Remittances, migration and poverty. A study for Mexico and Central America

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10 February 2021

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"no one leaves home unless
home is the mouth of a shark
you only run for the border
when you see the whole city running as well

your neighbors running faster than you
breath bloody in their throats
the boy you went to school with
who kissed you dizzy behind the old tin factory
is holding a gun bigger than his body
you only leave home
when home won't let you stay."

Warsan Shire,"Home"

This version: February 2021

Abstract

In the last two decades, remittances have acquired great importance as a source of external income for various developing economies. In the particular case of the Latin America region, the United States represents the most important destination, with nearly 25 million Latinos living in this country. This paper analyses the effect that migration and the sending of remittances have on poverty in Mexico and Central America. The results show that a 10% increase in migration to the United States (as a percentage of the population in the destination country) translates into an 8.6% reduction in the population living on less than US$ 1.90 a day; while the poverty gap is reduced by 12.8%. With regard to the sending of remittances, a reduction of 6.7% is observed in the poor population and 10% in relation to the poverty gap. These results are in line with previous literature and, in general, are maintained to various specifications.

Key words: Worker remittances; poverty; international migration; instrumental variables.

JEL: C36; F22; F24; I32.

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Introduction

Migration and its counterpart, remittances, are probably the most human and least studied subjects in economic science. Both constitute a phenomenon that has grown over time and whose existence in nations is increasingly evident. The economic analysis of immigration often boils down to an attractive syllogism (Banerjee and Duflo, 2019), since despite the efforts and advances in the study of migration and remittances, it is still necessary to know the dynamics of migration in order to understand the link that exists between this population group and the evolution of the remittances they send to their families in the country of origin to be able to analyse the effect on poverty.

This work contributes to identifying, characterising and modelling the impact on poverty of remittances from the United States in Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama in the period 1981-2017, our results report that a 10% increase in remittances generates a 6.7% reduction in the poor population and 8.6% when migration increases in the same proportion. The study is not only in line with the widely recognised work of Adams and Page (2005) but it is relevant because it is the first work to analyse this region as a whole, which is highly dependent on migration and remittances. We consider that, ultimately, it is an essentially macroeconomic problem, which of course has repercussions on the microeconomy. With this study, we seek to contribute to the academic debate which should inform the decision makers of economic policies in order to eradicate this serious problem for underdeveloped countries such as Mexico and Central America.

Income from remittances in developing countries such as Mexico and the Central American countries: Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama, is characterised by its relative stability over time and by contributing positively to the evolution of the current income of the balance of payments, (World Bank Group, 2019) in addition to representing a considerable percentage of GDP (see Figure 1); at the same time, it is the result of a migratory process in which the migrant maintains a link with their country of origin (Mejía, 2006) and, therefore, the dynamics of the stock of migrants and their characteristics (Mohapatra and Ratha, 2010) are determining factors of worker remittance flows (Hagen-Zanker et al., 2009).

The remittances that Mexico and Central America receive from abroad increase the living standards of recipient households and reduce poverty in the recipient country (World Bank Group, 2019). In fact, remittances measured in relation to GDP reach very high percentages in economies with lower per capita income (see Figure 1). However, the contribution of remittances is often ignored when measuring poverty. Therefore, in this research we ask ourselves what the impact of remittances in Mexico and Central America has been in increasing the income of households that receive such resources and in reducing poverty levels in the recipient country.

Remittances to low-and middle-income countries reached an unprecedented figure in 2018, according to the latest edition of the World Bank's Migration and Development Brief, it is estimated that annual remittance flows to these countries reached US$ 529,000 million in 2018, which represented an increase of 9.6% over the previous record.

Mexico and Central America are not excluded from this phenomenon. In Mexico, during the 1990s, financial flows from the United States by way of remittances from Mexican workers in that country increased rapidly. In the United States, there were 38.4 million people of Mexican origin in 2018, which represented an increase of 2.4% compared to 2017. The World Bank reported that in 2018 remittances to Mexico reached their all-time high, reaching US$ 33.470 million, which represented a growth of 10.5% at an annual rate.

Central America, meanwhile, is an important migrant sending region. With just over 48 million inhabitants, around 9% of its population was migrant in 2017, with the United States as its main destination. In addition, in 2018 this area received more than US$ 22,000 million in remittances. These resources are very important in El Salvador, where they are equivalent to 21.4% of its GDP; Honduras, 20.0%; Guatemala, 12.0% and Nicaragua, 11.3% (Figure 2). In recent decades, two major stages of Central American emigration can be distinguished. One of them is associated with political conflicts and civil wars in different countries, exacerbated in the 1980s, and which caused an increase in emigrants from El Salvador, Nicaragua and Guatemala. The second is explained by the economic conditions, the search for better opportunities and the increase in violence, all of which have been increasingly noticeable since the beginning of the 21st century, leading to a growth of emigrants from Guatemala, El Salvador and Honduras (SEGOB-CONAPO-BBVA, 2019). (See Figure 2).

In addition to this introduction, the document contains seven additional sections. The second section describes the review of the relevant literature on the subject, the third section presents the methodology used in relation to indicators of poverty and remittances; in the fourth, the database used is described; in the fifth section, the relevant empirical results are shown, in the sixth some additional robustness tests are presented and in the last section the conclusions that arise from the analysis carried out in the paper are offered.

Literature review

In the 1980s, some studies on the relationship between migration and development indicated that remittances increased the income and well-being of families, although they did not have a significant impact on increasing production and employment in local communities (Wiest, 1984; Mines, 1981; Reichert, 1981). They suggested that the increasing flow of remittances entering developing countries did not generate a notable change in the economic conditions that had been generated by the first wave of migrants, since remittance-receiving households only increased their consumption levels and there was little or no investment in some kind of business (Stuart and Kearney, 1981; Reichert, 1981).

For the 1990s and 2000s, new conclusions emerged on the impact of remittances on economic development and, in particular, on the poverty of receiving communities. Researchers of the so-called new economy of labour migration argued that migration and remittances had diverse, relevant and positive effects on development (Taylor, 1999; Stark, 1991). They noted that household spending decisions are taken considering all household income and assets that are available in the present and future period. Once emigration is undertaken, remittances depend on the individual choices of the migrants themselves and are also influenced by decisions made within the migrants' households of origin.

Specifically, in matters of poverty, in addition to consumption, the positive impact of remittances on education is considered, since they reduce the risk of the children of migrants dropping out of school, as well as helping with the payment of tuition fees and school supplies (Zhunio et al., 2012; Edwards and Ureta, 2003). In terms of health, they help to meet the medical needs of the family and invest in prevention (Hildebrandt and Mckenzie, 2005). Other authors have identified that remittances can act as insurance in times of crisis, when

there is a contraction in national economic activity (Yang and Choi, 2007), in addition to helping to replace inefficient capital, credit or insurance markets (Stark, 1991). Likewise, their potential role for productive development is recognised, either in low-risk assets such as real estate (Mezger Kveder and Beauchemin, 2015; Chappell et al., 2010) or in productive activities typical of the community (Le, 2011). Griffin (1976) and Stark et al. (1986, 1988) point out that remittances can finance productive investments, mainly in rural or more backward regions.

There are also authors who estimate that remittances can have negative effects on local economies, such as the decrease in the labour supply of recipients, due to the disincentive caused by having a constant flow of economic resources (Airola, 2008; Vacaflores, 2012). In addition, they influence the exchange rate, (Ball et al., 2013; Singer, 2010), or they deepen the economic inequality between the families that receive remittances and those who are excluded from this flow (Taylor and Wyatt, 1996; Stark et al., 1986); and they even generate negative emotional effects due to the emptiness that migration brings to the people who are left behind at home (Chappell et al., 2010). There is also some evidence that international migration does improve the lives of migrants and localities (parks, churches, roads, water, electricity, schools), but not the productive structure (Stuart and Kearney, 1981; Canales, 2007). Also, it is possible that remittances only replace income that could be earned locally. Therefore, for this group of authors, remittances have a limited impact on boosting development and reducing poverty, being in the poor strata with many deficiencies where remittances contribute to alleviating poverty, but in no case to reversing it. (Canales, 2007).

There is specialised literature on the relationship between remittances and poverty that has addressed this issue, reaching various conclusions, for example, Adams and Page (2005) analyse the effect of remittances in a sample of 71 developing countries. Their conclusions show that a 10% increase in remittances per capita would reduce the proportion of people living below the poverty line by 3.5%. For their part, Fajnzylber and López (2008) find that remittances have a positive effect on reducing poverty, they explain that for every 1% increase in the proportion of remittances to GDP, the segment of the population living in poverty would decrease by 0.4%. However, they clarify that the impact of remittances on poverty varies between countries depending on their general level of development. Gosh

(2006), states that although there is a minority of poor recipients, most of the migrants do not come from poor households, if there is a link between remittances and poverty reduction, it would be indirect and would be a spillover of the remittances received by the families of these migrants.

There are great efforts when it comes to Central American case studies, however, these are still in short supply. Among the relevant research, we highlight the work of Vacaflores (2018), in which he considers 18 countries in Latin America and analyses the effectiveness of international remittances in reducing poverty and inequality, finding that increases in remittances have a negative and statistically significant impact on overall poverty and inequality in the region. While, in another investigation for Mexico, the Dominican Republic, Nicaragua and Costa Rica, remittances seem to be associated with the traditional patriarchal family, whereas in the Dominican Republic it is matriarchal. The receipt of remittances is positively associated with the degree of development of Mexican households, but the association is negative in the Dominican Republic (Sana and Massey, 2005).

In studies for El Salvador, Edwards and Ureta (2003) point out that remittances have a much greater impact on the risk of dropping out of school, while for Gammage (2006), remittances mitigate poverty and create expansion opportunities for the financial market that have benefited the rich as well as some of the poor. Gindling (2009) finds little evidence to support the hypothesis that Nicaraguan migration to Costa Rica was an important factor that contributed to the fall in income, the increase in inequality or the stagnation of poverty in that country. In a study for Nicaragua, Hobbs and Jameson (2012), examine the impact of migrant remittances on poverty and income distribution and identify that the poorest migrants overwhelmingly migrate to Costa Rica which results in higher per capita household consumption for poor households; whereas richer immigrants favour the United States.

Székely and Rascón (2004) identify that for Mexico the effect of remittances in reducing extreme poverty between 2000 and 2002 was 2%, with the same effect in capability poverty and 12% in the case of patrimonial poverty. García Zárate (2015) finds that for the years 2006, 2010 and 2012, remittances mainly reach poorer households where they constitute the second source of income, being even higher than what they receive through government

support; the evidence is that remittances reduce multidimensional poverty to a greater extent because recipient households are in worse poverty conditions.

Along these lines, Esquivel and Pineda (2007), analyse the effect that remittances have on the probability of having some type of poverty (food, capability, patrimonial). Their results show that remittances decrease the probability of being in food poverty (-7.7%) and capability poverty (-6.3%), which represent a reduction in food and capability poverty equivalent to 36 and 23% in the recipient households sampled, versus non-recipients. Nevertheless, the use of remittances for productive investment and entrepreneurship is limited (Finkelstein and Mandelman, 2016; Woodruff and Zenteno, 2007). According to data from SEGOB-CONAPO-BBVA (2019), the main purpose for which they are used in Mexico is to cover basic food and clothing needs (on average 80%), while the remaining 20% is used for health, education, paying debts as well as setting up a business.

Data

Based on world development indicators from the World Bank, Figure 3 shows the average percentage of people living on less than US$ 1.90 a day for the countries of Central America and Mexico. It is interesting to note that between 1998 and 2017, the percentage of poor people in the region decreased considerably, from 17% of the population to 5.7%. What stands out is the sharp drop in poverty rates between 1998 and 2007 (-9 percentage points), which is followed by a moderate reduction between 2007 and 2017 (-3 percentage points).

[Insert Figure 3 here]

In the same time period, the population that migrated to the United States as a percentage of the region's total population increased from 5.5% to 7.9% (Figure 4, left); while in the case of remittances being sent, in per capita terms, it went from an annual average of US$ 200 to US$ 640 (Figure 4, right). It is worth noting that, in the case of sending remittances, between 1998 and 2007, there was a significant increase (around an additional US$ 400), followed by a slight reduction between 2007 and 2012, and a subsequent recovery in 2017.

[Insert Figure 4 here]

Table 1 presents the main variables used in this study, which were used every year with available information[2]. In the case of distance measurement, information was obtained from Google Maps using the code *gmapsdistance*[3]; in this way, the distance between the capital of each of the Central American countries and Mexico with California in the United States was calculated. We consider this city as a connection point in the United States since it is close to the main border crossing points from Mexico (EMIF, 2020).

Regarding poverty measurements, we used three indicators. Firstly, the poverty ratio, which measures the percentage of the population that lives on at least US$ 1.90; $ 3.20 or $ 5.50 per day. In general, we can see that between 1981 and 2017, 12.2% of the population of Mexico and Central America lived on at least US$ 1.90 per day (21 million people), the countries with the highest poverty ratios being: Honduras (23.6%) and Guatemala (21.2%). This characteristic is accentuated when we use the other poverty lines.

Secondly, we used the poverty gap, for the same poverty lines as the previous indicator, in order to analyse the depth of poverty in the region. This index allows us to analyse the population's income deficit, to reach the minimum poverty line required. Thus, for example, a value of 5.3 such as that observed for the average of the region, indicates that it would be necessary to increase US$ 0.10 to each individual on a daily basis to reach the poverty line of US$ 1.90 per day or transfer US$ 17.4 million to the poor in the region. At a country level, Guatemala and Honduras have the largest poverty gaps. Thirdly, we use the squared poverty gap, which measures the severity of poverty. This is calculated as the average of the squared poverty gap and allows us to consider a person's distance from the poverty line.

With regard to migration, we used the number of migrants in the United States with respect to the total population of each country. In general, for the period under study and according to World Bank data, 7% of the population of Mexico and Central America reside in the United States. The countries with the highest levels of migrants per capita are: El Salvador (18.1%), Mexico (10%) and Honduras (5.6%). It is important to mention that this study only considers those migrants from Central America who arrive in the United States and not the

[2] See the footnote to Table 1 for more information on the years used for each country.
[3] For more information see: https://github.com/rodazuero/gmapsdistance

migration that occurs to Mexico; In this sense, the results found can be interpreted as a lower bound of migration between the countries under study.

Similarly, Table 1 presents information on remittances received, which is expressed annually and as a percentage of the population. In general, for the group of countries under study, remittances per capita amounted to US$ 397 on average per year, with El Salvador (US$ 981), Guatemala (US$ 480) and Honduras (US$ 446) being the countries with the largest remittances received in the period under study. It is important to mention that this information only includes the formal channels for sending remittances. According to De Luna Martinez (2005), Roberts and Banaian (2004), Acosta et al. (2006), Freund and Spatafora (2008), Shonkwiler et al. (2011) there is a sub-report on the amount of remittances that would be around 60% of the registered value. In this sense, and as in the case of migration, we only focus on the effects of registered remittances on poverty.

Regarding the explanatory variables used in the model, we considered both GDP per capita and average income per capita as possible explanatory variables of poverty. Following Adams and Page (2005), countries with higher GDP growth rates are expected to have lower levels of poverty. Although GDP per capita as an indicator is too aggregated to explain the reasons why some countries are poorer than others, and it does not refer to inequality in the distribution of the country's income, it can give indications of the effects of macroeconomic policies on poverty. We also considered the average income per capita, which was calculated at household level and makes it possible to have a better approximation of the effects of household income on poverty. As can be seen in Table 1, the average monthly income per capita in the region was US$ 353, the countries with the lowest incomes being those with the highest poverty ratios.

The Gini index was also considered as an explanatory variable of poverty. Cornia (2004), shows that high levels of inequality lead to a lower impact of economic growth on the reduction of poverty. Similarly, domestic credit provided by the financial sector was taken into account as an indicator of restrictions on access to the market and to the creation of new companies. As shown by Arestis and Caner (2005) and Kirkpatrick et al. (2000), as restrictions on the market and the creation of companies increase, the effect on poverty will

be greater. Finally, we considered the percentage of the population that works in the rural sector, since it is the area in Latin America that still has the largest number of poor people (López and Valdés, 2000; Duncan, 1992).

[Insert Table 1 here]

Methodology

In order to analyse the relationship between poverty with the sending of remittances and migration, we followed the model proposed by Ravallion (1997), Ravallion and Chen (1997) and Adams and Page (2005), who formulate the equation:

$$\log Y_{it} = \alpha + \gamma_i + \beta \log X_{it} + \theta W_{it} + \mu_{it} \quad (1)$$

Where Y_{it} is one of the poverty indicators mentioned in the previous section for each country i in the year t; γ_i are country fixed effects; X_{it} represents remittances per capita or the percentage of migrants in the United States with respect to the population of each country; W_{it} is a set of explanatory variables such as: GDP per capita (or monthly income per person), Gini index, percentage of the population that works in rural activities, and domestic credit provided by the financial system (as a percentage of GDP); finally, μ_{it} represents an error term.

It is important to mention that the estimation of (1) may be biased as long as the causality between the dependent and independent variables is not unidirectional. In other words, changes in the sending of remittances, as well as in migration, may have implications for poverty, just as poverty can have an effect on the behavioural profile of people who decide to migrate and, therefore, on the sending of remittances.[4] Failure to take these characteristics into account would lead to biased estimators. Similarly, Acosta, et al. (2006) mention, as a possible additional problem, that remittances can affect poverty through changes in income or inequality.

[4] For example, it is possible that as a country reduces its poverty indicators, the volume of people who decide to migrate will be less, since the country of origin presents better conditions for the development and well-being of its inhabitants.

Given this, authors such as Karemera et al., (2000), Vogler and Rotte (2000), Hanson and Woodruff (2003), Adams and Page (2005), Hanson (2005), Amuedo-Dorantes and Pozo (2006), Acosta, et al. (2006) and Acosta (2006), consider the application of instrumental variables as a way to recover the causal effect of migration. The use of this method requires an instrument Z that mainly meets the relevance and exclusion conditions. The relevance condition for the instrument indicates that it must be related to the explanatory variable that causes endogeneity; that is to say: $Cov(X, Z|W) \neq 0$; while, the exclusion condition is related to the independence of the instrument with those unobservable factors that affect the dependent variable; that is; $Cov(Z, \mu|W) = 0$. It is important to mention that, while the relevance conditions for the instrument are possible to prove (Bound, et al., 1995; Stock and Yogo, 2005), the exclusion conditions are not, so it is important to have the necessary evidence to guarantee the exogeneity of the proposed instrument in order to avoid the problem of weak instruments.

The literature on the subject mainly proposes the use of instruments such as: access to ATMs (Amuedo-Dorantes and Pozo, 2006), migrant population in the destination country (Vogler and Rotte, 2000; Hanson and Woodruff, 2003; Hildebrandt and McKenzie, 2005; McKenzie, 2005; Acosta, 2006; Acosta, et al., 2006) and distances to the destination country (Karemera et al., 2000; Adams and Page, 2005, Lopez Cordoba, 2005). For each of the proposed instruments, it is possible to think that the population's accessibility to them encourages migration. For example, in the case of the distance to the destination country, those countries with greater proximity to the destination country are more likely to migrate in a larger proportion than those further away, as it represents lower travel costs. Likewise, in relation to distance to the destination country, in general, it does not represent a priori a variable that determines poverty.

In this sense, and following Karemera et al. (2000) and Adams and Page (2005), we used the distance to the United States as an instrumental variable to determine the causal effect of migration and the sending of remittances on poverty in Mexico and Central America. In this regard, as Vogler and Rotte (2000) mention, since the proposed instrument does not vary with time but only between countries, we used the interaction of this variable with time in order to add variation to it.

Results

Table 2 presents the results by OLS of equation (1) using a pooled model. Panel A shows the effect of migration (expressed in logarithms and as a percentage of the population of each country) on different indicators of poverty (in logarithms). In all cases, the covariates indicated in the previous section were incorporated. In the case of the poverty indicator, a 10% increase in the participation of the migrant population in the region reduces the percentage of people living on less than US$ 1.90 per day by 2%, while for the poverty line of US$ 3.20 per day, the reduction is 0.8%. However, these results are not significant. Similarly, with respect to the poverty gap and squared poverty gap, we observed negative effects in all the poverty lines but they are not significant.

Panel B shows the effect of sending remittances (expressed in logarithms and as a percentage of the population of each country) on poverty. In the case of the poverty ratio, column 2 shows that a 10% increase in remittances per capita, translates into a 1.2% reduction in the percentage of people who receive less than US$ 1.90 a day. For the poverty lines of US$ 3.20 and US$ 5.50, the values are -0.6% and -0.1%, respectively. However, in all cases the values are not significant. We found similar results for both the poverty gap and squared poverty gap. Although the values presented in this table do not indicate any relationship between migration and remittances to poverty, we consider that these results should be taken with caution in the presence of unobservable factors that may bias our results. In that sense, Table 3 seeks to correct this problem.

[Insert Table 2 here]

Table 3 presents the results of the model using instrumental variables.[5] It is interesting to note that both in the estimates of the effects of migration (panel A) and in the case of remittances (panel B), the proposed instrument is significant and the F test of weak instruments is above the values proposed by Bound et al. (1995) and Stock and Yogo (2005).

In the case of migration (panel A), we observed that the effects are negative and significant in all poverty indicators, with the magnitude of poverty reduction being greater than that observed in the OLS estimate. In relation to the poverty ratio, when US$ 1.90 per day is used

[5] For complete details of the results presented in this section, see Tables A1 to A4 of the online Appendix.

as the poverty line (column 2), an increase in the percentage of the migrant population of 10% translates into a reduction in poverty of 8.6%; that is, the population in the region that lives on less than US$ 1.90 a day is reduced by 1.8 million. In the case of the poverty lines of US$ 3.20 and US$ 5.50, poverty is reduced by 1.8 and 1.3 million people, respectively.

Similar results are found with the poverty gap indicator (columns 5 to 7); where, as the poverty line increases, the impact of migration on the poverty gap is reduced. In the case of the poverty line of US$ 1.90 per day, we observed that the 10% increase in the percentage of migrants in the region reduces the poverty gap by 12.8%; that is, the transfer necessary to get out of poverty is reduced by US$ 2.2 million. For the thresholds of US$ 3.20 and US$ 5.50; transfers are reduced by US$ 4.3 million and 7.4 million on average, respectively.

Finally, the squared poverty gap indicator shows a reduction of 16.2%, which translates into a reduction of US$ 1.7 million needed to get out of poverty. These results are higher than those found by Adams and Page (2005) for the general case of developing countries. Although they only use US$ 1.08 per day as the poverty line, their results indicate a reduction in both the poverty ratio (-3.4%) and the poverty gap (-2.3%), while, in the case of the squared poverty gap indicator, the result is negative (-0.6%) but not significant. A possible explanation for the difference in magnitudes between the two estimates is the greater importance that migration plays in Mexico and Central America as a mechanism for reducing poverty.

Panel B shows the effect of sending remittances on poverty in the region. As in the case of migration, the results are negative and significant, and of greater magnitude than those found by OLS. Thus, in the case of the poverty ratio, for the poverty line of US$ 1.90 per day, the 10% increase in remittances as a percentage of the population reduces the number of poor people by 6.7% (1.4 million people). In the case of the poverty line of US$ 3.20 per day, the reduction is 3.5% (1.4 million people), while for the poverty line of US$ 5.50 per day the effect is 1.4% (1 million people). These results are in line with those found by Acosta, et al. (2008), who observe that an increase of 10% in remittances (as a percentage of GDP) reduces the poverty ratio between 3% and 4%.

Similarly, the poverty gap indicator and the squared poverty gap show negative and significant effects. In the case of the poverty line of US$ 1.90 per day, the 10% increase in

remittances per capita reduces the poverty gap by 10%; in other words, the transfer necessary to reach the poverty line is reduced by US$ 1.7 million. Likewise, for the poverty lines of US$ 3.20 and 5.50 per day, the reduction in the poverty gap is 5.9% and 3.1%, respectively. This represents an approximate reduction of US$ 3.4 million and 5.7 million, respectively, in the required transfers to the region's poor. Finally, using the squared poverty gap, the reduction is 12.6% (around US$ 1.4 million). In comparison with the results found by Adams and Page (2005), we observed that the negative effect is maintained, but is of greater magnitude for the group of developing countries. This would indicate that, although both migration and the sending of remittances help to alleviate poverty in the destination countries, in the particular case of Mexico and Central America, migration per se has a greater impact on the fight against poverty.

[Insert Table 3 here]

Robustness

Table 4 presents additional results to those shown in Table 3. Column 1 removes El Salvador, Honduras and Guatemala from the sample, since they present different poverty trajectories from the rest of the countries in the period under study. The results for both the migration variable and remittances show that poverty is reduced, the magnitude of the effects being significant in most cases, but greater than that found in Table 3. In general, for the poverty line of US$ 1.90, poverty is reduced by half a million people.

In the same way, the period under study may have an effect on the results presented in the previous section, as it may incorporate structural changes in the countries that affected migration decisions. For this reason, column 2 restricts the analysis to 1990 onwards, where the majority of countries showed a reduction in poverty levels. We can see that the results of the effects of migration and remittances on poverty are maintained, being negative and significant in most cases. Thus, on average, poverty is reduced by 2 million people in the region.

[Insert Table 4 here]

Conclusions

In this paper, the impact of migration and the sending of remittances on poverty was analysed. One of the findings of the research carried out is that migration (measured as a proportion of the population in the country of origin) reduces poverty by 8.6% (people living on less than US$ 1.90 a day), while reducing the poverty gap by 12.8%. Regarding remittances, the 10% increase in the sending of remittances (in per capita terms) reduces poverty by 6.7% for the poverty line of US$ 1.90 per day. The understanding of the similarities between countries in terms of the economic, political and social effects of migration and remittances on the population of origin, as well as the challenges that the phenomenon poses, are fundamental for the debate and the formulation processes of economic policies, both national and international. These debates must take into account that the characteristics of migration and remittances present important trends and global patterns that are constantly changing, as well as the profound implications for the economy as a whole, consequences that directly impact on economic development, and in turn, the consequent institutional challenges that these represent, especially for underdeveloped economies such as Mexico and Central America.

We conclude that, in the particular case of Mexico and Central America, migration has a greater impact in the fight against poverty, with the sending of remittances being an additional component in this objective. That is why this factor seems to be emerging as an element that will continue to have effects on the regional social and economic structure, beyond those related to the consumption of migrant families and households, therefore, it is urgent to analyse the effects that migration and remittances present.

There are still many issues on the table of academic debate to be solved in this regard, for all those who migrate due to poverty, academic research will have to continue with the uncompromising conviction to find an answer.

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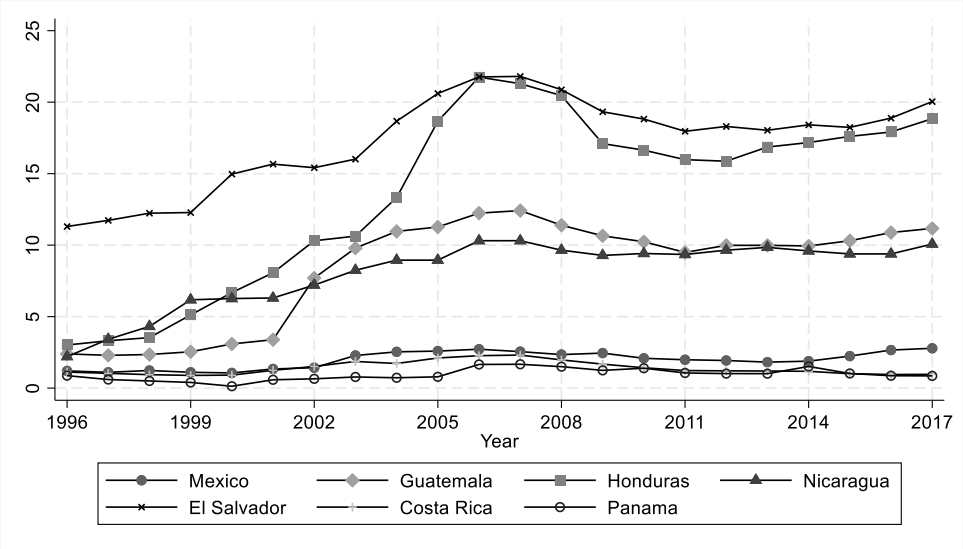
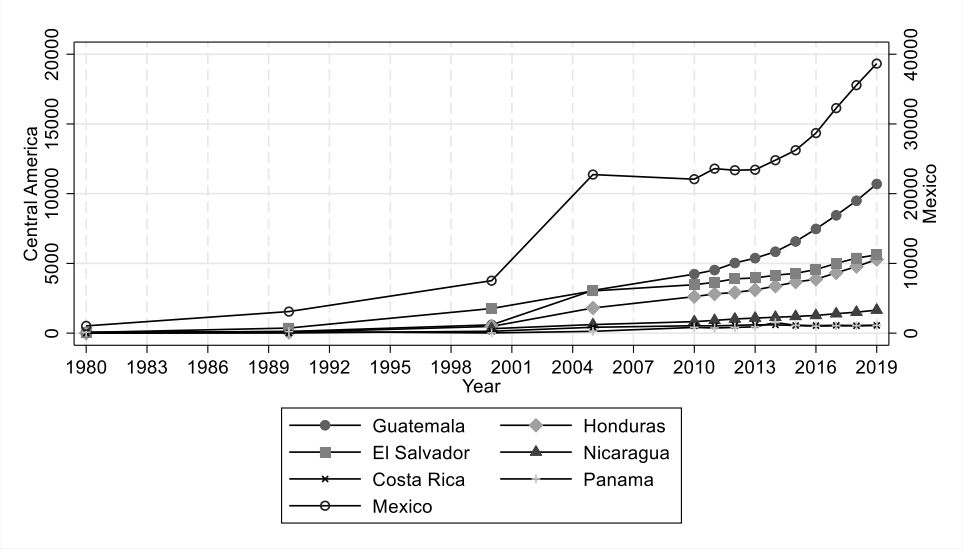
Tables and Figures

Figure 1: Remittances (% of GDP)



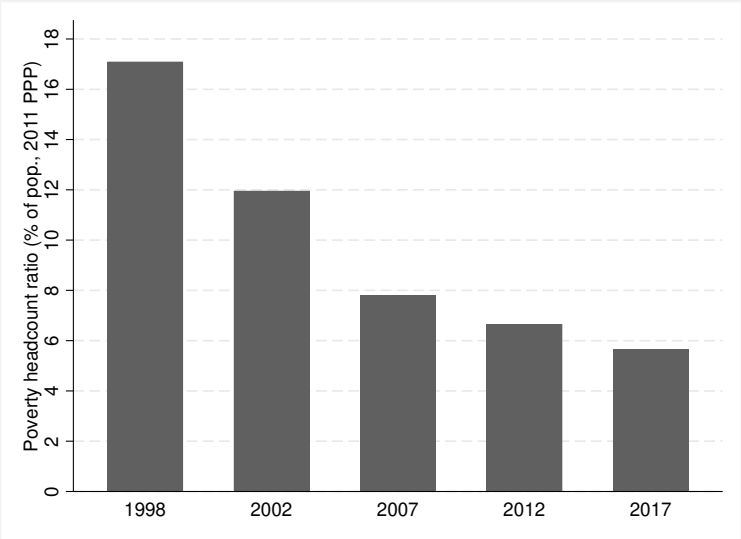
Note: Authors' calculations, using the Federal Reserve Economic Data. Seasonally adjusted percentages.

Figure 2: Remittances (in US$ millions)



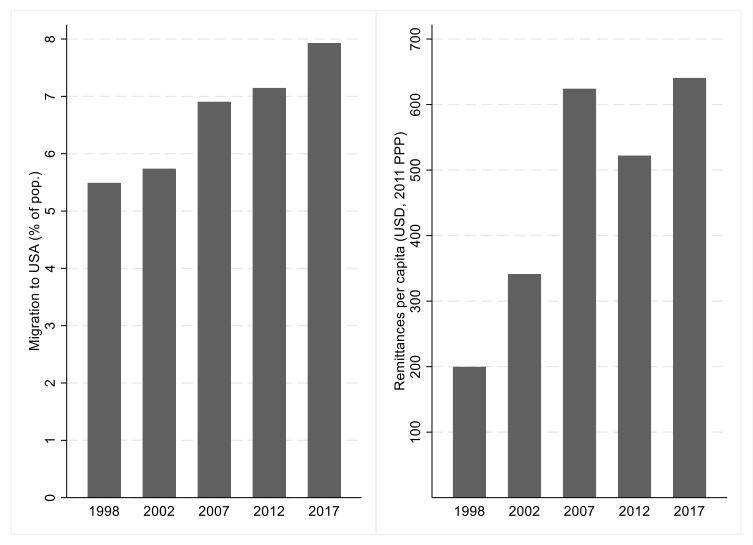
Note: Authors' calculations, using the World Bank data.

Figure 3: Poverty headcount ratio at US$ 1.90 a day (% of pop., 2011 PPP)



Note: Authors' calculations, using the World Development Indicators of the World Bank. The figure shows the average poverty headcount ratio in Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. We only consider the years that have information for most countries.

Figure 4: Migration to the United States and Remittances per capita



Note: Authors' calculations, using the World Development Indicators of the World Bank. The figure shows the average migration per capita to the USA and the annual remittances per capita of Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama. We only consider the years that have information for most countries.

Table 1: Descriptive statistics

	All	Costa Rica	El Salvador	Guatemala	Honduras	Mexico	Nicaragua	Panama
Poverty headcount ratio (% of pop., 2011 PPP)								
US$ 1.90 per day	12.2	5.7	9.5	21.2	23.6	7.7	16.0	9.5
US$ 3.20 per day	23.3	11.8	21.1	36.9	40.7	18.8	33.8	17.0
US$ 5.50 per day	41.7	26.2	43.4	57.4	61.4	39.9	57.5	30.1
Poverty gap (2011 PPP)								
US$ 1.90 per day	5.3	2.7	4.1	9.3	9.9	2.8	6.5	4.9
US$ 3.20 per day	10.4	5.1	8.6	17.5	19.1	6.9	13.9	8.3
US$ 5.50 per day	19.7	10.8	18.6	30.2	32.9	16.4	27.5	14.7
Squared poverty gap (US$ 1.90 per day, 2011 PPP)	3.3	1.9	2.7	5.5	5.7	1.5	3.9	3.5
Migration to USA (% of pop.)	6.9	1.9	18.1	4.8	5.6	9.8	4.1	3.5
Yearly remittances per capita (US$, 2011 PPP)	396.8	136.0	980.6	479.9	446.4	292.6	294.3	140.4
GDP per capita (US$, 2011 PPP)	8,616.2	11,261.0	5,928.8	6,311.7	3,649.9	15,857.4	3,734.9	13,569.5
Average monthly income per capita ($, 2011 PPP)	353.4	472.4	277.8	249.0	220.0	334.1	227.2	501.7
Gini index	50.96	47.52	46.87	55.00	54.69	51.00	50.60	54.20
Domestic credit provided by financial sector (% of GDP)	49.6	41.9	48.9	33.4	37.4	39.4	77.2	68.7
Rural labor (% of total employment)	24.6	14.1	21.9	34.9	35.1	17.4	30.7	17.9
Distance to USA (in miles)	2,950.7	3,398.4	2,812.7	2,704.0	2,942.5	1,809.8	3,135.9	3,851.3
Population (in miles)	172,751	4,950	6,388	16,715	9,429	124,777	6,385	4,107
Observations	134	31	24	6	28	15	6	24

Note: Authors' calculations, using the World Development Indicators of the World Bank. Distance to the USA computes the distance between the capital of each country and California. Costa Rica covers the years: 1981, 1986, and 1989-2017; El Salvador: 1989, 1991, 1995, 1996, and 1998-2017; Guatemala: 1986, 1989, 1998, 2000, 2006, and 2014; Honduras: 1989, 1990-1999, and 2001-2017; Mexico: 1989, 1992, 1994, 1996, 1998, 2000, 2002, 2004-2006, 2008, 2010, 2012, 2014, and 2016; Nicaragua: 1993, 1998, 2001, 2005, 2009, and 2014; and Panama: 1989, 1991, 1995, and 1997-2017. Data shows the annual average for each country. Population presents the last value registered in the sample.

Table 2: OLS results

	Poverty headcount ratio (% of pop., 2011 PPP)			Poverty gap (2011 PPP)			Squared poverty gap
	US$ 1.90	US$ 3.20	US$ 5.50	US$ 1.90	US$ 3.20	US$ 5.50	
			Panel A				
Migration	-0.198	-0.083	0.000	-0.308	-0.164	-0.064	-0.412
	(0.129)	(0.071)	(0.044)	(0.197)	(0.111)	(0.062)	(0.254)
N	134	134	134	134	134	134	134
Adj. R-squared	0.756	0.847	0.895	0.668	0.781	0.865	0.604
F-statistic	46.06	117.5	433.8	84.47	49.25	91.13	41.86
			Panel B				
Remittances	-0.116	-0.056	-0.012	-0.193	-0.107	-0.049	-0.263
	(0.085)	(0.052)	(0.031)	(0.129)	(0.076)	(0.044)	(0.172)
N	134	134	134	134	134	134	134
Adj. R-squared	0.749	0.847	0.896	0.662	0.778	0.866	0.597
F-statistic	5260	681.9	126.9	145.4	661.1	1579	76.07

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment), and country fixed effects.

Table 3: IV results

	Poverty headcount ratio (% of pop., 2011 PPP)			Poverty gap (2011 PPP)			Squared poverty gap
	US$ 1.90	US$ 3.20	US$ 5.50	US$ 1.90	US$ 3.20	US$ 5.50	
				Panel A			
IV - first stage	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Migration	-0.864***	-0.455***	-0.184***	-1.278**	-0.754***	-0.395***	-1.618**
	(0.314)	(0.125)	(0.045)	(0.519)	(0.257)	(0.113)	(0.689)
N	134	134	134	134	134	134	134
Adj. R-squared	0.495	0.686	0.810	0.340	0.543	0.717	0.242
F-weak identification	36.67	36.67	36.67	36.67	36.67	36.67	36.67
				Panel B			
IV - first stage	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Remittances	-0.671**	-0.354***	-0.143***	-0.992**	-0.586**	-0.306***	-1.256*
	(0.308)	(0.134)	(0.045)	(0.489)	(0.253)	(0.115)	(0.641)
N	134	134	134	134	134	134	134
Adj. R-squared	0.392	0.643	0.810	0.223	0.469	0.689	0.114
F-weak identification	22.51	22.51	22.51	22.51	22.51	22.51	22.51

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment), and country fixed effects. We use the distance between the capitals of each country and California in the USA as an instrument in the first stage.

Table 4: Robustness testing

	(1)						(2)					
	Poverty headcount ratio (% of pop, 2011 PPP)			Poverty gap (2011 PPP)			Poverty headcount ratio (% of pop, 2011 PPP)			Poverty gap (2011 PPP)		
	US$ 1.90	US$ 3.20	US$ 5.50	US$ 1.90	US$ 3.20	US$ 5.50	US$ 1.90	US$ 3.20	US$ 5.50	US$ 1.90	US$ 3.20	US$ 5.50
						Panel A						
IV- first stage	0.012**	0.012**	0.012**	0.012**	0.012**	0.012**	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Migration	-0.226***	-0.203***	-0.106***	-0.218	-0.212***	-0.151***	-0.984***	-0.489***	-0.173***	-1.471**	-0.844***	-0.419***
	(0.061)	(0.023)	(0.023)	(0.134)	(0.062)	(0.032)	(0.380)	(0.163)	(0.057)	(0.601)	(0.308)	(0.140)
N	76	76	76	76	76	76	125	125	125	125	125	125
Adj. R-squared	0.944	0.943	0.954	0.930	0.952	0.963	0.307	0.591	0.791	0.117	0.383	0.636
F-weak id.	28.98	28.98	28.98	28.98	28.98	28.98	37.15	37.15	37.15	37.15	37.15	37.15
						Panel B						
IV - first stage	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Remittances	-0.194***	-0.174***	-0.091***	-0.187*	-0.182***	-0.129***	-1.017**	-0.506**	-0.179**	-1.521**	-0.872**	-0.433**
	(0.052)	(0.028)	(0.028)	(0.106)	(0.046)	(0.028)	(0.493)	(0.228)	(0.078)	(0.747)	(0.399)	(0.186)
N	76	76	76	76	76	76	125	125	125	125	125	125
Adj. R-squared	0.932	0.925	0.945	0.930	0.944	0.955	0.039	0.448	0.754	-0.173	0.169	0.523
F-weak id.	68.51	68.51	68.51	68.51	68.51	68.51	18.74	18.74	18.74	18.74	18.74	18.74

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment) and country fixed effects. Column 1 does not consider El Salvador, Honduras, and Guatemala. Column 2 only takes account years from 1990 to ahead.

Online Appendix

Table A1: IV results

	Poverty headcount ratio (% of pop., 2011 PPP)						Poverty gap (2011 PPP)					
	US$ 1.90		US$ 3.20		US$ 5.50		US$ 1.90		US$ 3.20		US$ 5.50	
	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage
IV - first stage	0.009***		0.009***		0.009***		0.009***		0.009***		0.009***	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Gini	0.085	0.068	0.085	0.037	0.085	0.009	0.085	0.082	0.085	0.057	0.085	0.031
	(0.156)	(0.124)	(0.156)	(0.069)	(0.156)	(0.031)	(0.156)	(0.170)	(0.156)	(0.104)	(0.156)	(0.058)
Restriction	0.132	0.636	0.132	0.300	0.132	0.104	0.132	0.898	0.132	0.519	0.132	0.253
	(0.261)	(0.418)	(0.261)	(0.243)	(0.261)	(0.151)	(0.261)	(0.602)	(0.261)	(0.364)	(0.261)	(0.219)
Rural	0.220**	0.337***	0.220**	0.201***	0.220**	0.113***	0.220**	0.473***	0.220**	0.294***	0.220**	0.176***
	(0.060)	(0.102)	(0.060)	(0.052)	(0.060)	(0.031)	(0.060)	(0.156)	(0.060)	(0.085)	(0.060)	(0.047)
Income	-0.943**	-1.855***	-0.943**	-1.482***	-0.943**	-1.119***	-0.943**	-2.131***	-0.943**	-1.757***	-0.943**	-1.400***
	(0.383)	(0.308)	(0.383)	(0.196)	(0.383)	(0.137)	(0.383)	(0.438)	(0.383)	(0.268)	(0.383)	(0.173)
Migration		-0.864***		-0.455***		-0.184***		-1.278**		-0.754***		-0.395***
		(0.314)		(0.125)		(0.045)		(0.519)		(0.257)		(0.113)
N	134	134	134	134	134	134	134	134	134	134	134	134
Adj. R-2	0.611	0.495	0.611	0.686	0.611	0.810	0.611	0.340	0.611	0.543	0.611	0.717
F-weak id.		36.67		36.67		36.67		36.67		36.67		36.67

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment) and country fixed effects. We use the distance between the capitals of each country and California in the USA as an instrument in the first stage.

Table A2: IV results

	Squared poverty gap	
	1° Stage	2° Stage
IV - first stage	0.009***	
	(0.001)	
Gini	0.085	0.069
	(0.156)	(0.199)
Restriction	0.132	1.078
	(0.261)	(0.752)
Rural	0.220**	0.587***
	(0.060)	(0.198)
Income	-0.943**	-2.272***
	(0.383)	(0.547)
Migration		-1.618**
		(0.689)
N	134	134
Adj. R-squared	0.611	0.242
F-weak identification		36.67

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment) and country fixed effects. We use the distance between the capitals of each country and California in the USA as an instrument in the first stage

Table A3: IV results

	Poverty headcount ratio (% of pop., 2011 PPP)						Poverty gap (2011 PPP)					
	US$ 1.90		US$ 3.20		US$ 5.50		US$ 1.90		US$ 3.20		US$ 5.50	
	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage	1° Stage	2° Stage
IV - first stage	0.011***		0.011***		0.011***		0.011***		0.011***		0.011***	
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
Gini	0.343	0.225	0.343	0.119	0.343	0.042	0.343	0.314	0.343	0.194	0.343	0.103
	(0.236)	(0.212)	(0.236)	(0.108)	(0.236)	(0.042)	(0.236)	(0.310)	(0.236)	(0.176)	(0.236)	(0.090)
Restriction	0.122	0.604*	0.122	0.283	0.122	0.098	0.122	0.851*	0.122	0.492	0.122	0.239
	(0.253)	(0.344)	(0.253)	(0.208)	(0.253)	(0.135)	(0.253)	(0.482)	(0.253)	(0.299)	(0.253)	(0.186)
Rural	1.017***	0.830**	1.017***	0.461***	1.017***	0.218***	1.017***	1.201**	1.017***	0.724**	1.017***	0.401***
	(0.168)	(0.361)	(0.168)	(0.169)	(0.168)	(0.068)	(0.168)	(0.557)	(0.168)	(0.298)	(0.168)	(0.144)
Income	0.152	-0.939	0.152	-0.999***	0.152	-0.924***	0.152	-0.777	0.152	-0.957*	0.152	-0.982***
	(0.458)	(0.644)	(0.458)	(0.263)	(0.458)	(0.103)	(0.458)	(1.056)	(0.458)	(0.535)	(0.458)	(0.230)
Remittances		-0.671**		-0.354***		-0.143***		-0.992**		-0.586**		-0.306***
		(0.308)		(0.134)		(0.045)		(0.489)		(0.253)		(0.115)
N	134	134	134	134	134	134	134	134	134	134	134	134
Adj. R-2	0.850	0.392	0.850	0.643	0.850	0.810	0.850	0.223	0.850	0.469	0.850	0.689
F-weak id.		22.51		22.51		22.51		22.51		22.51		22.51

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment) and country fixed effects. We use the distance between the capitals of each country and California in the USA as an instrument in the first stage.

Table A4: IV results

	Squared poverty gap	
	1° Stage	2° Stage
IV - first stage	0.011***	
	(0.002)	
Gini	0.343	0.363
	(0.236)	(0.384)
Restriction	0.122	1.019*
	(0.253)	(0.597)
Rural	1.017***	1.509**
	(0.168)	(0.721)
Income	0.152	-0.557
	(0.458)	(1.392)
Remittances		-1.256*
		(0.641)
N	134	134
Adj. R-2	0.850	0.114
F-weak id.		22.51

Note: Authors' calculations, using the World Development Indicators of the World Bank. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are computed in logs. Migration refers to the percentage of migrants in the USA as a proportion of the population in the origin country. Remittances refer to per capita official remittances. Dependent variable in US$ per day. Calculations in both stages include the following variables: Gini index, average monthly income per capita, domestic credit provided by the financial sector (% of GDP), rural labor (% of total employment) and country fixed effects. We use the distance between the capitals of each country and California in the USA as an instrument in the first stage