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Emigration, Remittances, and Financial Conditions in Emerging Market Economies

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Abstract

This paper examines the drivers of fluctuations in emigration and labor-market variables in emerging market economies, highlighting the role of external financial conditions. Employing vector autoregression analysis and estimating a small open economy New Keynesian model with search-and-matching frictions and labor mobility, we find that foreign interest rates and country risk premia significantly affect the dynamics of emigration, particularly through their impacts on the real exchange rates and altering the relative value of foreign wages.

Keywords: Emerging market economies, Emigration, Exchange rates

JEL classification: E58, F31, J61

1 Introduction

Migration from emerging market economies (EMEs) to developed countries has increased markedly over the past few decades and is expected to rise further as populations in EMEs continue to grow over the next 30 years (Engler et al., 2020). Recent research has examined the determinants of fluctuations in emigration using dynamic stochastic general equilibrium (DSGE) models. These include wage differentials, total factor productivity (TFP) shocks,

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migration costs, and fiscal policy shocks (e.g., Mandelman and Zlate, 2012; Bandeira et al., 2022).

By contrast, relatively limited attention has been paid to the role of external financial conditions for emigration dynamics in the macroeconomic literature. Yet business cycles in EMEs are known to be highly susceptible to such conditions, such as foreign interest rates, country risk premia, and real exchange rates (Canova, 2005; Neumeyer and Perri, 2005; Uribe and Yue, 2006; Christiano et al., 2011; Miranda-Agrippino and Rey, 2020). Moreover, numerous microeconomic studies document a relationship between real exchange rates and emigration outflows. A 1% real depreciation of the origin country's currency increases emigration flows by approximately 0.13% to 1.94% (e.g., Hanson and Spilimbergo, 1999; Yang, 2008; Mishra and Spilimbergo, 2011; Keita, 2016). Mishra and Spilimbergo (2011) attribute this relationship to various channels, such as changes in cross-country wage differences, inflation driven by higher import prices, and fluctuations in net exports and domestic labor market variables.

This paper studies how external financial shocks affect migration dynamics and labor markets in EMEs. The empirical analysis employs a vector autoregression (VAR) model using Mexican data. We find that positive shocks to foreign interest rates and country premia can induce emigration outflows through domestic currency depreciation. The theoretical framework consists of a DSGE model with New Keynesian elements, search-and-matching frictions, and labor mobility. Model estimation identifies shocks driving fluctuations in emigration outflows. External financial shocks account for approximately 18% of the forecast error variance in emigration flows. Impulse response analysis suggests that external these shocks influence emigration by altering the value of foreign wages denominated in domestic currency terms, as well as through their effects on consumption, production, and domestic labor market variables.

This paper contributes to the growing body of DSGE literature on migration, including both immigration and emigration, and business cycles. Existing studies analyze the macroeconomic roles of remittances, skilled migration, immigration shocks, and emigration in settings such as Mexico, New Zealand, the U.S., Ireland, and Greece (e.g., Mandelman and Zlate, 2012; Smith and Thoenissen, 2019; Kiguchi and Mountford, 2019; Lozej, 2019; Bandeira et al., 2022; Oikonomou, 2023). While our study shares the focus on the interaction between migration and business cycles, it differs by emphasizing external financial conditions and explicitly examining how such shocks transmit to emigration through exchange-rate movements and labor-market adjustments.

Our analysis also relates to Mandelman (2013), which explores the macroeconomic effects of remittance flows using the Philippines as a case study. Although Mandelman's model incorporates heterogeneous households and labor supply decisions, it does not explicitly model emigration, the search-and-matching frictions in the labor market, or unemployment. This leaves a gap in understanding how external financial shocks are transmitted to emigration through exchange-rate movements and labor-market adjustment, which our research aims to address. This study also connects to the literature on labor mobility and macroeconomic adjustment, including the seminal work on currency unions by Mundell (1961) and more recent studies (e.g., Hauser and Seneca, 2022; House et al., 2026). Unlike that literature, however, our focus is on EMEs, where exchange rate movements and external financial conditions play a central role.

The rest of the paper is organized as follows. Section 2 conducts the VAR analysis. Section 3 outlines the model and derives the optimality conditions. Section 4 describes the quantitative analysis. Section 5 presents the estimation and simulation results. Section 6 concludes.

2 Empirical analysis

In this section, we employ a VAR model to analyze the relationship between emigration and external financial conditions using data from Mexico and the United States. The VAR model is formulated as follows:

$$\mathbf{A}\boldsymbol{y_t} = \mathbf{C} + \mathbf{B}(\boldsymbol{L})\boldsymbol{y_t} + \boldsymbol{\epsilon_t},$$

where $\boldsymbol{y_t}$ is a vector of endogenous variables, $\mathbf{A}$ is a contemporaneous structural coefficient matrix with ones along the diagonal, $\mathbf{C}$ represents a vector of constants, $\mathbf{B}(\boldsymbol{L})$ denotes a lag-operator polynomial capturing the dynamics at various lags, and $\boldsymbol{\epsilon_t}$ is a vector of serially uncorrelated errors with mean zero and a time-invariant covariance matrix. For identification, we impose recursive short-run restrictions on the matrix $\mathbf{A}$. To reflect the small-open-economy nature, we adopt the block exogeneity assumption following Cushman and Zha (1997). This

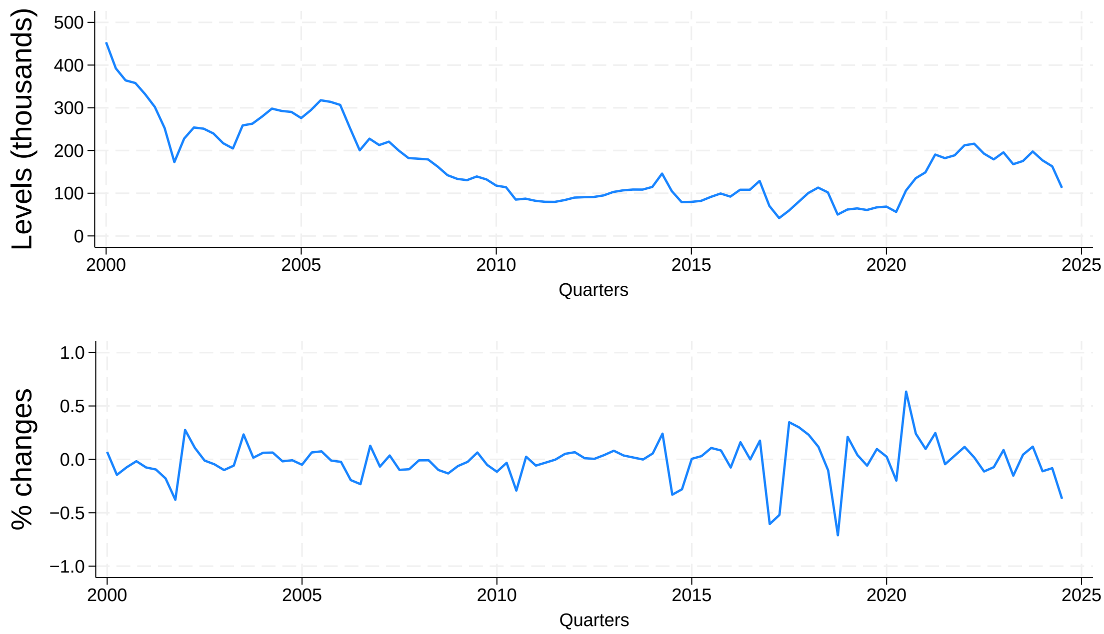

Figure 1: Flows and changes in US border encounters

Notes: Levels (top) and percentage growth (bottom) of U.S. border encounters. Levels are seasonally adjusted with Census X-13ARIMA-SEATS. Source: the U.S. Customs and Border Protection.

approach allows us to explore how external economic shocks, specifically exchange rate and U.S. interest rate shocks, influence the Mexican economy. As illustrated in the small-open-economy VAR studies by Del Negro and Obiols-Homs (2001), Canova (2005), Uribe and Yue (2006), and Carrillo et al. (2020), U.S. shocks play a central role in driving economic fluctuations in Mexico and Latin America.

The endogenous variables in the vector $\boldsymbol{y_t}$ are, in order, U.S. output, the federal funds rate, the real exchange rate of the Mexican peso against the U.S. dollar, Mexico's output, the domestic real interest rate, emigration flows, and remittances-to-GDP ratio. The real exchange rate is defined such that an increase denotes a depreciation of the peso. The U.S.–Mexico border encounters data (apprehensions, inadmissibles, and expulsions of illegal aliens) serve as a proxy for emigration flows. This proxy helps assess the size and trend of migration in relation to economic variables. This approach follows Espenshade (1994), Hanson and Spilimbergo (1999), and Mandelman and Zlate (2012).

Figure 1 presents the time series of encounters at the U.S.–Mexico border, obtained from the U.S. Customs and Border Protection. The data are quarterly and span from 1999Q4 to 2024Q4, and are constructed from the original monthly series.[1] The top panel presents the total numbers and the bottom panel depicts the percentage changes. The data indicate a decrease following the Great Recession (2007Q4–2009Q2) and some fluctuations during the Trump administration (2017Q1–2020Q4). After the COVID-19 pandemic, the numbers remained high until mid-2024.

Remittance data are sourced from the Banco de México, and are denominated in U.S. dollars. We deflate them by U.S. prices to obtain real values. The data series of border encounters and remittances are seasonally adjusted using Census X-13ARIMA-SEATS, and remittances are expressed as a percentage of Mexican real GDP. All other variables, namely, U.S. output, the federal funds rate, the real exchange rate of the Mexican peso, Mexico's inflation rate and real interest rate (calculated from the call rate and the inflation rate), and Mexican output are sourced from the Federal Reserve Economic Data. The VAR includes four lags and uses the logarithm of all variables except the Mexican and U.S. interest rate series. We also add dummy variables for the period 2008Q3–2009Q2 to capture the financial market turmoil following the Lehman collapse, and for 2017Q1–2020Q4 to capture the Trump administration period.

Figure 2 depicts the responses to a federal funds rate shock, which we interpret as an external interest rate shock, a possible exogenous factor that determines Mexico's real exchange rate. As the federal funds rate rises, the higher interest rate differential leads to a depreciation of the Mexican peso by 7.68 percentage points at its peak. As the federal funds rate is persistent, its response peaks at 2.40 percentage points above its mean. Border encounters increase substantially (peaking at 35.78%), and the remittances-to-GDP ratio also rises (peaks at 11.70 percentage points). The resulting elasticity of emigration with respect to the real exchange rates is $35.78/7.68 = 4.66$, which is substantially larger than the micro-level evidence reported in the literature (0.13–1.94, as noted in the introduction). The elasticity of emigration outflows with respect to the federal funds rate is as large as $35.78/2.40 = 14.90$, when computed using peak values. These values may reflect transmission channels other than real exchange-rate

[1]The dataset covering from 1999Q4 to 2020Q3 (fiscal years 2000 through 2020) is categorized by border region, namely the Coastal, Northern, and Southwest borders. The dataset based on a new classification, covering 2018Q4 and onward, is categorized by citizenship rather than border region. We extracted the figures for the Southwest border from the dataset covering 1999Q4–2018Q3 and the figures for Mexican nationals from the dataset covering 2018Q4 and onward. The definition of border encounters also changed over the data period. Starting in March 2020, the encounter statistics include U.S. Border Patrol (USBP) Title 8 apprehensions, Office of Field Operations Title 8 inadmissibles, and Title 42 expulsions, whereas the earlier classification included only USBP Title 8 apprehensions.

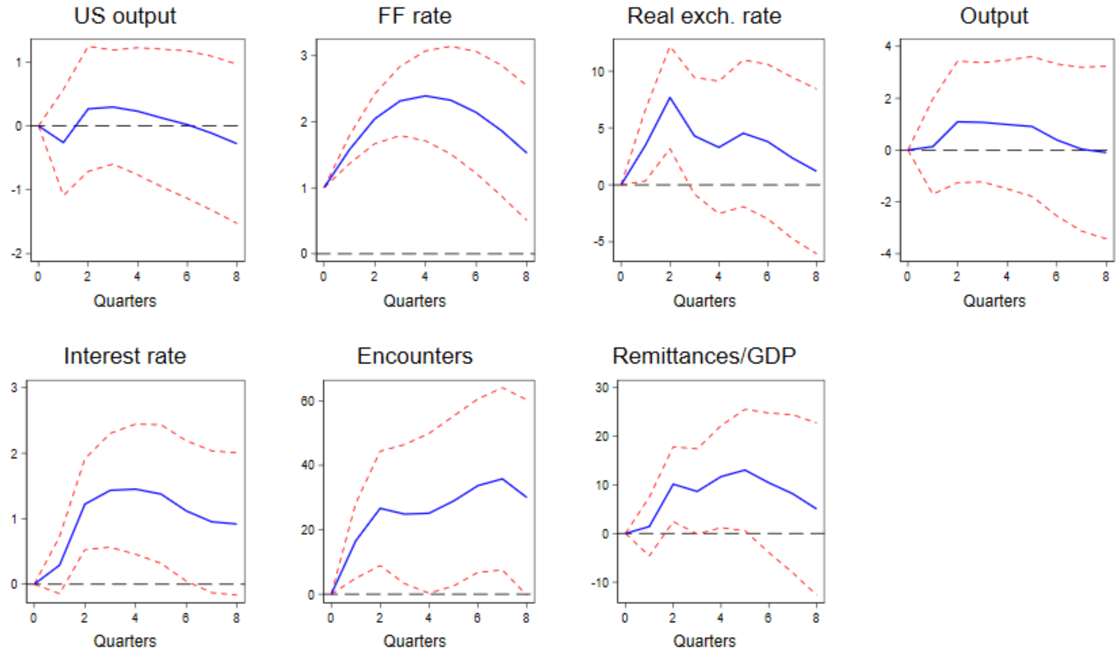

Figure 2: Impulse responses to a federal funds rate shock
Notes: Impulse responses to a 1 percentage point positive shock to the federal funds rate. Red dotted lines represent the 5th and 95th percentiles. The federal funds rate and the domestic interest rate are expressed in percentage point changes, and the other variables are presented in percentage deviations. Sample period: 1999Q4–2024Q4.

movements, through which foreign interest rate shocks affect emigration.

3 Model

In this section, we build a small open economy model with nominal rigidities and matching frictions, combining the New Keynesian settings of Galí and Monacelli (2008) with the search-and-matching mechanism of Diamond (1982) and Mortensen and Pissarides (1994) in the labor market. The emigration decision is endogenously determined following Lozej (2019) and Bandeira et al. (2022). Variables with an asterisk denote the foreign variables.

3.1 Households and migration

The domestic economy includes a continuum of identical infinitely-lived households with unit measure. Time is discrete and indexed by $t \in \{0, 1, 2, ...\}$. Each household has a constant numbers of members, $\bar{N}$, which comprises employed residents N_t, unemployed residents u_t, the stock of emigrants $N_{e,t}$, and non-labor-force population N_n,

$$\bar{N} = N_t + u_t + N_{e,t} + N_n.$$

Among the unemployed, a fraction s_t searches for jobs abroad and $(1 - s_t)$ searches in the domestic labor market. Therefore, domestic and emigrant employment follow

$$N_{t+1} = (1-\sigma)N_t + \psi_{H,t}(1-s_t)u_t \tag{1}$$

$$N_{e,t+1} = (1-\sigma^*)N_{e,t} + \psi_H^* s_t u_t, \tag{2}$$

respectively, where σ and σ^* are the separation rates in domestic and foreign labor markets, and $\psi_{H,t}$ is the domestic job finding rate defined later. The foreign job finding rate ψ_H^* is assumed to be constant. Matches in the domestic labor market are given by a matching function

$$m_t = \mu_1 (v_t)^{\mu_2} \left[(1-s_t)u_t\right]^{1-\mu_2},$$

where v_t denotes vacancies, μ_1 represents the matching efficiency and μ_2 denotes the elasticity of matches with respect to vacancies. The probabilities of a job seeker to be hired $\psi_{H,t}$ and of a vacancy to be filled $\psi_{F,t}$ are defined as

$$\psi_{H,t} \equiv \frac{m_t}{(1-s_t)u_t} \quad \text{and} \quad \psi_{F,t} \equiv \frac{m_t}{v_t},$$

respectively. Household consumption consists of purchases by home residents $C_{h,t}$ and by emigrants abroad, $C_{e,t}$,

$$C_t = C_{h,t} + C_{e,t}.$$

Following Mandelman and Zlate (2012), we assume that the emigrants' purchases are equal to their total wage minus remittances, Ξ_t,

$$C_{e,t} = w^* N_{e,t} - \Xi_t,$$

where w^* denotes the foreign real wage. Remittances are determined by

$$\Xi_t = \rho \left(\frac{e_t w^*}{w_t} \right)^{\varphi} N_{e,t}, \tag{3}$$

where $\rho > 0$ and $\varphi > 0$ represent the altruistic motive between emigrants and home workers, and e_t is the real exchange rate defined later. Equation (3) is a version of the remittance function in Mandelman and Zlate (2012), extended to incorporate the real exchange rates and the stock of emigrants.

The household's utility is given by

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\eta}}{1-\eta} - \chi \frac{(N_t + N_{e,t})^{1+\xi}}{1+\xi} \right) \tag{4}$$

where E_0 is the conditional expectations operator, $\beta \in (0, 1)$ is the subjective discount factor, and η is the inverse of the intertemporal elasticity of substitution. The weight of hours worked $\chi > 0$ and the inverse Frisch labor supply elasticity ξ govern the disutility of labor supply.

We assume that the only international financial assets are foreign currency denominated, non-state contingent bonds B_t^*. Its gross nominal interest rate R_t^* is determined by the world nominal interest rate and the country risk premium mentioned later. Households can also hold domestic government bonds B_t with gross nominal interest rate R_t. Letting P_t denote the price of domestic final goods, the per-period budget constraint in real terms is given by

$$C_{h,t} + \frac{B_{t+1}}{P_t R_t} + \frac{\mathcal{E}_t B_{t+1}^*}{P_t R_t^*} + \Phi\left(N_{e,t}\right) \leq w_t N_t + \frac{B_t}{P_t} + \frac{\mathcal{E}_t B_t^*}{P_t} + ben \cdot u_t + e_t \Xi_t + \Pi_t + T_t, \tag{5}$$

where w_t is the real wage, $\mathcal{E}_t$ is the nominal exchange rate, $ben \geq 0$ is the coefficient of unemployment benefits, T_t is lump-sum transfers, and Π_t is the profits of monopolistic wholesale goods producers. We normalize the foreign price level to unity, thus foreign gross inflation equals one and the real exchange rate can be written as $e_t = \mathcal{E}_t / P_t$. Similar to Hauser and Seneca (2022), we model the costs of moving and living abroad as an emigration cost function $\Phi(N_{e,t})$ with $\Phi'(\cdot) > 0$. We specify a quadratic function for the cost of living abroad or emigration, $\Phi(N_{e,t}) = \frac{\phi}{2} N_{e,t}^2 \varepsilon_t^{\phi}$, where the stochastic component ε_t^{ϕ} captures exogenous policy shocks, such as changes in U.S. border controls.

Following Schmitt-Grohé and Uribe (2003), we assume that the external debt interest rate R_t^* is sensitive to the outstanding debt level:

$$R_t^* = \bar{R}_t^* \exp\left[\Gamma\left(-\frac{e_t b_{t+1}^*}{gdp_t} + \frac{eb^*}{gdp}\right) + \varepsilon_t^{cp}\right],$$

where $\bar{R}_t^*$ denotes the world interest rate, Γ governs the elasticity of the interest rate to debt position, $b_t^* \equiv \frac{B_t^*}{P_t}$ is real foreign bond holdings, and gdp_t is the real GDP of the economy. Endogenous variables without subscript t denote deterministic steady-state values. The stochastic component ε_t^{cp} captures exogenous fluctuations in the country risk premium.

Households maximize utility (4) subject to equations (1), (2), and (5). Letting $\lambda_{c,t}$ be the Lagrange multiplier on equation (5), the optimality conditions with respect to B_{t+1}, and B_{t+1}^* are given by

$$\beta E_t\left[\frac{\lambda_{c,t+1}}{\lambda_{c,t}}\frac{R_{t+1}}{\pi_{t+1}}\right] = 1, \tag{6}$$

$$\beta E_t\left[\frac{\lambda_{c,t+1}}{\lambda_{c,t}}\frac{e_{t+1}}{e_t}R_{t+1}^*\right] = 1, \tag{7}$$

respectively, where $\pi_t \equiv \frac{P_t}{P_{t-1}}$ is the domestic gross inflation. Equations (6) and (7) imply the uncovered interest rate parity (UIP) condition. Letting $\lambda_{n,t}$ and $\lambda_{e,t}$ be the Lagrange multipliers on equations (1) and (2), respectively, the optimality conditions with respect to N_{t+1}, $N_{e,t+1}$, and s_t are

$$\lambda_{n,t} = \beta E_t\left[-\chi(N_{t+1}+N_{e,t+1})^{\xi} + \lambda_{c,t+1}(w_{t+1} - ben) + \lambda_{n,t+1}(1-\sigma-\psi_{H,t+1})\right], \tag{8}$$

$$\begin{aligned}\lambda_{e,t} = \beta E_t\Big[&-\chi(N_{t+1}+N_{e,t+1})^{\xi} + \lambda_{c,t+1}\left\{e_{t+1}w_{t+1}^* - ben - \Phi'(N_{e,t+1})\right\} \\ &+\lambda_{e,t+1}(1-\sigma^*-\psi_H^*)\Big],\end{aligned} \tag{9}$$

$$\psi_{H,t}\lambda_{n,t} = \psi_H^*\lambda_{e,t}, \tag{10}$$

respectively. Equations (8) and (9) provide the values of being employed in domestic and foreign labor markets, respectively. Equation (10) states that these values must be equal, when adjusted by the corresponding job finding probabilities.

3.2 Firms

We consider four types of firms in the production sector: intermediate goods producers, wholesale firms, retailers, and final goods producers. Intermediate goods producers are perfectly competitive and employ domestic labor through the matching mechanism. Wholesale firms are monopolistically competitive and differentiate the intermediate goods into varieties, which retailers aggregate into a tradable composite. Final goods producers combine domestic retail goods and imported goods to produce a non-tradable composite.

3.2.1 Intermediate goods producers and labor market

Intermediate goods producers have Cobb–Douglas technologies,

$$Y_t = scale \cdot A_t N_t^{1-\alpha},$$

where *scale* normalizes the steady-state level of Y_t to one and A_t denotes TFP driven by the exogenous component ε_t^a. Firms maximize the discounted value of future profits $Q(N_t)$ by choosing the number of vacancies posted v_t, taking $\psi_{F,t}$ and current employment N_t as given. The optimization problem can be written as

$$Q(N_t) = \max_{v_t} \; p_{y,t} Y_t - (1-\tau) w_t N_t - \kappa v_t + \beta E_t \frac{\lambda_{c,t+1}}{\lambda_{c,t}} Q(N_{t+1}),$$

subject to the law of motion of employment (1), where $p_{y,t}$ is the relative price of intermediate goods in terms of the final good, τ is the employment subsidy rate, and κ is the vacancy cost. The first-order condition with respect to v_t is

$$\frac{\kappa}{\psi_{F,t}} = \beta E_t \left[\frac{\lambda_{c,t+1}}{\lambda_{c,t}} \left\{ (1-\alpha) p_{y,t+1} \frac{Y_{t+1}}{N_{t+1}} - (1-\tau) w_{t+1} + (1-\sigma-\psi_H^*) \frac{\kappa}{\psi_{F,t+1}} \right\} \right]. \tag{11}$$

Equation (11) indicates that the marginal cost of hiring must equal the expected marginal benefit, computed as the marginal product of labor minus the wage income plus the continuation value.

Wages are determined by the Nash bargaining mechanism

$$\max_{w_t} \, (S_t^H)^{1-\theta\varepsilon_t^\theta}(S_t^F)^{\theta\varepsilon_t^\theta},$$

where $\theta \in (0,1)$ determines the firm's bargaining power, and varies with the exogenous component ε_t^θ, and S_t^H and S_t^F denote the worker and firm surpluses, respectively. The first-order condition with respect to wage provides the wage splitting rule, $\theta\varepsilon_t^\theta S_t^H = (1-\theta\varepsilon_t^\theta)S_t^F$. The equilibrium wage is given by

$$w_t = \frac{1}{1-\tau+\theta\varepsilon_t^\theta\tau}\left[(1-\theta\varepsilon_t^\theta)\left\{(1-\alpha)p_{y,t}\frac{Y_t}{N_t} + \frac{\psi_H^* - \psi_{H,t}}{\psi_{F,t}}\kappa\right\} + \theta\varepsilon_t^\theta\left(ben + \frac{\chi}{\lambda_{c,t}}N_t^\xi\right)\right]. \quad (12)$$

3.2.2 Wholesale firms and retailers

A continuum of monopolistically competitive wholesale firms with measure one. Wholesale firm i differentiates intermediate goods Y_t into wholesale goods $Y_{i,t}$ using a linear technology $Y_{i,t} = Y_t$. The real marginal cost is the relative price $p_{y,t}$ of the intermediate goods. Retailers aggregate the varieties of wholesale goods into tradable retail goods,

$$Y_{r,t} = \left[\int_0^1 (Y_{i,t})^{\frac{\varepsilon-1}{\varepsilon}} di\right]^{\frac{\varepsilon}{\varepsilon-1}},$$

where $\varepsilon > 1$ is the elasticity of demand for each variety. The nominal price of retail goods is $P_{r,t} = \left(\int_0^1 P_{i,t}^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}}$, where $P_{i,t}$ is the price of variety i. The retailer's demand for $Y_{i,t}$ can be written as

$$Y_{i,t} = \left(\frac{P_{i,t}}{P_{r,t}}\right)^{-\varepsilon} Y_{r,t}. \quad (13)$$

Following Calvo (1983), wholesale firms reset prices with probability $1-\lambda_p$ in each period. Each firm chooses price $P_{i,t}$ to maximize

$$E_t \sum_{s=0}^{\infty} (\beta\lambda_p)^s \frac{\lambda_{c,t+s}}{\lambda_{c,t}} \left(\left[\frac{P_{i,t}}{P_{t+s}} - p_{y,t+s}\right] Y_{i,t+s}\right)$$

subject to demand function (13). As all firms face the same demand schedule, the optimal reset price $\hat{P}_{i,t}$ is identical for all i, and can be written as $\hat{P}_{r,t}$. Letting $p_{r,t} \equiv P_{r,t}/P_t$ denote the relative price of retail goods, the real reset price $\hat{p}_{r,t} \equiv \hat{P}_{r,t}/P_t$ is given by

$$\frac{\hat{P}_{r,t}}{P_{r,t}} = \frac{\hat{p}_{r,t}}{p_{r,t}} = \frac{\varepsilon}{\varepsilon - 1}\frac{\mathcal{N}_t}{\mathcal{D}_t},$$

where

$$\mathcal{N}_t = p_{y,t} Y_{r,t} + \lambda_p E_t \beta_{t+1} \pi_{r,t+1}^{\varepsilon} \mathcal{N}_{t+1},$$
$$\mathcal{D}_t = p_{r,t} Y_{r,t} + \lambda_p E_t \beta_{t+1} \pi_{r,t+1}^{\varepsilon - 1} \mathcal{D}_{t+1},$$

and $\pi_{r,t} \equiv P_{r,t}/P_{r,t-1}$ is the producer price inflation. Assuming price indexation ι_p, Calvo pricing implies the transition process

$$P_{r,t}^{1-\varepsilon} = \lambda_p (P_{r,t-1}^{\iota_p})^{1-\varepsilon} + (1 - \lambda_p)(\hat{P}_{r,t})^{1-\varepsilon}.$$

The market clearing condition for tradable retail goods implies

$$Y_{r,t} = Y_{r,t}^d + Y_{r,t}^*,$$

where the export demand for retail goods,

$$Y_{r,t}^* = \left(\frac{p_{r,t}}{e_t}\right)^{-\gamma_x} Y_t^*,$$

is determined by elasticity γ_x and the aggregate foreign demand Y_t^*.

3.2.3 Final goods producers

Perfectly competitive firms produce a non-tradable final good $Y_{f,t}$ by combining the composite of domestic retail good $Y_{r,t}^d$ and imported good $Y_{m,t}$ using a constant-elasticity-of-substitution technology

$$Y_{f,t} = \left[\omega^{\frac{1}{\gamma}} (Y_{r,t}^d)^{\frac{\gamma-1}{\gamma}} + (1-\omega)^{\frac{1}{\gamma}} Y_{m,t}^{\frac{\gamma-1}{\gamma}}\right]^{\frac{\gamma}{\gamma-1}},$$

where ω governs the home bias and γ is the elasticity of substitution between domestic and imported goods. Final-good producers maximize profits

$$\Pi_t^f = Y_{f,t} - p_{r,t}Y_{r,t}^d - e_t p_m \varepsilon_t^{tot} Y_{m,t},$$

where p_m denotes the mean relative price of imported goods, assumed constant. The exogenous component ε_t^{tot} captures a terms-of-trade shock (e.g., Mendoza, 1995; Kose, 2002). The first-order conditions yield the demand functions

$$\begin{aligned} Y_{r,t}^d &= \omega(p_{r,t})^{-\gamma} Y_{f,t} \\ Y_{m,t} &= (1-\omega)[e_t p_m \varepsilon_t^{tot}]^{-\gamma} Y_{f,t}. \end{aligned}$$

3.3 Government

The government budget constraint is given by

$$b_{t+1} = R_t b_t + ben \cdot u_t + T_t + \tau w_t N_t, \tag{14}$$

where we assume $b_t = 0$ in equilibrium. The monetary policy rule takes the form

$$R_{t+1} = R\left(\frac{\pi_t}{\pi}\right)^{\alpha_\pi}\left(\frac{Y_t}{Y}\right)^{\alpha_Y}\left(\frac{\mathcal{E}_t}{\mathcal{E}_{t-1}}\right)^{\alpha_e}\varepsilon_t^r, \tag{15}$$

where $\alpha_\pi \geq 0$ and $\alpha_Y \geq 0$ determine the responses to inflation and output deviations, respectively, and ε_t^r represents a monetary policy shock that follows an independent and identically distributed (i.i.d.) normal distribution $N(0, \sigma_r^2)$. The policy rules in EMEs typically feature $\alpha_e > 0$, implying that the central banks adopt inflation targeting with flexible exchange rates but still respond to nominal exchange-rate movements. Therefore, we interpret changes in α_e as changes in the exchange rate policy rule. As $e_t = \mathcal{E}_t/P_t$, the rule (15) can be rewritten as

$$R_{t+1} = R\left(\frac{\pi_t}{\pi}\right)^{\alpha_\pi}\left(\frac{Y_t}{Y}\right)^{\alpha_Y}\left(\frac{e_t\pi_t}{e_{t-1}}\right)^{\alpha_e}\varepsilon_t^r.$$

Thus, stabilization of the nominal exchange rate means stabilizing inflation and the real exchange rate simultaneously, as noted by Devereux and Yu (2018).

3.4 Aggregate market clearing

Final goods are used for consumption, vacancy costs, and migration costs:

$$Y_{f,t} = C_{h,t} + \kappa v_t + \Phi(N_{e,t}). \tag{16}$$

Combining the household budget constraint (5), the relevant market clearing conditions, the government budget constraint (14), and aggregate profits shows that trade surpluses lead to foreign asset accumulation:

$$e_t \left(\frac{b^*_{t+1}}{R^*_t} - b^*_t \right) = NX_t + e_t \Xi_t,$$

where net exports NX_t are defined as

$$NX_t \equiv p_{r,t} Y^*_{r,t} - e_t p_m \varepsilon^{tot}_t Y_{m,t},$$

with ε^{tot}_t denoting terms-of-trade shocks. GDP is defined in units of the final good as

$$gdp_t = Y_{f,t} + NX_t.$$

3.5 Shock Processes

We assume that the world interest rate follows an AR(1) process

$$\bar{R}^*_t = (1 - \rho_{r^*})\bar{R}^* + \rho_{r^*} \bar{R}^*_{t-1} + \varepsilon^{r^*}_t,$$

where the deterministic steady-state value of the world quarterly interest rate is set to $\bar{R}^* = 1/\beta$. Other stochastic components follow $\ln \varepsilon^x_t = \rho_x \ln \varepsilon^x_{t-1} + \eta^x_t$, where $x \in \{a, y^*, w^*, cp, tot, \theta, \phi\}$, $\rho_x \in (0, 1)$, and η^x_t follows an i.i.d. normal distribution $N(0, \sigma^2_x)$.

4 Quantitative analysis

4.1 Methods

We estimate the model using Bayesian estimation techniques with several quarterly macroeconomic series. For Mexico, we use real GDP growth ($\Delta \ln GDP_t^{mex}$), real consumption growth ($\Delta \ln C_t^{mex}$), Consumer Price Index inflation rates (π_t^{mex}), real wage growth ($\Delta \ln w_t^{mex}$), and border encounter growth ($\Delta \ln enc_t$). U.S. variables include real GDP growth ($\Delta \ln GDP_t^{us}$), real wage growth ($\Delta \ln w_t^{us}$), and the change in the federal funds rate (Δr_t^{us}). The sample period spans from 1999Q4 to 2024Q4. The series Δr_t^{us} is demeaned and the other variables are linearly detrended. The estimation methodology follows Smets and Wouters (2007) and Mandelman and Zlate (2012). We use Dynare to conduct Bayesian estimation. Dynare estimates the mode of the posterior distribution by maximizing the log posterior function, which is obtained from the prior distribution and the data likelihood. A Metropolis–Hastings Markov chain Monte Carlo algorithm then generates 150,000 draws from the posterior distribution in each case. The initial 75,000 draws are discarded as burn-in. The algorithm also evaluates the marginal likelihood of the models.

4.2 Calibrated parameters

Table 1 summarizes the calibrated parameter values. The model period is a quarter. We set the subjective discount factor β to 0.98 following Aguiar and Gopinath (2007), which implies a quarterly real interest rate of approximately 2%. The inverse elasticity of intertemporal substitution η is calibrated to 1.01, the inverse Frisch labor supply elasticity ξ is set to 1.62, and the weight on labor disutility χ is set to 0.56 as in Bandeira et al. (2022). The labor share takes the standard value of 0.67. Following Devereux and Yu (2019), we set the elasticity of substitution between domestic and imported goods γ and the export elasticity γ_x to 5, consistent with recent estimates (e.g., Simonovska and Waugh, 2014; Imbs and Mejean, 2015). The elasticity of substitution among intermediate goods is set to $\varepsilon = 11$, ensuring a steady-state markup over marginal costs of 10%. The home bias in production ω is set at 0.75. The employment subsidy rate is set to $1/\varepsilon$ to eliminate distortions from monopolistic competition.

Table 1: Calibrated parameters

Parameter	Description	Value	Rationale
Preferences			
β	Discount factor	0.98	Aguiar and Gopinath (2007)
η	Inverse of intertemporal elasticity	1.01	Hansen and Singleton (1983)
ξ	Inverse of Frisch elasticity	1.62	Mandelman and Zlate (2012)
χ	Weight of labor disutility	0.56	Bandeira et al. (2022)
Production			
$1-\alpha$	Labor share in production	0.67	Standard value
ε	Elasticity of intermediate goods substitution	11	Bandeira et al. (2022)
γ	Elasticity of trade substitution	5	Devereux and Yu (2019)
γ_x	Elasticity of exports	5	Devereux and Yu (2019)
ω	Home bias in production	0.75	Imports/GDP
λ_p	Calvo price rigidity parameter	0.25	See text
τ	Employment subsidy rate	$1/\varepsilon$	See text
Labor market and migration			
$N_n/\bar{N}$	Share of not-in-labor-force	0.3	To ensure convergence
$N_e/\bar{N}$	Share of migrant stock	0.1	UN data (Mexico)
$u/(u+N)$	Unemployment rate	0.08	Boz et al. (2015)
θ	Firm's bargaining power	0.34	Leyva and Urrutia (2023)
μ_2	Elasticity of matches to vacancies	θ	Hosios condition
κ	Vacancy posting cost	0.17	1% GDP total vacancy costs
ben/w	Replacement rate	0.41	Bandeira et al. (2022)
ρ	Remittance function (coefficient)	0.41	See text
φ	Remittance function (exponent)	1	Mandelman and Zlate (2012)
w^*/w	Steady-state wage premium	2.2	Mandelman and Zlate (2012)
ψ_F	Vacancy-filling probability	0.83	See text
ψ_H	Job-finding probability	0.89	See text
ψ_H^*	Job-finding probability abroad	0.85	See text
σ	Job separation rate	0.072	Pappa et al. (2015)
σ^*	Job separation rate abroad	0.03	See text
ϕ	Migration cost	24.00	See text
Shock processes			
$\bar{R}^*$	Steady-state value of world interest rate	2%	$1/\beta$
A	Steady-state value of TFP	1	Normalization
ρ_{y^*}	Persistence of foreign output	0.75	See text
ρ_θ	Persistence of firm's bargaining power	0.75	See text
Policy rules			
α_y	Taylor rule (output)	0.50	Standard value

For labor market parameters, we use Mandelman and Zlate (2012) and Mexican data. We normalize the measure of nationals $\bar{N}$ to one. To ensure convergence, we assume that 30% of this measure are not in the labor force, and 10% are emigrants, based on the UN Population Division data. We set the unemployment rate to 0.08, close to the value used by Boz et al. (2015). We assume the Hosios condition by setting the elasticity of matches to vacancies equal to the bargaining power of firms, $\mu_2 = \theta = 0.34$. Workers' bargaining power $1 - \theta$ then equals 0.66, consistent with Leyva and Urrutia (2023). The steady-state ratio of vacancy posting to GDP is set to 1% following Bandeira et al. (2022), which implies $\kappa = 0.17$. As in Mandelman and Zlate (2012), we set the remittance elasticity parameter φ to 1, which is close to the prior and posterior values in their study, and the wage premium abroad to 2.2. We set the steady-state vacancy-filling and job-finding probabilities to $\psi_F = 0.83$ and $\psi_H = 0.89$, respectively. Kiguchi and Mountford (2019) employ the former value, while the latter calibration ensures that the job-finding rate abroad, ψ_H^*, becomes 0.85, which is close to the value adopted by Bandeira et al. (2022). The domestic job separation rate σ is set to 0.072 following Pappa et al. (2015) and its foreign counterpart, σ^*, is set to 0.03 to ensure convergence of the system. To limit the number of estimated parameters and to focus on the role of shock variances, we impose a persistence value 0.75 for foreign output and firm's bargaining power. The steady-state value of the technology parameter is normalized to $A = 1$. The Taylor parameter for the response to output deviation is assumed to be 0.5, a standard value in the literature.

We set the steady-state net foreign debt to 40% of GDP, close to the Mexican value based on the World Bank data. The country risk premium elasticity Γ is set to 0.10 to ensure convergence to the steady state. The steady-state rate of gross domestic inflation is set to one. The monetary policy parameters are set to $\alpha_\pi = 1.25$ and $\alpha_Y = 0.31$, following the IMF's (2016) estimates for Mexico. The coefficient of the migration cost function, ϕ, is determined by the steady-state system of equations (9), (12), and (16), together with the steady-state values of C_t and e_t. The steady-state value of remittances, Ξ, is set at 4.2% of GDP, corresponding to the 2022 ratio for Mexico in the World Development Indicators. The coefficient of the remittance function, ρ, is calibrated to match this value.

4.3 Prior distributions

Table 2 shows the priors and posterior distributions for the estimated parameters. The prior mean for the Taylor rule parameter describing the response to inflation is set to 1.5, a standard value in the literature. The monetary policy parameters α_π and α_e are assumed Gamma-distributed with a standard deviation of 0.5. Given the central bank's fear of floating, the prior mean for the response to exchange-rate movements, α_e, is set to a positive value. The prior mean for Calvo's price rigidity parameter is set to $\lambda_p = 0.25$, within the range typically estimated for EMEs. The persistence of the AR(1) processes follows a Beta distribution with mean 0.75 and standard deviation 0.05. The priors for the standard deviations of measurement errors on observables, σ_x^{me} with $x \in \{y, c, \pi, w^*, enc\}$, follow a common distribution of Gamma distribution with mean 0.15% and standard deviation 0.05%. We assume zero measurement errors for the other observable variables.

5 Results

5.1 Posterior distributions

The last three columns of Table 2 report the posterior mode, median, and 90% probability interval of the estimated parameters. The estimated Taylor coefficient for the real exchange rate, α_e, is positive and larger than the prior mean, indicating fear of floating in monetary policy management. Posterior means of shock standard deviations are mostly higher than their prior means. Posterior means of the persistence parameters ρ_x also exceed the prior means for most shocks. Although migration cost shocks exhibit the highest value ($\rho_\phi = 0.890$), external financial shocks also have high persistence ($\rho_{r^*} = 0.759$ and $\rho_{cp} = 0.768$). These estimates imply that external financial disturbances are both persistent and quantitatively important for macroeconomic and migration dynamics.

Table 2: Prior and posterior distributions

Description	Parameter	Prior			Posterior	
		Density	Mean	S.D.	Mean	[5%, 95%]
Structural parameters						
Financial friction	Γ	Gamma	0.10	0.50	0.033	[0.031, 0.036]
Price rigidity	λ_p	Gamma	0.25	0.05	0.250	[0.250, 0.250]
Taylor rule (inflation)	α_π	Gamma	1.50	0.50	1.474	[1.471, 1.477]
Taylor rule (real exchange rate)	α_e	Gamma	0.50	0.50	0.531	[0.530, 0.534]
Standard deviations						
Technology	σ_a	Gamma	1.00	0.50	1.88	[1.85, 1.91]
Monetary policy	σ_r	Gamma	1.00	0.50	1.68	[1.55, 1.84]
Bargaining power	σ_θ	Gamma	1.00	0.50	7.92	[7.91, 7.92]
Migration cost	σ_ϕ	Gamma	1.00	0.25	2.00	[1.97, 2.03]
Foreign output	σ_{y^*}	Gamma	1.00	0.50	1.11	[1.11, 1.12]
Foreign wage	σ_{w^*}	Gamma	0.70	0.50	0.42	[0.36, 0.47]
Terms of trade	σ_{tot}	Gamma	0.50	0.25	0.95	[0.92, 0.96]
Foreign interest rate	σ_{r^*}	Gamma	1.00	0.50	1.18	[1.13, 1.22]
Country risk premium	σ_{cp}	Gamma	0.65	0.30	1.00	[0.97, 1.03]
Persistence						
Technology	ρ_a	Beta	0.75	0.05	0.700	[0.699, 0.701]
Migration costs	ρ_ϕ	Beta	0.75	0.05	0.890	[0.872, 0.909]
Foreign wages	ρ_{w^*}	Beta	0.75	0.05	0.769	[0.762, 0.777]
Terms of trade	ρ_{tot}	Beta	0.75	0.05	0.774	[0.769, 0.779]
Foreign interest rate	ρ_{r^*}	Beta	0.75	0.05	0.759	[0.756, 0.762]
Country risk premium	ρ_{cp}	Beta	0.75	0.05	0.768	[0.763, 0.772]
Measurement errors						
Output	σ_y^{me}	Gamma	0.15	0.05	0.12	[0.12, 0.12]
Consumption	σ_c^{me}	Gamma	0.15	0.05	0.22	[0.21, 0.22]
Inflation	σ_p^{me}	Gamma	0.15	0.05	0.18	[0.18, 0.19]
Foreign wages	$\sigma_{w^*}^{me}$	Gamma	0.15	0.05	0.19	[0.18, 0.20]
Emigration (encounters)	σ_{enc}^{me}	Gamma	0.15	0.05	0.25	[0.24, 0.25]
Log marginal likelihood					184.21	

Notes: Standard deviations of shocks and measurement errors (except for inflation) are expressed in percentages. Standard deviations of inflation are expressed in percentage points. The posterior distribution is obtained using the Metropolis–Hastings algorithm.

Table 3: Variance decomposition (%)

Description	Shock	Output	Emigrant flows	Domestic unemp. rate	Inflation
Technology	ε_t^a	97.43	25.20	28.59	18.17
Monetary policy	ε_t^r	0.00	0.00	0.00	13.30
Bargaining power	ε_t^θ	0.39	1.18	15.54	0.07
Migration costs	ε_t^ϕ	0.15	38.07	28.40	0.21
Foreign demand	$\varepsilon_t^{y^*}$	0.04	0.92	0.68	0.15
Foreign wages	$\varepsilon_t^{w^*}$	0.02	8.72	6.31	0.03
Terms of trade	ε_t^{tot}	0.71	7.52	4.92	0.55
Foreign interest rates	$\varepsilon_t^{r^*}$	0.45	9.18	8.01	34.15
Country risk premium	ε_t^{cp}	0.43	9.22	7.55	32.72
External financial shocks		0.88	18.40	15.56	66.87

Notes: "External financial shocks" includes shocks to foreign interest rates and country risk premium. The contributions of measurement errors to output, emigrant outflows, the domestic unemployment rate, and inflation are 0.38%, 0.00%, 0.00%, and 0.64%, respectively.

5.2 Variance decomposition

Table 3 reports the results of variance decomposition. External financial shocks explain 18.40% of the variation in emigration outflows (foreign interest rate shocks: 9.18%; country risk premium shocks: 9.22%). Real exchange rate-related shocks, namely, external financial shocks (18.40%) and terms-of-trade shocks (7.52%), account for 25.92% of fluctuations in emigration in total. By contrast, the contribution of domestic monetary policy shocks is negligible. External financial shocks also explain more than 15% of the fluctuations in the domestic unemployment rate (foreign interest rate shocks: 8.01%; country risk premium shocks: 7.55%). These results indicate that changes in external financial conditions affect households' migration incentives and thereby influence domestic labor supply.

Shocks to technology, migration costs, and foreign wages explain a substantial portion of fluctuations in emigrant flows. Shocks to migration costs, which can be influenced by changes in U.S. immigration policies, are the dominant drivers among all shocks, explaining 38.07% of the variation. Shocks to foreign wages explain approximately 8.72% of the variation in emigration. These findings are consistent with those in Mandelman and Zlate (2012), who find that domestic and foreign technology shocks and migration cost shocks explain most of the fluctuations in emigration. Shocks to technology and migration costs also explain a significant portion of the fluctuations in domestic unemployment (28.59% and 28.40%, respectively), while

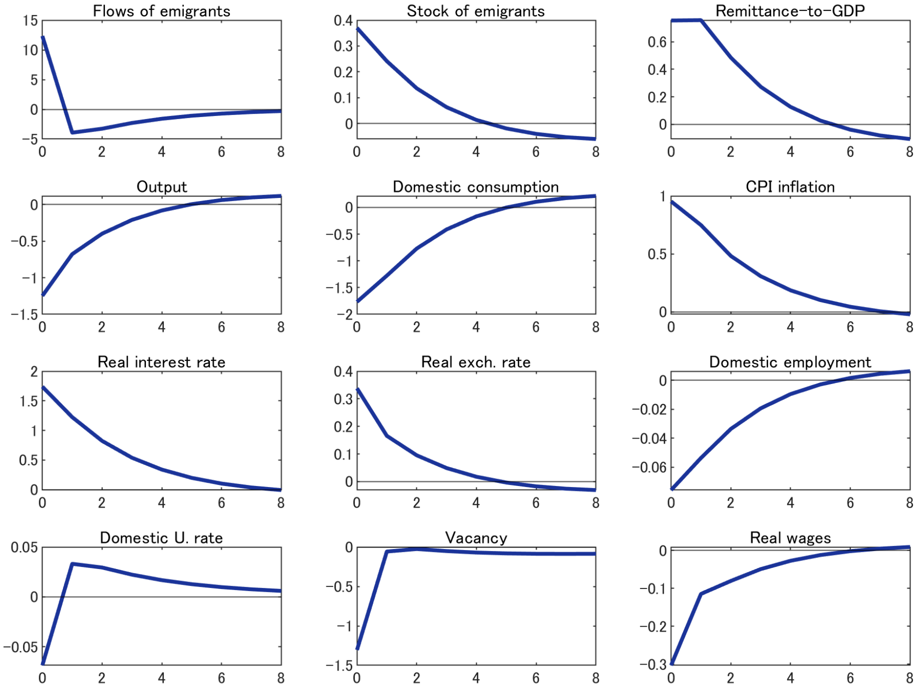

Figure 3: Impulse responses to a foreign interest rate shock

Notes: This figure shows the impulse responses to a 1% positive shock to the world nominal interest rate. Output, consumption, emigrant stock, real wages, employment, and net exports are shown in percentage changes from the steady-state levels. Other variables are shown as deviations from steady-state levels. "Domestic U. rate" is the unemployment rate of the home stayers.

bargaining power shocks account for 15.54%.[2]

5.3 Impulse responses

We now examine the impulse responses to shocks that contribute substantially in the variance decomposition shown above. Figure 3 depicts the impulse responses to a 1% increase in the world interest rate $\bar{R}_t^*$, using the posterior mean of the estimated parameters. A 1% rise in the foreign interest rate leads to a 12.33% increase in emigrant flows, $\psi_H^* s_t u_t$, and a 0.37% increase in emigrant stock $N_{e,t}$ on impact. The remittances-to-GDP ratio increases by 0.76 percentage points at the peak. These responses are qualitatively consistent with the empirical results in Figure 2, where border encounters (representing emigrant outflows) and the remittances-to-

[2]Whereas financial shocks explain a meaningful share of forecast error variance, the historical decomposition suggests that shocks to foreign wages, migration costs, and TFP played a larger role in realized fluctuations over the sample period.

GDP ratio increase in response to a positive federal funds rate shock. The estimated elasticity of emigration flows with respect to the foreign interest rate (12.33) is close to the VAR counterpart (14.90) from Section 2. A positive country risk premium shock, ε_t^{cp}, also raises the real interest rate on external debt, R_t^*, and generates broadly similar responses of the variables (not shown).

The responses of the other variables reveal the mechanism behind these dynamics. A higher world interest rate reduces consumption (by 1.77%) through the intertemporal substitution effect, leading to a decline in output, which decreases vacancies and wages. Lower wages suppress the value of being employed in the domestic labor market, $\lambda_{n,t}$, through equation (8). At the same time, the real exchange rate depreciates (e_t rises by 0.34 percentage points on impact) due to the UIP condition, which increases the domestic-currency value of foreign wages in equation (9) and exerts a upward pressure on the value of being employed abroad, $\lambda_{e,t}$. Therefore, emigrant stock increases whereas that of domestic employees decreases to satisfy equation (10). The resulting 1.25% drop in output reflects the changes in demand and labor supply, as well as the rise in the real interest rate in response to higher inflation. Lower domestic wages, local currency depreciation, and increased emigration raise altruistic remittance inflows.

6 Conclusion

This study examined the effects of external financial shocks on emigration dynamics in EMEs. We employed a two-pronged approach: (1) a structural VAR analysis using Mexican quarterly data from 1999Q4 to 2024Q4, and (2) Bayesian estimation of a small open-economy New Keynesian DSGE model with search-and-matching frictions and endogenous emigration decisions. The VAR analysis revealed that positive foreign interest rate shocks induce emigration outflows through domestic currency depreciation. The DSGE model estimation indicated that external financial shocks (foreign interest rates and country risk premia) explain approximately 18% of emigration fluctuations, with similar individual contributions from each shock type (9.18% and 9.22%, respectively). Real exchange rate-related shocks collectively account for 25.92% of emigration variation. Three major inferences emerge from this study. First, external financial conditions affect households' migration incentives by altering the domestic-currency value of foreign wages. Second, these shocks transmit to emigration primarily through exchange-rate movements and domestic labor-market adjustments. Third, migration cost shocks (potentially influenced by U.S. immigration policies) are the dominant driver of emigration fluctuations, explaining 38.07% of the variation. Our findings have important implications for research on migration and business cycles. They demonstrate that external financial conditions, particularly foreign interest rates and country risk premia, play a significant role in shaping emigration dynamics in emerging markets. This extends the DSGE migration literature by highlighting exchange-rate movements as a key transmission channel. Policymakers in EMEs should consider how external financial volatility influences labor mobility and domestic unemployment.

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