Fertility and Migration

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Abstract

We observe the following patterns in 42 middle- and low-income countries from 1991 to 2022: (i) the increase in emigration associated with remittances, (ii) a positive correlation between education expenditure and remittances, and (iii) a sustained decline in fertility rates associated with emigration. We explain these three facts through a general equilibrium model in which fertility decline is driven by an opportunity cost effect and an income effect induced by migration. As emigration occurs, households' income increases through remittances, enabling education investment, while migrant departures increase the opportunity cost of child-rearing by redistributing household labor and tightening labor markets, which raises wages and reinforces fertility decline. We calibrate the model and quantitatively show that these mechanisms explain (i) the cross-sectional convergence in fertility rates observed in our sample of developing countries and (ii) the observed fertility decline in economies with high migration and remittance inflows, such as El Salvador.

JEL classification codes: J13, F22, F24, J61

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1 Introduction

In this paper, we document that the development process in middle- and low-income countries is characterized by three interconnected facts: (i) the increase in emigration associated with remittances, (ii) a positive correlation between education expenditure and remittances, and (iii) a sustained decline in fertility rates associated with emigration.

To illustrate these facts, we use data from 42 countries during the period 1991–2022 and follow Garcia-Santana (2020) procedure to eliminate country fixed effects in data to show the trend of emigration and fertility rates along development process. Thus, the first fact regarding emigration is illustrated by Figure 1, panel A. This figure shows pooled data on emigration, measured as the proportion of emigrants from a country relative to its total population, and the levels of economic development, represented by the logarithm of GDP per capita at constant prices. Although the data exhibit dispersion, Figure 1 shows a clear upward trend, indicating that emigration not only increases systematically with economic development but also contributes to development through remittances as Figure 1, panel B, points out.[1] This figure illustrates that remittance flows, as a percentage of GDP, increase alongside emigration, which in turn contributes to increase income at the receiving countries.

In the economic literature, there are three explanations regarding emigration and development. First, as countries develop economically, higher income levels enable more individuals to afford the costs of migrating, leading to an initial increase in emigration (Clemens, 2014; Hatton & Williamson, 2005). Second, high GDP levels are associated with improvements in education and skill levels within the population, which promote the emigration of skilled workers seeking better employment opportunities and returns on their human capital abroad (Beine, Docquier, & Rapoport, 2008; Docquier & Rapoport, 2012). Finally, established emigrants provide information and support to new emigrants, facilitating continued emigration despite economic improvements at home (Carrington, Detragiache, & Vishwanath, 1996; McKenzie & Rapoport, 2007).

The second empirical fact is regarding education, which is illustrated in Figure 2. In this figure, Panel (a) shows there is a positive association between education expenditure, measured as a percentage of Gross National Income (GNI), and economic development, proxied by GDP per capita. Economic literature has extensively documented the positive relationship between education and economic development, arguing that education plays a fundamental role in promoting economic growth. One of the main theoretical channels through which education fosters development is by enhancing human capital, leading to higher productivity and innovation (Lucas, 1988; Romer, 1990) and empirical studies provide strong evidence that investment in education significantly contributes to long-term growth by improving labor market

[1] To obtain Figure 1, we follow the methodology of García-Santana (2021). We pool the data from all countries and years and regress emigration and remittances on a polynomial of log GDP per capita (measured in international dollars) and country fixed effects. Thus, each dot in the graph corresponds to a country-year observation after filtering out the country fixed effects. For further details, see Appendix A.

Figure 1. Emigration and Remittances in Middle- and Low-Income Countries

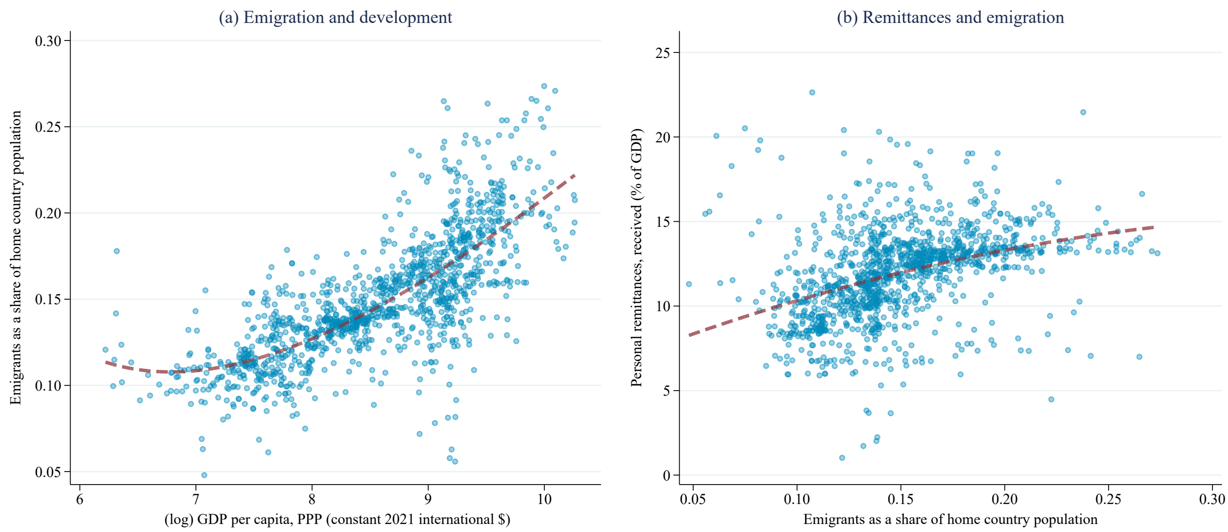

Figure 1 shows the association between emigration and GNI per capita (see Panel a) and between remittances and emigration (see Panel b). Each dot in the graph corresponds to a country-year observation after filtering out the country fixed effects, where the dashed line represents the predicted values obtained from a regression of the filtered data on log GDP per capita. Source: emigration stocks from United Nations Development Program (UNDP) and remittances from the World Bank.

outcomes and facilitating technological diffusion (Barro, 1991; Hanushek & Woessmann, 2008, 2012).[2] In Figure Figure 2, Panel (b) explores the relationship between education expenditure and remittances, measured as a percentage of GDP. The observed upward trend indicates that higher remittance inflows are associated with increased investment in education, reinforcing the hypothesis that remittances serve as a crucial mechanism for the accumulation of human capital in low- and middle-income countries.

The third fact on fertility is illustrated by Figure 3, panel A. This figure shows the sustained decrease in fertility, measured as the number of births per woman, associated with increases in income. This sustained decline in fertility along the development process is a well-documented fact that reflects changes in socioeconomic factors such as education, healthcare access, and employment opportunities that affect the decision to conceive (see Becker, 1960; Becker & Lewis, 1973; Barro & Becker, 1989; Schultz, 1997). In low-income countries, this patterns is also associate to emigration process. Figure 3, panel B, shows the correlation between fertility and emigration. This association suggests that as more individuals emigrate, the fertility rates in the originating countries decline. In the literature, there are two explanations for this negative association between fertility and emigration. The first explanation argues that migrants adopt behavioral norms when they are exposed to cultural and demographic standards in their host countries, including fertility behaviors. When migrants return home, they implement the behaviors learned

[2] Cross-country analyses suggest that increases in educational attainment and public spending on education are closely linked to higher GDP per capita, as more educated populations generate positive externalities that stimulate overall economic performance (Bils & Klenow, 2000; Krueger & Lindahl, 2001).These findings align with the observed pattern in Figure 3, Panel (a), where education expenditure as a share of Gross National Income (GNI) rises with economic development.

Figure 2. Education Expenditure and Remittances in Middle- and Low-Income Countries

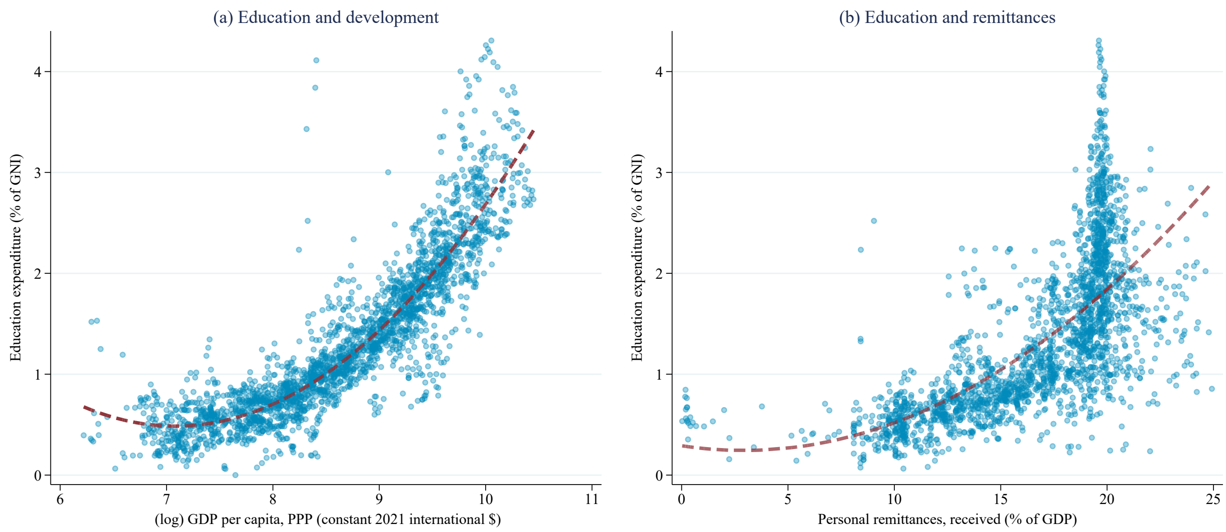

Figure 2 illustrates the association between education expenditure (see Panel A) and between remittances (see Panel B). As previously noted, these figures display the implicit association among these variables after controlling for country-fixed effects, as detailed in Appendix A. Source: education expenditure and remittances from World Bank.

abroad. Under this mechanism, we would observe a decrease in fertility associated with an increase in migration, as seen in real data (Beine, Docquier, & Schiff, 2013; Fargues, 2006; Lindstrom & Giorguli Saucedo, 2002; Stephen & Bean, 1992). The second explanation argues that migration disrupts fertility in the short term due to the separation of spouses, the physical and psychological stress of relocation (Bach, 1981; Goldstein & Goldstein, 1982; Hervitz, 1985).

While previous studies have primarily attributed the negative association between fertility and emigration to cultural transmission and migration-induced disruption, we argue that the negative correlation between fertility and emigration is driven by two mechanisms: an opportunity cost effect and an income effect induced by emigration.

The first channel operates through the opportunity cost of child-rearing in migrant households. When a family member emigrates abroad, their previous household responsibilities—such as work and childcare—must be redistributed among the remaining household members. This reallocation increases time constraints on those who stay, thereby raising the opportunity cost of having additional children. As a result, households adjust their fertility decisions by reducing the number of children they have. Furthermore, emigration influences fertility through an additional opportunity cost channel linked to labor market adjustments. As migration reduces the local labor supply, wages may adjust accordingly, altering individuals' incentives to participate in market work versus home production. If wages rise due to a labor shortage, the increased returns to market work may incentivize individuals to allocate more time to labor force participation, reinforcing the fertility decline.

The second channel is linked to remittance-induced income effects. Countries that experience an increase in emigration typically observe a corresponding rise in remittance flows, which

Figure 3. Fertility Rate and Emigration in Middle- and Low-Income Countries

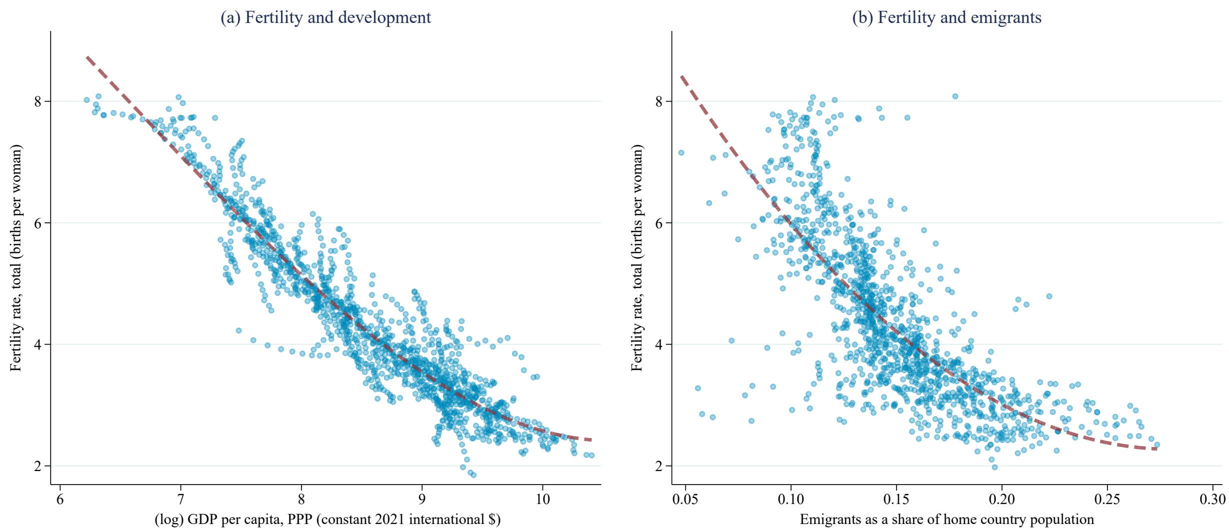

Figure 3 illustrates the association between fertility rate and level of development (see Panel A) and between fertility rate and emigration (see Panel B). As previously noted, these figures display the implicit association among these variables after controlling for country-fixed effects, as detailed in Appendix A. Source: emigrant stocks form United Nations Development Program (UNDP) and fertility rate from World Bank.

constitute a significant share of household income for those who remain in the country of origin. This increase in income expands overall household expenditures, particularly in education investment. As families allocate a larger proportion of their resources to human capital accumulation, fertility rates decline, consistent with the quantity-quality trade-off framework in demographic economics. Thus, the combined effect of higher opportunity costs of child-rearing and remittance-driven investment in education contributes to explaining the sustained fertility decline observed in high-emigration countries. These mechanisms operate through shifts in household labor dynamics, remittance-driven investments, and labor market adjustments, offering a complementary but distinct explanation for fertility decline in migrant-origin countries.

To formalize these mechanisms and quantify their impact on fertility trends, we develop a general equilibrium model that integrates migration, remittance flows, and endogenous fertility decisions. Our framework builds upon De La Croix (2013), in which individuals derive utility from consumption, the number of children they have, and the level of education they provide to their offspring. However, we extend this baseline model by incorporating an explicit migration decision, allowing individuals to endogenously choose whether to emigrate.

In our model, the decision to migrate is driven by a comparison between local and foreign wages, where the wage level abroad is determined exogenously, while domestic wages adjust endogenously to labor market conditions. Once migration occurs, it generates two distinct economic effects on the household left behind. First, migration induces an income effect through remittances, relaxing household budget constraints and enabling greater investment in education. Second, it generates an opportunity cost effect, as the departure of a household member increases the remaining members' time constraints, and reduces labor force participation raising the opportunity cost of child-rearing. These combined forces shape the household's fertility decision, reinforcing the negative correlation between migration and fertility observed in the data. We calibrate the model and show that this capable to replicate the trend of fertility rate for the 42 middle- and low-income economies in our sample.

We then use the model to conduct two quantitative exercises to assess the role of migration in shaping fertility dynamics. These experiments allow us to evaluate the relative importance of the income effect of remittances and the opportunity cost effect of migration in explaining two key demographic patterns: (i) the convergence of fertility rates across countries and (ii) the demographic transition in a high-emigration developing economy, El Salvador.

First, we examine the extent to which international migration has contributed to cross-country fertility convergence between 1991 and 2019. During this period, emigration increased significantly across developing economies, while fertility disparities narrowed. Using the model, we quantify how much of this decline in fertility dispersion can be attributed to migration-induced mechanisms. Second, we apply the model to a case study of El Salvador, a country that experienced a sharp demographic shift alongside a substantial rise in migration and remittance inflows. This exercise allows us to isolate the contribution of migration to El Salvador's fertility decline by disentangling the effects of remittances, labor market adjustments, and broader economic transformations.

Our findings suggest that migration serves as a key driver of fertility decline, primarily through two reinforcing mechanisms: (i) a remittance-induced income effect, which increases household investment in education and reduces fertility incentives, and (ii) opportunity cost adjustments, arising from both the reallocation of household labor and shifts in labor market conditions due to emigration. At the cross-country level, our counterfactual analysis indicates that, had migration patterns remained unchanged, the average fertility rate across 42 developing countries in 2017 would have been 17.7% higher than observed, with fertility dispersion increasing by 43%. At the country level, our numerical experiment for El Salvador shows that, absent migration and remittances, the fertility rate in 2019 would have been 3.43 instead of the observed 1.92, implying a 44% decline attributable to migration dynamics. These results provide robust empirical support for the argument that emigration constitutes a significant yet often overlooked factor in explaining fertility transitions in developing economies, particularly those experiencing sustained increases in migration and remittance inflows.

The remainder of the paper is structured as follows. Section 3 introduces the theoretical model, while Section 4 characterizes the equilibrium conditions. Section 5 presents the numerical solution, details the counterfactual experiments, and discusses the key results. Finally, Section 6 concludes with a discussion of the broader limitations but also implications of our findings.

2 Econometric Analysis

In this section, we formally examine the negative relationship between emigration and fertility, previously illustrated in Figure 3, by conducting a panel data econometric analysis. To ensure that the observed correlation is not driven by omitted variables or broader economic trends, we estimate a fixed-effects model that accounts for unobserved heterogeneity across countries and time controlling for key macroeconomic determinants of fertility. Our panel dataset covers 42 developing countries from 1991 to 2017. The following subsections provides a more detailed description of the data sources, the selection and justification of the variables, and the econometric specification employed in the analysis.

2.1 Data

We build a panel dataset covering a sample of developing countries from 1991 to 2017 using data from the World Bank, the United Nations Population Division, the World Health Organization (WHO), and the International Labour Organization (ILO). From these sources, we obtain data on emigration, remittances, expenditure in education, GDP per capita, contraceptive, mortality rate, and statistics on female population i.e. female labor participation.

Our dependent variable is the total fertility rate (FERT), defined as the number of children that would be born to a woman if she were to live through the end of her reproductive years and bear children in accordance with age-specific fertility rates for a given year. This measure, widely used in demographic and economic analyses, provides a standardized indicator of fertility across countries and over time. The key explanatory variable is emigration (EMIGR), measured as the share of emigrants in the home country's total population.[3] This variable captures the intensity of migration flows and their potential impact on demographic and economic dynamics in the home country.

To control for broader economic conditions and structural factors affecting fertility, we incorporate the following variables into the econometric analysis. The first control variable is GDP per capita (GDPPCAP), measured in constant PPP-adjusted 2021 international dollars. This variable serves as a proxy for economic development, which influences fertility decisions through multiple channels, including income effects, changing labor market incentives, and improved access to healthcare and education. Given that access to family planning services is a critical determinant of fertility associate to economic development, we include contraceptive prevalence (CONTRACE), which measures the percentage of married women aged 15–49 using any contraceptive method. Higher contraceptive use is typically associated with lower fertility rates, as it enhances reproductive autonomy and reduces unintended pregnancies.

To account for shifts in population structure, we include the share of the female population

[3] The emigration rate is computed as the ratio of the total stock of emigrants from a country to its total population. The stock of emigrants is obtained from the United Nations Population Division, while total population figures are sourced from the World Bank.

aged 15–49 years (FEMLEFFERT), expressed as a percentage of the total female population. This variable captures potential changes in fertility trends driven by demographic shifts, particularly as younger cohorts transition into reproductive ages. The availability and quality of healthcare services significantly influence reproductive decisions. To capture this dimension, we include nurses and midwives per 1,000 people (NURSES) as a proxy for access to maternal and child healthcare. A higher density of healthcare professionals is expected to improve access to family planning services, reduce maternal and infant mortality, and consequently lower fertility rates. Additionally, we incorporate the infant mortality rate (INFMORT), defined as the number of infant deaths per 1,000 live births. A higher infant mortality rate is often associated with increased fertility, as parents may adopt compensatory fertility behaviors in response to higher child mortality risks.

Education is another key determinant of fertility. We include the female primary completion rate (PRICOMPLETE), which measures the percentage of females who complete primary education. Education, particularly among women, is strongly correlated with lower fertility rates, as it increases awareness of reproductive health, enhances labor market opportunities, and shifts intergenerational preferences towards child quality rather than quantity. Labor market dynamics also shape fertility decisions, particularly through female economic participation. To account for gender disparities in employment, we introduce the ratio of female to male labor force participation (LABORATIO). A higher value of this variable indicates greater female integration into the workforce, which is typically associated with delayed childbearing and lower fertility due to increased opportunity costs of child-rearing.

Finally, to account for external macroeconomic and social shocks that may influence fertility trends across countries, we include a global shock variable that captures temporal effects shared across the sample period.[4] In Appendix A, Table A.1 provides summary statistics for all variables used in the empirical analysis, providing insight into their distribution and variability throughout the sample period.

2.2 Estimation

To estimate the effect of migration on fertility, we employ a fixed-effects panel regression model that controls for time-invariant heterogeneity across countries.[5] The baseline specification is given by the following equation:

$$\ln(\text{FERT}_{it}) = \beta_0 + \beta_1 \ln(\text{Emigration}_{it}) + X'_{it}\Gamma + \mu_i + \lambda_t + \varepsilon_{it} \tag{2.1}$$

[4] The global shock variable consists of a set of dummy variables identifying periods of major international economic crises, specifically the years 1997, 1998, 2008, and 2009. These years correspond to significant downturns in the global economy: the 1997–1998 Asian financial crisis, which led to widespread economic contractions in emerging markets, and the 2008–2009 global financial crisis, which resulted in a severe worldwide recession. The inclusion of these dummy variables accounts for exogenous shocks that may have influenced fertility trends independently of migration dynamics

[5] In Appendix A we show that a fixed-effect specification is preferred for this analysis.

where FERT_{it} is the total fertility rate in country i at time t, Emigration_{it} denotes the emigration rate, X_{it} is a vector of control variables, μ_i captures country fixed effects, λ_t represents time fixed effects, and ε_{it} is the error term. The estimations were performed using several specifications to ensure the robustness of the results. Table 1 reports the results of the estimation of the relation between fertility and migration, controlling for other covariates.

Regarding the effect of other covariates than emigration, from Table 1, we highlight a substantial reduction in the explanatory power of GDP per capita as additional covariates are introduced into the model. In all specifications, the estimated effect of GDP per capita on fertility remains negative, consistent with the classic Easterlin hypothesis (1975), which posits that as countries develop and income levels rise, fertility declines due to shifts in economic incentives.[6] However, as more control variables are incorporated, the explanatory power of GDP per capita diminishes, suggesting a reassignment of variance within the model. Initially, GDP per capita captures a broad spectrum of structural factors influencing fertility. As these mechanisms are explicitly taken into account in the estimate, the variance previously attributed to GDP per capita is redistributed among newly introduced covariates, leading to its loss of statistical significance. This result underscores that the impact of economic development on fertility is not driven by GDP per capita per se, but rather by its role in shaping key structural determinants of demographic behavior.

Among the key structural determinants of fertility, demographic variables emerge as significant predictors. Contraceptive prevalence (CONTRACE) and the share of the reproductive age female population (FEMALEFERT) exhibit a negative and statistically significant association with fertility, while infant mortality (INFMORT) shows a positive effect. The inverse relationship between fertility and the first two variables is in agreement with the well-established role of contraception in fertility reduction (Bongaarts, 1978; Bailey, 2006) and the effect of demographic composition, where a higher proportion of women in reproductive age may reflect lower fertility rates due to changes in cohort dynamics. In contrast, the positive association between infant mortality and fertility is consistent with the classic replacement effect, in which higher child mortality induces parents to have additional births to compensate for expected loss, or because expectations about future mortality cause hoarding (Rosenzweig & Schultz, 1983).

Table 1 also shows that socioeconomic investments and human capital accumulation contribute to explain fertility rates. In the case of education, the coefficient for the completion of primary education of women (PRICOMPLETE) is consistently negative in estimates models, which consisntent with the robust empirical evidence about the effect of women's education on fertility from aggregate and microdata across countries (Martín, 1995).[7] In contrast, the effect

[6] This result is also in line with Galor and Weil (2000), who argue that economic growth increases the returns to human capital investment, leading to lower fertility rates. Unlike studies suggesting a nonlinear relationship (e.g., Schultz, 1997), our findings indicate a more direct inverse association.

[7] A positive relationship between female education and fertility may arise in early demographic transitions due to several mechanisms. First, improved maternal health increases biological fecundity. Second, education can erode traditional birth-spacing practices (e.g., prolonged breastfeeding), accelerating childbirth intervals. Third, greater

Table 1: Impact of Migration on Fertility: Regression Estimates

Independent var.	FE (a)	FE (b)	FE (c)	FE (d)	FE (e)	FE (f)	FE (g)	FE (h)	IV (i)
EMIGR	-2.550**	-2.435**	-1.414**	-1.647***	-1.793***	-1.710***	-1.692***	-1.692***	-2.139***
	(1.176)	(0.924)	(0.551)	(0.560)	(0.446)	(0.493)	(0.504)	(0.504)	(0.533)
GDPPCAP	-1.387***	-0.613***	-0.518***	-0.554***	-0.012***	-0.097***	-0.176	-0.176	0.001
	(0.342)	(0.190)	(0.099)	(0.137)	(0.155)	(0.169)	(0.150)	(0.150)	(0.109)
CONTRACE		-0.047***	-0.031***	-0.023***	-0.014***	-0.014***	-0.015***	-0.015***	-0.024***
		(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
FEMALEFERT			-0.136***	-0.150***	-0.120***	-0.118***	-0.119***	-0.119***	-0.186***
			(0.016)	(0.024)	(0.019)	(0.020)	(0.020)	(0.020)	(0.033)
NURSES				-0.029	-0.036	-0.049	-0.048	-0.048	0.007
				(0.042)	(0.038)	(0.036)	(0.032)	(0.032)	(0.034)
INFMORT					0.020***	0.016***	0.014***	0.014***	-0.001
					(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
PRICOMPLETE						-0.000	-0.000	-0.000	-0.007
						(0.002)	(0.002)	(0.002)	(0.004)
LABORATIO							0.003	0.003	0.003
							(0.002)	(0.002)	(0.003)
Constant	15.970***	11.380***	16.560***	17.270***	9.812***	10.630***	11.270***	11.270***	14.680***
	(2.881)	(1.462)	(1.160)	(1.793)	(1.920)	(1.943)	(1.882)	(1.882)	(1.966)
Observations	1,260	991	991	716	716	656	631	631	631
R-squared	0.454	0.736	0.845	0.761	0.826	0.802	0.810	0.810	0.933
Number of id	42	41	41	41	41	41	40	40	
Country effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors are in parentheses: *** p< 0.01, **p< 0.05, *p< 0.10.

of female labor force participation (LABORATIO) remains negative but statistically attenuated in certain specifications, suggesting its influence operates indirectly through delayed marriage or interacts with unobserved institutional factors, such as childcare availability (Goldin, 1994). Similarly, health infrastructure investments (NURSES) show a non-significant positive coefficient, echoing Pörtner's (2001) threshold hypothesis: health systems may first reduce mortality before triggering fertility transitions, creating a temporal decoupling between service provision and behavioral response. Together, these results underscore that socio-economic determinants shape fertility not merely through immediate material constraints but via institutional learning processes that gradually reconfigure reproductive norms.

The results presented in Table 1 provide strong empirical support for the negative relationship between emigration and fertility observed in Figure 3. Across all specifications, the estimated coefficient for emigration (EMIGR) remains negative and statistically significant, indicating that higher levels of emigration are associated with lower fertility rates. In the baseline fixed-effects specification (column a), the coefficient suggests that a one percentage point increase in the emigration rate is associated with a 2.550 percentage point decline in fertility, a result that remains stable across more comprehensive specifications. As additional covariates are introduced, the magnitude of the effect decreases slightly but remains robust, with estimates ranging from -1.414

marital stability and lower child mortality may extend the reproductive period. Finally, women with limited schooling may lack access to effective contraception, delaying the fertility-reducing effects of education (Martín, 1995).

to -1.793 in specifications (c) through (f), confirming that the relationship is not merely driven by omitted economic or demographic factors. The persistence of this effect after controlling for structural determinants of fertility, such as income, contraceptive use, and female labor force participation, suggests that migration influences fertility through distinct channels beyond household income shocks from remittances.

Moreover, to address potential endogeneity concerns in the relationship between fertility and emigration, we re-estimate the model using an instrumental variable approach (column h). Following the migration literature, we employ a Shift-Share Instrument (see Appendix A), which allows us to mitigate potential simultaneity issues arising from reverse causality or omitted variable bias. The results obtained from this instrumental variable specification remain consistent with our baseline estimates, further validating the robustness of the negative effect of migration on fertility. These findings support the hypothesis that migration alters intra-household labor allocation and increases the opportunity costs of childbearing, leading to a sustained decline in fertility rates among the population remaining in the home country.

Taken together, these results underscore that migration remains a key determinant of fertility decline, even after accounting for economic, demographic, health, and education factors. The persistent negative relationship between emigration and fertility provides compelling evidence in favor of the hypothesis that migration operates through labor reallocation and shifts in household time constraints, rather than merely through financial channels such as remittances.

3 The model

3.1 Households

The model based on De la Croix (2013), considers an economy populated by a continuum of agents with a mass of one. The agents live for childhood and adulthood and their decisions are taken when they are adults. Agents care about their consumption, the number of children, and their children's education. The utility function that represents the agents' preferences is:

$$U_t = \ln c_t + \gamma(\ln n_t + \eta \ln e_t), \tag{3.1}$$

where $\gamma > 0$ means the weight attached to children in the function, and $\eta\gamma$ represents the weight attached to their education, with $0 < \eta < 1$. Parents care about both child quantity and quality. The budget constraint for a single agent is about in terms of resources and time and it is represented by the following equations:

$$c_t = h_t w_t + \Pi + (R_t - \psi)m_t - e_t n_t, \tag{3.2}$$

and

$$1 - \phi_n n_t = \phi_h h_t + \phi_m m_t, \tag{3.3}$$

where h_t is the share of household members that work at home country; w_{it} represents the salary in the home country. Π is the profit deriving from being the owner of a firm; R_t is the salary abroad while m_t and ψ represent respectively the share of household members that decide to migrate and the cost of sending remittances. The expenditure in education is indicated like e_t, while n_t the number of children. In the equation (3.3), the time endowment of the household is normalized to 1; The parameters ϕ_n, ϕ_h,and ϕ_m are the time cost of child care, work in the home country, and work abroad which are considered to be constant. As a result, the interaction between the parameters and the variables represents the share of total hours spent in child care, working in the home country, and migrating. Consequently, the household chooses the number of the children, the number of household members who work in the home country and abroad such that the agents maximize their utility subject to the equation (3.2) and (3.3). In Appendix A, we show that the solution of the household's problem is characterized by the following equations:

$$e_t = \frac{\eta}{1-\eta}\frac{\phi_n}{\phi_h}w_t, \tag{3.4}$$

$$c_t = \frac{1}{1+\gamma}\left(\Pi + \frac{w_t}{\phi_h}\right), \tag{3.5}$$

$$n_t = \frac{\phi_h}{\phi_n}\frac{1-\eta}{w_t}\frac{\gamma}{1+\gamma}\left(\Pi + \frac{w_t}{\phi_h}\right), \tag{3.6}$$

$$m_t = \frac{1}{\phi_m} - \frac{\phi_h}{\phi_m}h_t - \frac{\phi_n}{\phi_m}n_t. \tag{3.7}$$

We can see that the education of children depends on w_t, c_t and n_t are a function of the earning profit, while m_t depends from the profit wage, and the labor supply of the households. In equilibrium the labor supply in the home country will be determined by the following condition:

$$\frac{w_t}{\phi_h} = (R_t - \psi)\frac{1}{\phi_m} \tag{3.8}$$

The decision to migrate in this economy is given by w_t. The worker is indifferent to the decision to migrate if the labor income in the home country, applying the effort which corresponds to the worked hours abroad, is the same as the labor income abroad. If the labor income is higher in the home country with respect to the income abroad, the agent chooses to stay

3.2 Firm

Production of the consumption good is carried out by a single representative firm which operates the technology:

$$y = Ah^{\alpha}, \tag{3.9}$$

where h is the labor input, $A > 0$ represents the TFP, and the elasticity of the output respect to labor is $\alpha \in (0,1)$. The firm solves the maximization problem:

$$\max_{h} \Pi = Ah^{\alpha} - wh, \tag{3.10}$$

choosing the amount of labor. From the first order condition we obtain the demand function of labor equal to:

$$h^{d} = \left(\frac{\alpha A}{w}\right)^{\frac{1}{1-\alpha}},$$

which implies that the profit is:

$$\Pi^{*} = (1-\alpha) A \left(\frac{\alpha A}{w}\right)^{\frac{\alpha}{1-\alpha}}.$$

4 Equilibrium

We define a competitive equilibrium as an allocation,{c,e,m,n,h}, and prices,{w}, such that I)consumers choose the quantity of the consumption, level of education, migration, numbers of children, and hours to work in the home country to maximize the (3.1), II) firms choose the quantity of labor demand to maximize 3.10, III) the goods and domestic labor markets are cleared. In this equilibrium the optimal demand of labor is:

$$h^{*} = \left(\frac{\alpha A}{w}\right)^{\frac{1}{1-\alpha}}, \tag{4.1}$$

Given this constant demand of labor, the household decision to migrate is:

$$m_t^{*} = \Delta_1 - \Delta_2 w_t^{-\left(\frac{1}{1-\alpha}\right)}, \tag{4.2}$$

and the amount of children is:

$$n_t^{*} = \Delta_3 + \Delta_4 w_t^{-\left(\frac{1}{1-\alpha}\right)}, \tag{4.3}$$

where $\Delta_1, \Delta_2, \Delta_3$ and Δ_4 are function of parameters which are showed in the appendix. The optimal choice of consumption and education are defined in the equation (3.5) and (3.4).

4.1 Comparative Statics

Based on the previous equations, we find that migration causes two effects on fertility: income and substitution effect. The substitution effect prevails on the first, which entails a decrease in fertility. To examine the implications and the reduction in fertility we examine the partial derivatives of the equilibrium solution, in particular the solution of m and n. From (4.2) we have:

$$\frac{\partial m_{it}^*}{\partial R_{it}} = \frac{\Delta_2}{1-\alpha} \frac{\left[(R_t - \psi) \frac{\phi_h}{\phi_m} \right]^{-\frac{1}{1-\alpha}}}{R_t - \psi} > 0$$

where we substituted the wage using (3.8). This result shows that when the wage abroad increases and is higher that local wage migration increases, which is consistent with the empirical evidence in the previous section. From (4.3) we obtain that the effect of remittances on the fertility rate is:

$$\frac{\partial n_{it}}{\partial R_{it}} = -\frac{\Delta_4}{1-\alpha} \frac{\left[(R_t - \psi) \frac{\phi_h}{\phi_m} \right]^{-\left(\frac{1}{1-\alpha}\right)}}{R_t - \psi} < 0$$

The negative effect of remittance on fertility is explained by two mechanisms. The first mechanism is associated with the general equilibrium effect on the local labor market induced by migration. When migration takes place the local labor supply declines and as a consequence the intern salary increases. This is due to the internal equilibrium market to satisfy the firm demand for labor. As a result, the individual who stays in the home country faces up a higher salary but also a higher opportunity cost for raising children. The second mechanism is associated with an income effect deriving from the remittances due to migration: when the family receives the money, this relaxes the budget constraints and allows to expends more for the education of the children (and for the consumption). This implies that parents substitute the number of children with the quality, which means having fewer children but more educated. The migration process, in our model, boosts the quality-quantity pointed out by De la Croix (2013) through remittances. This increase in the opportunity cost of having children induces a reduction in fertility.

5 Quantitative Analysis

5.1 Calibration

In this section, we present the strategy to calibrate the model's parameters to analyze the effect of migration on fertility. For this purpose, in this first exercise, we show that our model can replicate the observed fertility rate in the countries in our sample.[8] Our strategy consists of identifying first the parameters which are common to all the economies, and then those parameters which are specific to each country.

The first set of parameters is represented by $\{\gamma, \eta, \alpha\}$. We set the value of elasticity of the output with respect to labor, α equals to 0.53 which is the average value of the labor income share in the Penn World Table. Then we give a value of 0.08 to the weight attached to children in the

[8] Our sample consists of 42 countries described in the appendix. We focus on this group of countries given the available data on labor income share, cost of sending remittances, number of children per woman, migration stock, GDP per capita, GDP per worker, total remittances, and education spending per child.

Table 2: Model Parameters Common Across Countries

Parameter	Value	Target	Data	Model	Std. Error
α	0.5300	Average labor income share	0.5300	0.5300	-
γ	0.1030	Estimation from De la Croix (2013)	-	-	0.0124
η	0.5703	Estimation from De la Croix (2013)	-	-	0.0350

household's utility, γ, and 0.64 to the elasticity of income to schooling, η. These two parameters are taken inside of an interval estimated by De la Croix (2013) which correspond to the upper limit of the estimated coefficient to match the median value of fertility rate for the poorest countries and the median value of the labor income share from the total sample, respectively.[9]

The second set of country-specific parameters is represented by $\{A, \phi_h, \phi_m, \phi_n, \psi\}$. We jointly set the values of $\{A, \phi_h, \phi_m, \phi_n\}$ to match the average value of each country for the following targets: GDP per capita, the stock of migrants, the number of individuals engaged in the home country as a fraction of the total population, and education expenditure as a percentage of GDP. Finally, we set the value of emigration fixed cost, ψ, using the average emigration cost in developing countries reported in KNOMAD-ILO Migration and Recruitment Costs Surveys.[10] In Appendix, Table C.2 presents the country-specific parameter values, while Table 3 provides an assessment of the model's performance in matching the calibration targets and reproducing non-target empirical moments.

The first panel of Table 3 reports the mean and standard deviation of the variables explicitly targeted in the calibration, including GDP per capita, the number of emigrants, labor force participation, and education expenditure as a share of GNI. The model successfully replicates these targets with exact precision, as indicated by the 1.000 ratio between simulated and actual values, confirming the accuracy of the calibration process. Beyond the calibration targets, the second panel of Table 3 evaluates the model's ability to match non-targeted moments, providing an additional test of its empirical validity. Specifically, we compare the model-generated correlations between fertility and GDP per capita, as well as between fertility and emigration, against their empirical counterparts. The model closely replicates the negative correlation between fertility and GDP per capita, with a simulated correlation of **-0.9065** compared to the actual value of -0.8973, yielding a ratio of 1.012. Similarly, the negative correlation between fertility and emigration is somewhat stronger in the model (-0.2535) than in the data (-0.1813), with a ratio of 1.390, suggesting that the model may slightly overestimate this relationship. Finally, Table 3 also

9 We compute the quartiles of income (GDP per capita, PPP) to calculate the median value of the fertility rate for the poorest country group.

10 The KNOMAD-ILO Migration and Recruitment Costs Surveys aim to systematically document monetary and non-monetary costs incurred by migrant workers seeking jobs abroad. The project is a joint initiative by the Global Knowledge Partnership on Migration and Development (KNOMAD), which is hosted at the World Bank, and the International Labor Organization (ILO). In this database, migration costs are reported only for the years 2015 or 2016 for some countries in our sample. For the model simulation, we assume that the migration cost remains constant as reported in the surveys for all years. For countries without an estimated migration cost, we impute a value using the average migration cost of the respective geographical region (continent or subcontinent) for which we have information.

Table 3: Model Performance: target and non-target variables

Targets	(a) Data		(b) Simulation		Ratios (b/a)	
	Mean	Std	Mean	Std	Mean	Std
Emigrants	0.162	0.022	0.162	0.022	1.000	1.000
Labor force	0.838	0.022	0.838	0.022	1.000	1.000
Education spending	0.075	0.029	0.075	0.029	1.000	1.000
GDP per capita	5438.1	3400.9	5438.1	3400.9	1.000	1.000

Non-target moments

	(a) Data	(b) Model	Ratio (b/a)
Correlation			
Fertility and GDP per capita	-0.89730	-0.90650	1.012
Fertility and emigrants	-0.18131	-0.25350	1.390
Relative volatility			
Fertility and GDP per capita	0.000364	0.000366	1.070
Fertility and emigrants	56.68568	56.94401	1.004

examines the model's ability to reproduce the relative volatilities of fertility with respect to GDP per capita and emigration. The results indicate that the model successfully captures the relative volatility structure observed in the data, with minor deviations. These findings reinforce the credibility of the model in replicating both the targeted macroeconomic aggregates and broader demographic patterns observed in the data.

Based on this calibration strategy, we validate the model by comparing its ability to replicate key empirical patterns. Table 3 shows that the model successfully matches the observed correlations between fertility and GDP per capita, as well as between fertility and emigration. Additionally, we assess the model's performance in replicating the relationship between fertility and remittances, a key mechanism in our analysis. Figure 4, panel (a), illustrates that the model-generated correlation between fertility rates and remittances per capita closely aligns with the empirical counterpart, with an actual correlation of -0.9886 and a simulated correlation of -0.9849.

To evaluate the robustness of this relationship, we conduct a sensitivity analysis by varying the preference parameters γ and η by ± 2 standard errors from their estimated values.[11] Figure 4, panel (b), illustrates the resulting variation in fertility rates across different levels of remittances. The results confirm that the negative relationship between fertility and remittances remains consistent across all parameter configurations, reinforcing the robustness of the model's predictions. Given the strong empirical alignment and model robustness, we leverage this framework to analyze how migration has contributed to cross-country fertility differences and its role in the demographic transition in developing economies.

[11] Table 2 reports the standard errors from De La Croix's estimation for γ and η. We use those values for the sensitivity analysis.

Figure 4. Non-target variable: fertility rates

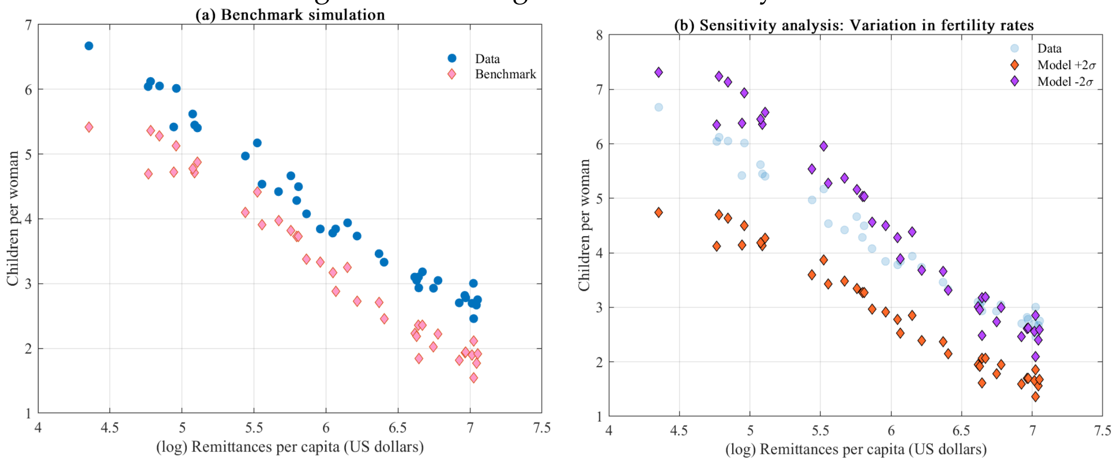

Figure 4 shows the increasing relationships between emigration and GNI per capita in Panel a and between remittances and GNI per capita in Panel b. We control for country-fixed effects, as explained in Appendix A. Source: United Nations Development Program (UNDP) and World Bank.

5.2 Numerical Experiments

In this section, we use the model to conduct two numerical experiments. The first experiment aims to analyze the contribution of changes in international migration to cross-country differences in fertility rates between 1991 and 2019. During this period, emigration intensified in our sample of developing countries, while cross-country differences in fertility declined. Thus, in light of our model, we assert that emigration contributes to explaining the convergence in fertility rates. The second experiment examines the importance of the migration process in the demographic transition of a country that is a significant recipient of remittances, such as El Salvador. Between 1991 and 2019, the country experienced a sharp decline in fertility rates alongside a substantial increase in migration and remittance inflows. We use the model to quantify the contribution of migration to the observed decline in fertility in the case of El Salvador.

5.2.1 The Role of Migration in Cross-Country Fertility Differences

Over the period 1991 to 2019, fertility rates have declined in our sample of developing countries, yet the magnitude of this decline has varied significantly across countries. Figure 5, panel (a), illustrates this trend by comparing the distributions of fertility rates across countries in 1991 and 2017. This figure shows a substantial downward shift in the fertility rate distribution, suggesting a generalized decline in fertility levels. Specifically, the median number of child per women in those countries was around to 4.5 in 1990. This average decline to 3.0 child per women in 2017. More importantly, data suggest that there is a convergence process in the average of fertility rates across countries as standard deviation (a measure of dispersion) decreases from 1.29 to 1.03.[12] In contrast, an opposing pattern emerges in the case of emigration. Figure 5, panel (b), shows a rightward shift

[12] The differences in median and standard deviation are statistically significant based on Wilcoxon rank-sum test, which test if two samples come from the same distribution (i.e., their population medians are equal), and Levene's test, which assesses variance differences between two distributions.

Figure 5. Cross-country differences in fertility and emigration: 1991 vs. 2017

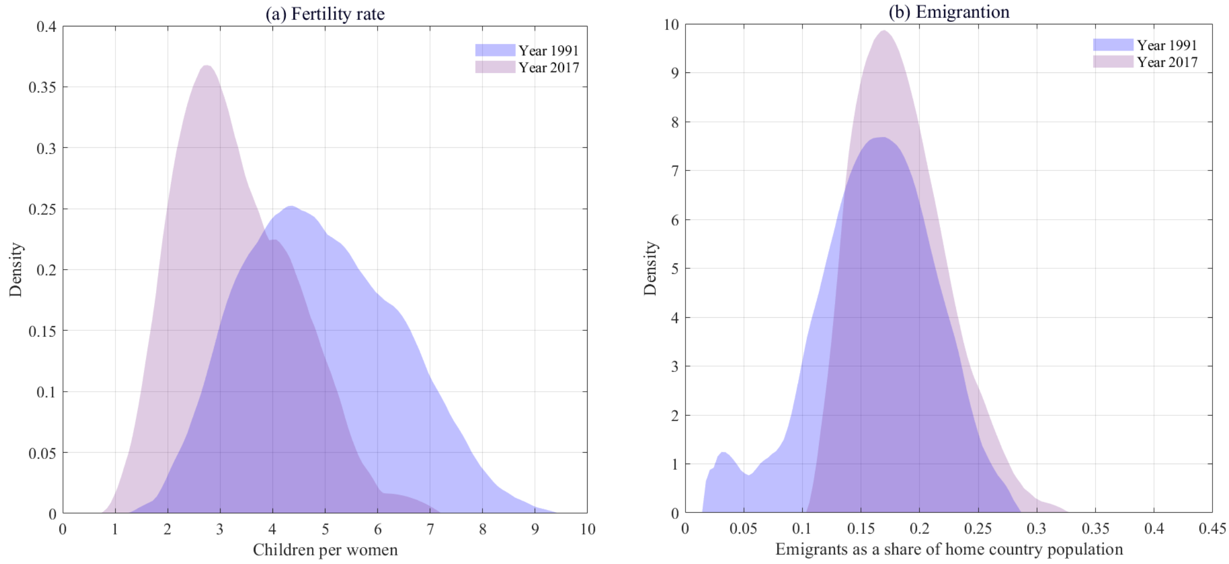

Figure 5 compares the distribution of fertility rates (Panel A) and emigration rates (Panel B) across two periods, 1991 and 2017. The density curves highlight a significant decline in fertility rates and a shift in emigration patterns over time, suggesting dynamic changes in demographic and migration behaviors. Source: emigrant stocks from United Nations Development Program (UNDP) and fertility rate from World Bank.

in the emigration distribution between 1991 and 2017, accompanied by a decline in dispersion. The median emigration rate increased from approximately 0.16 in 1991 to 0.18 in 2017, reflecting a 10% rise, while dispersion decreased by approximately 22%, from 0.0519 in 1991 to 0.0457 in 2017. According to the proposed model, the observed convergence in fertility rates may be explained by the changes in migration patterns over this period. In our framework, higher emigration levels lead to an increase in remittances received by households, which in turn raises education expenditure and consequently reduces fertility rates. Additionally, as migration increases, the domestic labor supply declines, raising the opportunity cost of child-rearing for households that remain in the home country. This increase in opportunity costs further discourages fertility, reinforcing the negative relationship between migration and fertility observed in the data. These mechanisms jointly contribute to fertility decline, providing a structural explanation for the demographic transition in developing countries.

To formally assess the extent to which migration contributes to cross-country fertility differences, we conduct a counterfactual analysis. To this end, we first calibrate the model parameters separately for 1991 and 2017, ensuring that the model replicates key macroeconomic indicators, including GDP per capita, the stock of migrants, the share of individuals engaged in the home country as a fraction of the total population, and fertility rates for each country. This calibration strategic yields two distinct sets of parameter values, one for each period, reflecting the structural conditions governing migration and fertility at different points in time. Using these calibrated parameters, we then simulate the economy in 2017 under the assumption that the structural parameters governing migration remain fixed at their 1991 values. Instead of directly imposing the migration rates observed in 1991, we use the migration-related parameter

Table 4: Statistics for fertility distributions in 2017 and the counterfactual scenario.

Statistic	(a) Actual data 1991	(b) Actual data 2017	(c) Counterfactual	(d) % Difference	(e) p-value
Measures					
Mean	4.911	3.293	3.878	17.737	0.038
Standard Deviation	1.294	1.030	1.468	42.468	0.049
Ratio 90/10	2.630	2.717	3.135	15.377	-

Table 4 compares the average fertility rate, dispersion (measured by the standard deviation), and the 90/10 fertility ratio for a sample of 42 countries across three scenarios: (a) actual data for 1991, (b) actual data for 2017, and (c) the counterfactual for 2017. Column (d) shows the percentage difference between the counterfactual and observed 2017 values, while column (e) reports p-values for statistical tests on mean and variance differences. The 90/10 ratio is defined as the average fertility rate of countries in the top 90th percentile or above relative to the average fertility rate of countries in the bottom 10th percentile or below, mitigating the influence of extreme values.

value from the 1991 calibration, allowing migration and remittance flows to be determined endogenously within the model's equilibrium structure.[13] While the migration process is constrained by the incentives and economic conditions of 1991, all other macroeconomic variables (including labor supply, remittances, output, and fertility) evolve dynamically according to the model's equilibrium relationships, reflecting the endogenous adjustments in response to migration restrictions. This approach enables us to assess how fertility rates would have evolved if the structural determinants of migration had remained unchanged since 1991, while the broader economic environment continued to adjust endogenously over time. By comparing the simulated fertility rate with the observed data, we can assess the extent to which changes in migration incentives have contributed to the observed fertility decline across countries.

Table 4 summarizes the results of this counterfactual exercise and Figure 6 shows the changes in fertility distribution associated to this counterfactual. Table 4 reports the mean fertility rate for 1991 and 2017, along with two dispersion measures: the standard deviation and the 90/10 ratio. Column (c) presents the counterfactual values for 2017, while column (d) reports the percentage differences between the actual and counterfactual values. Finally, column (e) displays the p-values assessing the statistical significance of these differences.[14]

These results suggest that the decline in fertility rates across countries over time is accompanied by a convergence process associated with changes in migration patterns. On the one hand, the counterfactual results indicate that the mean fertility rate in 2017 would have been significantly higher (approximately 17%) had the structural determinants of migration (captured through ϕ_h) remained at their 1991 levels. On the other hand, the counterfactual scenario reveals that while some countries would have maintained high emigration rates, others would have experienced a decline, leading to an increase in fertility dispersion across countries. As shown in Table 4, the standard deviation rises by 42% in the counterfactual, indicating that in the

[13] Specifically, we set the value of ϕ_h to its calibrated value for 1991, while remittances (as a fraction of GDP, ry_0) are recalculated endogenously to reflect changes in migration levels (m) under the counterfactual scenario.

[14] The p-values reported in Table 4 are obtained from statistical tests comparing the actual and counterfactual distributions of fertility. Specifically, we apply Welch's t-test to assess differences in means under the assumption of heteroskedasticity, while Levene's test is used to compare variances.

Figure 6. Cross-country differences in fertility and emigration: counterfactual

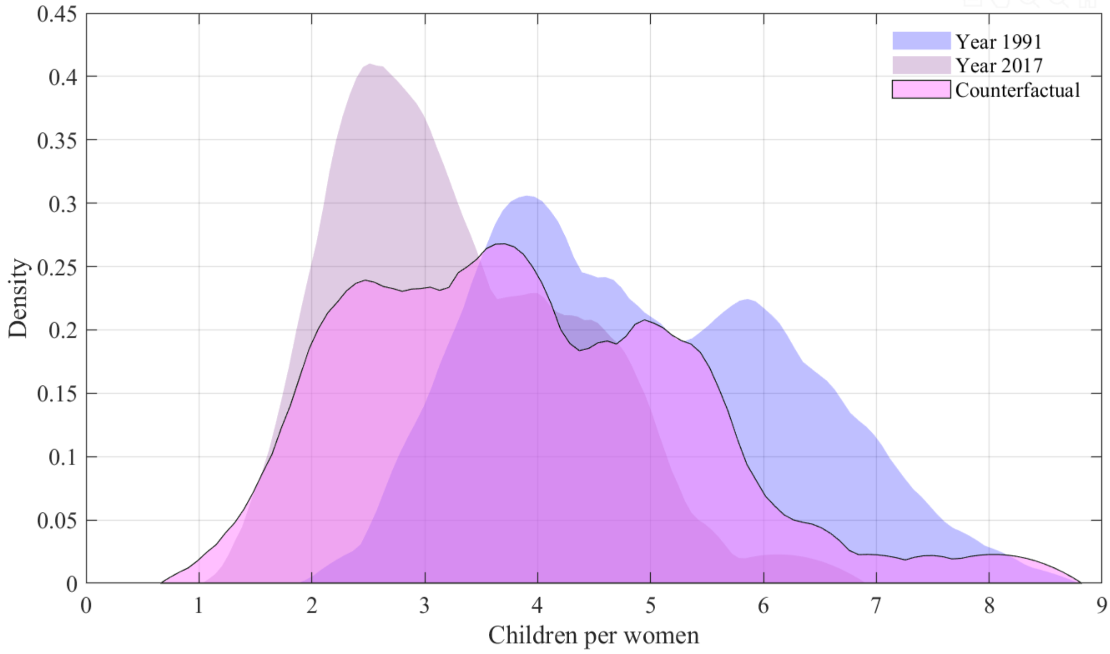

Figure 6 compares the distribution of fertility rates across 42 countries for three scenarios: 1991 (blue), 2017 (gray), and the counterfactual for 2017 (pink). The counterfactual scenario, where migration dynamics remain at their 1991 levels, reveals a higher mean fertility rate and increased dispersion compared to the observed 2017 distribution. This suggests that migration played a significant role in the fertility decline and convergence process over time.

absence of migration-induced adjustments, fertility heterogeneity across countries would have been significantly greater. These findings highlight the role of migration in fostering fertility convergence, reducing cross-country disparities in fertility levels over time.

To further understand the mechanisms driving the observed increase in fertility under the counterfactual scenario, we decompose the effects of migration into two key channels: the income effect and the opportunity cost effect. First, a decline in migration leads to a reduction in remittance inflows, lowering total household income. This, in turn, limits the ability of households to invest in education, reinforcing higher fertility rates as parents allocate fewer resources toward human capital accumulation. Second, the decrease in migration increases the local labor supply, exerting downward pressure on wages. As local wages decline, the opportunity cost of having children decreases, making larger families economically more viable. Moreover, these two mechanisms reinforce each other. The decline in wages further suppresses household income, amplifying the constraints on educational investment and strengthening the shift towards higher fertility. This interaction highlights the nonlinear effects of migration on demographic transitions, where both direct (income reduction) and indirect (wage adjustments) effects jointly contribute to fertility changes.

We conduct a decomposition exercise that isolates the impact of migration-induced changes in income and opportunity costs to quantify the relative contribution of these mechanisms to the observed increase in fertility, we. Specifically, we employ two counterfactual simulations. In Simulation A, we fix household income at its 1991 level by exogenously holding remittance

Table 5. Decomposition of the Impact of Migration on Fertility

Component	Absolute Change	Percentage Contribution
Total Fertility Increase (Counterfactual - 2017 Actual)	0.585	100.0%
Decomposition of Effects:		
Income Effect (Simulation A - Counterfactual)	0.316	54.01%
Opportunity Cost Effect (Simulation B -Counterfactual)	0.202	34.52%
Interaction Effect (Residual)	0.067	11.47%

Table 5 presents the decomposition of the fertility increase in the counterfactual scenario relative to 2017. The income effect is estimated by fixing household income at its 1991 level (Simulation A), while the opportunity cost effect is obtained by fixing local wages at their 1991 equilibrium (Simulation B). The interaction term captures the residual effects arising from the joint operation of both mechanisms.

inflows constant, while allowing labor supply and wages to adjust endogenously to migration restrictions. This isolates the income effect by capturing how reduced access to remittances constrains educational expenditure, independent of labor market adjustments. In Simulation B, we fix local wages at their 1991 equilibrium, neutralizing the opportunity cost channel, while permitting remittance-driven income changes to operate. This simulation isolates the opportunity cost effect by decoupling wage suppression from income dynamics.

Based on this approach, we compute the contribution of each mechanism by comparing fertility rates across these simulations using a sequential counterfactual approach. Thus, the income effect is measured as the difference between the full counterfactual fertility (with both mechanisms active) and Simulation B (opportunity cost neutralized). On the other hand, the opportunity cost effect is derived as the difference between the full counterfactual and Simulation A (income neutralized). The interaction term, capturing synergies between the two channels, is calculated as the residual difference between the total fertility increase and the sum of individual effects. Table 5 reports the results of this decomposition exercise. This decomposition reveals that approximately 54% of the fertility increase stems from the income effect, 34.5% from the opportunity cost effect, and 11.5% from their interaction, underscoring the predominance of constraints in shaping fertility decisions under restricted migration. Thus, our results suggest that migration has played a fundamental role in driving fertility convergence across countries, primarily by stimulating educational investment and through general equilibrium effects that alter the opportunity cost of child-rearing.

5.2.2 The Effect of Migration on Fertility Dynamics in El Salvador

El Salvador represents an ideal case study to examine the impact of migration on fertility dynamics due to its significant reliance on remittances and the sustained emigration flows observed over the past decades. Between 1991 and 2019, the country underwent profound demographic and economic transformations, characterized by a sharp decline in fertility rates and a substantial increase in migration and remittance inflows. Over this period, the total fertility rate declined from 3.49 to 1.92 children per woman, while remittances as a share of GDP tripled from 7% to 21%.

Concurrently, the stock of Salvadorans living abroad increased by 150%. Given the magnitude and direction of these structural shifts, migration emerges as a central determinant in shaping the country's demographic transition.

To quantify the impact of migration on demographic dynamics, we employ the proposed model to conduct a counterfactual analysis. This approach enables us to isolate the effect of migration from broader macroeconomic forces and assess its role in fertility decline. The model is calibrated using economic and demographic data from 1991 and 2019, ensuring that key structural parameters reflect observed trends. Specifically, we calibrate the parameters governing the opportunity cost of child-rearing (φ_n), labor force participation elasticity (φ_h), and total factor productivity (A) to match labor force participation rates, fertility rates, and GDP per capita in both periods. The calibrated values for these parameters, which capture the structural evolution of the Salvadoran economy, are reported in Table 6.

To identify the causal impact of migration on fertility, we conduct a counterfactual simulation where selected parameters are held constant at their 1991 values, while others are allowed to adjust endogenously. This methodological approach ensures that the effects of migration and remittances are disentangled from concurrent macroeconomic forces shaping fertility outcomes. We implement four counterfactual scenarios, each designed to assess a distinct channel through which migration influences fertility.

First, we estimate the fertility rate that would have prevailed in 2019 had migration and remittance inflows remained at their 1991 levels. By constraining these variables while allowing the rest of the economy to adjust, we quantify the extent to which migration dynamics contributed to fertility decline. Second, we analyze the effect of changes in the opportunity cost of child-rearing by fixing the time requirement for childcare, φ_n, at its 1991 level. This allows us to determine whether shifts in household preferences regarding time allocation played a significant role in the demographic transition. Third, we evaluate the impact of changes in labor supply by holding φ_h constant at its 1991 level. Given the well-documented negative relationship between female labor force participation and fertility rates, this counterfactual isolates the contribution of increased employment opportunities for women to fertility decline. Finally, we examine the role of broader economic development by keeping total factor productivity (A) at its 1991 level, allowing us to assess the impact of structural productivity growth on fertility reductions.

Table 6 presents the results of the counterfactual simulations. The findings indicate that migration and remittances played a decisive role in El Salvador's fertility decline. When migration and remittance inflows are constrained to their 1991 levels, the simulated fertility rate for 2019 remains at 3.43—substantially higher than the observed rate of 1.92. This suggests that migration dynamics explain a significant share of the fertility reduction, primarily through increased remittance inflows, which alleviated household income constraints and altered opportunity costs.

The results further highlight the importance of changes in the opportunity cost of child-rearing. When φ_n is held at its 1991 level, the simulated fertility rate in 2019 rises to 2.24,

Table 6: Labor force, migration, education expenditure, and fertility

	Labor Supply	Migration	Exp. Education	Fertility
Data 1991	0.77577	0.22423	67.35	3.4906
Data 2019	0.72453	0.27547	243.89	1.923
Model 2019	0.72453	0.27547	211.28	1.923
Counterfactual (fixing each parameter to its 1991 value)				
(1) Remittances & Migration = 1991	0.77577	0.22423	78.562	3.4320
(2) φ_n = 1991	0.72453	0.27547	181.12	2.2431
(3) φ_h = 1991	0.21494	0.78506	211.28	1.3558
(4) A = 1991	0.3186	0.6814	211.28	1.2538

confirming that shifts in time allocation costs contributed to the demographic transition. In contrast, fixing labor supply elasticity at its 1991 level results in a simulated fertility rate of 1.36, suggesting that increased female labor force participation was associated with lower fertility. Finally, maintaining total factor productivity at its 1991 level leads to a simulated fertility rate of 1.25, underscoring the role of broader economic development in shaping fertility decisions.

The counterfactual analysis provides robust evidence that migration-induced economic changes, particularly through remittances and shifts in labor force participation, have been key drivers of fertility decline in El Salvador. The model indicates that, absent migration and remittance inflows, the country's fertility rate would have remained significantly higher, reinforcing the hypothesis that migration accelerates demographic transitions in economies with substantial emigration outflows.

These findings align with the existing literature, which emphasizes the role of remittances in modifying household economic behavior. Previous studies, such as Rapoport and Docquier (2006), document that increased remittance inflows are associated with higher investments in education, a reduction in child labor, and greater female labor force participation, all of which contribute to lower fertility rates. Additionally, the shift in opportunity costs linked to childcare highlights the importance of labor market dynamics in shaping fertility decisions, further supporting the model's predictions.[15]

A key implication of these results is that migration does not merely operate as a financial mechanism through remittances but also induces broader structural changes in fertility behavior. The interplay between migration, remittances, and demographic transitions suggests that policy interventions aimed at regulating migration should consider its far-reaching implications beyond labor markets, particularly in terms of long-term demographic shifts.

Our analysis of El Salvador provides strong empirical and theoretical support for the role of migration in shaping fertility dynamics. The counterfactual simulations demonstrate that

[15] While the results provide strong empirical support for the role of migration in fertility transitions, several caveats must be acknowledged. First, the model assumes that migration primarily affects fertility through remittance flows and labor market constraints, without explicitly incorporating cultural or social factors that may also influence fertility decisions. Second, while the model is calibrated using observed macroeconomic data, unobserved heterogeneity across households may introduce additional variation in fertility outcomes that is not fully captured within the framework.

migration and remittances have significantly contributed to the country's demographic transition, primarily by increasing household incomes, altering opportunity costs, and reshaping labor force participation patterns. These findings suggest that migration-induced changes in economic structure can serve as a catalyst for demographic transitions in developing economies.

6 Conclusion

In this paper, we document that the development process in low-middle-income countries is characterized by an increase in emigration associated with remittances, a positive correlation between education expenditure and remittances, and a sustained decline in fertility rates associated with emigration. We contribute to the literature on fertility changes by relating these three facts. We argue that the negative correlation between fertility and emigration is driven by an opportunity cost effect and an income effect induced by emigration. As emigration occurs, households' income increases through remittances, enabling education investment, while migrant departures increase the opportunity cost of child-rearing by redistributing household labor and tightening labor markets, which raises wages and reinforces fertility decline.

We build a general equilibrium model to formalize these mechanisms and quantify their impact on fertility trends. Our framework is based on De La Croix (2013), in which individuals derive utility from consumption, the number of children they have, and the level of education they provide to their offspring. The new feature of the model is the introduction of an explicit migration decision that allows individuals to endogenously choose whether to emigrate. We calibrate the model and we show that it accounts for the trend of fertility rate for the 42 middle- and low-income economies in our sample.

Through two counterfactual experiments, we quantify the impact of migration on fertility. Specifically, we quantify the extent to which migration has contributed to the observed convergence in fertility rates across countries and to the demographic transition of remittance-dependent economies.

At the cross-country level, our counterfactual analysis reveals that, had migration patterns remained at their 1991 levels, the average fertility rate across 42 developing countries in 2017 would have been 17.7% higher than observed, with fertility dispersion increasing by 43%. This result underscores the role of migration in promoting fertility convergence in developing economies. At the country level, our numerical experiment for El Salvador demonstrates that, in the absence of migration and remittance inflows, the fertility rate in 2019 would have been 3.43 instead of the observed 1.92, implying a 44% decline directly attributable to migration. This provides compelling evidence that migration has been a key determinant in the country's demographic transition.

These findings suggest that migration and the flow of remittances associated with migration are a structural force driving demographic and economic transitions in developing countries. In this regard, our results highlight that migration not only affects short-term labor market outcomes but also shapes long-term demographic dynamics by altering fertility decisions through income effects and opportunity cost adjustments.

Beyond the demographic implications, our findings contribute to the broader debate on the economic consequences of migration. While migration is often analyzed through the lens of labor mobility, wage differentials, or human capital formation, our study provides new evidence that migration operates as a fundamental determinant of fertility transitions. The results suggest that policymakers in remittance-dependent economies must account for migration's demographic effects when designing policies related to education, labor markets, and social protection. Neglecting these interactions may lead to an underestimation of migration's role in shaping human capital accumulation and long-term economic trajectories.

Future research could extend this framework in several directions. First, incorporating heterogeneity in household preferences and labor market frictions could provide deeper insights into the differential impacts of migration across income groups. Second, analyzing the intergenerational effects of migration on fertility and educational investment would shed light on whether these demographic shifts are persistent over time. Finally, investigating how migration-induced demographic changes interact with broader macroeconomic forces—such as productivity growth and structural transformation—could further refine our understanding of the link between migration and long-term economic development.

In sum, our findings suggest that migration is a key driver of demographic change in developing countries, playing a central role in fertility transitions and human capital investment. As migration continues to reshape global labor markets, its demographic consequences will remain a crucial dimension of economic development, requiring further empirical and theoretical investigation.

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Appendices

A Data and Econometric analysis

A.1 Data

We use data used in the regression are available for the following countries: Algeria, Bangladesh, Benin, Burkina Faso, Cabo Verde, Cameroon, China, Colombia, Dominican Republic, Ecuador, El Salvador, Eswatini, Fiji, Ghana, Guatemala, Guinea, Guinea-Bissau, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Madagascar, Mali, Morocco, Mozambique, Namibia, Nigeria, Pakistan, Paraguay, Peru, Philippines, Rwanda, Senegal, Sierra Leone, Sri Lanka, Sudan, Suriname, Togo, Tunisia, and Turkey.

A.1.1 Filtering Data to Remove Country Fixed Effects

To construct Figures 1 to 3, we follow the methodology of Garcia-Santana, Pijoan-Mas, and Villacorta (2021) to eliminate country fixed effects, thereby isolating the dynamic relationships between economic development, migration, and remittances. This process removes time-invariant country-specific characteristics, allowing us to uncover the underlying trends that drive cross-country variation.

Following Garcia-Santana et al. (2021), we estimate the following specification:

$$z_{it} = \alpha_{zi} + \alpha_{z1} \log(y_{it}) + \alpha_{z2} \log(y_{it})^2 + \varepsilon_{it}$$

where z_{it} represents the variable of interest (e.g., migration, remittances, or fertility), y_{it} denotes GDP per capita in country i at time t, and α_{zi} captures country fixed effects.

In the second step, we compute the predicted values from the regression as:

$$\hat{z}_{it} = \alpha_{zi} + \hat{\alpha}_{z1} \log(y_{it}) + \hat{\alpha}_{z2} \log(y_{it})^2$$

where α_{zi} is replaced by the unweighted average of all country fixed effects, ensuring that the transformation maintains the overall level of the data while filtering out cross-country heterogeneity. The trend lines in Figures 1 to 3 depict the predicted values, illustrating the systematic relationship between development and migration dynamics across the sample.

We apply this filtering technique to sectoral composition, remittances, and migration data for our sample of 42 developing countries, allowing us to disentangle the long-run effects of economic development from persistent country-specific factors.

A.2 Econometric analysis

A.2.1 Descriptive Statistics

To assess the suitability of estimating a fixed-effects (FE) or random-effects (RE) model, we analyze the variance decomposition of the key variables in our dataset. Specifically, we examine the overall, between, and within standard deviations to determine the relative importance of cross-country versus within-country variation over time. Table A.1 presents summary statistics for the primary variables of interest, distinguishing between these three sources of variation.

The variance decomposition of the key variables reveals that cross-country differences dominate over within-country fluctuations, suggesting that a fixed-effects (FE) model is generally more appropriate for controlling unobserved heterogeneity. The emigration rate (EMIGR) exhibits low within-country variation (0.035 vs. 0.086 between), indicating relative stability over time, reinforcing the use of FE estimation. Similarly, the log of GDP per capita (GDPPCAP) shows a larger between-country variation (0.762) compared to within-country (0.260), further supporting FE estimation to account for persistent economic disparities. Contraceptive prevalence (CONTRACE) and female labor force participation (LABORATIO) display strong between-country variation (23.040 and 23.193, respectively), suggesting that cultural and institutional factors may influence these variables, making random-effects (RE) a potential alternative if these factors are assumed exogenous. Healthcare availability, measured by nurses per 1,000 people (NURSES), also exhibits substantial variation between countries (1.042 vs. 0.467 within), indicating that structural differences in healthcare systems persist between countries. In contrast, infant mortality rate (INFMORT) and female primary completion rate (PRICOMPLETE) show relatively higher within-country variation (15.818 and 12.886, respectively), suggesting that short-term policy shifts or economic changes could be influential, warranting further robustness checks.

Overall, the dominance of the variance between countries in most variables strengthens the case for a fixed effect approach, while RE remains a viable alternative for variables driven by time-invariant structural factors. To determine whether a fixed-effects or random-effects model is more appropriate, we conduct a Hausman test. The test yields a chi-squared statistic of 23.81 with 8 degrees of freedom, resulting in a p-value of 0.0025. Given that the p-value is below the 0.05 threshold, we reject the null hypothesis that the random-effects estimator is consistent. Thus, the fixed-effects specification is preferred for this analysis, as it accounts for unobserved heterogeneity across countries.

A.2.2 Shift-Share Instrument without Destination Information

To address the potential endogeneity between fertility and emigration, we adopt an identification strategy based on a *Shift-Share* instrument without destination information. This approach mitigates potential simultaneity issues in the relationship between emigration and fertility. The construction of the instrument follows the methodology employed in previous studies that exploit

Table A.1: Model Performance: Target and Non-Target Variables

		Mean	Std. Dev.	Min	Max	N/n/T-bar
EMIGR	Overall	0.066	0.092	0.000	0.647	1302
	Between		0.086	0.005	0.450	42
	Within		0.035	-0.167	0.272	31
GDPPCAP	Overall	8.580	0.797	6.221	10.406	1344
	Between		0.762	6.886	9.869	42
	Within		0.260	7.211	9.683	32
CONTRACE	Overall	44.373	23.389	1.700	86.900	994
	Between		23.040	6.637	84.969	41
	Within		6.554	21.663	74.683	24.244
FEMALEFERT	Overall	49.790	3.542	41.570	57.931	1386
	Between		2.999	43.522	54.751	42
	Within		1.939	41.403	55.273	33
NURSES	Overall	1.428	1.137	0.122	6.407	846
	Between		1.042	0.277	4.795	42
	Within		0.467	-0.420	4.161	20.143
INFMORT	Overall	47.253	31.295	4.800	213.900	1344
	Between		27.320	11.900	117.728	42
	Within		15.818	2.843	187.943	32
PRICOMPLETE	Overall	76.052	24.812	8.680	135.340	1129
	Between		21.291	35.606	102.454	42
	Within		12.886	37.477	121.517	26.881
LABORATIO	Overall	63.827	23.154	14.164	124.007	1111
	Between		23.193	19.182	102.834	42
	Within		6.152	28.284	87.339	26.452

exogenous variations in global migration to identify local effects (see Card, 2001; Borjas, 2003; Jaeger et al. 2018). Specifically, we define the instrumental variable (IV) as:

$$IV_{it} = \left(\frac{Emigrants_{i,1991}}{Population_{i,1991}}\right) \times \left(\frac{\sum_i Emigrants_{i,t}}{\sum_i Population_{i,t}}\right) \tag{A.1}$$

where:

- $\frac{Emigrants_{i,1991}}{Population_{i,1991}}$ represents the historical emigration rate of country i in the base year 1991.
- $\frac{\sum_i Emigrants_{i,t}}{\sum_i Population_{i,t}}$ is the global emigration rate in year t, capturing international migration shocks.

This approach captures how exposed each country i is to global migration shocks, leveraging historical migration patterns while avoiding direct reliance on destination-specific data. The first term reflects structural factors and pre-existing migration networks, which are largely exogenous to contemporary fertility decisions. The second term introduces exogenous time variation based on international migration flows, thereby ensuring that country-level migration responses are influenced by external shocks rather than endogenous domestic factors.

This methodology follows the tradition of *Shift-Share* instruments in migration and labor economics, where historical emigration rates serve as weights to predict contemporary migration inflows (Peri, 2011; Adão et al. 2019). Since the global emigration rate reflects aggregate migration trends and exogenous international shocks, this instrument effectively captures each country's differential exposure to these changes. By constructing the IV in this manner, we mitigate simultaneity issues and improve the robustness of our estimates of the impact of emigration on fertility.

To demonstrate that the proposed Shift-Share instrument effectively mitigates potential endogeneity concerns, we conduct the following validity tests. A key condition for IV estimation is that the instrument must be both relevant, meaning it is strongly correlated with the endogenous variable, and valid, implying it is uncorrelated with the error term. The Kleibergen-Paap rk LM statistic ($\chi^2 = 5.313$, p-value $= 0.0212$) indicates that the model is not underidentified, confirming that the instrument is sufficiently correlated with migration. Furthermore, the weak identification test (Cragg-Donald Wald F-statistic = 784.622) significantly exceeds the Stock-Yogo critical threshold of 16.38 for 10% maximal IV size, ruling out concerns of weak instruments. These results provide strong statistical support for the relevance of the instrument and suggest that it serves as a valid tool for addressing endogeneity in the migration-fertility relationship.

B Solution of the model

B.1 Solution of the consumer problem

The consumers maximize the utility function subject to the budget constraint 3.2. The Hamiltonian present value associated to this maximization problem is:

$$\mathcal{L} = \ln c_t + \gamma \ln \left[n_t \pi_t \left(e_t \right) \right] + \lambda_1 \left[h w_t + \Pi + R_t m_t - \psi m_t - e_t n_t - c_t \right] + \lambda_2 [1 - \phi_h h - \phi_n n_t - \phi_m m_t] \quad \text{(B.1)}$$

The first order conditions with respect to c_t, n_t, e_t, m_t, and h_t, are,respectively,

$$c_t \quad : \quad \frac{1}{c_t} = \lambda_1, \quad \text{(B.2)}$$

$$n_t \quad : \quad \frac{\gamma}{n_{it}} = \lambda_1 e_t + \lambda_2 \phi_n, \quad \text{(B.3)}$$

$$e_t \quad : \quad \frac{\eta\gamma}{e_t} = \lambda_1 n_t, \quad \text{(B.4)}$$

$$m_t \quad : \quad \lambda_1 \left(R_t - \psi \right) = \phi_m \lambda_2, \quad \text{(B.5)}$$

$$h_t \quad : \quad \lambda_1 w_t = \phi_h \lambda_2, \quad \text{(B.6)}$$

$$\lambda_1 \quad : \quad h w_t + \Pi + R_t m_t = \psi m_t + e_t n_t + c_t, \quad \text{(B.7)}$$

$$\lambda_2 \quad : \quad 1 = \phi_h h_t + \phi_n n_t + \phi_m m_t. \quad \text{(B.8)}$$

From (B.2) and (B.7), we obtain

$$\lambda_2 = \frac{1}{c_t} \frac{w_t}{\phi_h}. \tag{B.9}$$

We can substitute (B.2) and (B.9) in (B.3) to obtain fertility rate as a function of education and consumption

$$n_t = \frac{\gamma c_t}{e_t + \frac{\phi_n}{\phi_h} w_t}. \tag{B.10}$$

Then, we substitute (B.10) together with (B.2) in (B.4) to obtain education expenditure

$$e_t = \frac{\eta}{1-\eta} w_t \frac{\phi_n}{\phi_h}. \tag{B.11}$$

We obtain the fertility rate as a function of consumption expenditure by substituting (B.11) in (B.10),

$$n_t = \frac{\phi_h}{\phi_n} (1-\eta) \gamma \frac{c_t}{w_t}. \tag{B.12}$$

From (B.5) and using (B.2) and (B.9), we can obtain the following knife condition

$$R_t - \psi = \frac{\phi_m}{\phi_h} w_t \tag{B.13}$$

which means that the individual in this condition it is indifferent if to migrate or stay in the country. We use (B.7), (B.13) and (B.8) to obtain migration rate

$$m_t = \frac{1}{\phi_m} - \frac{\phi_h}{\phi_m} h_t - \frac{\phi_n}{\phi_m} n_t. \tag{B.14}$$

We then substitute (B.14), (B.11) in (B.10) and, after arranging terms, we obtain the consumption expenditure as function of wage and profit,

$$c_t = \frac{1}{1+\gamma} \left(\Pi + \frac{w_t}{\phi_h} \right) \tag{B.15}$$

Substituting (B.15) in (B.12) to obtain the optimal fertility choice is

$$n_t = \gamma \frac{\phi_h}{\phi_n} \frac{1-\eta}{1+\gamma} \frac{1}{w_t} \left(\Pi + \frac{w_t}{\phi_h} \right). \tag{B.16}$$

B.2 Firm's problem with profits

The representative firm maximize profits choosing the amount of labor given the exogenous wage

$$\max_h \Pi = Ah^\alpha - wh$$

which implies

$$w = \alpha A h^{\alpha-1} \tag{B.17}$$

We obtain the demand function of labor by clearing h from (B.17),

$$h^d = \left(\frac{\alpha A}{w}\right)^{\frac{1}{1-\alpha}}. \tag{B.18}$$

Given the labor demand, the optimal production is

$$y^* = A\left(\frac{\alpha A}{w}\right)^{\frac{\alpha}{1-\alpha}}, \tag{B.19}$$

and the profits Π are

$$\Pi^* = (1-\alpha)\, y^*. \tag{B.20}$$

B.3 The optimal migration and fertility rates

To obtain the optimal migration rate, we use the market clearing condition in the home-country labor,

$$h = h^d.$$

Consequently, we substitute (B.20), (B.18) and (B.16) in (B.14) to obtain that the optimal migration rate is

$$m_t^* = \Delta_1 - \Delta_2 w^{-\left(\frac{1}{1-\alpha}\right)} \tag{B.21}$$

where

$$\Delta_1 = \frac{1+\gamma\eta}{1+\gamma}\frac{1}{\phi_m},$$

and

$$\Delta_2 = \left[\frac{1}{1+\gamma} + \frac{\gamma}{\alpha}\frac{1-(1-\alpha)\,\eta}{1+\gamma}\right]\frac{\phi_h}{\phi_m}\,(\alpha A)^{\frac{1}{1-\alpha}}.$$

Substituting (B.20) in (B.16), we obtain the fertility rate is

$$n_t^* = \Delta_3 + \Delta_4 w^{-\left(\frac{1}{1-\alpha}\right)},$$

where

$$\Delta_3 = \frac{1-\eta}{\phi_n}\frac{\gamma}{1+\gamma},$$

and

$$\Delta_4 = \left[(1-\eta)\,\frac{\phi_h}{\phi_n}\frac{\gamma}{1+\gamma}\frac{1-\alpha}{\alpha}\right](\alpha A)^{\left(\frac{1}{1-\alpha}\right)}. \tag{B.22}$$

B.4 Remittances effect on migration and fertility

From (B.13), we obtain that the home-country wage should satisfy the following condition for an interior solution

$$w_t = (R_t - \psi)\frac{\phi_h}{\phi_m}. \tag{B.23}$$

Substituting this condition in (B.21), we obtain that migration depends on the wage abroad, R_t, as follows

$$m_t = \Delta_1 - \Delta_2\left[(R_t - \psi)\frac{\phi_h}{\phi_m}\right]^{-\left(\frac{1}{1-\alpha}\right)},$$

which partial derivative respect to the wage abroad is

$$\frac{\partial m_t}{\partial R_t} = \frac{\Delta_2}{1-\alpha}\frac{\left[(R_t - \psi)\frac{\phi_h}{\phi_m}\right]^{-\frac{1}{1-\alpha}}}{R_t - \psi}$$

and under the assumption that $R_t - \psi > 0$, the partial derivative is positive. Substituting (B.23) in (B.22),and taking the partial derivative respect to fertility, we obtain that

$$\frac{\partial n_t}{\partial R_t} = -\frac{\Delta_4}{1-\alpha}\frac{\left[(R_t - \psi)\frac{\phi_h}{\phi_m}\right]^{-\left(\frac{1}{1-\alpha}\right)}}{R_t - \psi}.$$

which is negative given the assumption $R_t - \psi > 0$.

C Calibration

Table C.2 presents the calibrated country-specific parameter values used in the model. These parameters capture key structural characteristics of each economy, reflecting differences in productivity, migration dynamics, labor market conditions, and household decision-making. Specifically, the table reports the following parameters for each country:

- A: Total factor productivity, calibrated to match GDP per capita in each country.
- ϕ_m: Migration elasticity, which determines the responsiveness of migration decisions to income differentials between the home and foreign labor markets.
- ϕ_h: Labor supply elasticity, capturing the sensitivity of household labor participation to wage changes.
- ϕ_n: Time cost of child-rearing, which influences fertility choices by determining the opportunity cost of having additional children.
- ψ: Fixed cost of migration, reflecting country-specific barriers to emigration, such as regulatory restrictions, financial costs, or social constraints.

The calibration strategy follows a joint estimation approach in which $A, \phi_m, \phi_h, \phi_n$ are set to match country-level data on GDP per capita, migration stocks, labor force participation, and education expenditure as a share of GDP. The migration fixed cost ψ is calibrated using estimates from the KNOMAD-ILO Migration and Recruitment Costs Surveys, which provide data on migration expenses for a subset of countries in the sample. For countries without direct estimates, we impute migration costs using the average for their respective geographic region.

The table is structured in two panels to facilitate readability, listing country names alongside their corresponding parameter values. The diversity in parameter estimates highlights cross-country heterogeneity in migration dynamics and labor market conditions, which shape the fertility-migration relationship analyzed in the paper. These calibrated parameters serve as the foundation for the model simulations presented in the main text.

Table C.2: Country-Specific calibration parameters

Country	A	ϕ_m	ϕ_h	ϕ_n	ψ	Country	A	ϕ_m	ϕ_h	ϕ_n	ψ
BEN	2990.898	6.755	1.160	0.062	0.142	BFA	1669.094	3.991	1.497	0.058	0.082
BGD	2691.070	7.920	1.008	0.059	0.043	CHN	4462.467	8.286	0.939	0.083	0.081
CMR	3194.495	9.579	0.860	0.061	0.044	COL	10531.952	6.146	1.075	0.135	0.080
CPV	5122.611	8.312	0.945	0.086	0.101	DOM	9867.363	6.565	1.036	0.124	0.080
DZA	10099.705	5.457	1.149	0.154	0.080	ECU	9896.760	6.493	1.040	0.126	0.081
FJI	10683.119	6.923	1.038	0.117	0.134	GHA	3697.115	8.656	0.951	0.066	0.095
GIN	1996.049	6.246	1.195	0.058	0.082	GNB	2005.847	5.658	1.269	0.057	0.082
GTM	7371.050	7.751	0.927	0.102	0.052	HND	4906.021	9.776	0.834	0.069	0.053
IDN	8028.195	6.908	1.003	0.117	0.069	IND	3739.021	8.850	0.901	0.073	0.070
JAM	10715.025	6.405	1.047	0.128	0.080	JOR	9558.835	6.944	1.000	0.116	0.080
KEN	3573.538	8.732	0.966	0.062	0.105	LKA	8381.726	7.048	0.983	0.111	0.056
MAR	5936.058	8.199	0.920	0.094	0.076	MDG	1720.134	6.366	1.182	0.057	0.085
MLI	2024.286	6.266	1.184	0.058	0.086	MOZ	1090.591	1.041	2.120	0.065	0.191
NAM	7175.335	7.680	0.951	0.104	0.079	NGA	4350.415	8.940	0.887	0.078	0.087
PAK	4018.667	9.564	0.836	0.072	0.054	PER	7237.373	7.407	0.970	0.108	0.080
PHL	5808.654	8.637	0.884	0.087	0.061	PRY	10250.240	6.165	1.066	0.133	0.079
RWA	1539.021	3.485	1.613	0.063	0.140	SDN	3570.225	9.340	0.868	0.065	0.045
SEN	2883.804	9.179	0.910	0.062	0.077	SLE	1579.809	3.821	1.524	0.057	0.075
SLV	7634.926	8.104	0.904	0.097	0.045	SUR	15471.873	5.451	1.140	0.152	0.080
SWZ	7254.865	6.520	1.098	0.127	0.157	TGO	1869.055	4.139	1.485	0.058	0.093
TUN	9379.337	6.184	1.069	0.133	0.077	TUR	16078.362	4.816	1.222	0.175	0.078

Table C.2 reports the calibrated parameter values for each country. The parameters are set to match macroeconomic aggregates, migration statistics, and education expenditures.