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Macroeconomic Factors that Conditioned International Migration from Ecuador: A Scientific Approach for the Period 2000-2021

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Abstract

Migration since ancient times has been a global phenomenon that is determined by many factors that influence people's decision to look for another country to settle. The research from a macroeconomic perspective analyzes in depth the factors that explain migration in the case of Ecuador, seeking to establish whether the changes suffered by the country have had an impact on the decisions to migrate. A Vector Autoregressive (VAR) model was chosen seeking to characterize the simultaneous interactions between the group of variables and establish whether the relationships are transmitted in the long term. The results indicate that the macroeconomic variable that exerts the greatest influence is unemployment, since an increase in the unemployment rate translates into an increase of 0.74% in migration to countries that offer job stability.

Keywords: *emigration, unemployment, real GDP, remittances, real salary.*

Introduction

Migration has become a relevant issue for governments. According to the International Organization for Migration (IOM) and the United Nations (UN), the global number of migrants has been increasing in recent decades; in 1980 it represented 2.3% of the world population, by 2000 it reached 2.8% and by 2020 it was 3.6%.

In Ecuador, international migration has become one of the most important events, which has had cultural, social and economic repercussions. From the 1950s until the end of the twentieth century with the banking crisis of 1999 and in the early years of this new century Ecuador has had strong migratory waves. Ecuadorians migrated mainly to countries such as the United States, Spain and Italy due to better living conditions in these places, especially attractive to women, who became the first group of migrants in the country (Espinosa Garcés & Jácome, 2018).

Among the socioeconomic causes that motivated Ecuadorian migration are government policies with no long-term vision, internal and external debt, unemployment, insufficient

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wages to cover basic needs, poverty, crime, and corruption. These critical conditions have led to increased poverty and social inequality in Ecuador (Saad et al., 2004).

Migratory balances between 1976 and 1990 averaged around 20,000 people per year. Since 1993, there has been a persistent increase, reaching 40,735 individuals in 1998, according to the records of the National Migration Directorate of the National Police. The important departure of Ecuadorians occurs from 1999 to 2003, generating a migratory balance for the period 1999 - 2007 of 954,396, this would imply that 7% of the Ecuadorian population moved abroad. (ECUADOR: International migration in figures 2008).

Among the difficulties that states have is in identifying the macroeconomic factors that support migration, based on the theoretical review carried out in the research of Ahmad, et al. (2008); Lapid, Lugtu and de la Cruz (2022); Portes and Forte (2017) Barahona and Veres (2019) and Yormirzoev (2017) the macroeconomic determinants are composed of wages in the host country, inflation, exchange rates, economic conditions in both the country of origin and destination.

The macroeconomic effects of remittances have become an important topic of analysis as a development tool. In that sense, macroeconomic determinants have increasingly begun to be analyzed to see if they can be used as a macroeconomic tool to attract more remittances (Ayvar Campos & Armas Arévalos, 2014; Barahona & Veres, 2019; Karras & Chiswick, 1999; Simionescu, 2016). One of the complexities faced by governments is the identification of the macroeconomic factors that encourage migration. Through theoretical studies, these factors have been determined to include variables such as wages in destination countries, inflation, exchange rates, and general economic conditions in both sending and receiving nations.

In addition, the macroeconomic impact of remittances has been established as a crucial field of analysis, given their relevance as an instrument of development. Consequently, the study of macroeconomic factors is being studied in depth with the aim of exploring their effectiveness as a mechanism for encouraging an increase in remittances. This research interest has been reflected in the works of Ayvar Campos and Armas Arévalos (2014), Barahona and Veres (2019), Karras and Chiswick (1999), and Simionescu (2016), who have addressed this issue in order to better understand these interactions.

The research is based on a review of the scientific literature on the macroeconomic determinants of international migration. Ahmad et al. (2008) in Pakistan, Lapid, Lugtu and de la Cruz (2022) in the Philippines, and Portes and Forte (2017) in the United Kingdom support the push-pull theory, arguing that migration flows originate due to push-out conditions in the country of origin to countries with better job opportunities and quality of life. Ahmad et al. (2008) also relate international migration to the unemployment rate, inflation and remittances, while other authors present contradictory results on the relationship between real wages and migration.

In addition, other studies, such as those by Mendoza Cota (2006) in Mexico, Portes and Forte (2017) in the United Kingdom, and Simionescu (2016), have introduced additional variables, such as GDP per capita and real GDP, to explain migration in their respective countries. The results vary according to the methodology used and the specific characteristics of each country.

Theories of international migration

Migration has been the subject of study for various researchers, who have investigated the reasons that lead people to leave their country of origin and seek residence elsewhere. As a result, several theories of international migration have emerged. Since migration is an ancient phenomenon that has been present throughout history, different economic currents have addressed this issue, from the classics to the present day. In the academic

literature, we find works by authors such as Massey et al. (2008), Gómez Walteros (2010), de la Garza Toledo and Bouzas (2000), Wickramasinghe and Wimalaratana (2017), and Micolta León (2005), who explain various theories and approaches that support the understanding of international migration.

The classical school, views international migration as beneficial. Adam Smith saw emigration as an essential part of production, allowing the free movement of productive factors and being an individual choice driven by wage differentials. In contrast, Thomas Malthus saw migration as a solution to overpopulation, being beneficial in the short run, but unsustainable in the long run. These authors were opposed to state regulation of mobility, as they believed that this only sought welfare (Castro Rodríguez, 2021).

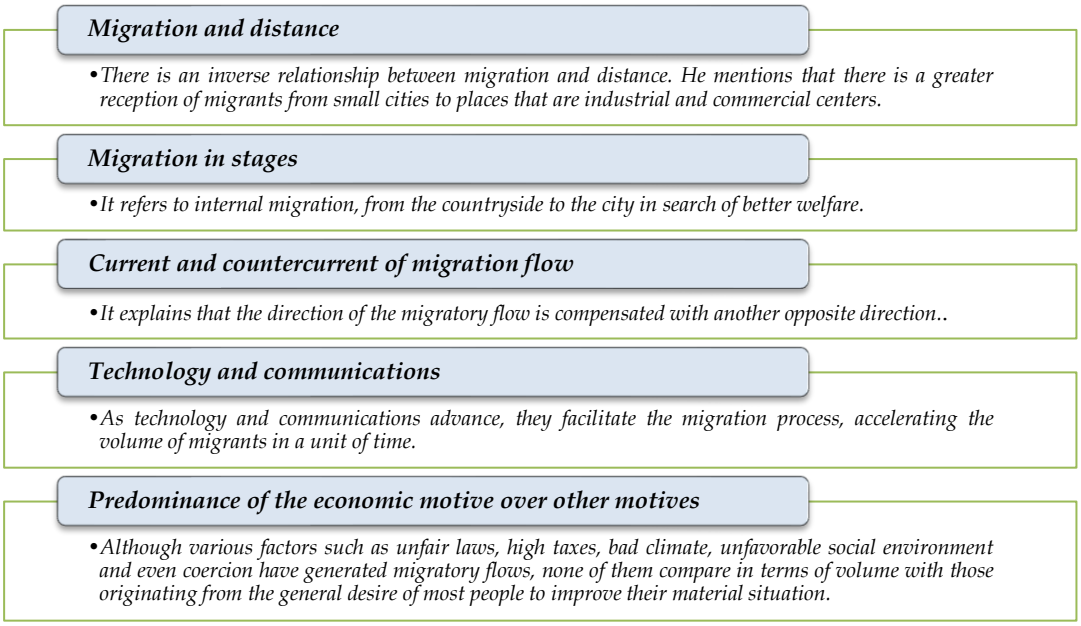
The Austrian school, represented by authors such as Ludwig von Mises (2004) and Friedrich Hayek (2010), considers international migration inseparable from liberal principles. Hayek defends tolerance towards migrants, arguing that the diversity of people in a country benefits productivity and advocates the elimination of national borders in favor of trade and competition. Julian Simon (1989, 1998), on the other hand, argued that migration should not be prohibited under any argument, comparing it to the interruption of imports into a country because they affected national production, arguing that this could have negative effects in the short run, but would be beneficial in the long run.

The neoclassical school, on the other hand, was the first to approach international migration from an economic perspective, focusing on the "rational choice" of individuals to maximize benefits and minimize costs in terms of utility of expected net returns to human capital. This theory was developed by Sjaastad, Harris and Todaro, who modified the ideas of the classical school, especially those of Adam Smith (Cantú Herrera & Alpuche de la Cruz, 2019).

The neoclassical approach examines migration from a labor perspective at two levels. At the macroeconomic level, it considers the situation of two countries: one with an abundant labor force and low wages, and another with a labor shortage and high wages. This causes individuals from the first country to seek employment in the second country, where they can earn more money. In summary, international migration is directly related to wage, economic and social differences between countries. To avoid a massive flow of people, the state should intervene through policies that regulate these wage differences (De la Garza Toledo & Bouzas, 2000). The second level is the microeconomic level, where the individual is the main actor and makes decisions based on a cost-benefit analysis. Individuals migrate in the hope of obtaining a positive net return as a reward for their investment in human capital, such as their education. This perspective emphasizes the importance of investment in human capital to mitigate the costs of travel and increase personal and social welfare (Massey et al., 1993).

In this context, Ravenstein's "Push-Pull" theory (1889) arises, who was one of the pioneers in explaining the behavior of migration from the country of origin and the country of destination. Ravenstein argued that there are push and pull factors in both countries. He also studied migration flows in terms of distance, formulating the "laws of migration" that conclude that economic disparities are the main cause of movement and that many international migrations are short-distance, with people moving from rural areas to urban centers for economic reasons. These long-term migration patterns follow a staggered behavior (Arango Vila-Belda, 1985). Research by different schools of thought has shed light on the complexity of international migration, and each of these theories provides a unique perspective on the reasons behind migratory movements. Based on the above, Figure 1 illustrates Ravenstein's principles.

Figure 1. Ravenstein's principles.



Note: Description of the most relevant principles considered by Ravenstein in his approach.

Source. Own elaboration based on data obtained from (Arango Vila-Belda, 1985; Gómez Walteros, 2010; Massey et al., 1993).

Of all the principles presented in Figure 1, the most relevant is the economic predominance that prompts people to make the decision to migrate internationally to countries that offer a stable outlook, thus fulfilling the push-pull theory.

The dual market theory developed by Michael Piore in 1979 indicates that international migration is more striking because of the permanent demand for foreign workers inherent in the economic structures of developed countries. He maintains Ravenstein's pull and push terms; however, he considers that migration does not originate from push factors in the sending countries, such as low wages or high unemployment, but depends more on pull factors in the receiving countries, such as the need for foreign labor. This labor demand is underpinned by four fundamental characteristics: structural inflation, where wages do not reflect supply and demand conditions and reflect a status inherent to the work performed by the person; motivational problems, which increase migratory flows, as nationals are not willing to perform jobs located at the bottom rung of the labor hierarchy, causing these jobs to be filled by migrants; economic dualism with a bifurcated labor market (man and machine) where the need to hire foreign labor is seasonal; and finally, the demographics of the labor supply that makes the labor market of the destination country more attractive due to the salary (De la Garza Toledo & Bouzas, 2000; Massey et al. , 2008; Wickramasinghe & Wimalaratana, 2017).

The new economic theory of labor migration (NELM) emerges to challenge some conclusions of neoclassical theory. In this theory, the decision to migrate internationally is not solely an individual one, but is also influenced by parental ties, as it focuses on family or community behavior (Stark & Bloom, 1985). People act collectively, and their objectives are not only limited to maximizing their income or income levels, but they also seek to minimize risks and reduce inadequacies in various markets, in addition to the labor market. When considering collective behavior, the aim is to compensate for the social problems of the families that remain in the country of origin by sending remittances, which benefits both parties by guaranteeing a better livelihood. In developed countries, risks are minimized through private insurance markets or government

programs, while in developing countries, these mechanisms are non-existent or imperfect (De la Garza Toledo & Bouzas, 2000; Massey et al., 2008; Wickramasinghe & Wimalaratana, 2017).

The world system theory, proposed by Wallerstein in 1974, is based on the interaction of the world as a whole, through constantly evolving political, economic, social and cultural relations (Robertson & Lechner, 2016). This theory is based on the existence of three types of countries: the central ones, which are developed economies with bargaining advantages and productive and technological superiority; the semi-peripheral ones, which are moderately industrialized economies dependent on the central countries to be competitive, with acceptable social and economic indicators; and finally, the peripheral countries, which are economies subordinated to the central ones, mostly dependent on natural resources and incompetent at the international level. This theory recognizes the incidence of capitalism and its insertion in developing countries, generating great imbalances since industries only took advantage of raw materials and cheap labor to obtain maximum profit and return to the investing country. These factors make people make the decision to migrate to developed countries to perform activities that natives are not willing to do (Gómez Walteros, 2010; Wickramasinghe & Wimalaratana, 2017).

On the other hand, network theory is based on the microeconomic approach, in which individuals or families make the decision to migrate based on the historical behavior of the networks around them (Vertovec, 2002). This theory argues that there is social capital that benefits individuals and affects their decisions to migrate. As migration increases, so does social capital, generating a feedback process that only stops when non-migrants who have the opportunity to migrate decide not to do so (Arango, 2002; Yans-McLaughlin, 2011).

International migration, according to network theory, occurs for two main reasons: cost reduction, as new migrants know that they will do well in the host country due to the experiences of previous migrants, and risk reduction, as the process of moving entails expenses that exceed people's budgetary constraints, resulting in indebtedness (Massey et al., 1993; Morawska, 2007).

Institutional theory, on the other hand, focuses on the role of institutions as a result of the high demand for migrants abroad, becoming a type of social capital. Migration flows depend on institutional networks, as the high demand for visas in the host country generates incentives for the creation of a black market or what is known as "illegal migration" by private groups. Institutions work to protect the welfare and integrity of migrants through the creation of humanitarian groups such as IOM, UN, UNHCR, among others (Gómez Walteros, 2010; Massey et al., 1993). Institutional networks can enter a growth spiral that is difficult for governments to control, since illegal organizations are not easy to control and greater control increases the price of the black market, which incentivizes the strengthening of these institutions (Massey et al., 2008). In addition, non-profit institutions experience growth due to increased demand for their services by people wishing to migrate.

Methodology

This research adopts an explanatory scientific approach to analyze international migration in Ecuador. By contrasting data and migration theories, it seeks to establish and understand the behavior of people when making the decision to migrate in search of better life opportunities.

The research focuses on the macroeconomic determinants of international migration in Ecuador, based on the theoretical review conducted by Ahmad, Hussain, Hussain Sial and Akram (2008). The main macroeconomic determinants that explain international migration are unemployment, real gross domestic product (real GDP), real wage and

remittances, supported by various authors who have also considered some of these variables in their analyses (Ayvar Campos & Armas Arévalos, 2014; Barahona & Veres, 2019; Karras & Chiswick, 1999; Simionescu, 2016).

Data were collected from secondary sources, such as the Central Bank of Ecuador (BCE), the National Institute of Statistics and Census (INEC), the Ministry of Tourism, the Ministry of Foreign Affairs and Human Mobility, and the Ecuadorian Migration System.

The methodology used is based on Vector Autoregressive (VAR) models, which are dynamic models developed by Christopher Sims in 1980. These models offer an alternative to traditional econometric modeling and allow for the analysis of empirical regularities and interactions between the variables under study.

The term "autoregressive" refers to the inclusion of lagged values of the endogenous variable, and the term "vector" indicates that one works with a set of two or more variables in the model. The objective is to find a relationship that adequately represents the dynamics of migration with a long-run equilibrium equation between the defined variables.

A VAR model generates efficient estimators even though it does not take into account the information contained in the covariance matrix of innovations. Together with the fact that the collinearity between the explanatory variables does not allow to be very strict in the interpretation of the t-statistics, it suggests that it is preferable to keep all the initial explanatory variables in the model.

Thus in the study it is posited that the covariance matrix of the innovations εt of the VAR model $\sum \varepsilon_t$; have zero covariance, since the correlation between y1t and y2t is already harvested by each of these variables in the equation of the other variable in the structural model. Thus, the possible correlation between the two variables in the model is explained by the contemporaneous effect of each of them on the other.

The above assumptions lead us to a dynamic structural model of the following form:

$$y_{1t} = \alpha_{10} + \alpha_{11}y_{2t} + \alpha_{12}y_{1t-1} + \alpha_{13}y_{2t-1} + \varepsilon_{1t} \quad (1)$$

$$y_{2t} = \alpha_{20} + \alpha_{21}y_{1t} + \alpha_{12}y_{1t-1} + \alpha_{13}y_{2t-1} + \varepsilon_{1t} \quad (2)$$

VAR Model

$$y_{1t} = \beta_{10} + \beta_{11}y_{1t-1} + \beta_{12}y_{2t-1} + u_{1t} \quad (3)$$

$$y_{2t} = \beta_{20} + \beta_{21}y_{1t-1} + \beta_{22}y_{2t-1} + u_{2t} \quad (4)$$

In this study, migration is evaluated by analyzing the number of international departures, quantified in quarterly periods. Within the model used, migration acts as the dependent variable, while the unemployment rate, real Gross Domestic Product (GDP) and real salary are established as the independent variables. Additionally, the volume of remittances received by Ecuador each quarter is included as a variable that potentially attracts migrants, supporting this approach with Ravenstein's theory, which distinguishes "push" and "pull" factors in migratory movements.

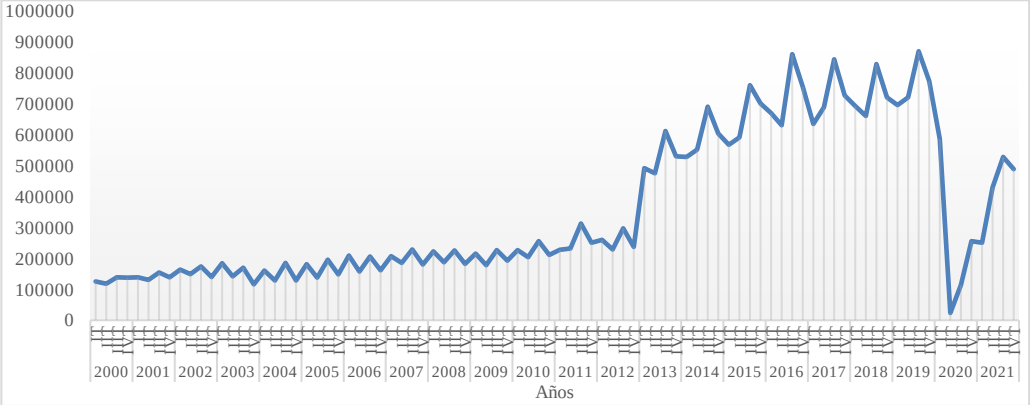
As for the theories that explain migratory behavior, the study focuses mainly on the "neoclassical approach", which is based on economic considerations. This approach emphasizes the search for higher incomes due to wage differences between countries and the personal and occupational progress that can be achieved in the host country. It also takes into account the "Ravenstein approach", which emphasizes two fundamental factors: attraction and push-pull. These factors influence people's decisions to migrate internationally, depending on the economic and social conditions in their country of origin.

Results

International Departures in Ecuador

In the Ecuadorian case, the migratory wave began during the Fabián Alarcón administration, but experienced an exponential growth during the mandate of Jamil Mahuad. The year 1999 left one of the most heartbreaking and distressing images in the memory of Ecuadorians, as the country was immersed in one of the deepest crises in its history: the banking crisis of 1999 (Luque et al., 2019; Ramírez Gallegos & Ramírez, 2005). In this context, Ecuadorian families made the decision to emigrate to other countries in search of job opportunities that would allow them to improve their socioeconomic well-being and purchasing power, with the purpose of contributing economically to the livelihood of their families who remained in the country. The data on international departures are presented below on a quarterly basis for the period 2000-2021.

Figure 2. Quarterly evolution of international departures in Ecuador, period 2000 - 2021 in persons.



Note: There is a long-term growth trend; however, there was a contraction in 2020 due to the COVID-19 health crisis.

Source. Own elaboration based on data obtained from (Ministerio de Turismo del Ecuador, 2022).

In 2013, there was a dramatic increase in international departures due to the elimination of visa requirements and economic growth. In 2018, emigration peaked due to lack of employment, insecurity and family reunification. In the first quarter of 2020, emigration dropped sharply due to the COVID-19 pandemic and border closure measures. However, from the second quarter of 2020, there was a recovery due to economic recovery and the gradual opening of borders with biosecurity measures.

Unemployment in Ecuador

Unemployment is a persistent problem worldwide, especially in Latin America, due to economic, political and social imbalances. Governments seek to reduce unemployment rates to avoid economic and social tensions (Jumbo Lapo, 2002). In Ecuador, unemployment contributes to inequality between social classes, which affects the production and consumption of goods and services (Encarnación Ramírez, 2008).

Unemployment in Ecuador peaked at 16.10% in the first quarter of 2000 due to the banking crisis of 1999 and for the period between 2000 and 2003 the rate was reduced to 7.70% in the fourth quarter of 2002 (López Fiallos, 2021). In 2003, despite the 6.90% growth in GDP attributable to favorable external conditions, unemployment rose to 10.53%, in view of the magnitude of the external debt, the overvalued real exchange rate and limited competitiveness. Between 2004 and 2007, unemployment remained high.

From 2007 to 2017, investment and public spending kept unemployment between 8% and 5%. In 2020, COVID-19 raised unemployment to 16.82%, but in the third quarter of 2020, it dropped to 8.59% with the economic reactivation (López Fiallos, 2021; INEC, 2022b).

Gross Domestic Product at constant prices in Ecuador

Ecuador's real GDP grew by an average of 5.20% between 2000 and 2006 due to stabilization policies, and investments in the oil sector, highlighting the operation of the Heavy Crude Oil Pipeline [OCP] in 2004 (Banco Central del Ecuador [BCE], 2006, 2010). From 2007 to 2017, public investment and social spending were emphasized, tax reforms were implemented (Jácome Estrella, 2007).

Between 2018 and 2021, real GDP stagnated due to fiscal adjustment measures and the COVID-19 crisis that caused a 12.14% drop in the second quarter of 2020 (Guayaquil Chamber of Commerce, 2017; Sanchez et al., 2021). Between 2020 and 2022 there was a growth of 3.66% on average.

Real wages in Ecuador

Basic wage setting involves negotiations between employers and employees, with government intervention in case of disagreement. Factors such as inflation, the consumer price index, labor productivity and employment in the informal sector are considered (Amaya, 2022; Berrezueta Carrión, 2016).

The real wage in Ecuador for 2000 was $203.40 in the first quarter, but increased to $284.58 in the fourth quarter of that year. Between 2001 and 2007, it remained relatively constant. In 2008, there was a significant increase to $263.01(Banco Central del Ecuador, 2022d; Instituto Nacional de Estadística y Censos [INEC], 2023; Varela, 2012).

In the period 2099 - 2016, Ecuador's real wage increased 3.41% on average. Between 2017 and 2022, the real wage remained stationary, with a growth rate of 0.79% on average (Banco Central del Ecuador, 2022d; Instituto Nacional de Estadística y Censos [INEC], 2023; Varela, 2012).

Remittances in Ecuador

Emigration is a common phenomenon in Latin America, driven by factors such as poverty, unemployment, natural disasters and insecurity. Ecuador is no exception, and emigration has been mainly due to economic crises that affect the social welfare of its citizens (Tobar Pesántez, 2020). To mitigate the economic impact on migrants' families, remittances are sent, which are financial or in-kind transfers made by migrants to their relatives in the country of origin (Migration Data Portal, 2022). Studies show that these remittances benefit the economy of the country of origin, especially the most vulnerable strata, by increasing income and helping to meet basic needs, as well as to face economic challenges (Ratha, 2013; United Nations Development Programme [UNDP], 2011).

During the 2000-2020 period, emigration of Ecuadorians doubled, reaching one million people who went mainly to the United States, Spain and Italy, with a higher proportion of women (Tobar Pesántez, 2020). This increase in emigration resulted in a significant increase in remittances in the country, going from $289.70 million dollars in the first quarter of 2000 to $635.60 million dollars in the first quarter of 2006, representing an increase of 119%.

Between 2007 and 2017, a decrease in remittances was observed due to the 2008 global financial crisis, with a 22% reduction in the fourth quarter of 2008 compared to the fourth quarter of 2007 (Aguilera, 2015; Ocampo, 2009). Beginning in 2015, remittances experienced a gradual increase and peaked in the fourth quarter of 2019 at $843.30 million, which represented an increase of 32.64%. The year 2020 was negatively

impacted by the COVID-19 pandemic, resulting in remittances totaling $677.40 million (Ong, 2020).

Remittances play an important role in the Ecuadorian economy, accounting for approximately 3.8% of GDP in 2021, with 50.20% of remittances channeled through private banking (Swissinfo, 2022). The record increase in remittances is attributed to the economic stimulus provided by the U.S. Government in response to the COVID-19 crisis, with a significant increase in the second quarter of 2021, reaching $1.141 billion sent to the country.

Econometric model results

The objective of the research is to determine the macroeconomic variables that affect the migration decisions of Ecuadorian families, for this an Autoregressive Vector model (ARV) was chosen seeking to characterize the simultaneous interactions between the group of variables and to establish whether the relationships are transmitted in the long run.

Data were collected from secondary sources, such as the Central Bank of Ecuador (BCE), the National Institute of Statistics and Census (INEC), the Ministry of Tourism, the Ministry of Foreign Affairs and Human Mobility, and the Ecuadorian Migration System.

The main macroeconomic determinants that explain international migration are unemployment, real gross domestic product (real GDP), real wages and remittances.

In the methodological analysis, variance tests, unit root analysis, cointegration tests, determination of the optimal number of lags, model stability tests and verification of the residual assumptions were performed. In addition, the impulse response function, variance decomposition and causality in the Granger sense were carried out.

With the above mentioned, the econometric model for the estimation of the VAR in the research is:

$$Y_{1t} = \beta_0 + \beta_1 Y_{1(t-1)} + \beta_2 X_{1(t-1)} + \beta_3 X_{2(t-1)} + \beta_4 X_{3(t-1)} + \beta_5 X_{4(t-1)} + \mu_{1t} \quad (5)$$

$$X_{1t} = \gamma_0 + \gamma_1 Y_{1(t-1)} + \gamma_2 X_{1(t-1)} + \gamma_3 X_{2(t-1)} + \gamma_4 X_{3(t-1)} + \gamma_5 X_{4(t-1)} + \mu_{2t} \quad (6)$$

$$X_{2t} = \delta_0 + \delta_1 Y_{1(t-1)} + \delta_2 X_{1(t-1)} + \delta_3 X_{2(t-1)} + \delta_4 X_{3(t-1)} + \delta_5 X_{4(t-1)} + \mu_{3t} \quad (7)$$

$$X_{3t} = \theta_0 + \theta_1 Y_{1(t-1)} + \theta_2 X_{1(t-1)} + \theta_3 X_{2(t-1)} + \theta_4 X_{3(t-1)} + \theta_5 X_{4(t-1)} + \mu_{4t} \quad (8)$$

$$X_{4t} = \rho_0 + \rho_1 Y_{1(t-1)} + \rho_2 X_{1(t-1)} + \rho_3 X_{2(t-1)} + \rho_4 X_{3(t-1)} + \rho_5 X_{4(t-1)} + \mu_{5t} \quad (9)$$

Where:

$Y1t$ = International Departures in Ecuador in quarterly values.

$X1t$ = Real wage in dollars.

$X2t$ = Quarterly unemployment rate.

$X3t$ = Quarterly real GDP.

$X4t$ = Quarterly remittances in thousands of dollars.

After performing the variance tests, the data were transformed to logarithms to avoid heteroscedasticity problems. In addition, the ADF test was performed for the unit root test and then the Engel Granger test was performed to verify if the residuals present unit root, it is verified that in the three contrasts of the ADF test the residuals are stationary in mean, being necessary the application of an autoregressive model, that is to say, a VAR model. In addition, it is observed that there is a long-run equilibrium relationship according to the Engel-Granger criterion.

The optimal number of delays was calculated based on the following test statistics [LR], the final prediction error [FPE], the Akaike information criterion [AIC], the Schwarz information criterion [SC] and the Hannan-Quinn information criterion [HQ], it is suggested to work with 3 delays.

Calculation of the VAR model.

Table 1. Estimation of the VAR model without restrictions. Estimation of the VAR model with the optimal number of lags, which is 3.

	DLOGSAL	DLOGDES	DLOGPIBR	DLOGREM	DLOGSRE
DLOGSAL(-1)	-0.258069	0.016863	-0.013168	-0.050115	0.005341
	(0.21377)	(0.08529)	(0.01013)	(0.04070)	(0.05409)
	[-1.20723]	[0.19771]	[-1.29965]	[-1.23118]	[0.09875]
DLOGSAL(-2)	-0.104845	0.142162	-0.016506	0.003739	-0.053494
	(0.19563)	(0.07805)	(0.00927)	(0.03725)	(0.04950)
	[-0.53594]	[1.82135]	[-1.78017]	[0.10039]	[-1.08063]
DLOGSAL(-3)	-0.201012	0.031816	0.000230	0.022906	0.051870
	(0.20237)	(0.08074)	(0.00959)	(0.03853)	(0.05121)
	[-0.99327]	[0.39403]	[0.02393]	[0.59442]	[1.01292]
DLOGDES(-1)	0.042148	-0.345473	-0.007404	0.060610	-0.148607
	(0.47565)	(0.18978)	(0.02254)	(0.09057)	(0.12036)
	[0.08861]	[-1.82040]	[-0.32840]	[0.66921]	[-1.23469]
DLOGDES(-2)	0.745875	0.032871	0.008045	0.072912	0.187018
	(0.49295)	(0.19668)	(0.02336)	(0.09386)	(0.12474)
	[1.51309]	[0.16713]	[0.34435]	[0.77679]	[1.49931]
DLOGDES(-3)	-0.697483	0.055016	-0.011965	-0.016790	0.185542
	(0.50863)	(0.20294)	(0.02411)	(0.09685)	(0.12870)
	[-1.37131]	[0.27110]	[-0.49630]	[-0.17336]	[1.44162]
DLOGPIBR(-1)	0.870338	-0.090890	0.111234	-0.014970	-1.312002
	(4.70884)	(1.87876)	(0.22318)	(0.89662)	(1.19153)
	[0.18483]	[-0.04838]	[0.49840]	[-0.01670]	[-1.10111]
DLOGPIBR(-2)	3.645011	-2.053212	0.522195	0.105190	2.200868
	(4.23854)	(1.69112)	(0.20089)	(0.80707)	(1.07253)
	[0.85997]	[-1.21411]	[2.59936]	[0.13033]	[2.05204]
DLOGPIBR(-3)	-2.467703	1.503041	-0.218828	-0.616133	0.549540
	(4.45910)	(1.77912)	(0.21135)	(0.84907)	(1.12834)
	[-0.55341]	[0.84482]	[-1.03539]	[-0.72566]	[0.48704]

DLOGREM(-1)	1.192031	-0.248374	0.039159	0.113712	-0.269542
	(0.66763)	(0.26638)	(0.03164)	(0.12713)	(0.16894)
	[1.78546]	[-0.93242]	[1.23751]	[0.89448]	[-1.59551]
DLOGREM(-2)	-0.051645	0.212467	-0.032211	-0.025834	0.287570
	(0.67753)	(0.27033)	(0.03211)	(0.12901)	(0.17144)
	[-0.07622]	[0.78596]	[-1.00306]	[-0.20024]	[1.67734]
DLOGREM(-3)	0.058450	-0.254405	0.010085	-0.036134	-0.088773
	(0.67645)	(0.26990)	(0.03206)	(0.12881)	(0.17117)
	[0.08641]	[-0.94260]	[0.31456]	[-0.28053]	[-0.51862]
DLOGSRE(-1)	0.129229	0.073239	-0.000172	-0.103156	-0.959528
	(0.16748)	(0.06682)	(0.00794)	(0.03189)	(0.04238)
	[0.77160]	[1.09601]	[-0.02161]	[-3.23466]	[-22.6411]
DLOGSRE(-2)	0.047352	0.188635	-0.002570	-0.011438	-0.977144
	(0.17158)	(0.06846)	(0.00813)	(0.03267)	(0.04342)
	[0.27598]	[2.75548]	[-0.31600]	[-0.35009]	[-22.5061]
DLOGSRE(-3)	0.106865	0.161908	-0.004531	-0.018653	-0.899937
	(0.17297)	(0.06901)	(0.00820)	(0.03294)	(0.04377)
	[0.61782]	[2.34605]	[-0.55273]	[-0.56635]	[-20.5612]
C	-0.012330	-0.005113	0.004126	0.018748	0.021032
	(0.06135)	(0.02448)	(0.00291)	(0.01168)	(0.01552)
	[-0.20097]	[-0.20888]	[1.41888]	[1.60477]	[1.35472]
R-cuadrado	0.351523	0.327306	0.168667	0.382333	0.957920
R-cuadrado adjunto	0.208477	0.178918	-0.014716	0.246083	0.948637
Suma de residuos cuadrados	11.34308	1.805709	0.025482	0.411267	0.726296
Ecuación E.S.	0.408424	0.162956	0.019358	0.077769	0.103348
Estadístico F	2.457407	2.205739	0.919754	2.806115	103.1975
Probabilidad logarítmica	-35.09807	42.08342	221.0347	104.2210	80.33496
AIC de Akaike	1.216621	-0.621034	-4.881779	-2.100501	-1.531785
Schwarz SC	1.679633	-0.158021	-4.418766	-1.637488	-1.068772
Media dependiente	0.015035	-0.006354	0.006992	0.013454	0.011582
S.D. dependiente	0.459070	0.179836	0.019217	0.089566	0.456015

Note. The statistical indicators of the VAR model are correct, the R2 of the real wage is the highest.

Source. Own elaboration based on data obtained from Eviews 10.

With respect to the Akaike criterion in the five models, it is observed that they have a range of (-4.88 to 1.22). The stability test was performed, where all the values were less than one, so it satisfies the stability condition. To validate the model, autocorrelation and normality tests were performed.

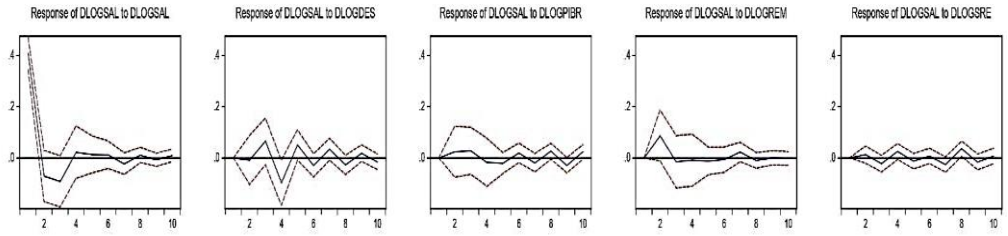
VAR model equation

The model equation can be analyzed in the short and long term, as shown in equation (10).

$$\Delta LogSalidas = -0.258\Delta logSal_{(t-1)} - 0.105\Delta LogSal_{(t-2)} - 0.201\Delta LogSal_{(t-3)} + 0.042\Delta logdes_{(t-1)} + 0.746\Delta logdes_{(t-2)} - 0.697\Delta logdes_{(t-3)} + 0.870\Delta logPibr_{(t-1)} + 3.645\Delta logPibr_{(t-2)} - 2.468\Delta logPibr_{(t-3)} + 1.192\Delta logRem_{(t-1)} - 0.052\Delta logRem_{(t-2)} + 0.058\Delta logRem_{(t-3)} + 0.129\Delta logSre(t-1) + 0.047\Delta logSre(t-2) + 0.107\Delta logSre(t-3) - 0.012 \quad (10)$$

Unemployment shows that with one and two lags the sign is positive, i.e., higher unemployment results in a greater outflow of people. On the other hand, real GDP has a positive effect in the first two lags and in the third lag it becomes negative, indicating that the greatest effect is produced starting in the third quarter. Regarding remittances, we see that their sign is unstable, going from positive to negative and positive, so their effect is not clear in the analysis. Finally, with respect to real wages, its relationship is positive in the three periods analyzed, indicating that it is a non-important variable in the analysis.

Figure 3. Response impulse function of the VAR model. Cholesky response with a S.D. (adjusted d.f.) Innovations ± 2 S.E.



Note. All long-term variables are no longer significant in the model. Source. Own elaboration based on data obtained from Eviews 10.

Figure 3 shows that, in the face of a shock in international outflows, there is a positive impact up to the second period. From the fourth to the tenth period the series becomes a steady state, in equilibrium. With respect to an unemployment shock in international outflows, a positive impact is generated until the third period, from then on it has a decreasing behavior, that is to say, its impact is more short term. On the other hand, a real GDP shock in international outflows generates a positive effect until the third period, after which the effect is slight.

With respect to remittance shocks on international outflows, there is a positive effect until the third period, when it decreases slightly, and from the fourth period onwards it reaches a constant long-term behavior. Finally, a real wage impulse or shock to international outflows generates a slight impact. In conclusion, the shocks received by international outflows due to an impact of the explanatory variables are relatively short term and mild, since from the fifth period onwards they enter a constant behavior.

Variance decomposition examines the inevitable prediction error in each variable at a given horizon, and attributing it to the uncertainty about the future evolution in each of

the variables. It is, therefore, a way of making inference about the intertemporal relationships between the variables that compose the vector y: To do this, the components of each variance are expressed in percentage terms. If a variable is practically exogenous with respect to the others, then it will explain almost 100% of the variance of its prediction error at all possible horizons. This is more usual at short horizons, while at long horizons, other variables may explain a certain percentage of the variance of the prediction error.

In this sense, we see that the international outflows variable is the most exogenous both in the short and long term, since its variance component is between 95% and 83%. It is followed by the unemployment variables with values between 0.04% and 8.94% and remittances with values of 4% and 3.95% respectively, the rest of the variables have much lower values, which indicates that the possible changes are a function of other variables.

Table 2. Causality in the Granger sense

Null Hypothesis:	Obs	F-Statistic	Prob.
DLOGDES does not Granger-cause DLOGSAL	84	4.88448	***
DLOGSAL does not Granger-cause DLOGDES		0.31701	*
DLOGPIBR does not Granger-cause DLOGSAL	84	1.49672	*
DLOGSAL does not Granger-cause DLOGPIBR		2.31853	**
DLOGREM does not Granger-cause DLOGSAL	84	3.65291	***
DLOGSAL does not Granger-cause DLOGREM		3.10217	***
DLOGSRE does not Granger-cause DLOGSAL	84	2.29659	**
DLOGSAL does not Granger-cause DLOGSRE		0.07213	*

Nota. *** p < 0,01; ** p < 0,05; * p>0.05.

Source. Own elaboration with data obtained in Eviews 10.

In the first set of hypotheses we observe a unidirectional behavior of unemployment, towards international outflows, given that its probability is less than 1%, HO is rejected. In other words, unemployment is one of the causes to be considered in the country when explaining international migration.

In the second set of hypotheses, there is a unidirectional behavior between international outflows and real GDP, since their probability is less than 5%. In the case that the outflows cause real GDP due to the outflow of skilled labor, resulting in a decrease in production processes, the third set of hypotheses shows a unidirectional behavior between international outflows and real GDP.

The third set of hypotheses shows a long-term bidirectional behavior between remittances and international outflows, based on economic theory, specifically Ravenstein's theory, which mentions that remittances are an attraction for people to migrate because they provide security in terms of the quality of life in other countries. And departures cause remittances, because people who migrate send money to their relatives in the country, as economic compensation to meet their needs, thus helping to reduce social inequality.

In the fourth set of hypotheses, a unidirectional behavior is observed between the real wage and international departures, arguing that the socioeconomic malaise of people due to the limitation in the purchasing power of the basic basket of goods due to the real wage increases the desire to migrate internationally.

Discussion of results

After estimating the model, it was possible to see the relationship between the explanatory variables with international outflows, where it was evidenced that unemployment is an important variable to explain migration, a direct relationship was obtained in the long term towards migratory flows, this is in agreement with the studies carried out by Ahmad et al. (2008), Ayvar Campos and Armas Arévalos (2014), Dinbabo and Nyasulu (2015), Etzo (2008), Karras and Chiswick (1999), Lapid et al. (2022), Mendoza Cota (2006), Portes and Forte (2017) and Sprenger (2013), proving and accepting the hypothesis that a higher unemployment rate in the country of origin drives emigration to other host countries that provide greater economic and social stability.

For Figueroa Hernández, Ramírez Abarca and Espinosa Torres (2012) and Kiguchi and Mountford (2017), the migratory stampede in the country has become a social problem, due to the lack of job opportunities for thousands of people seeking decent employment. In Ecuador, most workers are in the classification of underemployment or unsuitable employment, receiving an income below the minimum living wage, causing social discontent, (Instituto Nacional de Estadística y Censos [INEC], 2022a). Another point to be addressed is that unemployment induces a lack of productivity in the country, largely caused by the flight of human capital, it should be emphasized that productivity considers two essential factors: education and employment, and if there is a lack in one of these two aspects, productivity drops generating a negative effect for the country of origin and a positive effect in the country of destination (Nicodemo, 2013; F. Simon & Stark, 2007).

With respect to real GDP as a determinant of international migration, a causal relationship of international outflows to real GDP was obtained. This is consistent with the study by Ratha, Mohapatra, Vijayalakshmi and Xu (2007) who concluded that emigration generates a positive impact on the real GDP of the economy by the receipt of remittances, since remittances increase the demand for goods and services, which translates into higher production and economic growth. However, studies such as those by Blyde, Busso and Ibáñez (2020) and Canales Cerón (2011), in their research, concluded that migratory flows generate negative effects on the real GDP of the home country, due to the loss of human resources and, above all, to the brain drain of highly trained professionals, which is why investment in human capital declines. Along the same lines, Ecuador can experience both positive and negative changes, since it is well known that remittances are an essential contribution for Ecuadorians, and, in fact, are already counted as part of the GDP.

Regarding the relationship of real GDP to international outflows, according to the literature review, a negative relationship was expected; however, for the Ecuadorian case, a direct relationship of real GDP to the behavior of the migratory flow was obtained. Canales Cerón, Fuentes Knight and de León Escribano (2019) reached the same deduction, in their study where they analyzed some Latin American and Caribbean countries to the United States. It was evidenced that the increase in real GDP can generate greater emigration in the short term, due to income inequalities together with a greater demand for goods and services. The works of Dinbabo and Nyasulu (2015), Karras and Chiswick (1999) and Naudé (2010) concluded that real GDP is positive from the point of view of the variable as an attraction, following Ravenstein's theory, since people migrate to developed countries to obtain jobs with high salaries that allow them to satisfy their needs and increase their quality of life.

Remittances, on the other hand, had a bidirectional behavior to international outflows, given that both are significantly caused. Works such as those of Aumedo Dorantes, Geoges and Pozo (2010), Ratha and Maimbo Munzele (2005) and Yang (2011) evidenced this bidirectional behavior in their results, arguing that this variable can act as an incentive to emigrate or as a disincentive to leave the country, since remittances provide economic support to families residing in the country of origin, which reduces poverty,

increasing their quality of life and improving their socioeconomic condition. However, remittances also act as a motivator to migrate since, with the receipt of money, migrants finance either partially or totally the cost of travel.

Regarding the relationship of remittances as an explanatory determinant, the null hypothesis that remittances act as an attractive factor for migrating from the country was rejected. For Ecuador, remittances have an inverse relationship with international migration, i.e., a decrease in the receipt of remittances increases the desire to migrate. This result is ideal in terms of theory, since families not receiving economic aid from abroad increase their social discomfort, as they do not have the purchasing power to consume goods and services, thus increasing social inequality and poverty in the country, encouraging migratory flows. In agreement with the results obtained from Aggarwal, Dermiguc - Kunt, Martínez Pería (2011), Cohen (2011), Curran (2016) and Garavito Elías and Torres Baños (2004).

Finally, the real wage causes in Granger's sense international departures, from the perspective that low levels of real wages generate discomfort and concern in the acquisition of goods and services contemplated in the basic family basket, since it would increase the gap between social classes being a motivator to migrate internationally in search of acquiring higher incomes in countries with high wages, given that companies in these countries hire foreign labor to reduce their labor costs (Ahmad et al., 2008).

Regarding the relationship between real wages and international migration, it was observed that in the long term there is a direct relationship between these variables, which is explained from the point of view of Ravenstein's theory with the attraction factors in the host countries, given that migrants seek to settle in countries that provide them with high remuneration compared to that received in their own countries. In addition, the hiring of foreigners is attractive for companies in developed countries, since their labor costs are reduced, increasing their competitiveness (Borja & Lawrence, 2007; Gang & Rivera Batiz, 1994; Munshi, 2003).

Conclusions

In the research, the neoclassical theory with Ravenstein's approach, with its so-called "push-pull" opposite poles, is the most accurate to explain migratory flows, since it mentions that there are expulsion effects such as: financial crisis, political instability, corruption, insecurity and unemployment, so people migrate to more stable countries, which provide jobs and security, these are factors of attraction allowing Ecuadorians to develop in a better way, ensuring their quality of life.

Ecuadorian migratory flows have been more important since the banking crisis of 1999. The instability of the country was evident since 1997, an increase in poverty and extreme poverty, an increase in inflation that reached 96% in 2000, an increase in unemployment, and a loss of purchasing power of salaries. All this had an impact on the population, encouraging emigration to countries such as the United States, Spain and Italy: United States, Spain and Italy. This is related to the structural declines that encourage the flight of skilled and unskilled human capital.

When the econometric model was run, it became evident that unemployment is the one that best explains migration flows in the long term with a direct relationship. Remittances affect migration flows from a bidirectional causality, i.e., they act as a reason for migrants to leave, but at the same time this departure generates an effect on remittances.

Real GDP as a determinant of international migration, a positive causal relationship was obtained. This is consistent with the study of Ratha, Mohapatra, Vijayalakshmi and Xu (2007) who concluded that emigration generates a positive impact on the real GDP of the economy by receiving remittances. The real wage causes in the sense of Granger to

international departures, from the perspective that low levels of real wages generate discomfort and concern in the acquisition of goods and services included in the basic family basket, since it would increase the gap between social classes being a motivating factor to migrate internationally.

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