Macroeconomic variables of the United States and their effect on Mexican migration and remittances

Variables macroeconómicas de Estados Unidos y su efecto en la migración y las remesas de mexicanos

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Abstract

The objective was to analyse the influence of GDP per capita, the unemployment rate, the United States interest rate, and the exchange rate on migration and remittances of Mexican migrants in the United States. A model of simultaneous equations of the number of migrants and Mexican remittances in the United States with respect to the unemployment rate, the interest rate, the United States' Gross Domestic Product per capita, of the exchange rate, the number of migrants and remittances from Mexicans United States of the previous period. The results were: for the NMt equation, given an increase of 10.0% of the GDPpercaEUt, of the GDPpercaEUt-1, and of the NMt-1, migrants increased by 5.1%, 5.5%, and 4.9% on average respectively. For the remittances function, by increasing the UEUt by 1.0%, the GDP percaEUt, and Ret-1 would increase by 0.3%, by 6.5, and remittances by 3.7% on average, ceteris paribus. In conclusion, for the number of migrants the most significant were the GDP per capita of the United States and the number of migrants from the previous period; for remittances, the Gross Domestic Product per capita, the number of migrants and remittances from the previous period.

Gross Domestic Product per capita, Unemployment Rate, and inflation rate of the United States, Mexican migration, Remittances

Resumen

El objetivo consistió en analizar la influencia del PIB per-cápita, de la tasa de desempleo, de la tasa de interés de Estados Unidos, y el tipo de cambio sobre la migración y las remesas de los migrantes mexicanos en Estados Unidos. Se elaboró un modelo de ecuaciones simultáneas del número de migrantes y las remesas de mexicanos en Estados Unidos con respecto a la tasa de desempleo, la tasa de interés, el Producto Interno Bruto per-cápita de Estados Unidos, del tipo de cambio, el número de migrantes y las remesas de mexicanos Estados Unidos del periodo anterior. Los resultados fueron: para la ecuación del NMt, ante un incremento de 10.0% del PIBpercaEUt, del PIBpercaEUt-1, y del NMt-1, los migrantes aumentan en 5.1%, 5.5%, y en 4.9% en promedio respectivamente. Para la función de las remesas al aumentar en 1.0% el UEUt, el PIBpercaEUt, y de Ret-1 se incrementarían en 0.3%, en 6.5%, y en 3.7% las remesas en promedio, ceteris paribus. En conclusión, para el número de migrantes las más significativas fueron, el PIBper-cápita de Estados Unidos y número de migrantes del periodo anterior; para las remesas, el Producto Interno Bruto per-cápita, del número de migrantes y de las remesas del periodo anterior.

Producto Interno Bruto per-cápita, Tasa de desempleo, Tasa de inflación de Estados Unidos, Migración mexicana, Remesas

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Introduction

International migration consists of a movement of people across borders with the intention of residing in a country other than their own, which is a complex phenomenon with strong economic, political, social and cultural implications, both for the countries of origin and of destiny; with a growing influence from the local to the international sphere due to the integration of economies, the development of the media, economic growth, the needs of labor markets and military and political conflicts (BBVA Bancomer and CONAPO, 2016).

In 1965, the world population was 3,332 million people, of which 2.4% were international migrants. By 2017, the global population increased to 7.55 billion and international migrants accounted for 3.4%. The increase in migration is due to different factors: environmental, economic and cultural, among others. Simultaneously, mechanisms emerged for mobility to destination countries to occur under selectivity schemes (BBVA Bancomer and CONAPO, 2019).
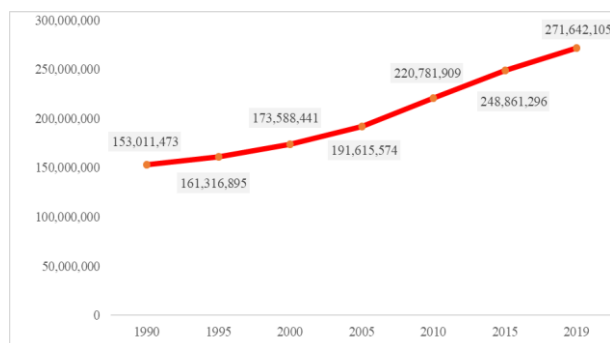

Figure 1 Migrants worldwide, 1990-2019
Source: Prepared with data from the United Nations, 2019

The migratory phenomenon has grown remarkably during the last decades. In 1990 it was estimated that 153 million people lived in a country other than the one where they were born, which increased to 244 million in 2015 (BBVA Bancomer and CONAPO, 2016).

The number of migrants worldwide in 2019 was estimated at 270 million, with the United States being the main destination, with almost 51 million. "This number is a very small percentage of the world's population, barely 3.5%, which means that the vast majority of people reside in the country where they were born, that is, 96.5%."

According to the United Nations (UN, 2019), more than half of international migrants (141 million) live in Europe and North America, it was estimated that 52.0% of the world number were men and that almost two thirds of they leave their country in search of work.

The number of international migrants increased from 153 million in 1990 to about 272 in 2019. Although the number of international migrants worldwide represents a small proportion of the total population, it has increased from 2.8% in 2000 to 3.5% in 2019, that is, in recent years the number of them has grown more than the world population (UN, 2019).

In 2017, there were 258 million international migrants representing 3.4% of the world's population. About 64.0% lived in high-income countries, where the percentage of immigrants went from 10.0% in 2000 to 14.0% in 2017 with respect to the total population. In the United Arab Emirates, Kuwait and Qatar, immigrants made up the majority group. For middle-income countries, immigration rates were two to three times higher than the world average, including Costa Rica, Côte d'Ivoire, Malaysia and South Africa. While in Albania, Georgia, Jamaica, Kyrgyzstan and Nicaragua they exceed 5.0% of the population. The busiest migration corridor goes from Mexico to the United States of America. Other routes run from Eastern Europe to Western Europe, from North Africa to Southern Europe, and from South Asia to the Gulf States (UNESCO, 2018).

The International Monetary Fund (IMF) pointed out that foreign migration can reduce economic growth in the countries of origin through a decrease in the supply of labor and productivity, especially when it comes to workers who are skilled. However, it also considered that remittances sent by migrant workers to their countries of origin are a mitigating factor (to the reduction of economic growth) as they constitute an important and relatively stable source of financing (Hernández, 2017); since remittances are the most visible and tangible benefit of labor migration. At the macroeconomic level, they contribute foreign currency and help to correct the current account balances in the countries of origin. In many countries, remittances represent a high percentage of the Gross Domestic Product (GDP).

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Through their direct and multiplier effects, they sustain demand, and therefore stimulate economic activity. As a result, they generate employment, at the family level remittances can contribute to the reduction of poverty and the development of human capital through investments in education and health care (Awad, 2009).

The crisis that affected most of the economies in the world during 2008 and 2009 led to a reduction in international mobility. However, the recovery of the labor market in various countries, particularly the United States, contributed to the reactivation of migratory flows (BBVA Bancomer & CONAPO, 2016). In Latin America, economic crises and the difficulties in overcoming them awaken an interest in people to migrate to other economies, encouraged either by the differences between supply and demand of work or by salary discrepancies. This migratory phenomenon has been presenting a considerable flow of remittances for the economies of Latin America, which have effects on the economic dynamics of these countries (Tarazona, Cuadra, Romero, and Fajardo, 2018).

Mexico does not escape this situation, in 2015 it ranked second with the highest number of migrants worldwide with 12.3 million, surpassed by India (15.6 million). Mexican migration has been concentrated primarily in the United States with 98.0% of nationals to this country, Canada and Spain complete the list of the three main destinations of Mexican migration with 1.0%, and the rest to other countries of the world total (BBVA Bancomer and CONAPO, 2016, p. 38).

In the period 2007-2009, a decrease in global migratory mobility was observed due to the international financial crisis, however, the rebound that was perceived in 2010 revealed that mobility would continue to increase due to growing demographic, economic, and political inequalities and social, to the effects of environmental change, to the new world political and economic dynamics, to technological revolutions and social networks (Domínguez, 2011).

International migration has shown changes in volume, trends, modalities and sociodemographic characteristics (Ramírez & Aguado, 2013). An important feature was that the migrants came from almost every country in the world and a considerable part migrated between border countries or within their own region. An increasing proportion of migrants are heading in particular to some important and renowned (global) cities that concentrate economic decisions, financial activities and specialized services of international companies, as well as production in innovative companies (Pellegrino, 2008).

During 2019, the dataset showed that 38 of international migrants represented 14.0% of those under 20 years of age globally. The majority of youth of all international migrants were from sub-Saharan Africa about 27.0%, followed by Latin America and the Caribbean, and North Africa and West Asia, about 22.0% each. Likewise, three out of every four international migrants, or 202 million are of working age, that is, between 20 and 64 years of age. Regarding distribution by sex, women represented about half of all migrants (48.0%), most of them were registered in North America (52.0%) and Europe (51.0%), and the smallest in sub-Saharan Africa (47.0%) and in Northern Africa and Western Asia (36.0%) (UN, 2019a).

Another characteristic of international migrants indicates that of every two people who carry out an international movement (emigrate or immigrate), one of them does so at a productive age (from 20 to 39 years old). This is consistent with the average age of emigrants from 2008 to 2014 (from 29.9 to 31.7 years). Regarding the level of schooling, without instruction and with basic education, it decreased from 74.7% in 2008 to 68.1% in 2014. On the other hand, people who emigrated with a high school and higher level increased from 25.3% in 2008 to 31.9% in 2014 (INEGI-ENOE, 2008-2014).

Mexican migration and remittances in the face of the economic crisis in the United States

According to the geographic characteristics and the socioeconomic stability of the United States, it is attractive for migrants (especially Mexicans) to go to that country (Jiménez, 2010).

However, the current panorama of Mexico-United States migration is different from the one that prevailed a few years ago, since the migratory flow to that country has decreased and the Mexican population living there has stagnated (Ramírez and Meza , 2011). Until 2007, Mexican immigration showed a growing and high rate, reaching 11.9 million people. As of that year, this trend slowed down to decrease in 2008 to 11.8 million in the American Union (Canales, 2012). One of the influencing factors was the economic recession resulting from the credit and mortgage crisis that affected the US economy since late 2007 and spread to all the world's economies in 2008. This crisis marked a setback in the growth of the economy. Mexican migration to that country since the 1980s (Ramírez and Meza, 2011).

According to the National Population Council (CONAPO), the phenomenon of Mexican migration to the neighboring country is due to an eminently labor process, immersed in a context of great economic inequalities. According to Jiménez (2010), this displacement occurred under the premise that human beings sell their workforce outside their place of origin, due to lack of minimum conditions to obtain adequate remuneration in the local market and, consequently, a positive social reproduction, for which there is a displacement categorized as cheap labor, which satisfies the demand in different productive branches, from technology to agricultural work in the United States.

The sectors where Mexican migrants mainly concentrated in the United States were construction, commerce, and manufacturing. In each of these, the number of employees that existed at the beginning of the crisis was close to two million people, the loss was greater in construction with about 26.0% of jobs, compared to manufacturing with 16.0 % and trade with 8.0%. For manufacturing and commerce, they began to show improvement, for workers of Mexican origin, in the first quarter of 2010 (BBVA Bancomer, 2010).
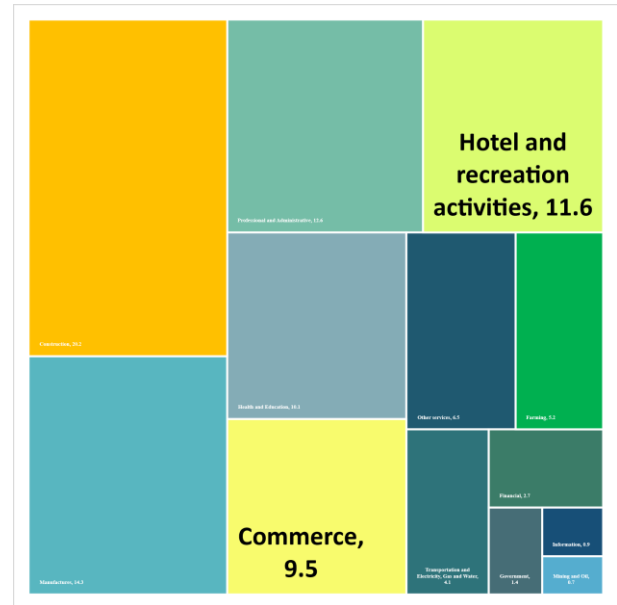
Note: * Employed population aged 15 and over. People who work in the US military are excluded

Figure 2 Distribution of the Mexican migrant population in the United States according to economic activity *, 2018 (%)
Source: Prepared with data from BBVA Bancomer and CONAPO, 2019

In 2018, the main economic activities in which the Mexican migrant population worked in the US were construction (20.2%), manufacturing (14.3%), professional and administrative activities (12.6%), hospitality activities and recreation (11.6%), health and education (10.1%) and commerce (9.5%) and to a lesser extent those of Government (1.4%), Information (0.9%), Mining and oil (0.7%), see figure 2.

The main consequence of the reduction in migration from Mexico to the United States was the drop in monetary remittances sent by migrants to their families in their communities of origin. According to Banco de México, sustained growth had been registered since the first years of the last decade, which accelerated after 2003 and remained until 2007 with around 26 billion dollars. At the end of 2007 these decreased, and in 2009 they were 21,245 million. In 2010, they grew by 21.271 million dollars, a lower level than the total remittances received in 2007, which represented a fall of 18.3% between 2007 and 2010 (Ramírez and Meza, 2011).

For 2014, Mexican families received close to 24.231 million dollars in remittances, 7.3% higher than that registered by foreign direct investment (FDI) and 49.0% higher than foreign exchange from international tourism. According to the Migration and Remittances Yearbook produced by BBVA Research, in 2014 Mexico was ranked fifth among the countries that received the most remittances, below India, China, the Philippines and France. Mexican households that receive remittances are characterized by belonging to rural localities with a high degree of marginalization. And with an average level of primary schooling by the heads of the family (Esquivel, 2015).
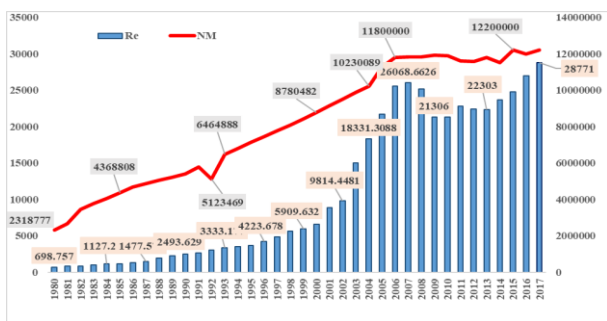
Figure 3 Behavior of the number of migrants and remittances, 1980-2017
Source: Own elaboration with data from Banxico and BBVA Bancomer, 2015, 2017 and 2018.

From figure 3, it can be seen how the number of migrants has been increasing at a rate of 4.72% and for remittances of 10.88% on average for the study period of migrants in the United States.

Literature review

The migration of Mexicans has existed since the beginning of the 19th century, going through times of ups and downs explained by different factors (economic asymmetries and complementarities, economic ups and downs, war events), but at the end of the so-called "lost decade" there was a restructuring of the migratory patterns of Mexicans to the United States. This change was preceded by the different crises in the Mexican economy (1976, 1982, 1994-95 and 2008), manifesting itself in a large number of people employed in the informal economy, unemployed and emigrants. On the other hand, the characteristics of the North American economy: an increase in the demand for low-skilled labor due to a gradual aging process of its population (Figueroa-Hernández and Pérez-Soto, 2011).

In the literature there are various research works that relate remittance flows with economic growth and other macroeconomic variables. In this regard, Meyer and Shera (2017) observed the impacts of remittances on the economic growth of Albania, Bulgaria, Macedonia, Moldova, Romania and Bosnia Herzegovina during the period 1999-2013, because these countries had experienced an increase in the flow of remittances. Economic growth as a dependent variable and using a multiple regression analysis obtained that workers' remittances contributed positively and significantly to economic growth in these countries, and that the productive use of these flows could contribute to maintaining and improving growth through consumption and investment.

The contribution to economic growth of Mexican migrants who work and reside in the United States almost quadrupled from 1994 to 2010, for the latter (2010) it increased to 586 billion dollars, which represented 4.0% of the GDP of the United States and 38.0% of that of Mexico, as well as 76.0% of the FDI captured in the country (Canales, 2011).

On the other hand, Macias (2016) carried out a study to determine the relationship of the flow of remittances in Mexico with macroeconomic variables. He proposed two econometric models, placing remittances as a dependent variable in both according to the GDP of Mexico, the GDP of the United States, the National Consumer Price Index of Mexico (INPC), the INPC of the United States, the exchange rate, the 28-day interest rate, exports and imports. The first model showed that remittances arriving in Mexico from the United States were unproductive, since most of them were used for family consumption. The second showed that this flow increased when the United States economy grew, but if prices rose, remittances fell, since immigrants will have to allocate a greater amount of their salary for their consumption in that country, it also revealed that if the Mexico's economy was not growing or was going into crisis, migrants would have to send a greater amount of remittances. This increase would have the purpose of maintaining the purchasing power of families in Mexico.

Batu (2017) used the standard model of the open economy of the Real Business Cycle (RBC), in order to evaluate the effectiveness and economic impact of worker remittances on the growth of GDP per capita taking data from 81 countries in a period between 1970 and 2012. The methodology used was a calibration of the RBC model of a small open economy. Analyzing data from the model, he estimated that only worker remittances that were temporary in nature had a positive impact on GDP per capita in the long run. The two previous investigations agreed that the remittances generated by workers had a positive participation in GDP, whether temporary or permanent, however, this effect on GDP was considered as the increase in capital flows without taking into account that the ultimate purpose of these resources was intended for consumption or investment (Tarazona et al., 2018). In accordance with the above, the contribution of this research consists in analyzing the influence of GDP per capita, the unemployment rate, the United States interest rate, and the exchange rate on migration and remittances from Mexican migrants in the United States. The hypothesis proposes that the number of migrants and remittances from Mexicans in the United States are directly related to GDP per capita, the exchange rate, and inversely to the interest and unemployment rates in the United States.

Theoretical framework

Simultaneous Equation Models (MES) is a set of equations where there is a two-way relationship. Such models focus on the estimation and / or prediction of the mean value of Y conditional on the fixed values of the variables X. Consequently, the cause-effect relationship in these models ranges from `from X to Y` or` from X to Y`. This happens when Y is determined by X and some X, in turn are determined by Y. That is, there is a two-way relationship. In these models, the jointly dependent variables are called endogenous, and the non-stochastic, exogenous or predetermined, in which there is more than one equation: one for each of the mutually dependent or endogenous variables, and it is not possible to estimate the parameters of an equation `by itself` without taking into account the information of the others in the system. In order to estimate the parameters of the system of equations, each equation in the model has to be checked (Gujarati and Porter, 2010, p. 673 and 691).

The equations that are known as structural or behavioral equations: they are so called because they `show the structure (of an economic model) of an economy or the behavior of an economic agent (for example, a consumer or a producer). The unknowns α and β are known as structural parameters or coefficients. From the structural equations it is possible to solve for the M endogenous variables, but not necessarily to derive the equations in reduced form and the corresponding coefficients in reduced form. An equation in reduced form is one that expresses only an endogenous variable in terms of the predetermined variables and stochastic shocks (Gujarati and Porter, 2010, p. 673 and 691).

The identification problem tries to establish whether the numerical estimates of the parameters of a structural equation can be obtained from the estimated coefficients in reduced form. If it can be done, the particular equation is considered to be (exactly) identified or over-identified if more than one numerical value can be obtained for any of the parameters of the structural equations, if not, the equation under consideration is unidentified or under-identified. In a model of M simultaneous equations, for an equation to be identified, the number of predetermined variables excluded (K - k) said equation must not be less than m-1 (Gujarati and Porter, 2010, p. 699), that is:

If, $K - k = m - 1$, the equation is exactly identified.

If, $K - k > m - 1$, the equation is overidentified.

If, $K - k < m - 1$, the equation is under identified.

Where K is the number of predetermined variables in the model, including the intercept, k is the number of predetermined variables in each equation, M is the number of endogenous variables in the model, and m is the number of endogenous variables in each equation. It should be noted that an exactly identified equation can be estimated using Indirect Least Squares (ICM). An over-identified equation can be estimated using Two-Stage Least Squares (LS2E) and an under-identified one cannot be estimated by any method (Gujarati and Porter, 2010, p. 699).

Methodology

To carry out the research, different sources of information were consulted: such as the World Bank (WB), Food and Agriculture Organization of the United Nations (FAO), United Nations (UN), United Nations Department of Economic and Social Affairs United Nations (DESA), International Labor Organization (ILO), United Nations Educational, Scientific and Cultural Organization (UNESCO), International Organization for Migration (IOM), the National Institute of Statistics and Geography (INEGI), Banco de México (B de M or Banxico), Center for Public Finance Studies of the Chamber of Deputies (CEFP), BBVA Bancomer Foundation (BBVA Bancomer, AC), National Population Council (CONAPO), among others; from where data were obtained on remittances, number of Mexican migrants, exchange rate, per-capita GDP, unemployment rate and the interest rate of the United States.

With the information obtained, a database for the period 1980-2018 was generated for the mentioned variables. Due to the interrelation between endogenous and predetermined variables, an econometric model of simultaneous equations was formulated with the objective of analyzing the relationship between the number of migrants and remittances from Mexicans in the United States with the unemployment rate. , the interest rate, the annual GDP per capita of the United States, the exchange rate, the number of migrants and the remittances of Mexicans delayed one period.

The econometric model of simultaneous equations in this investigation consists of two fundamental relationships:

The first equation relates the number of Mexican migrants in the United States (NMt), as a function of remittances (Ret), the unemployment rate of the United States (UEUt), the annual Gross Domestic Product per-capita (GDP percaEUt) and delayed a year (PIBpercaEUt-1) from the United States, and number of migrants delayed one year (NMt-1). The second relates remittances (Ret) according to the number of migrants (NMt), Exchange rate (Et), Mexican remittances delayed one year (Ret-1), the United States unemployment rate (UEUt), the Annual per-capita Gross Domestic Product of the United States (GDP percaEUt) and the interest rate of the United States (iEUt).

Variables of the system of simultaneous equations

The model proposed in this work is shown below:

Endogenous variables (M): NMt = Number of Mexican migrants in the United States, Ret = Remittances from Mexicans for the year.

Default variables (K): Ret-1 = Family remittances delayed one year (Millions of dollars); NMt-1 = Number of migrants delayed one year (Number of people); Et = FIX nominal exchange rate ($ / Dollar); UEUt = United States Unemployment Rate (% of the Civilian Labor Population); it = United States interest rate (%); GDP percaEUt = Annual per capita Gross Domestic Product of the United States (Billions of dollars at 2009 prices); GDP perchEUt-1 = Annual per-capita Gross Domestic Product of the United States lagged one year (Billions of dollars at 2009 prices).

$$NM_t = \beta_0 + \beta_1 Re_t + \beta_2 UEU_t + \beta_3 NM_{t-1} + \beta_4 PIBpercaEU_t + \beta_5 PIBpercaEU_{t-1} + \varepsilon_t \quad (1)$$

$$Re_t = \alpha_0 + \alpha_1 NM_t + \alpha_2 E_t + \alpha_3 Re_{t-1} + \alpha_4 UEU_t + \alpha_5 PIBpercaEU_t + \alpha_6 i_t + \varepsilon_t \quad (2)$$

Identification of the model

To carry out the identification of the structural equations of the system of simultaneous equations, the order condition was considered (Gujarati and Porter, 2010). In practice, this condition is generally adequate to ensure identifiability.

Equation number	K-k	m-1	K-k ≥ m-1	ID
1	7 − 4	2 − 1	3 > 1	Over identified
2	7 − 5	2 − 1	2 > 1	Over identified

Table 1 Identification of order of the model of simultaneous equations of NMt and Ret
Source: Own elaboration

As shown in Table 1, the two structural equations of the model were over-identified, therefore, to estimate the structural parameters of the equations, the method of least squares in two stages (LS2E) was used using the statistical package Statistical Analysis System (SAS), which is designed to handle over-identified equations (Gujarati and Porter, 2010).

Article

Analysis and discussion of results

In this section, the statistical and economic analysis was carried out on the basis of the structural coefficients estimated from the LS2 method and its relationship with economic theory. Finally, the elasticities were calculated and interpreted.

Statistic analysis

In the results of the analysis of variance, emphasizing the coefficient of determination (R2), the value of the calculated F (Fc), the mean square of the error and the value of the partial t's for each of the estimators. To test the statistical significance of each of the regression equations, the following sets of hypotheses were considered:

1) $H_0: \alpha_1 = \alpha_2 = \ldots = \alpha_n = 0$ contra $H_a: \alpha i \neq 0$,

2) $H_0: \beta_1 = \beta_2 = \ldots = \beta_n = 0$ contra $H_a: \beta i \neq 0$ para $i \geq 1$.

DEPENDENT VARIABLE	INDEPENDENT VARIABLES				
Model 1					
NM_t	Re_t	UEU_t	$PIBpercaEU_t$	$PIBpercaEU_{t-1}$	NM_{t-1}
Coefficient	-4.62	50902.76	93.63	100.15	0.49
t_c	-0.31	0.95	1.07	1.26	**3.19**
P	0.76	0.34	0.29	0.21	**0.0032**
R^2= 0.992 R^2 adjusted = 99.109					
F-valor = 823.76					
Prob>F = <.0001					

Table 2 Analysis of variance of model 1
Source: Own elaboration with the output of the statistical package SAS

The results of the analysis of variance (Table 2) indicated that for the equation of the number of migrants (NMt) the Fc = 823.76 was greater than the Ft, 0.05 (5, 32) = 2.51, therefore the null hypothesis was rejected (Ho) in favor of the alternative hypothesis (Ha), that at least one of the parameters estimated by the LS2E regression was different from zero. The number of migrants according to the determination coefficient (R2) was explained in 99.2% by the variables included in the equation. Regarding the individual test, the highly significant variable was: NMt-1 with a t value of 3.19> 1; Among the least significant according to the statistical results were: GDPperchEUt-1 and PIBperchEUt with t values of 1.26 and 1.07> 1 respectively. However, the Re and UEU were not significant.

DEPENDENT VARIABLE	INDEPENDENT VARIABLES					
Equation 2						
Re_t	NM_t	E_t	iEU_t	UEU_t	$PIBpercaEU$	Re_{t-1}
Coeficiente	**-0.004**	51.23	204.19	528.03	**1.67**	**0.96**
t_c	**-2.34**	0.18	0.55	0.94	**2.26**	**9.93**
P	**0.025**	0.86	0.58	0.35	**0.031**	**<.0001**
R^2= 0.97636 R^2 adjusted = 97.178						
F-valor = 213.35						
Prob>F = <.0001						

Table 3 Analysis of variance of model 2
Source: Own elaboration with the output of the statistical package SAS

Regarding the global test, Fc = 213.35 was greater than Ft, 0.05 (6, 31) = 2.41 with a probability of <0.0001, so the null hypothesis (Ho) was rejected in favor of the alternative hypothesis (Ha), which indicates that at least one of the parameters estimated by means of the LS2E regression is non-zero. The coefficient of determination (R2) indicates that the variable Ret was explained in 97.6% by the variables included in the equation (Table 4). The variables Ret-1, NMt and PIBpercaEUt turned out to be highly significant with a t value of 9.93> 1, -2.34> 1 and 2.26> 1 respectively. Those that were not significant UEUt, iEUt and Et with a value of t of 0.94, 0.55 and 0.18> 1 (Table 3).

Economic analysis

The estimated model for the number of migrants (NM), based on equation (1) and with the previously estimated parameters, was the following:

$$\widehat{NM} = -4705891 - 4.62Re - 50902.76UEU \mp 93.63PIBpercaEU + 100.15PIBpercaEU_{t-1} + 0.49NM_{t-1} \tag{3}$$

According to equation 3, the Gross Domestic Product per capita of the United States in the period 1980 to 2018, the number of Mexican migrants will increase. Due to an increase in unemployment in the United States, it will cause fewer migrants to the American Union.

This situation has been evident since 2000, Mexican migrants have increased their importance in the United States labor market, for every Mexican migrant employed in that country, there were four retired American workers, so some Mexican migrants active in the labor sector contributed to pensions and social security benefits for some of the retired Americans.

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The contribution of Mexicans in taxes (direct and indirect) to the US economy was much higher than what they sent to their relatives in Mexico, it was around double. According to figures from the Information System on International Migration and Development (SIMDE), Mexican migrants paid taxes in 2008 about 53 billion dollars, an amount well above the 25 billion dollars they sent in remittances. . Social security benefits in the US include more than just health care. About 60.0% of Mexican migrants do not have access to health services. Furthermore, in most cases, basic education was received in Mexico (BBVA Research, 2011); this investment was not financed by the United States.

The estimated model for remittances (Re), based on equation (2) and with the previously estimated parameters, was the following:

$$\bar{Re} = -46892.5 - 0.004NMt + 51.23E + 204.19iEU + 528.03UEU + 1.67PIBpercaEU + 0.96Re_{t-1} \qquad (4)$$

Remittances (Re) showed an increase in the face of an increase in the exchange rate (E), the interest rate of the United States and the Gross Domestic Product per-capita of the United States, as unemployment in the United States increased, the amount increased of employed Mexican migrants, causing an increase in remittances. Finally, the exchange rate also increases remittances.

Vargas-Silva (2009) analyzed the relationship between remittances, the exchange rate and demand in Mexico. The author found that there is a two-way relationship between remittances and the exchange rate. Furthermore, positive changes in remittances tend to appreciate the real exchange rate in Mexico. Although remittances can serve as a source of external financing for the country; The results also suggest that as remittances appreciate the Mexican peso, but harm exports to the world market.

López and Cruz (2016) concluded that remittances are determined by variables that directly affect the income of emigrants (growth of the GDP of the host country and of the real salary of migrants).

Second, that the macroeconomic variables belonging to the host or issuing country have a greater effect on the flow of remittances than the variables of the emigrant's country of origin, when judging by the magnitude of the coefficients of real GDP growth per capita of the United States and of the real wage of Hispanics, in contrast to the coefficients of the growth of the real GDP per capita and the open unemployment of the country of origin. Finally, it is clear that senders from the United States send remittances to Central America and the Dominican Republic for altruism reasons rather than for investment reasons, given the weak significance and small magnitude of the coefficient of the interest rate differential.

Economic interpretation of elasticities

The economic results of the elasticities in their structural form for each of the equations are shown in the following table:

$\varepsilon_{Re}^{NM} = -0.006$	$\varepsilon_{NM}^{Re} = -2.82$
$\varepsilon_{Re_{t-1}}^{Re} = 3.72$	
$\varepsilon_{UEU}^{NM} = 0.038$	$\varepsilon_{E}^{Re} = 0.029$
$\varepsilon_{PIBpercaEU}^{NM} = 0.516$	$\varepsilon_{iEU}^{Re} = 0.079$
$\varepsilon_{PIBpercaEUt-1}^{NM} = 0.548$	$\varepsilon_{UEU}^{Re} = 0.281$

Table 4 Elasticities of the model in its structural form
Source: Own elaboration with data from SAS outputs

The short-term elasticities, which were obtained from the model estimators, are presented in table 4, among the most outstanding are the following: in the case of the NMt equation, in the face of an increase of 10.0% in GDP percaEUt, Migrants will increase by 5.16%, while, for the GDP percaEUt-1 of the previous period, it will cause an increase of 5.48% in national migration and for the NMt-1 the number of migrants will increase by 4.86%. On the other hand, for the function of remittances, as UEUt increases by 1.0%, GDP percaEUt and Ret-1 will increase by 0.28%, by 6.5, from 3.7% remittances on average, ceteris paribus.

When talking about remittances and their macroeconomic impact on economic development, the World Bank in its Global Economic Prospects (2006), World Bank (2005), the United Nations (UN, 2006) and the Inter-American Development Bank (IDB, 2000, 2011) consider that when remittances increase continuously, predictably and meet a certain level of stability over time, they can: Reduce the instability of growth, promote the development of localities, regions and countries of origin (depending on its size), sustain the country's foreign exchange, withstand external crises, heal macroeconomic accounts, contribute to reducing poverty and inequality (especially when remittances reach the poorest households) (Reviewed in: Agudelo Tascón, 2016) .

On the other hand, remittances can reduce labor market pressures, increase investment and aggregate growth, serve as a conduit to link international markets and also for access to technology, therefore, remittances have direct and indirect positive effects on income (Koc & Onan, 2001; Catrinescu, Leon-Ledesma, Piracha & Quillin, 2009). Papademetriu and Martin (1991) already stated since the beginning of the 1990s that there is no guarantee to affirm that cross-border migration processes accompanied by remittances can become a development factor for the migrants' countries of origin. Fajnzylber and López, (2007) point out that it should not be forgotten that remittances are above all a complement and not a substitute for good and appropriate government economic policies (Reviewed in: Agudelo Tascón, 2016, p. 46).

The future growth of the United States economy, Latinos, especially Mexicans, will play a leading role. Of a population of almost 57 million Latinos, more than 63.0% were of Mexican origin (more than 36 million people). This includes Mexican immigrants residing in the country and Americans who, in the census, identified themselves as of Mexican origin. Who are the "hispennials" and why they have the power to transform America's economy. Although the migration of Mexicans to the United States has been driven for years by workers without higher education who worked mainly in the agricultural and construction sectors, the picture has changed recently.

Children of that generation that migrated to the United States will be more likely to obtain higher education, and to earn, spend, and invest more of their income. Latinos born in this nation are younger than the general population average, projecting them as a key workforce and consumer for the country's economic growth. Almost half of all Latinos born are under the age of 18, according to data from the Pew Center, and only 20.0% of non-Hispanic white Americans were under the age of 18 (Sulbarán, 2019).

Salas Alfaro & Pérez Morales (2006) affirmed that at least in the short term, the GDP of Mexico, that of the United States, and inflation in Mexico, exert a significant linear statistical influence on the amounts of remittances sent to the country. According to the assumptions of the migration economy, it is corroborated that, as the national GDP increases, the amounts of remittances sent will tend to decrease, due to the reduction of pressures on family income. In addition, they explained that the GDP of the United States grew, which will stimulate shipments since there will be greater employment opportunities. On the other hand, they indicated that remittances contributed to improving the distribution of income among the deciles of households, and in some cases, they reduce the inequality in the distribution of income within the deciles.

The flow of remittances increases when the United States economy grows, but if prices increase, remittances fall, since immigrants will have to allocate a greater amount of their salary for consumption in the country. In the case of the exchange rate, when the peso depreciates against the dollar, there will be a greater amount of remittance flows. This increase is intended to maintain the purchasing power of families in Mexico. For 2015, remittances in Mexico represented 2.5% of GDP according to Banxico and were mainly destined for consumption, which is why the demand of households receiving remittances increases, generating investment in businesses creating a multiplier effect in local and regional economies. local consumption in food, rent payment, and employment is created, among other things (Macías, 2016).

Conclusions

Based on the results obtained from the model, the following is concluded: for the equation of the number of migrants, the variables that most influenced were the GDP per capita of the United States and the number of migrants from the previous period, for remittances the Gross Domestic Product was per capita for the period, the number of migrants and remittances from the previous year. In the case of the hypotheses raised, it was corroborated that remittances and the number of migrants there is a direct relationship with the per-capita Gross Domestic Product of the United States, and inverse with the unemployment rate, but only in the case of the number of migrants.

The reasons for migration were related to the possibility of accessing jobs that will allow obtaining higher salaries than those established in the country of origin, which is why, given the geographic characteristics and relative socioeconomic stability of the United States, it was attractive to migrants. Mexicans (Avendaño, Rivera, & Díaz, 2015).

According to Tarazona et al (2018), the migratory phenomenon has been presenting a considerable flow of remittances, which have effects on the economic dynamics, which have been analyzed from different perspectives, there are various works and investigations that relate the flows of remittances with economic growth and other macroeconomic variables. Likewise, other authors analyze remittances as a dependent variable, as in the case of (Macías, 2016), who analyzed such as the Gross Domestic Product of Mexico, the Gross Domestic Product of the United States, the National Consumer Price Index of Mexico, the United States Consumer Price Index, the exchange rate, the 28-day interest rate, exports and imports determine remittances in Mexico.

In 2017, 94.7% of shipments came from the United States, according to a report by BBVA Bancomer and estimated that, in 2018, remittances that arrived in Mexico would reach 33,000 million dollars, which would represent an annual growth of 9.0%, while that for 2019 the expectation was 35,000 million dollars, an increase of 6.0%.

Serrano explained in the presentation of the Yearbook of Migration and Remittances 2018, that this would be due to the growth of the migration of nationals to the United States, once the migratory flows to that country recover and that employment levels are on the rise due to the behavior of the economy (Juárez, 2018).

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