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The Joint Effect of Emigration and Remittances on Economic Growth and Labor Force Participation in Latin America and the Caribbean

Alina Carare, Alejandro Fiorito Baratas, Metodij Hadzi-Vaskov, Jessie Nabulambo Kilembe, and Wenzhang Zhang

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ABSTRACT: We provide a consistent empirical framework to estimate the net joint effect of emigration and remittances on the migrants' countries of origin key economic variables (GDP growth and labor force participation), while addressing the endogeneity concerns using novel "shift-share" instrumental variables in the spirit of Anelli and others (2023). Understanding this joint impact is crucial for the Latin America and the Caribbean region that has seen a continuous growth in remittances over the past decades, due to steady emigration, and where remittances represent the largest capital inflows for many countries now. Focusing on the past two decades (1999-2019), this study finds that on average emigration has a negative and statistically significant impact on contemporaneous economic growth and change in labor force participation in the countries of origin across LAC, while remittances partially mitigate this adverse impact—especially on economic growth—resulting in a small negative net joint effect. There are significant differences across subregions for all estimates, with the largest negative effects observed in the Caribbean. In addition, the negative impact of emigration and remittances on the change in labor participation is small, but for the youngest cohort (15-24) is twice as large as for the overall labor force participation. The results are robust to various specifications, variables, and measurements of emigration and remittances.

JEL Classification Numbers:	F22, J21, O15
Keywords: Emigration; Remittances; Labor Force Participation; Economic Growth; Latin America	

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WORKING PAPERS

The Joint Effect of Emigration and Remittances on Labor Force Participation and Economic Growth in Latin America and the Caribbean[1]

Prepared by Alina Carare, Alejandro Fiorito Baratas, Metodij Hadzi-Vaskov[2], Jessie Nabulambo Kilembe, and Wenzhang Zhang[3]

[1] The views expressed in this paper are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management. We would like to thank Stephen Ayerst, Bas Bakker, Stephan Danninger, Romaine Duval, Yueling Huang, Florence Jaumotte, Flavien Moreau, Malhar Nabar, participants to the IMF Western Hemisphere Department Seminar, and the HUMANS LACEA Network Seminar. Any remaining errors are our own.

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Contents

FIGURES

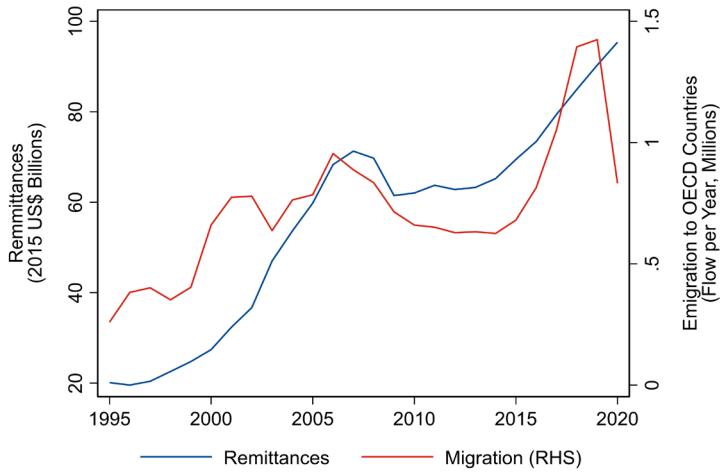
TABLES

I. Introduction

Over the past three decades migration increased worldwide, with the stock of migrants almost doubling from 1990 to 2020 (from 152 million to 280 million) according to data from the United Nations. Inflows of international migrants and refugees to OECD countries also increased considerably, reaching a record level in 2022 (OECD, 2023). At the same time, a steady increase in remittance inflows has been recorded in most migrants' countries of origin.

Those developments are even more important for the countries from Latin America and the Caribbean (LAC). Emigration flows from LAC to OECD countries have quadrupled between 1995-2020, despite an abatement over 2006-14 (see Figure 1). Remittances have increased almost five times over the same period, experiencing an even stronger upward trend, with the exception of a small dent during the global financial crisis (2007-09). Moreover, LAC is the only major region where remittances have not declined in the past decade, and annual growth rates exceeded the world's average by substantial amounts between 2020-22. For some LAC countries, remittances are not only providing a substantial income source and support for households, but also represent the largest source of foreign exchange inflows (exceeding exports, foreign direct investment, or official assistance).[4]

Figure 1. Emigration Flows and Remittances in LAC, 1995-2020



Sources: Personal remittances data is from World Bank World Development Indicators and the data on emigration flows to OECD countries is from OECD International Migration database.

Understanding the impact of emigration and remittances on economic growth and labor market dynamics, especially their net joint impact is of paramount importance for many LAC countries. The literature has not settled on this outcome, since even when estimating the impact of one factor at a time, for example of emigration on labor force participation, or of remittances on growth, the results are inconclusive (e.g., Clemens, 2011, Chami and others, 2008). This is because these effects depend on many factors. On one hand, emigration leads to a lower population, and a smaller labor force. However, the impact on labor force participation and GDP growth will also depend on the impact on wages for the remaining population. In

[4] Five LAC countries received about or over 20 percent of GDP in remittances in 2023, the only region with such a concentration of remittances-to-GDP flows (World Bank, KNOMAD, 2023).

theoretical models the impact of emigration on national income, via the wage effect, depends on the rigidity of wages and the degree of unemployment (Bhagwati and Hakamada, 1974). Furthermore, as remittances boost household incomes for the remaining population, they might raise reservation wages leading to a decline in labor supply (Killingsworth, 1983). Other items also matter and influence the outcome: the skills of migrants compared to the skills of the remaining population and their degree of substitutability, the economic structure, and therefore the labor demand.

Attempts at estimating the joint impact of emigration and remittances have pointed to econometric challenges (Beaton and others, 2017). Primarily there are endogeneity concerns, as remittances stem from emigration. In turn, other concerns arise, including reverse causality (low growth in the country of origin might also lead to emigration), omitted variable bias (especially if taking into account emigration but not the mitigating impact of remittances on GDP growth), and measurement errors. Even when instrumental variables were used to estimate the impact of emigration or remittances on growth, the validity of such instruments has often been questioned. In this context, we are not aware of attempts to estimate the net joint impact of emigration and remittances on labor force participation in a large panel setting.

This paper addresses the gap in the literature by estimating the net joint effect of emigration and remittances on economic growth and labor force participation for the migrants' countries of origin in LAC. The contribution to the literature is multi-fold. We use a novel instrumental variable approach to estimate the net joint effect of emigration and remittances on economic growth and labor force participation, addressing key endogeneity concerns. We expand this framework to explore the net joint effect of emigration and remittances on growth and labor force participation across various LAC subregions, and distinguish the net joint impact on labor force participation for the youngest cohort (15-24).

To account for the potential endogeneity between emigration and remittances, as well as other variables, and the outcome of interest (GDP growth or labor force participation), we use a two-stage lease square estimation. The instrumental variable used in the first stage is a shift-share Bartik style variable, in the spirit of Anelli and others (2023). Using 1999-2019 data, we regress real GDP growth or change in labor force participation, on emigration rates and remittances per capita as predicted by a first stage regression. In the first such stage, the emigration rates (emigration flows in a given year from LAC countries to OECD, over the population of origin for each coutnry) and remittances per capita are explained by a set of explanatory variables that vary over time in destination countries (the "shift"). These are pull-factor type variables: income, unemployment rate, and unit labor costs in manufacturing. The proposed three pull-factors are likely to be exogenous for the GDP growth and labor force participation in the origin countries, affecting only indirectly or partially these variables. Moreover, to strengthen their exogeneity, these variables are weighted by the historical shares of emigration from the particular origin country (the "shares").

We find that these instruments are highly relevant and statistically significant and imply there is a substantial negative effect of emigration on economic growth, while remittances are partially mitigating this effect. In particular, the outflow of population generates an average loss of about 0.28 percentage points of GDP growth per year, while the resulting increase in remittances contributes to a 0.19 percentage points higher GDP growth. Overall, these two effects imply a joint net effect of 0.09 percentage points lower GDP growth per year.

At a more granular level the impact of emigration and remittances is most significant in the Caribbean countries, compared to other LAC subregions[5]—LA5, which are the largest 5 LAC countries, CAPDR, which stands for Central America, Panama and the Dominican Republic, and other LAC. The negative impact on the change in the labor force participation is small, but for the young population between 15 and 24 years of

[5] A list of the countries and their groups can be found in Table A.1.

age is twice as large as that on the overall labor force. All results are robust using various specifications and data.

The remainder of the paper is organized as follows: Section 2 provides a short literature review, while section 3 describes the data used in the study. Section 4 shows the empirical strategy and estimation. The results are presented in section 5, and their robustness checks in section 6. Section 7 concludes.

II. Analytical Background

To understand the intuition, we start by summarizing the various channels through which emigration and remittances affect real GDP growth or labor force participation. We look first at the impact of emigration through the quantitative effect on the labor supply, followed by the impact on wages, and productivity in the country of origin, before adding the income effect of remittances, and more broadly the impact on growth through the aggregate demand.

Permanent emigration represents an outflow of people primarily of working age, thereby reducing the labor force. Employment, human capital (Docquier and Rapoport 2012, Antman, 2013), entrepreneurship, and hence GDP growth calculated from the supply side (medium-term) may also be reduced. However, the ultimate impact of emigration on the latter variables is not unambiguously negative, as it depends on how emigration affects the labor force participation rate, the degree of chronic unemployment (and underemployment), and depends on the skill characteristics of the migrants versus the people remaining at home, the structure of the economy, and thereby labor demand.

The impact of permanent emigration on wages, and thereby, aggregate demand is also unclear, since in some countries even large-scale emigration boosted employment and wages. In countries suffering from permanent emigration of high skilled labor, and where the skills of the emigrants are not substitutable with the skills of people remaining at home, the impact is expected to be unambiguously negative, through “brain drain” and reduced productivity. However, even in such cases, one also needs to take into account the positive network externalities, which could impact positively growth (Docquier and Rappaport, 2012, Berger, 2022) through trade and investment. For example, a strong business-oriented emigrant network can facilitate trade, increase investment by leveraging the emigrants’ business skills, their knowledge of the business and investment environment in both countries (destination and of origin), their appetite to undertake riskier projects, helping transfer technology cheaper, and develop capital markets in the countries of origin. For all these positive benefits to be accrued from trade and investment even in case of permanent emigration of high-skilled workers depend on the countries of origin’ political stability and good governance (a favorable business environment, and low corruption).

By introducing remittances into the conceptual framework, the impact of the net joint effect of remigration and remittances on labor force participation and growth clouds further, as remittances may decrease labor force participation when workers substitute labor income with remittances, and raise their reservation wages (Chami and others, 2005, 2008). On the other hand, remittances may increase labor force participation and hours worked,[6] if the substitution effect of the foregone labor dominates the income effect of remittances when the migrant sending families may encounter a shortage of working labor force for non-domestic activities (Acosta, 2020). Furthermore, the impact of emigration on labor force participation and employment

[6] Increasing evidence shows that emigration could also lead to beneficial “brain drain”, where emigration leads to higher income for the migrants (e.g., Clemens, 2011, 2020), which in turn leads to higher remittances to home countries and higher education expenditure in those countries (e.g., Alcaraz and others, 2012), especially in Latin America (Askarov and Doucouliagos, 2020). See Kerr and others (2016) for a more recent and broader discussion on the movement of talents.

may be different between formal and informal employment (Amuedo-Dorantes and Pozo, 2006), especially when adding remittances (Chami and others, 2018), and in rural versus city areas.

In addition, remittances may boost household income, and aggregate demand, especially if they are countercyclical or help alleviate the negative effects of natural disasters (Beaton and others, 2017), and armed conflicts, or the liquidity constraints for households. Moreover, if a larger share of remittances is used for investment, and increase human capital (Bird and Choi, 2020), or if they promote financial development, provide a source of finance for small businesses and help relax credit constraints (Aggarwal and others, 2011, Fromentin, 2018), remittances may also positively impact long-term growth through these channels. However, remittances may also negatively impact long-term growth by creating a moral hazard problem—reducing the incentives to pressure the government to implement necessary reforms to facilitate economic growth (Abdih and others, 2012) since remittances help ensure households against adverse economic shocks and insulate them from government policies—or by weakening exports competitiveness, when remittances support primarily current private consumption, increasing the non-tradables prices, and appreciating the real exchange rate (Chami and others, 2008, Acosta and others, 2009).[7]

Hence, evaluating the macroeconomic impact of remittances on growth has been found to be inconclusive (Clemens and McKenzie, 2018, Cazachevici and others, 2020), including when studies were focusing on LAC countries, which tend to have relatively higher rates of migration and remittances (Acosta and others, 2006, Feeny and others, 2014, Lim and Simmons, 2015).[8]

Even the studies that have tried to analyze remittances and labor migration as joint household decisions, in an intertemporal utility maximization setting, like Lim, Morshed and Turnovsky (2023), the ultimate effect on growth is unclear, since the impact on steady-state output is positive for the countries of origin, but losses in the transition due to reduced consumption seem to outweigh those gains in most cases.

III. Data

We present below the variables and datasets used in the study. In our main specification, we focus on 31 LAC countries over 19992019. The countries, and their regional or geographical groupings, along with the number of annual observations for real GDP growth or labor force participation, are listed in Table A.1.[9] Additionally, we use data 1989/1990 to obtain the pre-sample emigration stocks and economic conditions.

GDP and labor force participation: We use GDP data from the IMF World Economic Outlook database, 1989-2020, and labor force participation rates from the World Bank World Development Indicators (WDI). The two sets of labor force participation rates, overall (aged over 15) and the young population (aged between 15 and 24) in the WDI, are estimates obtained from the International Labor Organization (ILO).

Emigration: The two main sources of emigration data are the **OECD** International Migration Database and the United Nations Population Division (**UNPD)** International Migrant Stock database. In the main

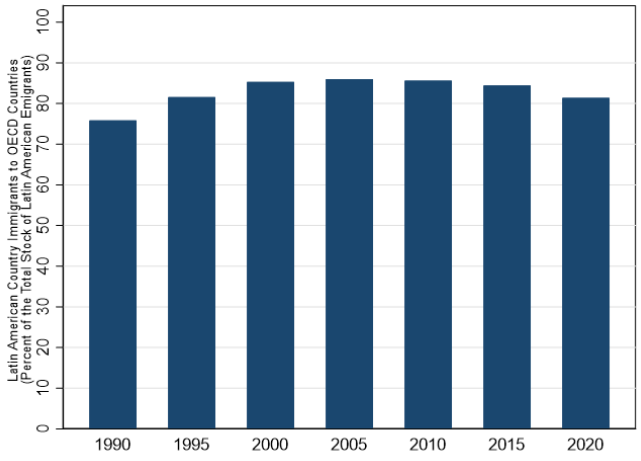
[7] When emigration. or emigration and remittances, lead to a definite decline in the labor supply, firms will be inclined to increase wages to retain workers. In the non-tradable sector, firms could increase prices to cover higher wages, but in the tradable sector firms face exogenously set international prices. Consequently, remittances may result not only to a decline in the labor supply but also in the reallocation of labor from the tradeable to non-tradable sectors, and to an erosion of competitiveness for the tradables sector (Acosta and others 2009).

[8] Acosta and others (2006) identify different effects on inequality across Latin American countries depending on their migration histories, the extent of migrant networks, and proximity to migrant destinations. For example, before 2008 migrants and remittance receiving households were more likely from the bottom of the income distribution in Mexico and Paraguay, and from higher-income distribution in Haiti, Peru, and Nicaragua.

[9] The share of international migrant stocks from LAC among the world increased from about 10 percent to 15.3 percent during 1990-2020 (UNPD, 2020). The share of LAC-origin migrant flow is slightly larger in the OECD destination.

specification, we rely on the OECD data, as it uses bilateral inflows and outflows of foreign populations to all OECD countries by nationality of the migrants. This is the most comprehensive dataset in terms of frequency and coverage of bilateral flows of migration. Moreover, the OECD countries are the main destination countries of LAC emigrants, as shown in Figure 2. The OECD data of bilateral migration flows is derived from population registers or residence permit data in the destination countries, and therefore our study is limited to the regular/legal emigration. The sample period is 1999-2019 since most countries start having available data in 1999.

Figure 2. Share of LAC Emigrant Stocks in OECD Countries, 1990-2020



Sources: UNPD data and IMF staff calculation.

The **UNPD** estimates of migration stocks are based on official statistics on the foreign-born or the foreign population. The data, which covers the period from 1990 to 2020, is considered to have the highest quality due to its global coverage (e.g., Beaton and others, 2017, Buettner, 2022, Beltran and Hadzi-Vaskov, 2023).

For robustness and further analysis, we also use annual migration flows data from the UN World Population Prospects (**WPP**).[10] The "net migration" in WPP (1950-2022) is based on estimates of migration flows and trends of the foreign-born populations in the major countries of destination—subtracting emigrants and adding the number of immigrants. It also considers the number of refugees in the main asylum countries, and the difference between overall population growth and natural increase. Therefore, this latter source of migration data also captures—at least partially—unofficial emigration.

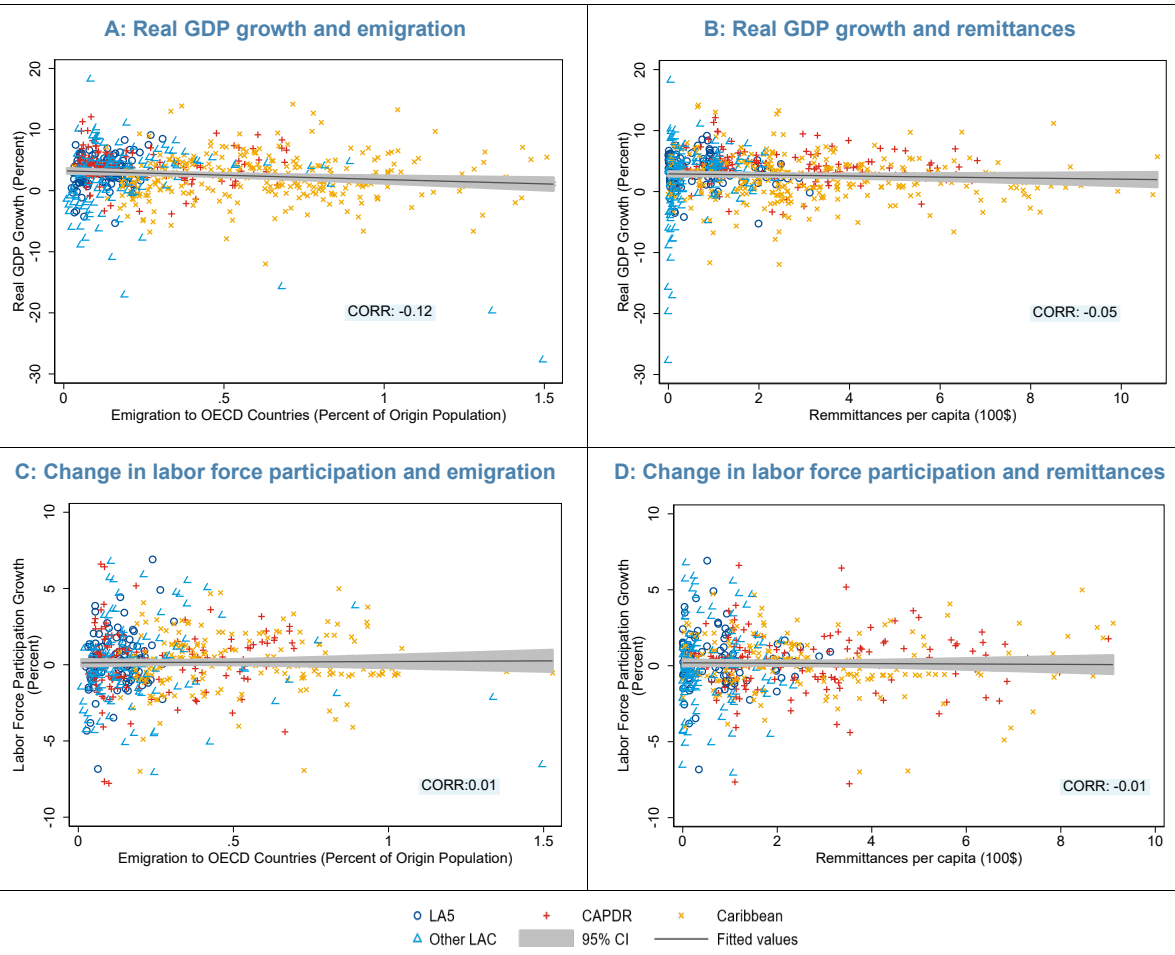
Remittances: We used personal remittances received data from the World Bank World Development Indicators (**WDI**), which uses IMF Balance of Payment data (aggregated, by countries of origin). For robustness we also use the remittance inflows from the World Bank **KNOMAD** (The Global Knowledge Partnership on Migration and Development) database as an alternative data source, as it aggregates data based primarily on migration-remittances corridors (from one country of destination to one country of origin).

Panel Figure 3 shows the correlation between the dependent variables (real GDP growth or change in labor force participation) and the two explanatory variables of interest (emigration and remittances), respectively.

[10] Retrieved from World Bank World Development Indicators. The original WPP data files and description can be found at https://population.un.org/wpp/.

The two charts on the left suggest on average a weak negative relationship between the emigration rate and real GDP growth and almost no correlation with the change in labor force participation. In the right-hand charts, the simple correlations of our dependent variables with remittances per capita[11] is weaker, with positive correlation in some subregions, but around zero for the overall dataset.

Figure 3. Correlations Between Real GDP Growth/Labor Force Participation Rate and Emigration/Remittances, 1999-2019



Sources: World Bank WDI and IMF staff calculation. Table A.1. shows country groupings by subregions.

Other explanatory variables: Data on employment, unemployment rate, and unit labor cost in manufacturing come from the IMF World Economic Outlook database. Data on GNI, foreign direct investment (FDI), official development aid (ODA), and trade openness (all expressed as a percent of nominal GDP) is obtained from World Bank World Development Indicators.[12] The cost of natural disasters is retrieved from EM-DAT, the international disaster database, where the total damages are summed up annually and represented as shares of current GDP value.

[11] We also use remittances per capita as our main explanatory variable in the estimation, as explained in Section 4.1.

[12] Trade openness is calculated as sum of exports and imports of goods and services.

IV. Empirical Strategy

4.1 Initial Model Specification

Given the variety of channels through which emigration and remittances could impact real GDP growth and labor force participation, ideally one would use household and labor force surveys to be able to calibrate a model and understand the net joint effect. Given the lack of consistent household surveys across the region which would help assess the joint decision of emigration and remittances done at the household level, and of labor force studies which would help understand the labor substitution or labor income effects, we exploit instead the variation in outcomes across time and countries (panel estimation), to estimate the net joint effect.

We start with a simple model:

$$y_{o,t} = \alpha + \beta_1 \frac{Emigration_{o,t}}{Population_{o,t}} + \beta_2 \frac{Remittances_{o,t}}{Population_{o,t}} + \gamma Controls_{o,t} + \phi_t + \phi_o + \epsilon_{ot} \quad (1)$$

where y_{ot} represents the dependent variable (either economic growth, or change in the labor force participation) in the emigrants' country of origin *o* in year *t*. The term $\frac{Emigration_{o,t}}{Population_{o,t}}$ is the yearly emigration rate (share of emigration flows over population) in the countries of origin in year *t*, and $\frac{Remittances_{o,t}}{Population_{o,t}}$ is the share of received remittances per capita in the country of origin o in year t.[13] This empirical specification estimates the impact of emigration and remittances on the same year economic growth and change in labor force participation as an average across countries. In the robustness section we report results with various lags. Moreover, while the main specification uses changes in the dependent variables, the independent variables (emigration or remittances) are not used in levels because the instruments used to predict these variables take into account changes over time (see next section).[14]

The control variables are net foreign direct investment (as percent of GDP), net official development assistance (as percent of GNI) and total damage of natural disasters (a percent of GDP). ϕ_t and ϕ_o are time-specific and origin country-specific fixed effects respectively and are used to capture the time-invariant country-level characteristics and the year-specific fixed effects.

The choice of these control variables is motivated by Cazachevici and others (2020), which shows that both foreign aid and foreign direct investments are important controls to include, even more important than institution quality. Most importantly, in the development literature, the net ODA and FDI variables are used to explain GDP growth not only because they provide important sources of foreign exchange inflows, but also because they may be highly correlated with other variables explaining growth (structure of the economy and exports, institutional quality and quality of governance and policy making, political stability, etc.). Natural disasters may directly affect economic growth or labor force participation, and both variables of interest (emigration and remittances) at the same time; thus, they are also included as controls. Country

[13] We use remittances per capita, rather than remittances as share of GDP, because one main outcome of interest is GDP growth, and using remittances as share of GDP would potentially bias the estimates.

[14] In addition, for LAC, Beaton and others (2017), also regress real (per capita) GDP growth on migrants flows and the share of remittances to GDP. Furthermore, in a meta-analysis of the literature review done by Cazachevici and others (2020), show that in an analysis of 95 studies and 538 estimations, the measure of economic activity in the short term varies widely, from GDP in nominal levels, to changes in GDP (48 versus 50 percent of times), or GDP per capita, and the explanatory variables remittances varies even more (remittances in absolute levels or shares of GDP or per capita, or growth in remittances).

fixed effects are used to absorb other important variables like unemployment rate and GDP per capita. We limit the number of explanatory variables to these crucial ones, to have meaningful estimates.

We also use an alternative specification in equation (2), which removes the origin-country fixed effects since controlling all origin-country fixed effects would remove much of the relevant variation given the sample size. Instead, in this specification we introduce geographic fixed effects (ϕ_g) and time-invariant country-specific controls ($Controls_o$) to capture the initial economic conditions of each origin country. Geographic fixed effects are dummy variables for three LAC subgroups based on their locations, adopted from the UN WPP dataset: Central America, South America, and the Caribbean. Tables A.1-A.3 show the descriptive statistics and the sample used; in particular Table A.1 shows the subregional grouping of countries, as well as their geographic division according to UN WPP. This specification uses the following time-invariant control variables: log real GDP, log population and log openness (trade as a share of GDP) in 1989, prior to the historical shares of emigrant stocks in 1990.

$$y_{o,t} = \alpha + \beta_1 \frac{Emigration_{o,t}}{Population_{o,t}} + \beta_2 \frac{Remittances_{o,t}}{Population_{o,t}} + \gamma Controls_{o,t} + \sigma Controls_o + \phi_t + \phi_g + \epsilon_{o,t} \quad (2)$$

In both regressions (1) and (2), the coefficients β_1 and β_2 would indicate the impact of emigration and remittances on the dependent variables, provided they are uncorrelated to the error term $\epsilon_{o,t}$, or in other words, they are random across countries over time conditional on the control variables and fixed effects.

Thus, the key identification challenge in these models (1 and 2) is endogeneity, as both emigration and remittances are likely to correlate with unobserved local economic conditions, and with each other, leading to biased estimates of β_1 and β_2. Most importantly, both emigration and remittances are private decisions, at the household level, which might be shaped by common characteristics, and which may also shape household expenditure patterns, education, and healthcare choices, etc. These issues make it difficult to establish causality and bias using the typical reduced-form regression framework.

Omitted variable bias may also occur if emigration and remittances are not included at the same time, or if a common factor affects both, and also the dependent variable. This is especially the case with remittances when emigration is not included. As noted by Clemens and McKenzie (2018), the relationship between remittances and growth is difficult to detect in growth regressions, as remittances are caused by emigration and emigration generally has an opposite effect on growth. Including both variables of interest allows to differentiate the effect through labor loss (emigration) and income gain (remittances) through coefficients β_1 and β_2, respectively.

4.2 Instrumental Variables

In the literature looking at the separate impact of emigration and remittances on growth (or labor force), the most likely instrument used were the lagged variables of interest, but this has been often criticized.[15]

A better “instrument” is correlated with emigration or remittances but uncorrelated with the common household characteristic leading to both emigration and remitting, and spending patterns, which ultimately affect economic growth. This way we can “split” the variation in emigration and remittances and “use” only the part uncorrelated with the error term.

[15] See Wang and Bellemare (2019) for a general discussion of using lagged IV. The use of income gap as IV is challenged by Barajas and others (2009).

We rely on a shift-share (Bartik-style) instrumental variable. The role of such instrument is to help address the endogeneity issue by decomposing the changes in the share of emigration or remittances per capita into two components: the shift and the share, which are both assumed to be exogeneous. This type of variable is largely adopted in the literature to resolve the endogeneity issue with migration but has never been used in this context of estimating the joint emigration-remittances impact on GDP growth and labor force participation.[16]

By using these "shift-share" instrument[17] it means that, rather than using the contemporaneous emigration rate and remittances per capita in our reduced form regressions to explain their impact on economic growth or in the labor force participation in the country of origin, we will be using predicted values from a series of instruments. In particular, these shift-shares are the products of an initial stock variable in country d (from country o), multiplied by the change in the shares in destination countries. The shifts are shown as the changes $\frac{X_{d,t}}{X_{d,t-1}}$ (where $X_{d,t}$ denotes the economic indicator in destination country, d, at time t).

We use as "shares" the historical/initial emigrant stocks in destination countries from each country of origin. A higher initial stock would encourage emigration through social connections,[18] and ensures an informative first-stage result. The "shifts" or "shocks" here are the changes in destination countries: income (represented by GNI per capita, denoted by GNIPC), labor unemployment rate (denoted by LUR), and unit labor costs in manufacturing (denoted by ULCM). The three pull-factor instrumental variables constructed are therefore:

$$Pull_{o,t}^{Income} = \sum_{d} \frac{Emigration\ Stock_{o,d,1990}}{Population_{o,1990}} \frac{GNICPC_{d,t}}{GNICPC_{d,t-1}} \quad (3)$$

$$Pull_{o,t}^{LUR} = \sum_{d} \frac{Emigration\ Stock_{o,d,1990}}{Population_{o,1990}} \frac{LUR_{d,t}}{LUR_{d,t-1}} \quad (4)$$

$$Pull_{o,t}^{ULCM} = \sum_{d} \frac{Emigration\ Stock_{o,d,1990}}{Population_{o,1990}} \frac{ULCM_{d,t}}{ULCM_{d,t-1}} \quad (5)$$

where $Emigration\ Stock_{o,d,1990}$ is the emigrant stock in country d from country o in 1990 using UNPD data, constant for each origin-destination pair over time. Intuitively, the shift-share instrumental variables are the changes of pull-factors in destinations weighted by historical emigrants' share.

We use these three pull-factors as instruments because they are indicators of labor markets in destination countries, directly related to incentives to migrate and to remit, while conveniently having a lower correlation with explaining GDP growth or labor force in origin countries.[19] Compared to the broader economic indicators of destination countries used in previous studies as instruments, such as economic growth (Anelli and others, 2023) and interest rates (e.g., Chami and others, 2005, Feeny and others, 2014), the proposed three pull-factors are more likely to be exogenous for the origin countries, affecting only indirectly or partially countries of origin. In addition, previous studies used changes only in one destination country (the US, e.g., Chami and others, 2005, Feeny and others, 2014). By using the weighted sum of all destination countries, the shift-share design restricts the magnitude of direct impact of such economic outcome through the interaction with migrant shares, again ensuring the exogeneity of the instruments. Moreover, there is no

[16] The shift-share instruments are constructed with past settlements of immigrants to estimate an impact on labor outcomes usually on the destination countries (e.g., Jaeger and others, 2018, Fouka and others, 2022, Imbert and others, 2022, Mayda and others, 2022), or for in-country domestic migration. The closest use to this method was by Aneli and others (2023), which explains entrepreneurship and firm dynamism (drivers of GDP growth, through emigration).

[17] For more examples of shift share instruments see Jaeger and others (2018), Fouka and others (2022), Imbert and others (2022), Mayda and others (2022), and emigration, Anelli and others (2023)

[18] Migration networks have been demonstrated as a key determinant in the location decision for immigrants (Munshi 2003, McKenzie and Rapoport 2010).

[19] Correlation coefficients among these factors, and basic statistics available by request from the authors.

reverse causality in using these pull factor instruments (i.e., the emigration rate in countries of origin does not affect income changes in the destination countries).

To test the relevance of these instruments, we show the results of the permutation tests performed by Anelli and others (2023) in Figure 1 in the Appendix (Figure A.1). The historical network between an origin and destination country is crucial for instrument identification. Additionally, Figure A.2 suggests that per capita income and unemployment together identify the effect of emigration, but not of remittances. Similarly, Figure A.4 shows that unemployment and unit labor cost in manufacturing together are crucial for identifying the effect of remittances but cannot identify that of emigration.

We also check the validity of instruments with tests on over-identifying restrictions and pre-trends. For the over-identifying restrictions, we perform the Sargan-Hansen tests on instrument validity when implementing the 2SLS estimation, as we have three IVs against two endogenous variables. The test statistics are reported in the main result tables and support the validity of the IVs (see section 5). For pre-trend tests, since the sample used for our estimation is 1999-2019, we show in Table 1 below that using the same set of data from 1995-1998 the IVs are not significantly correlated with the economic growth and labor force participation in origin countries prior to the sample period, suggesting independence of the IV from preexisting economic trends.

Table 1. Pre-trend Correlations, 1995-1998

	Real GDP growth		**LFP Change (15+)**		**LFP Change (15-24)**	
	Country FE	Geo FE	Country FE	Geo FE	Country FE	Geo FE
Pull IV: Income	15.88	1.05	9.77	9.17	23.51	29.18*
	(14.533)	(16.667)	(6.497)	(7.761)	(14.886)	(17.095)
Pull IV: Unemployment rate	45.38	287.09	157.82**	142.71*	379.08**	368.56*
	(142.000)	(178.333)	(64.432)	(82.510)	(165.773)	(192.788)
Pull IV: Manufacturing ULC	307.51	-244.01	84.9	3.99	269.65	200.73
	(216.826)	(266.973)	(119.414)	(89.675)	(304.664)	(250.993)
Observations	123	92	107	92	107	92
F-stat	1.031	3.247	2.160	1.384	1.920	1.366
Test p-value	0.383	0.026	0.100	0.254	0.134	0.259
Time-invariant controls	No	Yes	No	Yes	No	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	g,t	o,t	g,t	o,t	g,t

Notes: Robust standard errors are shown below the correlation coefficients. *** p<.01, ** p<.05, * p<.10. Pull IVs are constructed using four-year forward shocks from the sample period in the future. Tests are conducted under the null hypothesis that all coefficients of the included instruments are zero. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) fixed effects are used. Either origin country (o) or geographic (g, Central America, Caribbean, and South America) fixed effects are included.

In addition, Table A.4 shows that the pre-sample-period economic growth and labor force participation in 1995-1998 are not significantly correlated with the future instrumental variables using four-year lags, which corresponds to the time when the sample starts, and table A.5 shows the respective responses to the three IVs across different horizons, from two-year lags to two-year leads, confirming that the contemporaneous variations of the IVs are most relevant to both emigration and remittances.

4.3 Model Estimation

Following the identification of the relevant and valid instruments, we proceed with the two-stage estimation.

We first regress emigration and remittances respectively (both as a share of population of the country of origin) on the pull-factors mentioned above (income, unemployment rate and ULC in manufacturing), control variables, and time and country fixed effects, as shown in equations (6) and (7):

$$\frac{Emigration_{o,t}}{Population_{o,t}} = \alpha_1 + \delta_1 Pull_{o,t}^{Income} + \delta_2 Pull_{o,t}^{LUR} + \delta_3 Pull_{o,t}^{ULC} + \gamma_1 Controls_{o,t} + \phi_t + \phi_o + \epsilon_{ot} \quad (6)$$

$$\frac{Remittances_{o,t}}{Population_{o,t}} = \alpha_2 + \delta_4 Pull_{o,t}^{Income} + \delta_5 Pull_{o,t}^{LUR} + \delta_6 Pull_{o,t}^{ULC} + \gamma_2 Controls_{o,t} + \phi_t + \phi_o + \epsilon_{ot} \quad (7)$$

The control variables ($Controls_{o,t}$) are the standard variables used in literature (FDI, ODA, and natural disasters). FDI and ODA are used because they are the most important source of capital flows (along with remittances) for low and middle-income countries. Moreover, FDI plays an important role in explaining differences in economic growth for all countries (Borensztein and others, 1998), while ODA supports growth, and sometimes it is used specifically to deter migration (Clemens and others, 2012, Clemens and Postel, 2018). Natural disasters have a negative impact on short-term economic growth, and large natural disasters tend to lead to emigration. In the first stage regressions, we also use geographic fixed effects (ϕ_g) and country-specific controls ($Controls_o$, the pre-sample log real GDP, population, and trade openness) as in specification (2).

We use the predicted values of emigration and remittances in the first stage from equations (6) and (7), as the main explanatory variables in the second stage shown in equation (8), to obtain estimates of $\tilde{\beta}_1$ and $\tilde{\beta}_2$. The second stage model, which also includes the same sets of control variables and fixed effects, can be specified as:

$$y_{o,t} = \tilde{\alpha} + \tilde{\beta}_1 \frac{\widehat{Emigration}_{o,t}}{Population_{o,t}} + \tilde{\beta}_2 \frac{\widehat{Remittances}_{o,t}}{Population_{o,t}} \tilde{\gamma} Controls_{o,t} + \phi_t + \phi_o + \epsilon_{ot} \quad (8)$$

Therefore, the main specification explains the dependent variables (changes in the real GDP or the labor force participation rate), by instrumental variables also constructed in changes. For example, changes in the income of destination countries, impacting the growth rates of countries of origin, in addition to the direct effect of remittances (the shift-share).[20]

We allow for differences in sample sizes between the two stages when using labor force participation rates as explanatory variable, following a two-sample two-stage least squares estimation (2SLS) procedure.[21] The reason is that one of the outcome variables (labor force participation rates), $y_{o,t}$, contains a non-negligible share of missing values in the second stage. Since there are no missing observations on economic growth, we follow the standard 2SLS estimation with the same sample size for growth results. In other words, for all two-stage estimations (regressing on economic growth and on LFP), we use the same first stage as in

[20] Aneli and others (2023) explain the change in the stock of firms over time in Italy by the emigration rate, and other controls, with the emigration rate is instrumented by the sum of the initial emigration shares in each country, and the changes in GDP in those countries over the treatment period.

[21] See Pacini and Windmeijer (2016) for detailed description and derivation of the TS2SLS estimator used in this paper.

equations (6) and (7) under the same sample, obtaining the same set of predicted emigration rates and remittances per capita, $\frac{\widehat{Emigration}_{o,t}}{Population_{o,t}}$ and $\frac{\widehat{Remittances}_{o,t}}{Population_{o,t}}$.

In the second stage with economic growth, the sample size is the same as the first stage, while the sample with labor force participation in the second stage is restricted by data availability. Thus, we obtain the second stage estimates from a smaller size of the sample when estimating the impact of emigration and remittances on labor force participation (while still making use of the first-stage estimates based on the larger sample).

V. Empirical Results

In this section, we present the estimation results from the two stage estimations. Following the presentation of the common first stage results (equations 6 and 7), we separately show the results for the economic growth and the labor force participation in two dedicated sub-sections. In these main results, for ease of comparison we show the OLS results along with the 2SLS results (with country-specific or geographic fixed effects). The following section sheds light on alternative specifications that are serving as robustness checks.

5.1 Shift-shares/ Pull Factors

The first-stage regression results are presented in Table 2 below. The F-statistics suggest that the three IVs are highly informative of emigration and remittances across all specifications. As shown in the first row, income changes in destination countries are positively and significantly correlated with the emigration rate and remittances per capita. The unit labor cost in manufacturing is more relevant for remittances per capita. The effect of the unemployment rate in destination countries shows the expected negative correlation with received remittances; higher unemployment rate in the destination countries is associated with less remittances received in the origin country.[22] As expected, for this IV, the country-fixed effects lead to significant results, as geographic fixed effects are less relevant.[23]

[22] The effect of unemployment rate is less clear for emigration. First column suggests a positive relationship under country FEs, while under geographic fixed effects (second column) is the correlation is much smaller in scale and less significant.

[23] Immigrants tend to remit for altruistic reasons. Moreover, given the skills of immigrants, immigrants for certain countries tend to be employed in certain sectors. As a result, while on average as the unemployment rate in the destination countries increases less remittances are received, it is much harder to say so for the subregions in LAC, as on aggregate for that region some migrants from some countries are less affected in one sector, than the migrants from other countries working in another sector, see Babii and others (2022).

Table 2. First Stage

	OECD emigration rate		Remittances per capita	
	Country FE	Geo FE	Country FE	Geo FE
Pull IV: Income	3.60***	2.43***	1.25***	1.82***
	(0.332)	(0.243)	(0.447)	(0.151)
Pull IV: Unemployment rate	1.25***	0.06	-0.58***	-0.92
	(0.377)	(1.065)	(0.168)	(0.588)
Pull IV: Manufacturing unit labor cost	2.67	4.39	6.68***	10.53**
	(3.301)	(7.822)	(1.657)	(4.988)
Observations	612	461	612	461
R-squared	0.877	0.615	0.900	0.660
First-stage F-stat	40.352	48.825	10.403	53.682
Time-invariant controls	No	Yes	No	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed effects	o,t	g,t	o,t	g,t

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. First-stage F tests are conducted under the null hypothesis that all coefficients of the included instruments are zero. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) fixed effects are used. Either origin country (o) or geographic (g, Central America, Caribbean, and South America) fixed effects are included.

5.2 Economic Growth

Table 3 shows the estimation results for the specifications where the dependent variable is the percentage change in annual real GDP, and the two key explanatory variables are: the OECD emigration rate (the number of emigrants per year to all OECD countries as a percentage of current-year population of the country of origin) and remittances per capita (personal remittances measured in thousands of current USD[24] divided by the total population per country of origin), and in the 2SLS the predicted values of the instruments. For all estimations, we include year fixed-effects and additional control variables of FDI, ODA, and natural disaster damages, listed in “other controls”. The coefficients and standard errors for the latter are available upon request.

When controlling for geographic fixed effects rather than country-specific fixed effects, the time-invariant controls (GDP, population, and trade openness in 1989, before the period of study) are also included as pre-shock economic conditions. The sample size with geographic fixed effects is smaller due to missing values in the time-invariant controls. Robust standard errors are reported in the country fixed effects sample to account for heteroskedasticity.

[24] Since time fixed effects are controlled across all estimations, the variable remittances per capita is a real rather than nominal measure.

Table 3. Joint Estimates of Emigration and Remittances on Real GDP Growth, 1999-2019

	Country FE		Geographic FE	
	OLS	2SLS	OLS	2SLS
OECD emigration rate	-0.08	-10.28**	0.39	-15.32*
	(0.965)	(4.326)	(0.901)	(8.679)
Remittances per capita	2.18	19.93**	-3.07**	10.68
	(1.524)	(9.344)	(1.222)	(10.967)
Observations	612	612	461	461
Time-invariant controls	No	No	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	g,t	g,t
Instruments		Income, unemployment rate, unit labor costs in manufacturing		Income, unemployment rate, unit labor costs in manufacturing
Underidentification test		12.849		7.589
Endogeneity test		9.022		29.422
Sargan-Hansen test		0.123		0.021

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) fixed effects are used. Either origin country (o) or geographic (g, Central America, Caribbean, and South America) fixed effects are included.

Table 3 shows two sets of estimates, the country fixed effects in the first two columns, and geographic fixed effects the last two columns. For completeness, we show in the first column of each subset the OLS results.

The 2SLS estimation, with the use of the three instrumental variables, shows that both the emigration rate and remittances per capita have a significant contemporaneous impact on economic growth in the countries of origin. The former leads to a decline, while the latter to an increase in contemporaneous economic growth.[25]

The substantial test statistics in the respective endogeneity tests[26] confirms the validity of these instruments. The instrumental variables also pass both under- and over-identification tests, as shown by the large test statistic for under identification (Kleibergen-Paap rk LM statistic), and the small Sargan-Hansen test statistic, respectively.

We find that under the 2SLS estimation with country fixed effects (second column, Table 3), we find that annual emigration rate towards OECD countries reduces contemporaneous real GDP growth, and increases in remittances per capita increases contemporaneous economic growth.

[25] In contrast, the simple OLS results do not show any significant link between emigration (rate) or remittances (per capita) and economic growth in the countries of origin.

[26] The endogeneity test is under the null hypothesis that the two variables, emigration, and remittances, can be treated as exogenous, and the test statistic is distributed as chi-squared.

Similarly, the results in the last column controlling for geographic fixed effects also confirms the negative relationship between emigration and contemporaneous economic growth (albeit larger in magnitude). [27] The remittances coefficient is again positive, as expected, and unsurprisingly, given the previous results, insignificant only in the geographic fixed effects. Intuitively, the consistent result of the significant negative relationship between emigration and contemporaneous growth suggests that the labor loss in the countries of origin is associated with weaker economic activity. The received remittances provide monetary compensation to the households from such labor loss, and in turn, help raise economic activity.

It is important to emphasize that the net joint effect of emigration and remittances is not the simple sum of the two estimates of emigration rate and remittances variable, because the emigration rate and remittances per capita are not moving together on a one-to-one basis. To calculate the net joint effect, we use the results from the two-stage specification. However, we need to first introduce an external shock in destination countries, which affects both emigration rate and remittances, and eventually affects contemporaneous economic growth. In particular, we use a hypothetical 10 percent increase in income growth in all destination countries. Such a common shock will affect both emigration and remittances across the sample.

Figure 4 below shows the individual and joint effects across all LAC countries, or subregions (CAPDR, Caribbean, LA5 and other LA5),[28] in the two stages. The left chart, Figure 5a, plots the increase of emigration rate (blue bars) and remittances per capita (red bars) using the first-stage coefficients, and following such an increase in income by 10 percent in all destination countries. Figure 5b shows, in turn, the net joint effect on real GDP growth of emigration and remittances, using the second-stage coefficients for these variables, and the predicted values.

Figure 4. Individual and Net Joint Effects of Emigration and Remittances on Economic Growth, 1999-2019

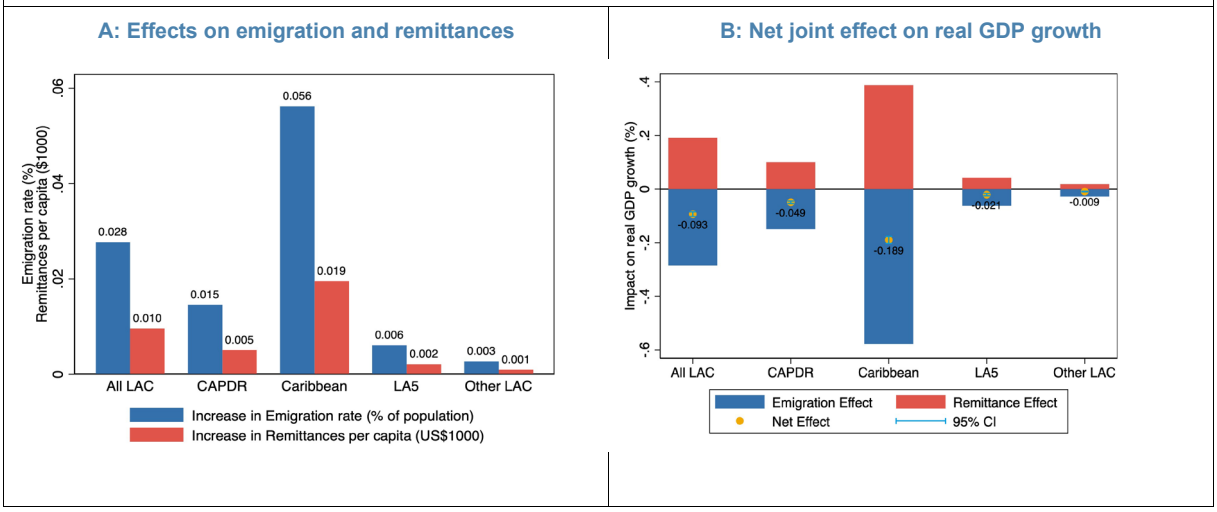


Figure 4 (left chart) shows that the 10 percent income increase in destination countries leads to an increase in the emigration rate towards OECD countries by 0.028 percentage point on average, and a $10 increase in average remittances per capita across all LAC countries. Breaking down into subregions, the Caribbean

[27] The sample size in the geographical fixed-effects estimations (last two columns in Table 1) is smaller due to the missing data in the country-specific controls.

[28] CAPDR: Central America, Panama, and the Dominican Republic. The largest five Latin American economies (LA5): Brazil, Chile, Colombia, Mexico, and Peru. Other LAC: Argentina, Bolivia, Ecuador, Paraguay, Uruguay, and Venezuela). A full list of the countries and their groups can be found in Table A.1

countries experience the most significant increase in emigration and remittances, followed by CAPDR countries and the LA5.

Figure 4 right chart shows that the net joint impact on GDP growth of emigration and remittances is -0.09 percent, following an increase in income of 10 percent in the destination countries. However, this aggregate result masks larger geographical variation. The net joint effect is the largest for the Caribbean countries, indicating a net -0.19 percent decrease in economic growth, because the emigration effect is larger than the remittances effect. The net joint effect on growth of emigration and remittances tends to also be negative for the CAPDR countries on average -0.05 percent, but almost zero for the largest five economies (LA5) and for the other LAC countries.

The results in the right chart of Figure 4 use the results from the left chart of Figure 5, plus the coefficients from Table 3.[29]

5.3 Change in Labor Force Participation

Table 4 presents the results about the contemporaneous impact of emigration and remittances on the change in overall labor force participation (15+), as well as on the change of labor participation for the younger generation aged between 15 and 24. Comparing the results from the OLS and IV estimations (the two-sample two stage least squares, 2SLS), we find similar patterns as with economic growth. While the OLS estimates do not appear to show a clear relationship between emigration and labor force participation, the IV estimates, which deal with the endogeneity concerns, indicate a much stronger and statistically significant relationship.[30]

The IV results confirm that emigration towards OECD countries has a negative effect on the contemporaneous change in labor force participation, and the impact on the younger generation is almost twice as large. For instance, a 0.1 percent increase in the emigration rate to OECD countries is associated with a drop of 0.76 percent of the overall labor force participation rate in the origin countries, and a with a considerably larger drop of 1.46 percent of the labor force participation for the youth cohort, on average.[31] Intuitively, this large coefficient may be explained by the fact that the people that tend to emigrate—especially when pushed predominantly by economic motives—are likely to be the most active in the labor market. At the same time, remittances per capita has an insignificant effect on LFP changes in the 2SLS estimations. This result is consistent with the literature that the impact of remittances on labor market outcomes is more ambiguous, as on average the results depend on the migrants versus the remaining workers characteristics (in particular skills).

To explore the net joint effect of emigration and remittances on the net change in labor force participation, we use the same method as before: a positive shock to the pull factor income of 10 percent. Figures 5 and 6 (left charts) show the changes in the emigration rate and remittances per capita in the first stage, because

[29] For example, the net joint effect from the emigration and remittances on real GDP growth is the sum of the effect of an income increase of 10 percent in destination countries on emigration and the effect of the same 10 percent income increase on remittances, taking into account the effect of emigration on real GDP growth and of remittances on real GDP growth respectively (hence, -0.093 = 0.028*(-10.282) + 0.010*19.933). The specific results in Figure 4 are obtained as follows. The impact of a 10 percent increase in income in destination countries is shown to be 0.028 for all LAC countries. This result comes from multiplying a 10 percent increase in income with the coefficient in Table 2 of the Income Pull-factor on emigration *and* the average predicted value of the income pull-factor IV for all countries (hence, 0.028 = 0.1 * 3.597*0.077). Please note that moving to the regional results, the coefficient from Table 2 using geographical fixed effects should be used (2.432), and in turn, the average predicted value of the income pull-factor IV that would be used has a different value than above, as it is calculated for that particular region.

[30] In the TS2SLS estimation, the first stage uses a larger sample compared to the second stage, given the larger data availability than for the labor force participation.

[31] The mean annual emigration share is 0.38 percent, with a large concentration around 0.1 percent (see figure 3).

of such shock (the former for the overall labor force, while the latter for the younger cohort only); and Figure 5 (right chart) shows the resulting effect on LFP in the second stage.

As in Figure 4 (left chart), the first stage results for LFP changes in Figures 5 and 6 (left charts) use the same estimates. The differences between the first-stage results for economic growth and those for LFPs is due to the latter's shorter sample size.

Table 4. Joint Effect of Emigration and Remittances on LFP Change, 1999-2019

	LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS
OECD emigration rate	0.63	-7.63***	1.11*	-14.64***
	(0.404)	(1.988)	(0.595)	(3.196)
Remittances per capita	0.99*	3.94	1.579*	3.27
	(0.600)	(3.148)	(0.816)	(5.061)
Observations	534	534	534	534
First-stage observations		612		612
Controls	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t
Instruments		Income, unemployment rate, unit labor costs in manufacturing		Income, unemployment rate, unit labor costs in manufacturing

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Two-sample instrumental variable estimates are reported in columns (2) and (4). First-stage is conducted on all sample with available data, while the second stage is restricted due to missing values in labor force participation. Controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and origin country (o) fixed effects are included.

As in the previous section, the net joint effect of emigration and remittances has a negative net effect on the labor force participation changes across all LAC countries. However, labor force participation rate among the younger generation faces a much more severe reduction as the pull factor becomes substantially stronger, especially in the Caribbean region.

Figure 5. Individual and Joint Effects of Emigration and Remittances on LFP (15+), 1999-2019

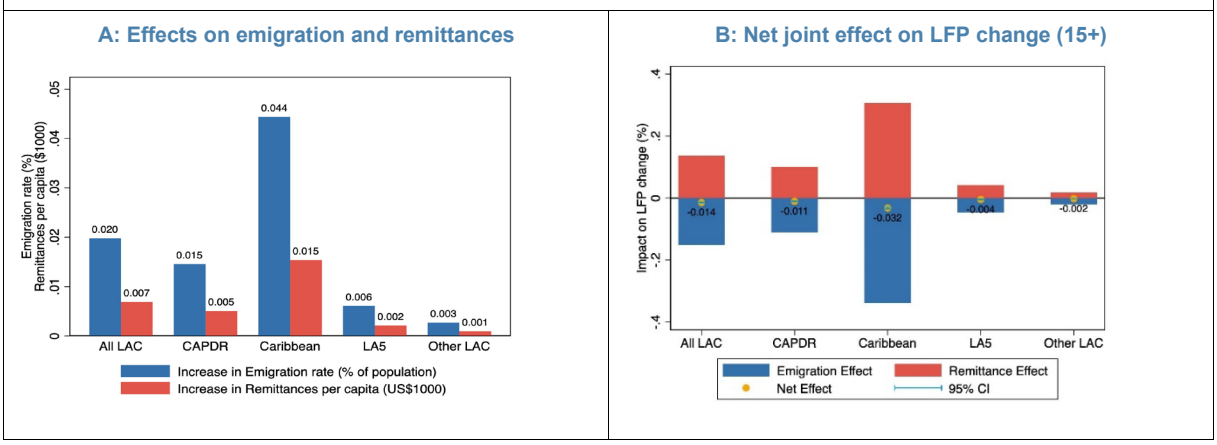
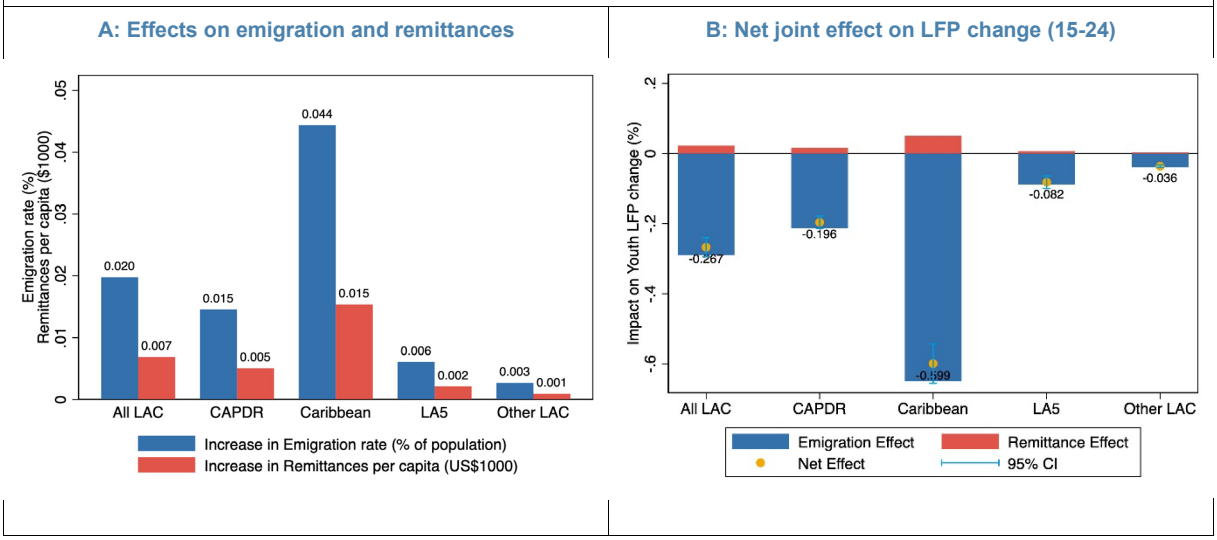


Figure 6. Individual and Joint Effects of Emigration and Remittances on LFP (15-24), 1999-2019



VI. Robustness

In this section, we discuss the heterogeneous effects of emigration and remittances across subregions, gender, and time horizons. In the latter subsections we present the results under alternative specifications and data sources. All these results confirm that the baseline results are robust to a range of additional considerations.

6.1 Heterogeneous Effects

Heterogeneous effects across subregions: Building on the main specification in equation (2) with geographic fixed effects, we further allow for the heterogeneous subregional effects of emigration and remittances by interacting the two variables with subregional dummy indicators for LA5, CAPDR, Caribbean, and other LAC countries, as shown in equation (9) below, where the subscript r denotes subregion. This allows to better capture the pull factors' variation, such that the region fixed effects are more accurately estimated.

$$y_{o,t} = \alpha + \sum_r \beta_{1,r} \frac{Emigration_{o,t}}{Population_{o,t}} \times \mathbb{1}\{o \in r\} + \\ + \sum_r \beta_{2,r} \frac{Remittances_{o,t}}{Population_{o,t}} \times \mathbb{1}\{o \in r\} + \\ + \gamma Controls_{o,t} + \sigma Controls_o + \phi_g + \phi_o + \epsilon_{ot} \qquad (9)$$

We are interested in the estimates for $\beta_{1,r}$ and $\beta_{2,r}$. Here, we use geographic fixed effects rather than country fixed effects to preserve more variations in the sample, as the additional interaction terms impose more restrictions on the data structure. In the first stage, the instrumental variables are also interacted with the subregional dummies to account for the additional endogenous variables.

Additionally, due to the recent refugee crises, the large increase of emigrants in Venezuela is considered as an outlier in the sample. We thus run the regression excluding Venezuela, showing that our main result remains consistent.

Table 5 presents the estimates of equation (9) for the full sample, and for the subsample excluding Venezuela. Like the previous result assuming homogenous effects, the OLS results differ significantly from the 2SLS results, and across subregions, the heterogeneity mostly comes from the Caribbean, where emigration leads to the largest negative impact. The remittances effects tend to be insignificant.[32]

Table 5. Subregional Net Joint Estimates of Emigration and Remittances on Economic Growth

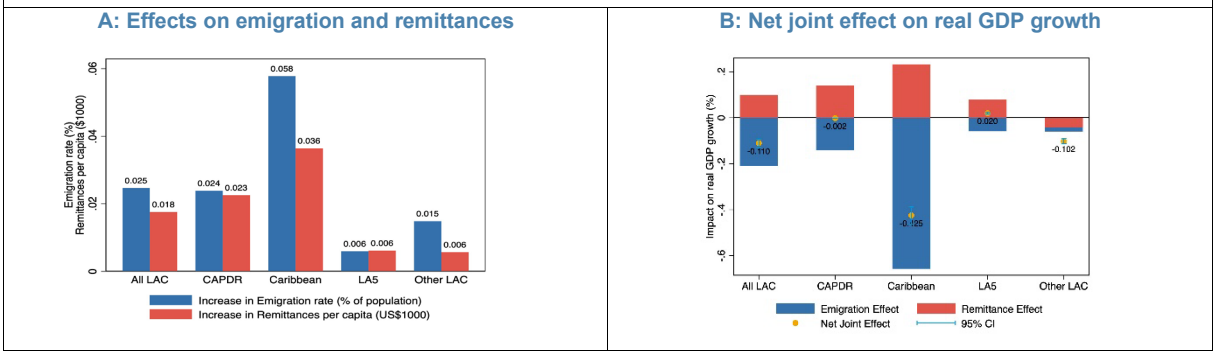
	Main		Excluding Venezuela	
	OLS	2SLS	OLS	2SLS
LA5 # OECD emigration rate	15.86***	-9.96	16.03***	-7.13
	(4.158)	(21.174)	(3.808)	(20.517)
CAPDR # OECD emigration rate	1.21	-5.93	0.86	-9.74
	(1.986)	(7.618)	(1.842)	(7.964)
Caribbean # OECD emigration rate	0.02	-11.37*	-0.21	-15.19**
	(1.010)	(6.045)	(0.940)	(6.443)
Other LAC # OECD emigration rate	1.61	-4.05	1.52	-1.43
	(1.574)	(7.563)	(1.442)	(7.762)
LA5 # Remittances per capita	-14.58***	12.84	-13.79***	15.05
	(5.148)	(19.753)	(4.764)	(19.912)
CAPDR # Remittances per capita	-0.75	6.19	-0.49	8.62
	(1.909)	(7.889)	(1.756)	(8.087)
Caribbean # Remittances per capita	-5.73***	6.38	-5.77***	8.58
	(1.561)	(8.352)	(1.428)	(8.513)
Other LAC # Remittances per capita	5.24	-7.40	3.77	-21.28
	(4.693)	(20.533)	(4.512)	(22.230)
Observations	461	461	445	445
Underidentification test		13.659		12.904
Endogeneity test		17.499		30.022
Sargan-Hansen test		3.626		4.172
Sargan-Hansen p-value		0.459		0.383

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time and geographic (Central America, Caribbean, and South America) fixed effects are included.

The overall net effect shown in Figure 7 is estimated at 0.1 percent decrease of economic growth across LAC countries and -0.4 percent for the Caribbean region respectively. This heterogeneity is consistent with the non-linear emigration life cycle (Clemens, 2020), where more developed regions benefit more from emigration in general, while the less developed may suffer from brain drain. A similar pattern is observed excluding Venezuela as in Figure A.5.

[32] Since this specification includes a total of 8 endogenous variables (instrumented by 12 IVs), it is not surprising that some sub-regional effect appears to be insignificant, given the small number of countries in each subgroup.

Figure 7. Heterogeneous Sub-regional Individual and Joint Effects of Emigration and Remittances



Heterogeneous effects by gender: We repeat our baseline analysis on the change in LFP by gender, separately for overall (aged 15+) and the younger (aged 15-24) labor force. Table 6 below shows the results. The relationship is similar to the baseline findings, that higher emigration is correlated with a decline in labor force participation, and the remittances effect is less clear. However, the negative effect from emigration is especially strong for the overall female labor force, as shown from the comparison between columns (2) and (4). This finding is consistent with the inverse added-worker effect in a previous study on 18 countries in Latin America (Serrano and others, 2019). Additionally, the emigration effect on the younger cohort is strong for both genders, but similar in scale. The result also echoes Serrano and others (2019) where "the married, with children and vulnerable women" are more likely to experience an adverse effect on labor force participation.

Table 6. Joint Effect of Emigration and Remittances on LFP Change by Gender, 1999-2019

	LFP Change (15+)				LFP Change (15-24)			
	Female		Male		Female		Male	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD emigration rate	0.423	-9.272***	0.865**	-6.100***	0.866	-14.370***	1.353**	-15.078***
	(0.546)	(2.445)	(0.379)	(1.820)	(0.644)	(3.272)	(0.687)	(3.522)
Remittances per capita	1.049	4.310	0.974	3.573	1.582*	2.750	1.580	3.712
	(0.769)	(3.871)	(0.621)	(2.882)	(0.943)	(5.181)	(1.019)	(5.577)
Observations	534	534	534	534	534	534	534	534
First-stage observations		612		612		612		612
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t	o,t	o,t
Instruments		Income, unemployment rate, unit labor costs in manufacturing		Income, unemployment rate, unit labor costs in manufacturing		Income, unemployment rate, unit labor costs in manufacturing		Income, unemployment rate, unit labor costs in manufacturing

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Two-sample instrumental variable estimates are reported in even columns. First-stage is conducted on all sample with available data, while the second stage is restricted due to missing values in labor force participation. Controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and origin country (o) fixed effects are included.

6.2 Dynamic Effects

We take into account that the impact of emigration and remittances could differ overtime. First, we extend the baseline sample period from 1998 to 2019, to 1995-2019. Second, to estimate both the current and past impacts of emigration and remittances, we adopt the multi-instrumentation method proposed by Jaeger, Ruist, and Stuhler (2018). To focus on the long-run effect, we use the UNPD emigration data.

Longer horizon: The reason we use the estimates from 1995 to 2019 as a robustness check and not to estimate the baseline results is because emigration data is not available for all destination countries before 1999. Table 7 shows the estimates repeating our main specification using the same set of instrumental variables and estimation procedure for real GDP growth and LFP change. Like the baseline findings, emigration is associated with a negative impact on growth, and the negative relationship is also shown in the decrease in labor force participation, especially among the younger generation. Remittances, on the other hand, provide some mitigation to this negative effect, but not necessarily for the younger cohort.

In addition, in the appendix, in Table A.4 we show results which also include the year 2020. The impact on labor market participation is similar to our prior findings in the baseline.

Table 7. Joint Estimates of Emigration and Remittances on Growth and change in LFP, 1995-2019

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD emigration rate	0.12	-8.71***	0.54	-3.17***	1.16	-5.01***
	(0.76)	(3.21)	(0.554)	(1.045)	(1.149)	(1.512)
Remittances per capita	1.47	19.29**	0.83	4.73*	2.15	5.43
	(1.215)	(8.305)	(0.988)	(2.492)	(2.082)	(3.604)
Observations	724	724	630	630	630	630
First-stage observations				724		724
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments		Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM
Underidentification test		23.937				
Endogeneity test		11.405				
Sargan-Hansen test		0.416				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Robust standard errors are used to calculate p-values for the first two columns. Remittances per capita is measured in US$1000. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Both country (o) and time (t)fixed effects are used.

Current and past effects: To consider the past effects of emigration and remittances, we start by using the one-year lagged values of the two endogenous variables instead of the current period, instrumented by one-year lagged shift-share instruments. After that we also follow Jaeger and others (2018) by adding both

current and one-year lagged endogenous variables in the estimation, using shift-share instruments of current and lagged period as well.

The comparison among the three estimation results (only the 2SLS) are shown in Table 8. The first column shows the baseline (current-period endogenous variables), the second column shows one-year lagged estimation, and the third column shows both current and one-year lagged results. Since adding one-year lags and their respective instruments imposes more restrictions on the data structure, the over-identification Hansen test statistic runs higher in the last specification, though not rejecting the null hypothesis at 0.15 significance level (with a p-value of 0.161). In principle, introducing more lags of the endogenous variables would require more valid instruments, which is not feasible with the limited sample size in this context. Additionally, longer lags also leads to the weak identification issue, as highlighted in Jaeger and others (2018), who also used only one-period lag of past immigration flow. However, we can still observe some general patterns from the comparisons between the estimates of the current-period and the past period, representing the short- and long run effects, respectively.

Past emigration and past received remittances have a larger and more significant impact on economic growth than the current effects, as shown in the comparison between the first and second column. Past emigration has the most persistent effect on economic growth, as shown in the last column (which shows the effect of current and past emigration and remittances on economic growth).

Table 8. Joint 2SLS Estimates of Current and Past Effects of Emigration and Remittances

	Baseline (current)	Past	Current and Past
OECD Emigration rate	-10.28**		3.74
	(4.326)		(4.225)
Remittances per capita	19.93**		-42.04
	(9.344)		(37.190)
Lag OECD Emigration rate		-15.96***	-14.02***
		(5.497)	(4.724)
Lag Remittances per capita		25.50*	57.82
		(13.523)	(42.848)
Observations	612	608	608
Controls	Yes	Yes (one lag)	Yes
Fixed effects	o,t	o,t	o,t
Instruments	Income, LUR, ULCM	Income, LUR, ULCM (one lag)	Income, LUR, ULCM (current and one lag)
Underidentification test	12.849	12.666	4.637
Endogeneity test	9.022	9.485	11.761
Sargan-Hansen test	0.123	1.249	3.656

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used.

Five-year effects: To further investigate the long-run effects, we adopt the same shift-share instrumental variable strategy using five-year UNPD data from 1995 to 2000. The explanatory variables, instrumental

variables and control variables are adjusted in accordance to the five-year changes. The five-year emigration rate is calculated as the change in 5-year emigrant stock over the lagged 5-year population, and remittances per capita is the 5-year average over lagged 5-year population (represented in 2015 constant USD in thousands). In terms of instruments, income and manufacturing unit labor cost changes are represented in terms of five-year growth, and labor unemployment rate is represented in five-year average since unemployment matters more in its stock compared to growth in the mid-run. Similarly, we use five-year average of both FDI and ODA as share of GDP and calculate the total disaster damages in terms of five-year lagged GDP as the standard controls. Since the sample size is largely reduced on a five-year scale, geographic fixed effects are used and time-invariant characteristics are controlled for, instead of using country fixed effects. For LFP results, we use the same first and second stage to estimate the result with instrumental variables, as there is no missing data of LFP in the first stage sample, following a standard two-stage least squares method rather than the two-sample two-stage least squares in the estimation with country fixed effects. Thus, the under-identification test statistics are the same across three estimations since they all share the same first stage. The results are shown in Table 9. It is important to note that the sample used is 1995-2020, given the availability of the data as five-year averages.

Table 9. Joint Estimates on Five-year Economic Growth and LFP Change, 1995-2020

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Emigration rate	-3.18***	-3.37*	-0.13	-0.38	0.02	-0.52
	(0.935)	(1.723)	(0.125)	(0.547)	(0.139)	(0.848)
Remittances per capita	10.83	26.91	0.53	12.83	2.48	17.10
	(6.872)	(26.322)	(1.396)	(8.066)	(1.818)	(10.987)
Observations	120	120	120	120	120	120
Time-invariant controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	g,t	g,t	g,t	g,t	g,t	g,t
Instruments		Income, Average LUR, ULCM		Income, Average LUR, ULCM		Income, Average LUR, ULCM
Underidentification test		6.029		6.029		6.029
Endogeneity test		0.452		5.320		4.311
Sargan-Hansen test		1.518		0.018		0.008

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Emigration rate is the UNPD 5-year emigration flow over five-year lagged population from UNPD, and Remittances per capita is the remittance inflow in 2015 constant US$1000 over five-year lagged population. Pull-factor instruments of income and unit labor cost in manufacturing are represented in terms of five-year growth, and changes in unemployment rate is the five-year average. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include the five-year average of FDI as a share of GDP, five-year average of ODA as a share of GNI, and total natural disaster damages over five years as a share of five-year lagged GDP. Both time fixed effects and geographic (Central America, Caribbean, and South America) fixed effects are included.

We find a similar relationship using five-year data suggesting that emigration has a negative impact on growth. The correlation between five-year average OECD emigration rate (to OECD countries) and the five-year UNPD emigration rate (to all destination countries) is around 0.31, explaining why the coefficient is smaller compared with the main estimation result of -10.282 in Table 3. The differences in estimates are explained by the difference in measurement of the emigration rates, and the sample periods.

The impact through remittances seems to be larger at scale but the relationship is less significant in the five-year horizon. These results are consistent with the results in Table 7, which also show that lag remittances have a larger effect on growth.

On the other hand, the five-year effect on the labor force participation rate is less significant. The result seems to suggest that lower labor force participation may be primarily a short-run negative effect on the economic growth.

6.3 Alternative IVs, Measurements and Specifications

Alternative instrumental variable: We consider another classic shift-share instrumental variable in the literature, using the number of total immigrant inflow in destination country as exogenous variations ("shifts") interacted with the same historical settlements ("shares") (e.g., Jaeger and others2018). To address the endogeneity issue that the bilateral emigration flow from an origin country is accounted in the total number of immigrants, we subtract the own bilateral emigration flow from the total number for each origin-destination country pair following a "leave-one-out" approach (e.g., Autor and Duggan 2003), as shown in equation (10) below.

$$Pull_{o,t}^{Income} = \sum_{d} \frac{Emigration\ Stock_{o,d,1990}}{Population_{o,1990}} (Total\ Immigration_{d,t} - Bilateral\ Emigration_{o,d,t}) \qquad (10)$$

The estimation results are presented in Table A.5 using the new IV replacing the GNI per capita as the pull factor ($Pull_{o,t}^{Income}$), where the two other IVs ($Pull_{o,t}^{LUR}$and $Pull_{o,t}^{ULCM}$) are kept the same as the main specification. We make this substitution because of two reasons. On the one hand, income growth in destination is most significantly related with emigration, and so is the leave-one-out total immigration. On the other hand, the income growth at destination countries is most likely to affect economic growth of origin countries through other channels than migration and remittances, compared with the two other IVs using unemployment rate and unit labor costs in manufacturing. Thus, we show in Tables A.5 that using the alternative IV, we obtained similar estimates for economic growth, where emigration is found to have a significant negative effect on growth rates and remittances may mitigate the effect. The estimation results for labor force participation are qualitatively similar to the main specification.

Additionally, we test our results using an alternative base year, 1995, instead of 1990. Following the baseline empirical specification, we construct the shift-share IVs using the historical migration stock in 1995 from the UNPD dataset, and use the initial conditions (log real GDP, log population and trade openness) one year before in 1994. The results (shown in Table A.6) are consistent with the findings that emigration rate is negatively correlated with growth, while remittances per capita is positively correlated.

Alternative measures: We repeat our analyses using different measures of the variables used and find that the baseline specification is robust to various data sources and measurement. In particular, Table A.9 shows the results using the net emigration rate from the World Bank, Table A.10 uses remittances in constant 2015 USD terms, and Table A.11 shows remittance data from KNOMAD, which has a smaller sample period starting from 2000 to 2019 due to data availability, Table A.12 shows estimate the effects of emigration and remittances on real GDP growth per capita.

Capturing population change: Another concern with our main specification is that we use current-year population to calculate the share of emigrants and per capita GDP, which might confound with the fact that emigration also leads to a change in population, holding up the result. Thus, we re-calculate the two endogenous variables using one-year lagged population. Table A.13 shows that the estimated coefficients

are almost the same with our baseline. This suggests the population change itself in the denominator is not a main driver of the effects of emigration rate and remittances per capita.

Capturing the effect of emigration and remittances on real GDP level: We report in Table A.14 results with the level of GDP rather than the changes in those variables. We find that emigration negatively impacts the level of contemporaneous GDP. While remittances positively impact the contemporaneous GDP level, the effect is not significant, including in the two stage least square estimation.

VII. Conclusion

There has been a remarkable increase in both emigration and remittances worldwide in recent years, with many countries in Latin America and the Caribbean being among the largest sources of emigrants as well as destinations for the associated remittance inflows. With remittances becoming the largest capital flows in many of these countries, understanding the impact on growth and labor force participation is critical. However, the literature does not provide conclusive results to understand the net joint impact of emigration and remittances on GDP growth and labor force participation. For example, some papers find a beneficial impact of emigration (from increasing labor force participation of the remaining active population), while others find the opposite. Adding the remittances to the mix makes the analysis more difficult, since remittances may raise growth in the short term, but they may impact negatively labor force participation, and hence growth in the longer term. Moreover, given the estimation challenges (primarily endogeneity issues), there are only a few papers that attempt to estimate the impact of emigration and remittances jointly.

This paper addresses these two gaps in the literature. First, we use a novel “shift-share” instrument, so that we can estimate jointly these effects. Second, we find robust and non-ambiguous results that point at significantly negative impact of emigration on economic growth and labor force participation in LAC. We also find that remittances may alleviate these adverse effects. Most importantly, the net joint effect on average is negative for the region. Across LAC, a 10 percent increase in income in OECD (destination countries) will lead to a net negative joint effect of -0.1 percent on contemporaneous real GDP growth, as the positive effect on economic growth from remittances falls short in offsetting the adverse impact of emigration.

Moreover, our analysis sheds light on the more nuanced effects of both emigration and remittances on the labor force, demonstrating a considerable decline in labor force participation, most notably among the younger age cohorts (15-24).

Our analysis also allows us to look at the differentiation across LAC subregions. We find that the largest negative net impact applies to the Caribbean region, followed by the CAPDR region, while the effect for the rest of Latin America seems more muted.

These findings not only deepen our understanding of the complexities inherent in emigration dynamics but also carry significant policy implications. To mitigate the adverse effects of emigration in the origin countries, it is imperative to prioritize policies that lead to the creation of high-quality jobs, particularly for the younger workforce. Additionally, authorities should strive for the highest quality governance and anti-corruption policies, along with a strong business environment, to ensure that any ‘brain drain’ leads to ‘brain gain’ or attraction of investment and development of capital markets, thereby expanding the origin economies productive capacities. Furthermore, policies that tilt the use of remittances to investment rather than consumption, and through better financial development, would also contribute to long-term growth. These policies are likely to be more urgent in the countries facing the most significant losses from emigration. Furthermore, the methodological innovations introduced in this study may benefit future research seeking to

disentangle the various impacts of migration and remittances, for example using more granular sub-national data and exploring the dynamic effects over time.

Annex I. Descriptives Statistics

Table A.1 Sample - Country Groupings per Subregions and Observations per Subsamples

	Geographic Group	Real GDP growth	Real GDP growth (Geo FE)	LFP change	LFP change (Geo FE)
LA5					
Brazil	SA	21	21	21	21
Chile	SA	18	18	18	18
Colombia	SA	21	21	21	21
Mexico	CA	21	21	21	21
Peru	SA	21	21	21	21
CAPDR					
Costa Rica	CA	21	21	21	21
Dominican Republic	CR	21	21	21	21
El Salvador	CA	21	21	21	21
Guatemala	CA	21	21	21	21
Honduras	CA	21	21	21	21
Nicaragua	CA	21	21	21	21
Panama	CA	21	21	21	21
Caribbean					
Antigua and Barbuda	CR	21	0	0	0
Aruba	CR	0	0	0	0
The Bahamas	CR	0	0	0	0
Barbados	CR	12	12	12	12
Belize	CA	21	21	21	21
Dominica	CR	21	12	12	12
Grenada	CR	21	0	0	0
Guyana	CA	21	21	21	21
Haiti	CR	21	21	21	21
Jamaica	CR	21	21	21	21
St. Kitts and Nevis	CR	15	0	0	0
St. Lucia	CR	21	0	21	0
St. Vincent and the Grenadines	CR	21	0	21	0
Suriname	SA	19	0	19	0
Trinidad and Tobago	CR	12	0	12	0
Other LAC					
Argentina	SA	21	21	21	21
Bolivia	SA	21	21	21	21
Ecuador	SA	21	21	21	21
Paraguay	SA	21	21	21	21
Uruguay	SA	16	16	16	16
Venezuela	SA	16	16	16	16

Notes: The geographic subgroups are obtained from UN WPP 2022, which classifies the LAC countries into three subgroups: Central America (CA), Caribbean (CR), and South America (SA).

Table A.2 Destination Countries Used in Shift-share IVs (number of origin-destination-time observations)

	OECD annual	UNPD 5-year
Austria	1,040	245
Belgium	847	240
Czech Republic	720	220
Finland	1,100	205
France	1,069	255
Germany	1,099	120
Greece	842	305
Italy	1,025	190
Japan	769	20
Korea	1,051	270
Norway	1,084	80
Poland	691	95
Portugal	713	35
Slovenia	1,052	185
Spain	1,042	170
United Kingdom	931	265
United States	962	185
Total	16,037	3,085

Table A.3 Summary Statistics

		Panel A: LAC	Panel B: LA5	Panel C: Caribbean	Panel D: CAPDR	Panel E: Other LAC
				Dependent Variables		
Real GDP Growth (Percent)	Mean	3.0	3.3	3.9	2.5	3.0
	SD	3.5	2.6	2.6	3.7	4.5
	Observations	612	102	147	247	116
Labor Force Participation (15+, Percent)	Mean	58.1	60.3	58.2	54.5	61.2
	SD	5.7	6.9	2.4	4.9	5.7
	Observations	534	102	147	169	116
Labor Force Participation (15 to 24, Percent)	Mean	40.3	44.3	43.2	34.1	42.0
	SD	8.5	9.7	5.5	7.1	7.6
	Observations	534	102	147	169	116
				Regressors		
OECD Emigration Rate (Percent)	Mean	0.38	0.12	0.23	0.67	0.19
	SD	0.33	0.07	0.19	0.30	0.18
	Observations	612	102	147	247	116
Remittances per Capita (1000 USD)	Mean	0.21	0.08	0.27	0.31	0.06
	SD	0.21	0.08	0.20	0.23	0.06
	Observations	612	102	147	247	116

Annex II. Additional Tables and Figures

Table A.4 Main Results with Time Horizon, 1995-2020

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD Emigration rate	-0.77	-6.07	0.14	-3.35***	0.95	-3.44***
	(1.523)	(4.766)	(0.606)	(1.005)	(1.139)	(1.296)
Remittances per capita	1.88	8.00	1.94*	5.37***	3.48*	2.42
	(1.475)	(11.060)	(1.023)	(2.039)	(1.943)	(2.630)
Observations	749		652		652	
First-stage Obs.		749		749		749
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments		Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM
Underidentification test		26.405				
Endogeneity test		8.714				
Sargan-Hansen test		0.900				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time and country fixed effects are used. Robust standard errors are used in two-stage least squares estimations.

Table A.5 Main Results with Alternative IV, 1999-2019

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD Emigration rate	-0.08	-20.29**	1.17*	-1.70	2.80*	-2.21
	(0.965)	(8.254)	(0.686)	(1.176)	(1.449)	(1.649)
Remittances per capita	2.18	15.19	1.64	4.76**	4.24*	5.54*
	(1.524)	(11.435)	(1.049)	(2.064)	(2.163)	(2.895)
Observations	612	612	534	534	534	534
First-stage observations				612		612
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments		Immigration, LUR, ULCM		Immigration, LUR, ULCM		Immigration, LUR, ULCM
Underidentification test		13.219				
Endogeneity test		17.752				
Sargan-Hansen test		1.062				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. An alternative instrumental variable, using the total immigration flows in destination country (excluding the origin country), is used. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time and country fixed effects are used. Robust standard errors are used in first two columns.

Table A.6 Main Results Using 1995 as Base Year, for real GDP growth regressions

	Country FE		Geographic FE	
	OLS	2SLS	OLS	2SLS
OECD Emigration rate	-0.084	-15.570**	0.187	-22.991**
	(0.965)	(7.156)	(0.943)	(9.909)
Remittances per capita	2.176	15.874*	-2.432**	22.060*
	(1.524)	(8.990)	(1.215)	(12.976)
Observations	612	612	482	482
Time-invariant controls	No	No	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes
FEs	o,t	o,t	g,t	g,t
Instruments	Income, LUR, ULCM		Income, LUR, ULCM	
Underidentification test	9.900		8.572	
Endogeneity test	10.668		36.923	
Sargan-Hansen test	0.061		0.126	

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. The dependent variable is the percentage growth of real GDP. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1994. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used. The shift-share instruments are constructed using the historical migration stocks in 1995 as “shares”, while the “shifts” are the same as baseline.

Table A.7 Pre-trends with Four-year Lagged IV, 1995-1998

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	Country FE	Geo FE	Country FE	Geo FE	Country FE	Geo FE
Pull IV: Income	-7.97	-16.29**	544.34	0.29	1888.39**	4.72
	(5.938)	(7.516)	(378.131)	(3.038)	(899.242)	(5.018)
Pull IV: Unemployment rate	-9.43	-9.92	40.24	-28.55	168.19	-78.62*
	(28.652)	(46.173)	(59.267)	(21.023)	(114.022)	(42.871)
Pull IV: Manufact. ULC	-192.54	42.42	0.85	-6.14	7.61	-87.10
	(138.293)	(245.384)	(88.200)	(84.223)	(171.400)	(189.649)
Test F stat	1.064	1.789	3.490	1.110	3.859	1.412
Test p-value	0.369	0.156	0.020	0.350	0.013	0.246
Observations	123	92	107	92	107	92
Time-invariant Controls	No	Yes	No	Yes	No	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	g,t	o,t	g,t	o,t	g,t

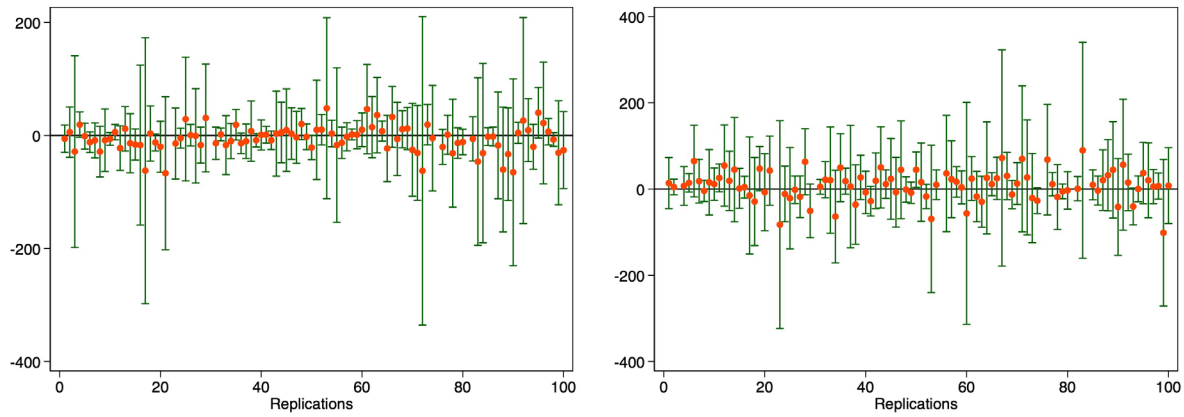
Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Pull IVs are constructed using four-year forward shocks from the sample period in the future. Tests are conducted under the null hypothesis that all coefficients of the included instruments are zero. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) fixed effects are used. Either origin country (o) or geographic (g, Central America, Caribbean, and South America) fixed effects are included.

Table A.8 Responses to IVs Across Horizons

	OECD Emigration Rate			Remittances per capita		
	GNIPC	LUR	LULCM	GNIPC	LUR	LULCM
t = -2	1.058	-0.216	-3.436	-0.090	-0.161	4.471***
	(0.890)	(0.294)	(3.079)	(0.365)	(0.173)	(1.515)
t = -1	0.562	0.054	-5.229*	0.480*	0.304*	4.820***
	(1.276)	(0.347)	(3.056)	(0.257)	(0.179)	(1.390)
t = 0	2.996**	0.693	0.776	0.607**	-0.669**	6.394***
	(1.160)	(0.444)	(3.653)	(0.296)	(0.284)	(1.676)
t = 1	-0.627	-0.131	1.342	0.343	-0.192	2.909*
	(0.774)	(0.429)	(2.625)	(0.359)	(0.376)	(1.669)
t = 2	-0.235	-0.228	2.715	-0.002	0.025	3.043
	(0.501)	(0.402)	(3.416)	(0.301)	(0.328)	(2.056)
Observations	680	680	680	669	669	669
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. First-stage F tests are conducted under the null hypothesis that all coefficients of the included instruments are zero. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used. Each column represents the responses of OECD emigration rate (columns 1-3) or remittances per capita (columns 4-6) to one of the three shift-share instrumental variables ranging from two years before the shock to two years after the shock, as shown by t = -2, -1, 0, 1, 2. When estimating the responses of one IV across different horizons, the other two IVs are included.

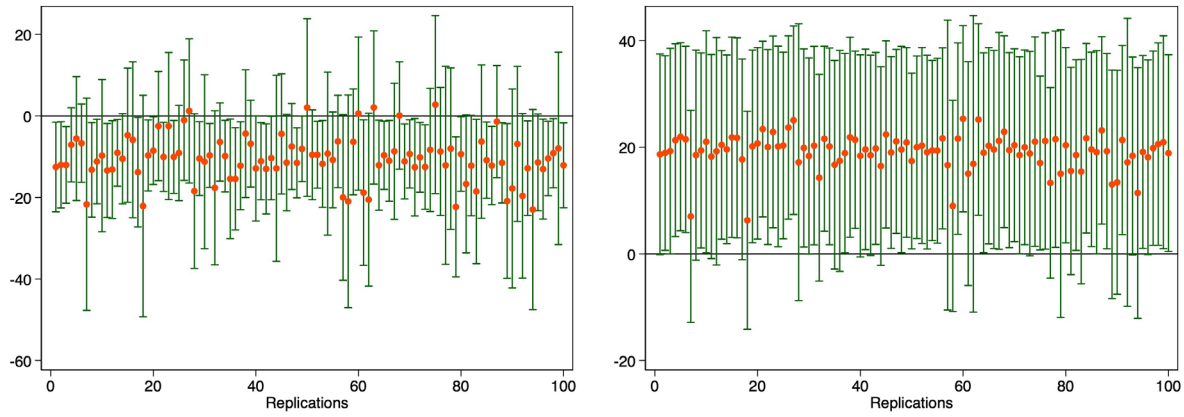
Figure A.1 Permutation of Shares



(a) Emigration (b) Remittances

Notes: This graph shows the estimated effects of emigration and remittances obtained in 100 different random permutations of the historical emigration shares, following the baseline specification. The exercise is based on 500 replications, but for visualization clarity only 100 are reported in the graph.

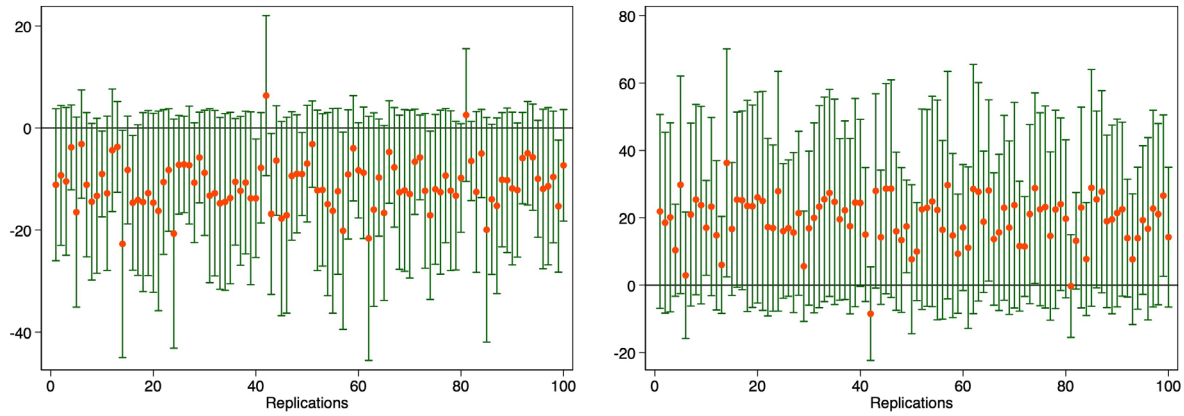
Figure A.2 Permutation of Shifts (per capita income)



(a) Emigration (b) Remittances

Notes: This graph shows the estimated effects of emigration and remittances obtained in 100 different random permutations of the per capita income (keeping the other two shift-share IVs the true values), following the baseline specification. The exercise is based on 500 replications, but for visualization clarity only 100 are reported in the graph. The average emigration effect is -10.18 (320 out of 500 times significant at the 10 percent level), and the average remittances effect is 19.34 (451 out of 500 times significant at the 10 percent level).

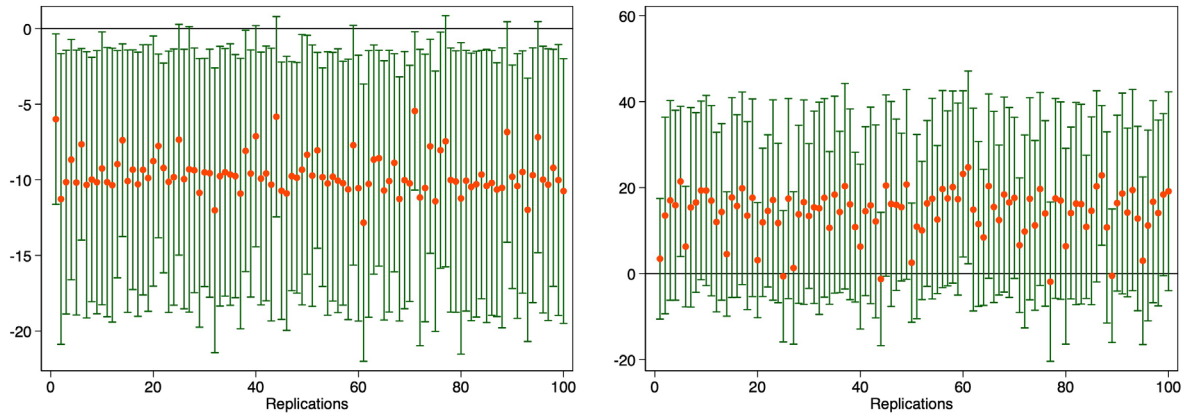
Figure A.3 Permutation of Shifts (LUR)



(a) Emigration (b) Remittances

Notes: This graph shows the estimated effects of emigration and remittances obtained in 100 different random permutations of the unemployment rates (keeping the other two shift-share IVs as the true values), following the baseline specification. The exercise is based on 500 replications, but for visualization clarity only 100 are reported in the graph. The average emigration effect is -10.93 (176 out of 500 times significant at the 10 percent level), and the average remittances effect is 19.50 (157 out of 500 times significant at the 10 percent level).

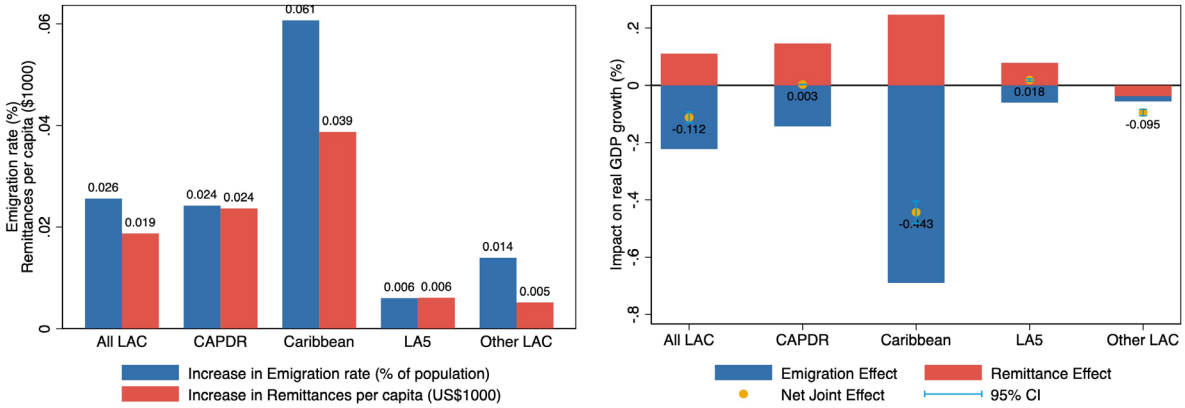
Figure A.4 Permutation of Shifts (ULCM)



(a) Emigration (b) Remittances

Notes: This graph shows the estimated effects of emigration and remittances obtained in 100 different random permutations of the unit labor costs of manufacturing (keeping the other two shift-share IVs as the true values), following the baseline specification. The exercise is based on 500 replications, but for visualization clarity only 100 are reported in the graph. The average emigration effect is -9.69 (493 out of 500 times significant at the 10 percent level), and the average remittances effect is 13.93 (106 out of 500 times significant at the 10 percent level).

Figure A.5 Heterogeneous Sub-regional Individual and Joint Effects of Emigration and Remittances (excluding Venezuela)



(a) Effects on emigration and remittances

(b) Joint effect on economic growth

Table A.9 Main Results with Net Emigration Rate

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Net Emigration/Population	-0.06	-9.07**	0.09	-12.43***	0.41	-21.78***
	(0.277)	(4.360)	(0.305)	(4.690)	(0.589)	(8.138)
Remittances per capita	2.13	13.12	1.89*	-7.69	4.9**	-16.87
	(1.509)	(9.712)	(1.076)	(8.015)	(2.215)	(13.908)
Observations	612	612	534		534	
First-stage observations				612		612
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments	Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM	
Underidentification test		2.039				
Endogeneity test		9.194				
Sargan-Hansen test		0.074				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Net emigration is obtained by the negative net migration from WB WDI. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used. Robust standard errors are used in two-stage least squares estimations.

Table A.10 Main Results with Remittances in 2015 Constant USD

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD emigration rate	-0.06	-9.22**	1.20*	-7.16***	2.95**	-14.26***
	(0.956)	(4.225)	(0.687)	(1.930)	(1.458)	(3.093)
Remittances per capita	2.49	29.84**	1.22	6.00	3.13	4.91
	(1.643)	(14.460)	(1.083)	(4.755)	(2.194)	(7.621)
Observations	612	612	534		534	
First-stage observations				612		612
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments		Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM
Underidentification test		13.850				
Endogeneity test		9.127				
Sargan-Hansen test		0.265				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in 2015 constant US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used. Robust standard errors are used in two-stage least squares estimations.

Table A.11 Main Results with KNOMAD Remittances, 2000-2019

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD emigration rate	-0.10	-13.19	1.48**	-0.42	3.84***	-1.00
	(1.018)	(11.162)	(0.699)	(1.095)	(1.410)	(1.553)
Remittances per capita	3.41**	13.52	2.28**	6.24**	5.17**	8.16**
	(1.638)	(8.710)	(1.102)	(2.604)	(2.173)	(3.694)
Observations	583		509		509	
First-stage observations	583			583		583
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments	Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM	
Underidentification test		7.995				
Endogeneity test		5.232				
Sargan-Hansen test		1.430				

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is obtained from KNOMAD. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used. Robust standard errors are used in two-stage least squares estimations.

Table A.12 Main Results Using Real GDP Per Capita

	Country FE		Geographic FE	
	OLS	2SLS	OLS	2SLS
OECD emigration rate	0.13	-9.43**	1.10	-10.85
	(0.939)	(4.102)	(0.874)	(7.722)
Remittances per capita	1.70	16.20*	-1.83	8.27
	(1.496)	(8.741)	(1.185)	(9.758)
Observations	612	612	461	461
Time-invariant controls	No	No	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	g,t	g,t
Instruments	Income, LUR, ULCM		Income, LUR, ULCM	
Underidentification test	12.849		7.589	
Endogeneity test	7.319		20.530	
Sargan-Hansen test	0.026		0.000	

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. The dependent variable is the percentage growth of real GDP per capita. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are used.

Table A.13 Main Results with Lag Population

	Real GDP growth		LFP Change (15+)		LFP Change (15-24)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
OECD Emigration rate (lag pop)	-0.07	-10.15**	1.12	-7.60***	2.76*	-14.59***
	(0.959)	(4.285)	(0.682)	(1.985)	(1.444)	(3.194)
Remittances per (lag) capita	2.16	20.01**	1.61	0.40	4.18*	0.35
	(1.517)	(9.338)	(1.049)	(0.315)	(2.162)	(0.507)
Observations	612	612	534	534	534	534
First-stage Obs.				612		612
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	o,t	o,t	o,t	o,t
Instruments	Income, LUR, ULCM		Income, LUR, ULCM		Income, LUR, ULCM	
Underidentification test	12.636					
Endogeneity test	9.050					
Sargan-Hansen test	0.117					

Notes: Standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Both emigration rate and remittances per capita are calculated based on population in the previous year. Remittances per (lag) capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, and natural disaster damages as a share of GDP. Time (t) and country (o) fixed effects are controlled. Robust standard errors are used in two-stage least squares estimations.

Table A.14 Joint Estimates of Emigration and Remittances on Real GDP (logs), 1999-2019

	Country FE		Geographic FE	
	OLS	2SLS	OLS	2SLS
OECD emigration rate	-0.003	-0.089**	-0.001	-0.077**
	(0.009)	(0.043)	(0.009)	(0.038)
Remittances per capita	0.004	0.146	0.005	0.108
	(0.016)	(0.109)	(0.015)	(0.089)
Observations	612	612	612	612
Time-invariant controls	No	No	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed effects	o,t	o,t	g,t	g,t
Instruments		Income, LUR, ULCM		Income, LUR, ULCM
Underidentification test		15.380		17.031
Endogeneity test		5.296		4.472
Sargan-Hansen test		0.027		0.00

Notes: Robust standard errors are shown below coefficients. *** p<.01, ** p<.05, * p<.10. Remittances per capita is measured in US$1000. Time-invariant controls include log real GDP, log population and trade openness in 1989. Other controls include FDI as a share of GDP, ODA as a share of GNI, natural disaster damages as a share of GDP, and Lag log Real GDP. Time (t) fixed effects are used. Either origin country (o) or geographic (g, Central America, Caribbean, and South America) fixed effects are included.

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