national minimum wage, 1-2 times the minimum wage, 2-3 times the minimum wage, 3-5 times the minimum wage, and more than 5 times the minimum wage. Descriptive statistics are shown in Table 1, and data details and sources are listed in Appendix Table 1. All quarterly variables are seasonally adjusted with the exception of remittances; the state remittance series is currently too short (only 20 observations per state) to run a seasonal adjustment. As discussed below, we include time fixed effects in the regressions, which should help control for any remaining seasonality.

Methods

We take a simple approach to examining the effect of remittances on measures of economic development within Mexican states. We regress the quarterly or annual state-level measure of economic development on real remittances received in that state. We also control for FDI and the size of the labor force.[5] We take the natural log of the dependent variable in the employment and wage regressions, while other outcomes (unemployment rate, wage distribution,

[5] Although quarterly labor force is available at the state level, we use annual average labor force as a control variable. This allows us to focus on the quarterly variation in the components of labor force, namely employment and unemployment, and relate those to changes in remittances.

enrollment rates) are fractions expressed as percents (multiplied by 100). Specifications include state fixed effects and, in some cases, time fixed effects:

$$Econ\ Dev_{st} = \alpha + \beta \text{Remittances}_{st} + \gamma \text{FDI}_{st} + \varphi \text{LF}_{st} + \sigma_s + \tau_t + \varepsilon_{st} \quad (1)$$

where *s* indexes states and *t* indexes time (which is either annual or quarterly, depending on the dependent variable). We estimate Huber-White standard errors clustered on the state.

This simple specification has several advantages. In the fixed effects models, the state effects control for unobservable differences that are fixed over time, such as distance from the U.S. border, while the time fixed effects control for changes that are common to states, such as changes in the U.S. or Mexican economy.[6] Ideally we would also control for time-varying, state-level measures of economic conditions that affect the outcomes of interest but are not endogenous or affected by remittances, but aside from FDI and labor force estimates, there are no such variables for which data are readily available. Because there are likely to be larger effects of remittances in high-migration states, we limit the sample to high-migration Central Mexican states in some specifications.[7] As discussed earlier, any general equilibrium effects of remittances are more likely to appear in this sample where spillover effects should be large.

Endogeneity bias is a concern because remittances increase in response to economic hardship. We address the dual causality by using U.S. wages and unemployment rates as instrumental variables for remittances. Instruments must be correlated with remittances but not

[6] We also tried specifications controlling for state-specific time trends in addition to state and time fixed effects but the trends wiped out all the results. The time series is presumably too short (only 5 years) and does not have the necessary power to estimate trends in addition to the other coefficients, particularly with regard to the annual data. Including state trends produces little change in goodness of fit of the regressions as measured by adjusted R^2, which is already 0.99 when the state and time fixed effects are included.

[7] The high-migration Central Mexico sample drops the following states: Baja California Norte, Baja California Sur, Campeche, Coahuila, Chihuahua, Nuevo León, Querétaro, Sonora, Tabasco, Tamaulipas and Yucatán.

with other Mexican economic development indicators and should vary by Mexican state and over time. To map U.S. wages and unemployment rates to Mexican states, we use the location choices of Mexican migrants who are in the Mexican Migration Project (MMP), a long-running survey of Mexican households that collects retrospective data on individuals' migration spells.[8] We construct time-invariant weights based on the recent migration histories of MMP household members[9] and multiply these weights by a measure of the wage from either the Current Population Survey (CPS) or the Quarterly Census of Employment and Wages (CEW) and with state-level unemployment rates from the U.S. Bureau of Labor Statistics.[10] Hence, the U.S. wage (unemployment rate) for Mexican state *i* at time *t* is simply the share of workers from *i* who are in U.S. state *j* multiplied by a measure of wages (unemployment rate) in U.S. state *j* at time *t* summed over all U.S. states and the District of Columbia:

$$\text{Wage}_{it} = \sum_{j=1}^{51} \text{ShareMigs}_{ij} \times \text{Wage}_{jt} \qquad (2)$$

Appendix Table 2 reports first stage regressions and joint F-tests. As indicated by the t-tests, both measures of U.S. wages and the unemployment rate measure are generally statistically significant in the first stage regression of remittances on the instruments and other exogenous

[8] Amuedo-Dorantes and Pozo (2009) use the same methodology to construct an instrument for household-level remittances in Mexico. We tried using wages reported in MMP as an instrument but there are too few observations in 2003-2007 to construct a state-specific earnings measure. See the MMP website http://mmp.opr.princeton.edu/ for more detailed information on these data.

[9] We base the location information on the first and last trips of all adult migrant workers who migrated to the U.S. in 1980 or later. For the 12 Mexican states that are not in MMP, we assigned the location distributions of the neighboring state deemed closest with regard to geographic proximity and most similar with regard to demographic profile. Details are available on request.

[10] The CPS wage is the median real weekly wage of all workers aged 18-49 in the merged outgoing rotation group files. Weekly wages under $100 were dropped before taking the median. The CEW wage is the average real weekly wage for all workers in private-sector industries covered by unemployment insurance.

variables. However, the instruments have greater power in the regressions that do not include time fixed effects, as shown by the F-tests.

Results

We find mixed evidence that remittance flows affect economic development. Table 2 shows employment, wage, and unemployment effects of remittances for the OLS and 2SLS regressions on the full sample of Mexican states in columns 1 and 2. The analysis for employment, wages, and unemployment is repeated on a smaller sample of Central Mexican states in Table 2 columns 3 and 4. This subsample of high-migration, high-remittance states excludes states in the north and southeast of Mexico, regions where there is either little overall migration (in the wealthy states of the north) or substantial domestic migration (in the southeast, where workers migrate to the tourist areas on the Yucatán peninsula). Columns 1 and 3 control for state fixed effects while columns 2 and 4 add time fixed effects. Our preferred specification is the 2SLS specification with time fixed effects, but we caution that the panel is very short.

The OLS results in the top panel of Table 2 suggest that remittances may affect employment and wages. In the sample of all states, higher remittances appear to boost wages (column 1) and reduce employment (column 2). A similar result holds for wages in high-migration states (column 3), while the estimated effect on employment switches from positive to negative when time fixed effects are included. This suggests that good macroeconomic conditions drove up both employment and remittances; adding time effects controls for this omitted variable. The negative correlation between remittances and employment observed in columns 2 and 4 in both the full and high-migration samples can likely be attributed to the endogenous nature of remittances and migration vis-à-vis employment growth. Low-growth

years are associated with higher out-migration and more remittances. This is one of the reasons we turn to instrumental variables regressions.

When we instrument for remittances, as shown in the bottom panel of Table 2, the employment and wage effects are positive when time fixed effects are not included (columns 1 and 3). When time fixed effects are included, however, there are no statistically significant results at conventional levels. There appear to be negative effects on the unemployment rate in the sample of high-migration states (column 4), although the coefficient lies just outside the standard cutoff p-value of 0.10. Still, the magnitude of the coefficient suggest that an additional $100 million in remittances in a quarter will reduce the unemployment rate by 1.95 percentage points. This is a large effect.

The fact that remittances do not increase employment but may lower the unemployment rate suggests that the labor force could be contracting. Unemployed workers may leave the labor force or trade places with employed workers that choose to exit as remittances rise. Either way, the results suggest that remittances do not cause the labor force to expand, which is consistent with the results of other studies.

Table 3 reports remittance effects on the wage distribution. The layout of the results is the same as in Table 2. The OLS results indicate that remittances shift the wage distribution to the right, with declines in the share of workers who are earning less than one times the minimum wage per day and significant increases in the share of workers earning either two to three or three to five times the minimum wage per day. Remittances are generally not related to the share of workers who are top earners (more than five times the minimum wage), at least not in the presence of time fixed effects. These workers are the most likely to be formal-sector workers and the least likely to become international migrants or receive remittances.

The distributional effects of remittances are enhanced in the 2SLS specifications. As can be seen in the lower panel of Table 3, the coefficient on remittances have the same signs as in the OLS specifications but are larger in magnitude. Focusing on column 4, remittances appear to shrink the fraction of workers earning at most the minimum wage by over two percentage points and boost the share who earns two to three times the minimum wage by 1.6 percentage points. As with the employment and unemployment results, coefficients typically are larger in high-migration states than in all states and when not controlling for time fixed effects. Since remittances primarily benefit poor households and the non-tradable sectors, such as food production and construction, it makes sense that low-wage workers benefit disproportionately and are pushed up in the wage distribution, particularly in heavily-affected states. Alternatively, the lowest-wage workers may be disappearing from the wage distribution if they leave the labor force as a consequence of receiving remittances.

Middle or positive selection of Mexican migrants may also help explain some of the distributional consequences of remittances with regard to wages. Workers who are most similar to the out-migrants are more likely to receive remittances and to benefit from the reduced ranks in the labor market. This may underlie part of the large increase in the share of the workers earning wages of two to three times the minimum wage in high-migration states in the 2SLS specification.

Table 4 shows the results from the school enrollment rate regressions for the full sample and the high-migration subsample. In keeping with much of the household-level evidence on remittances and schooling, we find that, without time controls, remittances appear to increase enrollment rates at almost all levels of schooling. Remittances appear to be positively and significantly correlated with higher primary, secondary, and university enrollment rates in both

the full sample of states and the high-migration subsample. However, once we include time fixed effects, the remittance coefficients become statistically insignificant. This suggests that remittances are increasing in the years during which enrollment rates are also rising. The positive relationship is simply two concurrent trends, remittance growth (as in Figure 1) and the well-documented rise in schooling in Mexico. Our state-level regressions are not able to capture a causal relationship between remittances and schooling. Given the complexity underlying enrollment rates, including demographic composition, more detailed data are likely needed to identify the true effect of remittances on schooling.

Conclusion

A look at remittances in Mexican states suggests that they have important effects on economic development. Higher remittances appear correlated with reductions in unemployment in high-migration states, although this result is weak. A longer time series will likely bolster these findings. Still, the fact that remittances do not appreciably increase employment while lowering unemployment is consistent with either no effect of remittances on the labor force or a negative effect, which is what theory of the income effect would suggest.

A more robust finding is the beneficial impact of remittances on the wage distribution, where higher remittances in high-migration states lead to fewer low-wage workers. Remittances appear to shift the wage distribution up and bolster the middle of the wage distribution, either because of selective exits or demand-side effects. We found no effects of remittances on school enrollment rates once we controlled for time fixed effects. The beneficial schooling effects found in previous research are not apparent in data at this level of aggregation. Our failure to find enrollment effects could be due to using state- instead of household-level data or could result

from our controlling for the endogeneity of remittances. Our findings suggest the need for further research on the effect of remittances on enrollment. This issue is particularly important given the increases in educational attainment are likely the best source of long-term economic growth for developing countries like Mexico.

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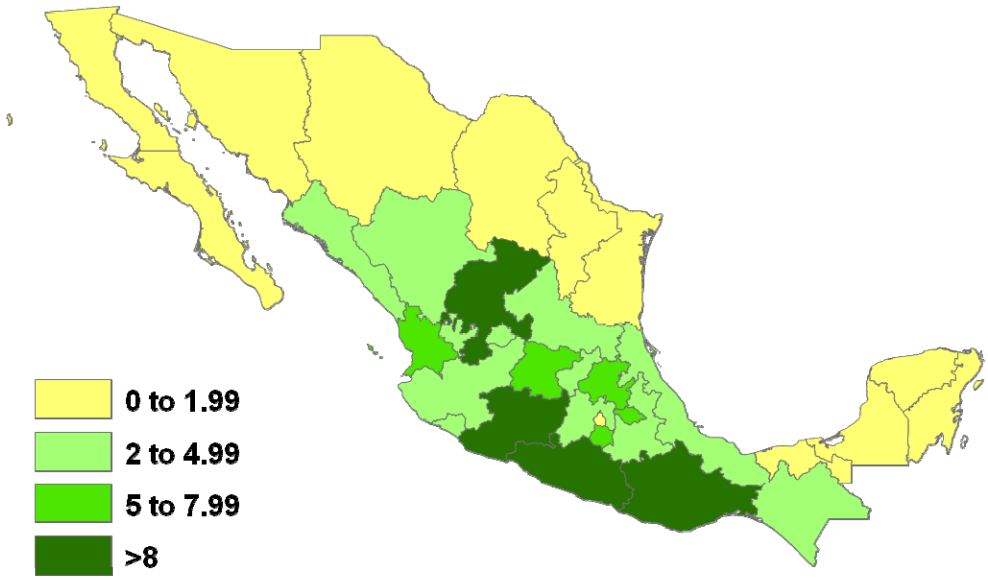
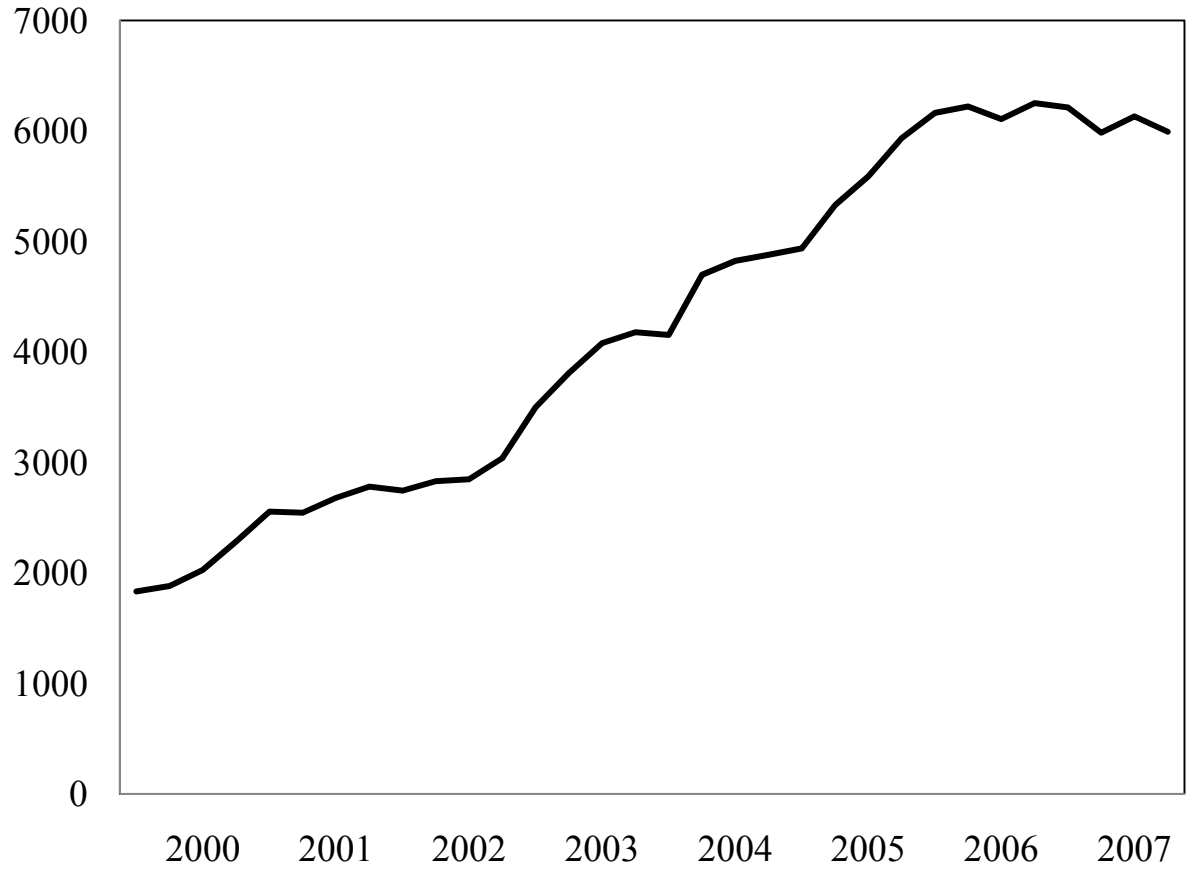
Figure 1: Remittances as a Share of State GDP in Mexico



Source: Banco de México; INEGI.
Note: State remittances are divided by state GDP (2008 data).

Figure 2: Remittances to Mexico, 2000-2007



Source: Banco de México; Bureau of Labor Statistics; authors' own calculations.
Note: Remittances are quarterly, seasonally adjusted, and deflated using the U.S. CPI-W (millions of 2007 dollars).

Table 1: Descriptive Statistics

	Mean	S.D.	High	Low
Remittances (millions of real U.S. $)	164.70	156.70	694.96	4.08
Employment (in 000s)	1289.59	1111.56	5798.13	204.27
Wage, median (real pesos per hour)	16.39	4.03	31.00	6.93
Unemployment rate	3.27	1.31	7.20	0.40
Labor force (in 000s)	1338.47	1168.83	6153.27	208.42
FDI (millions of real U.S. $)	165.18	573.19	8278.44	-293.13
Percent of all workers earning minimum wage or less	17.14	9.73	49.51	1.75
Percent of all workers earning 1-2 times minimum wage	25.54	5.33	35.70	9.71
Percent of all workers earning 2-3 times minimum wage	23.84	5.03	33.83	9.32
Percent of all workers earning 3-5 times minimum wage	20.61	5.26	35.87	8.67
Percent of all workers earning above 5 times minimum wage	12.87	5.22	29.93	4.31
Enrollment rate (primary school)	94.93	3.66	106.20	88.73
Enrollment rate (secondary school)	59.33	8.80	94.51	40.23
Enrollment rate (university)	3.88	0.90	6.76	2.14
Enrollment rate (technical school)	2.0	0.94	5.71	0.70
U.S. weekly wage, CEW	885.50	77.33	1328.3	675.63
U.S. weekly wage, CPS	617.32	24.28	679.80	556.82
U.S. unemployment rate	5.42	0.76	7.10	3.05

Note: Shown are descriptive statistics for quarterly state-level remittances, employment, unemployment rate, labor force, hourly wages, FDI and U.S. wages and unemployment rate. Wage distribution and school enrollment rates are annual data. Data details and sources are described in Appendix Table 1. Quarterly and annual data span 2003-2007.

Table 2: Employment and Wage Effects of Remittances

	All States		Central States	
	(1)	(2)	(3)	(4)
OLS				
Ln(Employment)	-0.00	-0.04**	0.01**	-0.02**
	(0.01)	(0.01)	(0.00)	(0.01)
Ln(Wages)	0.11**	0.01	0.13**	0.03
	(0.03)	(0.02)	(0.04)	(0.03)
Unemployment rate	-0.08	-0.07	-0.05	-0.20
	(0.17)	(0.19)	(0.16)	(0.22)
2SLS				
Ln(Employment)	0.07**	-0.00	0.05**	-0.01
	(0.02)	(0.04)	(0.02)	(0.04)
Ln(Wages)	0.35**	0.00	0.27**	0.08
	(0.08)	(0.07)	(0.05)	(0.07)
Unemployment Rate	-0.06	-0.97	0.08	-1.95
	(0.35)	(1.21)	(0.27)	(1.17)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
No. of observations	640	640	420	420

Note: Each coefficient is from a separate regression of the quarterly state-level natural log of employment or wages or the unemployment rate on remittances, FDI, and the annual average labor force. Regressions include time and state fixed effects as indicated. The second panel shows 2SLS regressions where U.S. wages and unemployment rates are IVs for remittances. Columns 3 and 4 refer to the restricted sample of central states. Robust standard errors are clustered on the state. Significance levels are denoted * $p<0.1$ and ** $p<0.05$.

Table 3: Wage Distribution Effects of Remittances

	All States		Central States	
	(1)	(2)	(3)	(4)
OLS				
Share earning ≤1 times MW	-1.01**	-0.97**	-1.11*	-1.33**
	(0.47)	(0.45)	(0.57)	(0.60)
Share earning 1-2 times MW	-0.26	0.33	-0.37**	0.22
	(0.20)	(0.30)	(0.17)	(0.28)
Share earning 2-3 times MW	0.25	0.54	0.17	0.78**
	(0.27)	(0.32)	(0.28)	(0.36)
Share earning 3-5 times MW	0.85**	0.44**	0.97**	0.40
	(0.19)	(0.20)	(0.20)	(0.25)
Share earning >5 times MW	0.17	-0.34	0.33**	-0.07
	(0.16)	(0.25)	(0.14)	(0.19)
2SLS				
Share earning ≤1 times MW	-1.61**	-1.23	-1.16*	-2.62*
	(0.69)	(1.05)	(0.65)	(1.38)
Share earning 1-2 times MW	-1.89**	0.01	-1.01*	0.72
	(0.77)	(1.03)	(0.48)	(0.85)
Share earning 2-3 times MW	-0.13	0.66	-0.54	1.60*
	(0.57)	(0.83)	(0.57)	(0.80)
Share earning 3-5 times MW	2.13**	0.74	1.83**	0.45
	(0.57)	(0.54)	(0.51)	(0.74)
Share earning >5 times MW	1.51**	-0.18	0.88**	-0.15
	(0.60)	(0.45)	(0.29)	(0.61)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
No. of observations	160	160	105	105

Note: Each coefficient is from a separate regression of the annual share of workers earning the stated multiple of the federal minimum wage on remittances, FDI, and the labor force. Regressions include time and state fixed effects as indicated. The second panel shows 2SLS regressions where U.S. wages and unemployment rates are IVs for remittances. Columns 3 and 4 refer to the restricted sample of central states. Robust standard errors are clustered on the state. Significance levels are denoted * $p<0.1$ and ** $p<0.05$.

Table 4: School Enrollment Effects of Remittances

	All States		Central States	
	(1)	(2)	(3)	(4)
OLS				
Enrollment rate, primary	0.15	0.00	0.33*	0.14
	0.20	(0.26)	(0.17)	(0.26)
Enrollment rate, secondary	0.46*	0.01	0.51*	-0.21
	(0.23)	(0.22)	(0.28)	(0.28)
Enrollment rate, university	0.04**	-0.02	0.05**	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Enrollment rate, technical	0.02	-0.02	0.02	-0.06
	(0.03)	(0.04)	(0.04)	(0.06)
2SLS				
Enrollment rate, primary	0.79*	-0.35	0.63**	-0.06
	(0.41)	(0.33)	(0.29)	(0.32)
Enrollment rate, secondary	1.54**	0.89	1.33**	0.66
	(0.50)	(0.62)	(0.47)	(0.94)
Enrollment rate, university	0.17**	-0.06	0.12**	-0.05
	(0.06)	(0.06)	(0.04)	(0.10)
Enrollment rate, technical	0.12	-0.13	0.12	-0.11
	(0.08)	(0.11)	(0.07)	(0.13)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes
No. of observations	160	160	105	105

Note: Each coefficient is from a separate regression of annual state enrollment rate on remittances, FDI, and the labor force. Regressions include time and state fixed effects as indicated. The second panel shows 2SLS regressions where U.S. wages and unemployment rates are IVs for remittances. Columns 3 and 4 refer to the restricted sample of central states. Robust standard errors are clustered on the state. Significance levels are denoted * $p<0.1$ and ** $p<0.05$.

Appendix Table 1: Data Description and Sources

Variable	Description	Frequency	Source
Remittances	Hundreds of millions of 2007 dollars, deflated by U.S. CPI-W	Quarterly	Banco de México www.banxico.org.mx
Employment	Thousands of jobs, SA; quarterly (ENOE)	Quarterly	INEGI, www.inegi.org.mx
Labor force	Thousands of people (ENOE)	Quarterly	INEGI, www.inegi.org.mx
Unemployment rate	Open unemployment rate (ENOE)	Quarterly	INEGI www.inegi.org.mx
Foreign direct investment	Millions of 2007 dollars, SA, deflated by U.S. CPI-U (SIRNIE)	Quarterly	Secretaría de Economía, www.economia.gob.mx
Wage, median hourly	Hourly wage in 2007 Q4 pesos, deflated by state CPI and SA; (ENOE)	Quarterly	INEGI www.inegi.org.mx
Percent of workers with earnings in given interval	Workers with earnings in the given interval over all paid workers; intervals defined by multiples of the federal minimum wage (ENOE)	Annual	INEGI www.inegi.org.mx

Variable	Description	Frequency	Source
Enrollment rate, elementary & middle school	Enrollment over eligible population (4-15 yrs old) (SEP)	Annual	Segundo Informe, http://www.informe.gob.mx
Enrollment rate, high school	Enrollment over eligible population (16-18 yrs old) (SEP)	Annual	Segundo Informe, http://www.informe.gob.mx
Enrollment rate, college	Enrollment over eligible population (over 18 yrs old) (SEP)	Annual	Segundo Informe, http://www.informe.gob.mx
Enrollment rate, technical school	Enrollment over eligible population (over 18 yrs old) (SEP)	Annual	Segundo Informe, http://www.informe.gob.mx
U.S. wage, median	Median weekly earnings, in 2007 Q4 dollars deflated by CPI-W (CPS-ORG)	Quarterly	Current Population Survey, Bureau of Labor Statistics, www.bls.gov
U.S. wage, mean	Average weekly wages in 2007 Q4 dollars deflated by CPI-W and SA (CEW)	Quarterly	Covered Employment and Wages, Bureau of Labor Statistics, www.bls.gov
U.S. unemployment rate	Unemployed over labor force (workers 16 and over)	Quarterly	Current Population Survey, Bureau of Labor Statistics, www.bls.gov

Variable	Description	Frequency	Source
Population	Midyear population estimate	Annual	Consejo Nacional de Población, www.conapo.gob.mx
Consumer price index, Mexico	Major city within state used as proxy for state	Quarterly	Banco de México, www.banxico.org.mx
Consumer price index, U.S.	SA, Quarterly value is monthly average	Quarterly	Bureau of Labor Statistics, www.bls.gov

Note: All variables at the state level unless otherwise noted. SA stands for seasonally adjusted.
IMSS – Instituto Mexicano del Seguro Social
ENEO – Encuesta Nacional de Ocupación y Empleo
INEGI – Instituto Nacional de Estadística, Geografía e Informática
SEP – Secretaría de Educación Pública
SIRNIE – Sistema de Información del Registro Nacional de Inversiones Extranjeras
EMIF – Encuesta sobre Migración en la Frontera Norte de México
CPS-MORG – Current Population Survey Merged Outgoing Rotation Groups
CEW – Covered Employment and Wages

Appendix Table 2: First Stage Estimates of the Effects of Remittances, Migration on Economic Development

Instrumental variable	All states (q)		All states (a)		Central states (q)		Central states (a)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittance Equation								
U.S. wage, CEW	-0.002**	-0.001**	0.006	0.050**	-0.003**	-0.001	0.011	0.046**
	(.000)	(.000)	(.012)	(.011)	(.001)	(.001)	(.011)	(0.13)
U.S. wage, CPS	-0.003**	-0.001	-0.020	-0.040**	-0.005**	-0.004**	-0.034**	-0.055**
	(.001)	(.001)	(.017)	(.016)	(.001)	(.001)	(.016)	(.016)
U.S. unemployment	-0.287**	-0.220	-0.817**	-0.619	-0.414**	-0.135	-0.946**	0.147
	(.051)	(.152)	(.273)	(.650)	(.066)	(.228)	(.326)	(.929)
F-test for joint	13.10	4.73	7.47	7.67	14.16	3.58	8.40	4.99
significance	(.000)	(.008)	(.001)	(.001)	(.000)	(.032)	(.001)	(.010)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
No. of observations	640	640	160	160	420	420	105	105

Note: The table shows estimated coefficients from first stage regressions of remittances on U.S. real weekly wages (from CEW and CPS) and unemployment rates and the F-statistic for the test of joint significance of the instruments. All the regressions also include FDI and labor force and state and time fixed effects as indicated. Robust standard errors (p- value for the F-test) are shown in parentheses; standard errors are clustered on the state. (q) indicates quarterly data and (a) indicates annual data. Significance levels are denoted * $p<0.1$ and ** $p<0.05$.