DOI: http://dx.doi.org/10.22185/24487147.2026.121.05

# Internal Mobility in Mexico as a Trigger for International Migration

## Movilidad Interna en México como detonante de la Migración Internacional

Eréndira Yaretni Mendoza-Meza, Arturo Torres-Mendoza, Yamile Rangel-Martínez, Luis Alberto Quezada-Téllez

*Universidad Autónoma del Estado de Hidalgo, México*

*Abstract*

This article analyzes how internal mobility in Mexico —viewed through a gravitational model— can act as a precursor to international migration, while also revealing the shifting dynamics of regional development. In the context of accelerated population growth and increasing pressure on public services, identifying development poles and nodal zones becomes essential for designing effective metropolitan and regional strategies. This study applies a gravitational model from a territorial perspective, combining population data and inter-entity distances to estimate migratory potential and labor pressure among Mexico's 32 federal entities. The findings show that, contrary to traditional assumptions, central states no longer concentrate the highest migratory attraction; instead, peripheral or intermediate municipalities are emerging as new poles of development. This suggests a reconfiguration of territorial dynamics, requiring a reassessment of where growth is occurring and how to manage it sustainably. The results contribute to a deeper understanding of internal migration patterns and their potential to escalate into international migration under conditions of persistent regional inequality.

*Keywords*: Development poles, nodal zones, territorial development, internal mobility, gravitational models, spatial dynamics, international migration.

*Resumen*

Este artículo analiza cómo la movilidad interna en México —vista a través de un modelo gravitacional— puede actuar como un precursor de la migración internacional, al tiempo que revela las dinámicas cambiantes del desarrollo regional. En un contexto de acelerado crecimiento poblacional y creciente presión sobre los servicios públicos, la identificación de polos de desarrollo y zonas nodales se vuelve esencial para diseñar estrategias metropolitanas y regionales eficaces. Este estudio aplica un modelo gravitacional desde una perspectiva territorial, combinando datos poblacionales y distancias entre entidades para estimar el potencial migratorio y la presión laboral entre las 32 entidades federativas de México. Los hallazgos muestran que, contrario a las suposiciones tradicionales, los estados centrales ya no concentran la mayor atracción migratoria; en cambio, están surgiendo municipios periféricos o intermedios como nuevos polos de desarrollo. Esto sugiere una reconfiguración de las dinámicas territoriales, lo cual exige una reevaluación de dónde está ocurriendo el crecimiento y cómo gestionarlo de manera sostenible. Los resultados contribuyen a una comprensión más profunda de los patrones de migración interna y su potencial de escalar hacia la migración internacional bajo condiciones de desigualdad regional persistente.

*Palabras clave*: Polos de desarrollo, zonas nodales, desarrollo territorial, movilidad interna, modelos gravitacionales, dinámicas espaciales, migración internacional.

## Introduction

Migration, both internal and international, is a complex social phenomenon involving the movement of people in search of better living conditions. In Mexico, internal migration is characterized by the movement of people between states or regions within the country, primarily motivated by economic and social disparities. According to the National Survey of Occupation and Employment (ENOE), analyzing the total population and the unemployed population provides essential insights into the dynamics of the labor market in the country.

The challenge lies in understanding how the proportion of the unemployed population relative to the total population influences internal migration patterns. Internal migration can be seen as a response to adverse conditions in regions of origin and as a precursor to international migration. However, it is necessary to quantify how unemployment and the total population affect migration decisions to design effective public policies that address regional disparities and promote balanced development.

Therefore, the objective of this work is to quantify and analyze the relationship between the unemployed population and the total population in each of Mexico's 32 federal entities using a gravitational model. Specifically, the study aims to calculate labor tension based on the proportion of unemployed individuals relative to the total population, apply a territorial gravitational model that integrates population size and geographic distance to estimate flows of internal migration, classify states according to their role as emitters, receivers, or retainers of unemployed populations, and analyze these spatial patterns in light of regional structural inequalities. Through this approach, the study also explores whether internal migratory flows, driven by persistent unemployment, may act as early indicators of potential international migration. In this regard, the central research question guiding the analysis is: How does the proportion of unemployed population relative to the total population influence internal migratory flows among Mexican states, and to what extent can these territorial patterns anticipate future international migration? By addressing this question, the study seeks to provide a solid foundation for designing public policies that reduce regional disparities and promote more balanced development throughout the country.

Addressing internal migration as a trigger for international migration requires a deeper understanding of internal migratory dynamics in Mexico. By identifying regions with high unemployment and their influence on

migration, more effective public policies can be designed to address economic and social inequalities. Additionally, understanding these patterns can help predict migration trends and implement strategies for balanced regional development.

Internal migration not only reflects regional disparities but can also act as a precursor to international migration. A detailed analysis of the relationship between unemployment and the total population will allow for better planning and resource management, contributing to Mexico's economic and social development.

Although this research focuses primarily on internal migration, it adopts the perspective that sustained regional inequality and persistent labor pressure, especially in areas with limited economic opportunities, can set in motion a chain of mobility that eventually leads to international migration. Internal migration, in this sense, not only reflects but also anticipates the structural conditions that push individuals to seek opportunities beyond national borders. Therefore, understanding internal migratory patterns provides early warning signs of potential international outflows.

This study offers a novel contribution by adapting the gravitational model, traditionally applied in physics and occasionally in transportation studies, to analyze internal migratory flows from a territorial and labor market perspective. Unlike conventional applications that focus on general population movements or trade flows, this research integrates unemployment as the core explanatory variable, positioning it as a direct determinant of internal mobility. Moreover, the methodological innovation lies in the construction and comparison of two gravitational models: one based on the total population and another centered exclusively on the unemployed population. This dual-model approach enables the calculation of labor tension, a concept developed here to quantify labor market pressure within and between states. Such a construct has not been previously explored in the literature through gravitational modeling, thereby offering a new lens to interpret mobility dynamics and regional inequalities.

## Theoretical Framework on Mobility and Migration

Migration is a complex social phenomenon that involves the movement of people either within a country or across borders, with the aim of improving their living conditions. According to the International Organization for Migration (OIM, 2021), migration is defined as the "movement of people across an international border or within a country to settle temporarily or permanently in a place other than their origin" (p. 15). The reasons for mi-

gration are varied, including the search for better job opportunities, family reunification, violence, and climate change, among others.

Internal migration refers to the movement of people within a country's borders. Unlike international migration, it does not involve crossing borders, but its causes and effects can be equally significant. According to Castillo and García (2017), in Latin America, internal migration is closely related to economic opportunities and accelerated urbanization, highlighting that "internal migratory movements are linked to the search for employment and better living conditions in urban areas" (p. 45).

Ravenstein (1885), in his theory of the laws of migration, emphasized that "migration is primarily a rural-to-urban process" (p. 4), suggesting that people move in search of better opportunities in cities. In the context of developing countries like Mexico, internal migration is often driven by economic and social disparities between rural and urban areas. These disparities have fueled a steady flow of people from rural regions to urban centers, as evidenced by the economic development differences between various regions of the country (INEGI, 2020).

Several factors influence internal and interstate migration. Economic factors, such as the search for jobs and better wages, are a primary cause. Social factors, on the other hand, include family reunification and access to healthcare and education services. Environmental factors, such as natural disasters, environmental degradation, and climate change, can induce significant internal displacements known as climate-induced migration (McLeman and Smit, 2006). If conditions in urban areas do not improve, migrants may seek opportunities abroad. Castles (2003) argues that "internal migration is a response to adverse conditions in the country of origin, and when these conditions do not improve, migrants may opt for international migration" (p. 42).

Throughout the 20th century, industrialization and urbanization were key driving forces behind internal migration. The maquiladora industry and industrial zones in northern Mexico attracted workers from across the country, concentrating the population in urban areas. Additionally, public policies such as land reform programs altered traditional land tenure structures, generating displacements toward urban areas in search of employment (Durand and Massey, 2003).

Interstate migration, which involves the movement of people between states or regions within a country, is often motivated by the search for better economic opportunities. Durand and Massey (2003) highlight that "interstate migration is deeply connected to the poles of economic deve-

lopment and the concentration of industrial activity" (p. 85). This form of migration can have both positive and negative impacts on sending and receiving regions. Receiving areas may experience economic growth but also face pressures on infrastructure and public services, while sending regions may suffer from the loss of human capital, although remittances can offset these losses (Smith and Espinoza, 2010).

The relationship between internal and international migration is significant. Internal migration patterns can serve as a precursor to international migration. Internal migrants who seek better conditions often encounter similar barriers to those they would face abroad. According to Massey, Arango, Hugo, Kouaoci, Pellegrino and Taylor (2002), Mexican states with high rates of internal migration, such as Michoacán and Guanajuato, are also large exporters of international migrants (p. 29). The dual labor market theory posits that countries that receive international migrants, such as the United States, depend on foreign labor to fill less desirable jobs (Piore, 1979). Internal migration can serve as training for international mobility, allowing individuals to acquire skills and social networks that facilitate their migration abroad. Additionally, the migration network theory suggests that links between previous and potential migrants reduce the costs and risks associated with international migration (Massey, Arango, Hugo, Kouaouci, Pellegrino and Taylor, 2002).

Previous studies on migration in Mexico have primarily focused either on international migration (Durand and Massey, 2003; Massey, Arango, Hugo, Kouaouci, Pellegrino y Taylor, 2002) or on rural-urban internal mobility (Castillo and García, 2017). However, there is limited empirical work that combines both approaches to assess how internal migration may serve as a trigger for international migration using quantitative spatial models. This article contributes to the literature by integrating gravitational modeling with recent labor market data, offering a territorial perspective on the dynamics that link internal displacements to potential international mobility. In doing so, it expands on the conceptual framework of migration as a continuum shaped by structural inequalities (Sassen, 1988; Taylor, 1999).

The experience of internal migration can create unmet expectations, pushing individuals to consider international migration as an alternative. Sassen (1988) argues that "internal migration can open migrants' eyes to opportunities abroad, especially if the promises of urban development are not fulfilled" (p. 73).

In some regions, both internal and international migration become part of the local culture. Taylor (1999) notes that "internal migration can create

a culture of mobility in which international migration is seen as the next step in a life strategy" (p. 55).

Internal migration in Mexico not only reflects regional disparities within the country but also acts as a precursor to international migration. The search for better economic and living opportunities drives both internal and international migration, and understanding these patterns is crucial for developing effective public policies that address the needs and challenges of communities in both their country of origin and international destinations.

Internal and interstate migration has been the subject of various theories that seek to explain its causes and effects. These theories offer a comprehensive understanding of migratory phenomena and their relationship with regional development. The Neoclassical Migration Theory, developed by Harris and Todaro (1970), posits that migration occurs due to wage differentials between regions. According to this theory, individuals migrate from regions with low wages to those with higher wages in search of improving their economic well-being. This theory asserts that migrants are motivated by the maximization of their economic utility, and their decision to move is based on evaluating differences in job and wage opportunities available in different locations.

Proposed by Gunnar Myrdal (1957), the Circular and Cumulative Causation Model suggests that migration contributes to reinforcing regional inequalities. According to this theory, regions receiving migrants tend to accumulate additional economic advantages, while sending regions face increasing disadvantages. The model explains how regional inequalities are amplified due to the accumulation of capital, talent, and resources in more developed areas, while less developed areas remain trapped in a cycle of underdevelopment.

The study of regional growth and development has evolved over time, giving rise to several theories explaining how regional economies develop and grow. Walter Christaller (1933) developed the Central Place Theory in 1933, which argues that urban settlements are organized in a hierarchy based on the goods and services they offer. Christaller proposed that central places function as economic hubs for surrounding areas and that the spatial distribution of settlements follows hexagonal patterns. In this case, Central Places are those areas that attract population.

On the other hand, François Perroux (1955) developed the Growth Poles Theory during the 1950s and 1960s. This theory postulates that economic growth concentrates in certain places, known as growth poles, which

act as engines of development. Growth poles generate pull effects that benefit surrounding regions, driving regional development. This is precisely demonstrated and developed in the gravitational model, identifying poles of attraction and expulsion.

The Input-Output Models, developed by Wassily Leontief (1936) and applied at the regional level during the 1970s and 1980s, analyze the economic interdependencies between sectors and geographic areas. These models use double-entry matrices to examine how productive sectors are interconnected and how changes in one sector affect others. This is the case with the gravitational model.

## Methodology

The analysis of migration and regional disparities can be better understood through theories of regional growth and development, as well as the gravitational model. Theories such as the Circular and Cumulative Causation theory and Growth Poles explain how economic and spatial differences between regions can exacerbate inequalities, influencing migratory flows (Boisier, 1980; Asuad, 2001). More developed regions, by attracting investments and opportunities, tend to capture migrants in search of better living conditions, while less developed regions experience an exodus of people toward growth centers (Theil, 1967).

The Central Place Theory is also relevant as it suggests that larger urban centers, by offering a greater variety of goods and services, have additional appeal to migrants (Miller and Blair, 2012). In this context, the gravitational model is applied to analyze how the unemployed population moves between regions. This model, based on the relationship between each region's population and the distance between them, allows for the quantification of migratory flows and an understanding of underlying dynamics (Leontief and Strout, 1963).

To assess the dynamics of the unemployed population, the proposed methodology focuses on constructing distance matrices and calculating the intensity of migratory flows using the gravitational model. First, data on the unemployed population are collected, and distance matrices between entities are constructed. Gravitational weights and demographic potentials are then calculated to analyze interactions between regions. Finally, this analysis is integrated with input-output models to understand how economic transformations affect migratory flows (Chiapa y Mendoza, 2023).

This methodological approach combines regional economic theory with a robust quantitative tool, providing a comprehensive view of regional disparities and migratory patterns.

To estimate the potential population dynamics between entities in Mexico, a gravitational model with a national focus was developed, specifically aimed at analyzing data on the unemployed population. This approach was implemented through a series of steps proposed by Chiapa y Mendoza (2023).

The research began with the collection of public data on the unemployed population from 2005 to 2023, using INEGI's National Survey of Occupation and Employment. The choice to analyze the total population and the unemployed population is based on the importance of understanding the specific dynamics of this demographic group, as it can reflect unique patterns of migration and employment and help identify areas with high unemployment levels that require specific public policies to improve well-being and economic development, considering that unemployment is the main trigger of migration and mobility.

According to Chiapa y Mendoza (2023), the traditional gravitational model, generally applied in the context of foreign trade (Boisier, 1980), was adapted for a national focus in Mexico. Instead of focusing on trade, populations of the employed and unemployed were used as the main input. This adjustment allows for new interpretations of regional economic theory, focusing on the unemployed population and the distance between entities to estimate interaction between them (Asuad, 2001; Albarrán, 2017).

In the data analysis provided by the National Survey of Occupation and Employment (ENOE), two key variables are:

- Total Population: Represents the total number of people in the survey area, including both the economically active population (those working or looking for work) and the economically inactive population (those unavailable for work, such as students, retirees, etc.).
- Unemployed Population: Reflects the number of people actively seeking employment but unable to find it. This variable is crucial for evaluating the level of unemployment and can indicate the pressure exerted by the lack of job opportunities in different regions.

The methodology is based on the principles of Leontief and Strout's (1963) input-output models, as well as Theil's (1967) analyses. Boisier (1980) suggests that this variant is associated with potential models as a

subclass of interaction models, but it is also considered a gravitational model (Asuad, 2001).

The next step was to build matrices with standardized information to calculate the results. The basic gravitational model suggests that the intensity of population dynamics between territories depends on distance and the unemployed populations. A distance matrix was created considering the shortest route between population centers in each municipality using georeferenced data from Google Earth. This methodology follows the approach described by Miller and Blair (2012), who highlight the advantage of input-output models for analyzing population and economic growth areas.

The methodology employed in this study is based on the application of a gravitational model with a territorial focus to estimate internal migratory flows in Mexico. This model incorporates two key variables: total population (as a proxy for demographic mass) and geographic distance (as a proxy for spatial friction), consistent with the classical formulation of the gravity model. These two variables are the essential inputs for constructing an input-output matrix that reflects attraction and expulsion dynamics among federal entities.

Both the total population and the unemployed population were obtained from the National Survey of Occupation and Employment (ENOE), New Edition, published by INEGI, specifically from the third quarter of 2023. This version of the ENOE, effective since Q3 2020, offers improved methodological consistency and granularity. The third quarter was selected due to its stability in labor market trends, avoiding distortions caused by seasonality in the first and last quarters of the year.

The distance variable corresponds to the shortest road distance between the capital cities of Mexico's 32 federal entities, including toll segments. These distances were calculated using Google Earth, prioritizing real travel routes over theoretical straight-line (Euclidean) distance. The use of GIS platforms such as QGIS or ArcGIS was not required in this context, given the limited number of variables and the non-cartographic nature of the model.

All calculations were carried out in Microsoft Excel, as the structure of the gravitational model requires only basic operations. The decision to use a minimal number of variables is consistent with the logic of input-output models, which rely on a simplified but interpretable matrix structure. Including additional variables would introduce unnecessary complexity and potentially distort the clarity of regional comparisons.

According to Chiapa y Mendoza (2023), the following steps were taken to calculate each indicator.

**Gravitational Weight**

The first calculated matrix combines the unemployed population and distance and can be interpreted as a function of the degree of influence of an entity. It is obtained by dividing the product of the unemployed populations by the distance between them, where FA is the attraction force, G corresponds to the constant analogous to gravitational potential, which is determined as 1, pi is the population mass of municipality i, pj is the population mass of municipality j, and d2ij corresponds to the distance between the two entities squared. The formula is as follows:

$$FA_{ij} = G\left(\frac{p_i p_j}{d_{ij}^2}\right) \quad (1)$$

**Potential Force**

The results of the FAij matrix show the potential for bidirectional flows, so the demographic potential matrix is calculated (Asuad, 2001), which allows for input-output analysis by identifying the territory of origin and destination. FP is interpreted as the demographic potential produced in a locality (i) given the distances with other localities (j). Demographic potential aims to analyze a locality's capacity to attract another based on its mass and the distances separating them (Asuad, 2001). The calculation for this matrix is obtained through the following formula:

$$FP_i = G\sum_{j=1}^{N}\left(\frac{P_j}{d_{ij}}\right) \quad (2)$$

Where FP is the gravitational force (or gravitational weight), G corresponds to the constant analogous to gravitational potential (equal to 1), Pj is the unemployed population of each municipality j, and dij corresponds to the distance between an entity (i) and each entity (j).

Finally, labor tension (LT) is calculated by dividing the unemployed population (pd) by the total population (pt), providing a measure of the gravitational weight of unemployment. This proportion helps to understand the magnitude of unemployment relative to the total population, indicating its potential influence on migration patterns and regional disparities. It allows

calculating the unemployment rate or proportion of the unemployed in a region. This is relevant in the context of the gravitational model to assess labor market pressure in a region.

The division of the unemployed population by the total population in a gravitational model applied to demographic potential (origin and destination) can offer key insights into labor tension and economic disparities between different regions. This ratio, representing the unemployment rate, provides an important indicator for understanding the behavior of migratory flows and a region's potential for attraction or expulsion. Dividing the unemployed population by the total population provides specific information about the labor situation in different contexts:

**Gravitational Weight**

Gravitational weight refers to the relative importance of the unemployed population concerning the total population in a region or entity. The reason for dividing the unemployed population by the total population is to evaluate the weight or influence of unemployment in the broader population context. A higher value indicates a larger proportion of unemployed people relative to the total population, which may suggest greater pressure in the labor market and possibly increased migration to areas with better opportunities.

$$TL = \frac{\sum_{pd=1}^{N} G\left(\frac{p_i p_j}{d_{ij}^2}\right)}{\sum_{pt=1}^{N} G\left(\frac{p_i p_j}{d_{ij}^2}\right)} \tag{3}$$

**In Origin**

In the context of the region of origin, this proportion measures the relationship between the unemployed population and the total population in the place where individuals are residing before emigrating. This measure shows the severity of the labor situation in the region of origin. A high proportion of unemployed people in the region of origin can be a significant factor driving migration to other places, as residents seek better job opportunities in regions with lower unemployment rates.

$$TL = \frac{G\sum_{i=1}^{N}\left(\frac{P_j}{d_{ij}}\right)}{G\sum_{i=1}^{N}\left(\frac{P_j}{d_{ij}}\right)} \tag{4}$$

**In Destination**

In the context of the destination region, this proportion measures the relationship between the unemployed population and the total population in the area to which individuals are moving. This value indicates how the unemployed population in the destination compares to the total population there. A high proportion of unemployed people in the destination may suggest that, although the region may offer certain job opportunities, it also faces significant employment challenges. This can influence migration decisions and the labor market dynamics in the destination region.

$$TL = \frac{G\sum_{j=1}^{N}\left(\frac{P_j}{d_{ij}}\right)}{G\sum_{j=1}^{N}\left(\frac{P_j}{d_{ij}}\right)} \quad (5)$$

The data were normalized to a scale of 0–1 or 0–100 per cent, ensuring that differences in population size among states would not dominate the analysis and allowing direct comparison across regions.

$$X_{norm} = \frac{X - X_{min}}{X_{max} - X_{min}} \quad (6)$$

Where X_norm represents the normalization of the data, that is, its expression on a linear scale from 0 to 1; X is each individual data point from the matrices of both FA and FP; X_min is the smallest data value, and X_max is the largest data value in the matrices.

Each resulting indicator (gravitational weight, labor tension, potential flows) was transformed into a ranking from 1 to 32, consistent with the hierarchical nature of input-output analysis. This approach enables clear and interpretable comparisons of migratory dynamics and labor pressure across Mexico's states.

Finally, it is important to note that two gravitational models were calculated: one using total population data and another based on the unemployed population, which allows for a comparison of territorial flow intensity from both a general demographic perspective and a specific labor dimension. This analytical distinction leads to the calculation of the labor tensor, understood as the proportion of unemployed population relative to the total population in a given region.

This indicator reflects the degree of pressure a region faces in terms of employment and helps identify areas where the lack of job opportunities may be generating structural vulnerability. A high labor tension value not only highlights internal challenges but may also act as a trigger for population mobility, since unemployment-driven internal migration can escalate into international migration in search of better living and working conditions.

## Results

After completing the calculations of the gravitational model, using distance and population as variables, the results reveal significant findings regarding the territorial dynamics in Mexico. This analysis, grounded in a mathematical model, enables a deeper understanding of the interactions between different regions of the country, offering valuable inputs for the design and implementation of public policies in urban, economic, and territorial development fields.

The gravitational model allows for the estimation of the force of attraction between territories, measured based on their demographic weight and geographical proximity. This force, known as gravitational weight, represents the intensity of interaction between two places. In this first approach, the results are unidirectional, meaning they reflect the magnitude of the link between territories but do not indicate the exact direction of the population flow (whether it is inbound or outbound), only the potential for interaction.

To complement this perspective, the concept of labor tension is introduced, this ratio helps estimate the level of pressure a region faces in terms of its labor market. Higher labor tension indicates a greater structural burden to absorb the economically active population, which may result in processes of out-migration, labor displacement, or the need for targeted policy interventions.

Together, the analysis of both models and the labor tension variable enables the identification not only of areas with greater population attraction capacity, but also those where labor conditions may be generating displacement dynamics or requiring specific attention. The results presented below provide a solid foundation for interpreting territorial flows from a critical and applied perspective, with direct implications for regional planning and the development of equitable growth strategies.

Since the key indicator of the gravitational model is the unemployed population, the analysis can focus on how migratory flows or economic interactions correlate with unemployment in each state.

The gravitational weight of each state is influenced by its capacity to attract or expel the unemployed population. This implies that states with higher gravitational weight could be experiencing significant movements of unemployed people seeking job opportunities in other entities (Table 1).

Mexico City, Mexico State, and Tlaxcala are the states with the highest gravitational weight, which could suggest that these entities have high levels of unemployment but also enough opportunities to attract unemployed populations from other states, demonstrating notable labor dynamics. Similarly, Hidalgo and Puebla also stand out, suggesting significant labor population flows, likely in search of better job opportunities.

States with low participation in the flow of unemployed populations, such as Baja California Sur, Campeche, and Baja California, show very low values in gravitational weight. This may be related to a lack of economic opportunities or stable working conditions that do not promote large population flows. This could indicate labor stability in these entities or a lack of opportunities that prevents both the attraction and migration of unemployed people.

Regarding the analysis of the origin or outflow of the population in the labor market (Table 2), the unemployed population is high in states such as Mexico City, the State of Mexico, and Jalisco. This suggests that, despite being large economic centers, these states also face significant unemployment issues, leading to an outflow of unemployed individuals to other states.

Labor tension measures the proportion of the unemployed population relative to the total population in a specific region, reflecting the economic and labor pressure in that area. A high proportion suggests that the region has a significant unemployment rate, which can act as a factor driving people to emigrate in search of better opportunities.

Baja California (165.69 per cent), Mexico City (112.23 per cent), and Mexico State (100.14 per cent) present the highest proportion of unemployed people relative to their total population, indicating high labor pressure. Despite being key economic centers, competition for jobs may be creating a situation where unemployment is a critical factor.

Table 1: Gravitational Weight of the Total Population in the Labor Market and the Unemployed Population in Mexico, 2023

| State | Total Population | Ranking | Unemployed Population | Ranking | Labor Tension |
|---|---|---|---|---|---|
| Aguascalientes | 0.07 | 16 | 0.04 | 15 | 50.19% |
| Baja California | 0.01 | 31 | 0.00 | 30 | 41.96% |
| Baja California Sur | 0.00 | 32 | 0.00 | 32 | 61.50% |
| Campeche | 0.01 | 30 | 0.00 | 31 | 26.90% |
| Chiapas | 0.05 | 19 | 0.02 | 21 | 33.23% |
| Chihuahua | 0.02 | 25 | 0.01 | 25 | 48.49% |
| Ciudad de México | 1.66 | 2 | 1.43 | 2 | 85.92% |
| Coahuila | 0.03 | 20 | 0.02 | 17 | 65.09% |
| Colima | 0.01 | 26 | 0.01 | 26 | 45.59% |
| Durango | 0.02 | 24 | 0.01 | 23 | 48.97% |
| Guanajuato | 0.31 | 7 | 0.17 | 6 | 53.34% |
| Guerrero | 0.08 | 13 | 0.02 | 20 | 20.71% |
| Hidalgo | 0.69 | 4 | 0.39 | 4 | 56.18% |
| Jalisco | 0.21 | 9 | 0.10 | 8 | 47.98% |
| México | 1.97 | 1 | 1.50 | 1 | 76.08% |
| Michoacán | 0.20 | 10 | 0.07 | 11 | 34.78% |
| Morelos | 0.25 | 8 | 0.11 | 7 | 43.43% |
| Nayarit | 0.02 | 22 | 0.01 | 24 | 40.06% |
| Nuevo León | 0.07 | 15 | 0.04 | 13 | 57.69% |
| Oaxaca | 0.08 | 14 | 0.03 | 16 | 31.49% |
| Puebla | 1.04 | 3 | 0.55 | 3 | 52.41% |
| Querétaro | 0.17 | 11 | 0.09 | 10 | 52.25% |
| Quintana Roo | 0.01 | 28 | 0.00 | 27 | 41.80% |
| San Luis Potosí | 0.11 | 12 | 0.06 | 12 | 51.31% |
| Sinaloa | 0.02 | 23 | 0.01 | 22 | 50.61% |
| Sonora | 0.01 | 29 | 0.00 | 28 | 48.96% |
| Tabasco | 0.03 | 21 | 0.02 | 19 | 53.01% |
| Tamaulipas | 0.06 | 17 | 0.04 | 14 | 56.11% |
| Tlaxcala | 0.39 | 5 | 0.23 | 5 | 59.12% |
| Veracruz | 0.32 | 6 | 0.10 | 9 | 31.43% |
| Yucatán | 0.01 | 27 | 0.00 | 29 | 32.43% |
| Zacatecas | 0.05 | 18 | 0.02 | 18 | 36.43% |

Source: Author's own elaboration.

Table 2: Gravitational Model of Origin in the Labor Market and the Unemployed Population in Mexico, 2023

| State | Total Population | Ranking | Unemployed Population | Ranking | Labor Tension |
|---|---|---|---|---|---|
| Aguascalientes | 0.48 | 21 | 0.37 | 19 | 77.53% |
| Baja California | 0.27 | 27 | 0.17 | 27 | 63.41% |
| Baja California Sur | 0.01 | 32 | 0.02 | 32 | 165.69% |
| Campeche | 0.12 | 31 | 0.05 | 31 | 42.64% |
| Chiapas | 0.90 | 11 | 0.45 | 15 | 50.18% |
| Chihuahua | 0.49 | 20 | 0.35 | 20 | 72.06% |
| Ciudad de México | 4.25 | 2 | 4.77 | 2 | 112.23% |
| Coahuila | 0.53 | 18 | 0.51 | 14 | 95.67% |
| Colima | 0.13 | 30 | 0.09 | 30 | 73.53% |
| Durango | 0.33 | 24 | 0.24 | 23 | 74.26% |
| Guanajuato | 2.19 | 6 | 1.67 | 5 | 76.49% |
| Guerrero | 0.77 | 15 | 0.21 | 25 | 26.79% |
| Hidalgo | 1.36 | 8 | 0.89 | 8 | 65.09% |
| Jalisco | 2.53 | 4 | 1.87 | 4 | 74.14% |
| México | 7.41 | 1 | 7.42 | 1 | 100.14% |
| Michoacán | 1.41 | 7 | 0.66 | 10 | 46.50% |
| Morelos | 0.71 | 16 | 0.39 | 18 | 54.40% |
| Nayarit | 0.24 | 28 | 0.15 | 29 | 61.11% |
| Nuevo León | 1.17 | 9 | 0.96 | 7 | 81.80% |
| Oaxaca | 0.88 | 13 | 0.41 | 17 | 46.16% |
| Puebla | 3.23 | 3 | 2.10 | 3 | 65.07% |
| Querétaro | 0.88 | 12 | 0.64 | 12 | 72.07% |
| Quintana Roo | 0.22 | 29 | 0.17 | 28 | 75.77% |
| San Luis Potosí | 0.92 | 10 | 0.70 | 9 | 76.36% |
| Sinaloa | 0.45 | 22 | 0.34 | 21 | 77.34% |
| Sonora | 0.29 | 26 | 0.22 | 24 | 77.02% |
| Tabasco | 0.43 | 23 | 0.42 | 16 | 96.19% |
| Tamaulipas | 0.79 | 14 | 0.65 | 11 | 82.40% |
| Tlaxcala | 0.66 | 17 | 0.61 | 13 | 92.21% |
| Veracruz | 2.37 | 5 | 1.05 | 6 | 44.09% |
| Yucatán | 0.32 | 25 | 0.18 | 26 | 56.04% |
| Zacatecas | 0.49 | 19 | 0.26 | 22 | 53.19% |

Source: Author's own elaboration.

This may suggest high mobility within the same area or to other metropolitan regions. Hidalgo (65.09 per cent) and Puebla (65.07 per cent) present moderate pressure, as these regions also have a considerable proportion of unemployed people, making them potential points of origin for migrants seeking better job opportunities. Jalisco (74.14 per cent) and Guanajuato (76.49 per cent): Although economically well-positioned, these entities face labor pressures that could be driving some of their inhabitants to migrate to regions with more favorable labor markets.

Regions with high proportions of unemployed people, such as Mexico City and Mexico State, present high labor pressure, which may be incentivizing migration to other metropolitan areas or even abroad in search of better job opportunities. This dynamic is particularly relevant in areas with high population densities, where competition for jobs is fiercer. In regions like Hidalgo and Puebla, although labor pressure is significant, it does not reach the critical levels observed in Mexico City. These regions may be experiencing internal labor migration to more prosperous areas, such as large cities.

Guerrero and Baja California Sur represent entities with Low Proportion of Unemployment (and Less Migration Pressure). On the one hand, Guerrero (26.79 per cent): Despite its high proportion of unemployed people, the unemployment rate is relatively low compared to its total population, suggesting that labor-related migration may not be as intense as in other regions. On the other hand, Baja California Sur (165.69 per cent): Although it paradoxically has a low unemployed and total population, its high percentage reflects specific pressure in a limited labor context. This region could be a special case where the lack of local opportunities generates a high unemployment rate in relative terms.

In entities like Baja California Sur and Guerrero, although the proportion of unemployed people is high relative to their total population, the absolute number of unemployed people is relatively low. This suggests that while labor pressure exists, the volume of migrants may not be as high as in regions with greater population density.

Nuevo León (81.80 per cent) and Tamaulipas (82.40 per cent), with High but Stable Unemployment Rates, present high proportions of unemployed people relative to their total population, but they are also diversified economies with high potential for labor attraction in certain specific areas. Labor migration pressure may vary internally depending on available opportunities.

The analysis should also consider other factors that can influence migration, such as quality of life, access to public services, and the existence of established migratory networks in the destination regions. The combination of these factors, along with the proportion of unemployed people, provides a more comprehensive view of the migratory dynamics in Mexico.

Regarding the calculation and analysis of the destination of the population in the labor market (Table 3), Tlaxcala, Mexico City, Hidalgo, and Morelos show high destination values, indicating that they are attracting an unemployed population seeking employment. This may be related to local labor policies, industrial development, or employment support programs. Additionally, it can be argued that the expanding urban sprawl of Mexico City has driven migration toward peripheral entities.

The central states of the country appear to be the focus of greater migratory interactions of unemployed populations. This could be due to a combination of high population density, economic centers, and job opportunities, despite the presence of unemployment. In contrast, the southern and southeastern states show lower destination values, possibly reflecting less economic dynamism and fewer opportunities for the unemployed population.

The gravitational analysis based on the unemployed population reveals significant disparities between entities. States with higher unemployment flows are generally located in the center of the country, while peripheral regions appear to have less participation in this process. Policies aimed at reducing unemployment should take these patterns into account to promote balanced economic development across regions.

Labor tension at the destination reflects that Michoacán, Hidalgo, Morelos, and Querétaro have a higher proportion of Unemployed Population/ Total Population, with Hidalgo and Michoacán standing at 84.14 per cent and 85.25 per cent, respectively. These entities may face challenges in absorbing migrants, as employment availability is insufficient to meet labor demand, negatively affecting migration decisions toward these destinations. Despite having the highest indicators, this suggests that, although they are significant destinations, they face severe employment challenges. The fact that these regions lead the ranking may hinder their ability to attract new migrants, as high unemployment could signal limited job opportunities.

Table 3: Gravitational Model of Destination in the Labor Market and the Unemployed Population in Mexico, 2023

| State | Total Population | Ranking | Unemployed Population | Ranking | Labor Tension |
|---|---|---|---|---|---|
| Aguascalientes | 1.46 | 9 | 1.10 | 10 | 75.70% |
| Baja California | 0.27 | 31 | 0.21 | 31 | 77.05% |
| Baja California Sur | 0.17 | 32 | 0.13 | 32 | 76.94% |
| Campeche | 0.60 | 25 | 0.43 | 25 | 72.24% |
| Chiapas | 0.65 | 24 | 0.49 | 24 | 75.42% |
| Chihuahua | 0.49 | 27 | 0.38 | 27 | 76.47% |
| Ciudad de México | 2.42 | 2 | 1.90 | 3 | 78.47% |
| Coahuila | 0.74 | 22 | 0.56 | 22 | 75.97% |
| Colima | 0.99 | 16 | 0.74 | 16 | 75.06% |
| Durango | 0.79 | 20 | 0.60 | 20 | 75.77% |
| Guanajuato | 1.45 | 10 | 1.12 | 9 | 77.29% |
| Guerrero | 1.04 | 15 | 0.82 | 14 | 78.44% |
| Hidalgo | 2.26 | 3 | 1.90 | 2 | 84.14% |
| Jalisco | 1.06 | 14 | 0.81 | 15 | 75.92% |
| México | 1.94 | 7 | 1.49 | 8 | 76.66% |
| Michoacán | 1.91 | 8 | 1.63 | 5 | 85.25% |
| Morelos | 2.04 | 4 | 1.66 | 4 | 81.59% |
| Nayarit | 0.93 | 18 | 0.71 | 18 | 75.77% |
| Nuevo León | 0.74 | 21 | 0.57 | 21 | 76.73% |
| Oaxaca | 0.94 | 17 | 0.71 | 17 | 75.39% |
| Puebla | 2.02 | 5 | 1.61 | 7 | 79.69% |
| Querétaro | 2.01 | 6 | 1.62 | 6 | 80.80% |
| Quintana Roo | 0.44 | 29 | 0.32 | 29 | 72.51% |
| San Luis Potosí | 1.38 | 11 | 1.07 | 11 | 77.23% |
| Sinaloa | 0.54 | 26 | 0.40 | 26 | 75.45% |
| Sonora | 0.37 | 30 | 0.28 | 30 | 75.31% |
| Tabasco | 0.73 | 23 | 0.52 | 23 | 70.29% |
| Tamaulipas | 0.86 | 19 | 0.65 | 19 | 76.01% |
| Tlaxcala | 2.82 | 1 | 2.13 | 1 | 75.24% |
| Veracruz | 1.09 | 13 | 0.85 | 13 | 78.33% |
| Yucatán | 0.48 | 28 | 0.35 | 28 | 73.33% |
| Zacatecas | 1.12 | 12 | 0.86 | 12 | 77.31% |

Source: Author's own elaboration.

In regions with a high proportion of unemployed populations, internal migrants may be discouraged from settling due to limited job opportunities, even though the region might offer other advantages, such as a lower cost of living or better environmental conditions. Mexico City and Puebla are in the intermediate range of the proportion of unemployed people relative to the total population (with values between 78.47 per cent and 79.69 per cent). Despite these destinations having a relatively high proportion of unemployed people, they continue to be attractive for migrants due to their economic dynamism and the availability of multiple job opportunities in specialized sectors.

Guanajuato and the State of Mexico have rates of 77.29 per cent and 76.66 per cent, respectively, indicating that although they are relevant destinations, they also face significant labor challenges that may affect their ability to employ new internal migrants. Baja California, Baja California Sur, and Sonora show relatively low unemployment rates compared to their total population, with 77.05 per cent, 76.94 per cent, and 75.31 per cent, respectively. This could make them more attractive as internal migration destinations, as the lower unemployment rates suggest a better labor situation and an environment with more opportunities for job-seeking migrants.

Regions with a lower proportion of unemployed populations (such as Baja California and Sonora) may be more attractive in terms of employment for job seekers, although these areas must continue to compete with more economically dynamic destinations like Mexico City or Puebla, where the labor market is more diversified. Quintana Roo and Tabasco present low proportions of unemployed people, with rates of 72.51 per cent and 70.29 per cent. These figures indicate that while unemployment rates are relatively low, the job supply may be insufficient to absorb those seeking employment, especially in economic sectors that fail to offer stable or high-quality jobs. These destinations may be limited in their ability to attract new workers, as their job prospects are not as competitive as in other regions.

The proportion of unemployed people relative to the total population in destination regions plays an important role in attracting migrants. Regions with lower unemployment tend to be more attractive, while regions with higher unemployment rates may have more difficulty absorbing migrants, as their labor markets fail to meet employment demand.

The initial approach in the analysis consisted of calculating gravitational models based on the total population of each state, with the primary purpose of understanding the spatial distribution of the labor force in the

market. However, to achieve a comprehensive analysis that considers not only the population size but also unemployment dynamics, the unemployed population was incorporated into the model, allowing the calculation of labor tension as a key indicator measuring pressure on the labor market in each entity. To structure the interpretation, states were categorized into groups based on their values in Tables 1, 2, and 3: Table 1 reflects the total gravitational weight of the active and unemployed population; Table 2 shows the origin gravitational model, representing each state's labor expulsion capacity; and Table 3 corresponds to the destination gravitational model, indicating labor attraction capacity. The classification was based on identifying states with high or low active population, high or low unemployment, and levels of labor tension, grouping states into attractors, expulsers, and stagnant or intermediate labor markets. This categorization is interpreted in light of classic regional economic theories, such as the center-periphery model, which helps understand how central regions like Mexico City or Estado de México act as attractor poles due to their economic dynamism and population concentration, while peripheral regions, with more limited labor markets and higher population outflows, face structural conditions of backwardness and imbalance. Additionally, Christaller's approach explains the spatial hierarchy of urban centers and their role in the distribution of services and jobs, while Myrdal's theory emphasizes accumulation processes and regional imbalances that perpetuate economic and social inequality. Thus, the comprehensive analysis not only describes the behavior of each indicator separately but also articulates a critical framework linking labor mobility, labor market tension, and territorial dynamics of development and underdevelopment, highlighting the need for differentiated policies addressing these structural disparities.

## Conclusions and Recommendations

The present study set out to analyze how unemployment influences internal migration flows in Mexico, guided by the question, to what extent does the proportion of unemployed individuals relative to the total population affect internal migratory flows among Mexican states, and how might these patterns signal future international migration? To address this, a gravitational model was applied using total and unemployed population data to estimate internal migratory flows and identify territorial dynamics of attraction, expulsion, and retention. The results reveal that unemployment is a significant driver of internal population mobility, and in turn, a possible early indicator of future international migration. By classifying federal en-

tities according to their role in labor-related mobility, this analysis provides empirical insights into the structural economic inequalities that shape the geography of opportunity in Mexico.

In the context of the current challenges countries face regarding international migration, it is crucial to analyze the dynamics that determine migratory flows and their socioeconomic implications. This study presents the results of an investigation that examines mobility and migration flows in detail through a gravitational model, which allows for the evaluation of interactions between origin and destination populations based on their demographic and economic weight. The results generated by these calculations provide an accurate visualization of migratory patterns, considering both the total labor market population and the unemployed population.

The maps presented (Illustration 1) in this document offer a clear representation of internal migratory flows in Mexico, focusing on the relationship between the unemployed population and the total population. These maps, based on the gravitational model, allow for the assessment of how unemployment is a determining factor in migratory flows between different federal entities. States such as Mexico City, the State of Mexico, and Puebla, which have high levels of unemployment but also economic opportunities, generate both attraction and expulsion of the unemployed population.

The interpretation of these maps helps identify entities that act as poles of attraction or expulsion based on their capacity to offer employment opportunities. Metropolitan areas with high population density and strong economic dynamism act as magnets for migrants seeking employment, while regions with lower density and fewer economic opportunities experience lower migratory flows. Additionally, the results illustrate how unemployment in certain entities may be driving internal mobility, creating pressure on the labor market and influencing migratory decisions toward other entities or even abroad.

These findings offer a deeper understanding of internal migratory dynamics in Mexico and provide a solid foundation for the design of public policies that address regional disparities and promote balanced economic development.

The highest migratory activity in Mexico is concentrated in the central region, particularly in Mexico City, the State of Mexico, and Tlaxcala, while peripheral regions experience lower migratory flows. This aligns with Raúl Prebisch's center-periphery theory, which suggests that central regions, being more developed and urbanized, function as poles of attraction

due to their greater economic capacity and job offerings. In contrast, peripheral regions, lacking this dynamism, remain marginalized and exhibit less migration. Prebisch's theory contextualizes how regional disparities in development create structural imbalances that fuel migratory decisions.

As mentioned on Theoretical Framework on Mobility and Migration, Christaller's central place theory complements this idea by stating that urban centers act as economic nodes that attract populations from surrounding areas due to the concentration of goods, services, and opportunities. In Mexico, the central region has solidified its position as a central place that captures internal migratory flows, while peripheral regions, such as the south and southeast, attract fewer migrants. This highlights the functional hierarchy of cities and their role in redistributing the labor force, reinforcing the gravitational pull of major urban hubs.

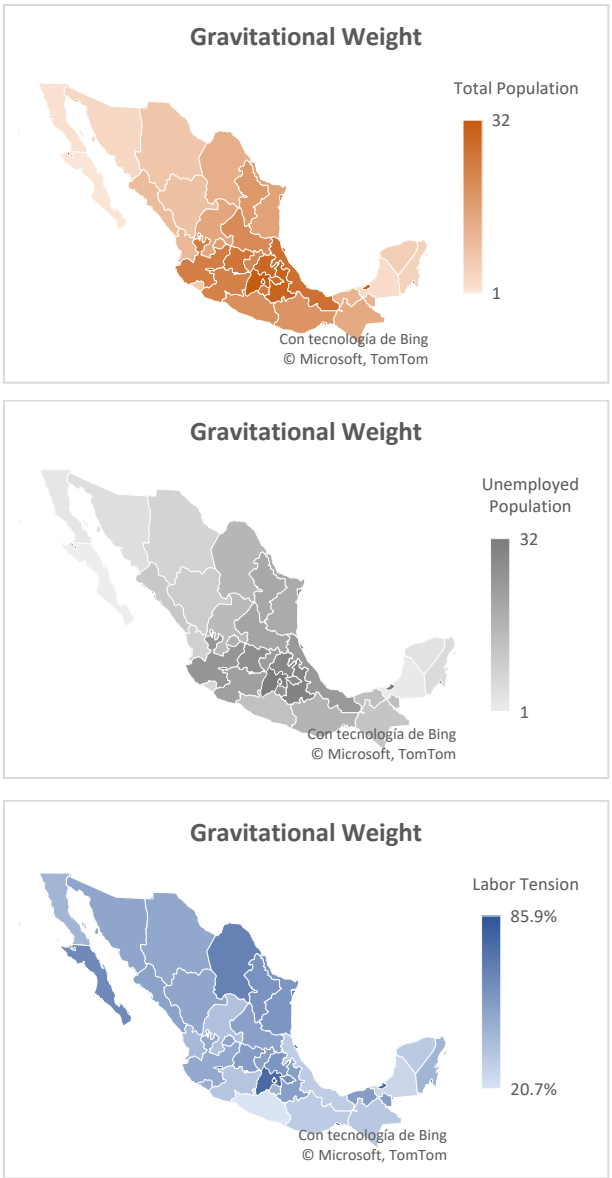
Also, Myrdal's circular and cumulative causation theory further reinforces this perspective. Myrdal argues that more developed regions tend to attract more resources, talent, and population, thereby increasing regional inequalities. In Mexico, the central region continues to accumulate economic advantages, which generates greater migratory attraction, while peripheral regions are trapped in a cycle of increasing disadvantages due to the loss of active population and resources. In this context, migration becomes not just a symptom of inequality but a mechanism that perpetuates it.

These theories explain why central Mexico, with its high economic dynamism, acts as a magnet for internal migration, while peripheral regions show lower migratory flows due to their limited capacity to generate economic opportunities.

The data analysis provides a comprehensive understanding of the factors driving migration, both internal and international, and their implications for the labor market, public finances, and the socioeconomic integration of migrants. The results not only offer better insight into migratory dynamics but also provide useful tools for designing more effective public policies to manage these flows.

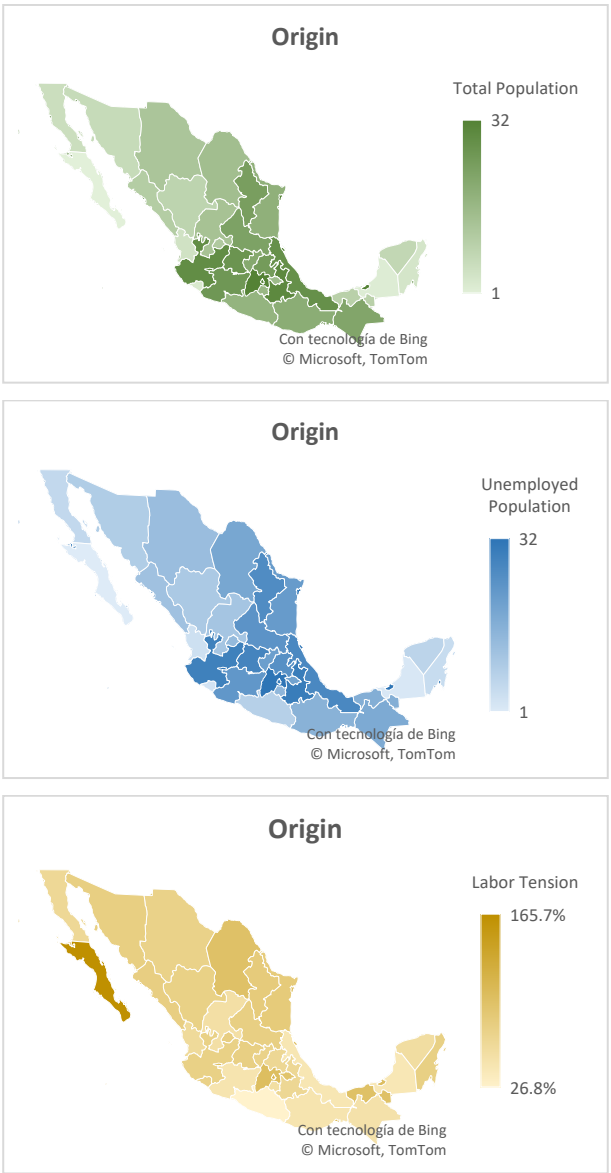
The gravitational model applied to the unemployed population reveals that unemployment is a key factor in internal migratory flows in Mexico. States like Mexico City, the State of Mexico, and Tlaxcala attract and expel a significant amount of unemployed population due to the combination of economic opportunities and high unemployment rates. This makes metropolitan areas magnets for job seekers, but intense competition for jobs also drives migration to other regions or even abroad.

Illustration 1: Maps of Migratory Dynamics: Gravitational Weight, Origin, Destination, and Labor Tension in the Total and Unemployed Population



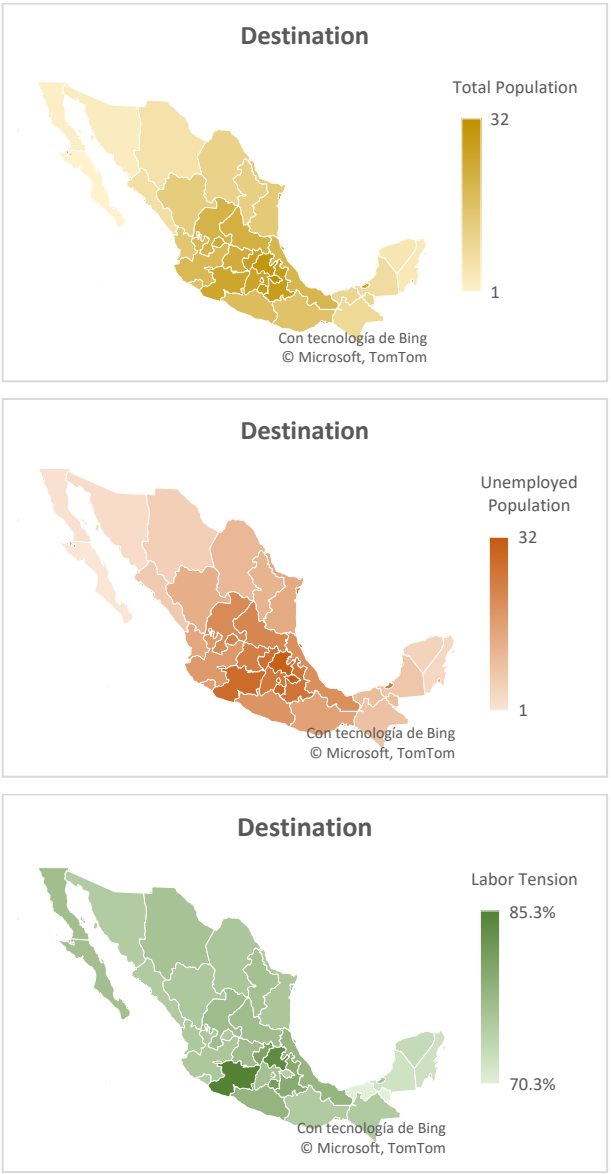

Source: Author's own elaboration.

Illustration 1: Continuation




Source: Author's own elaboration.

Illustration 1: Continuation




Source: Author's own elaboration.

In contrast, states such as Hidalgo and Puebla show significant internal migratory flows but with less labor pressure compared to central hubs like Mexico City. These states serve as points of origin for migrants seeking better job opportunities. Entities such as Baja California Sur and Guerrero, despite having high unemployment rates relative to their total population, show limited migratory pressure due to more stable or smaller labor markets. As a result, they do not experience large migratory flows, as the lack of opportunities neither attracts nor expels significant populations.

In conclusion, regional economic disparities in Mexico are driving internal migration and may be fostering international migration. To reduce migratory impact, it is essential to implement a comprehensive approach that promotes balanced development and creates job opportunities across all regions, thereby improving the quality of life for the unemployed population.

To address internal migration dynamics and mitigate migratory impact in Mexico, it is crucial to strengthen regional economies, particularly in states with low attraction of the unemployed population, such as Baja California Sur and Guerrero. Job creation at the local level would decentralize employment opportunities, reducing the over-reliance on metropolitan areas. Moreover, incentivizing internal mobility through relocation programs and job training in regions with high unemployment pressure would help redistribute the unemployed population more equitably, facilitating their access to emerging markets. Such programs would balance the supply and demand for labor, promoting a more homogeneous distribution of the workforce and reducing the concentration in large cities.

A continuous monitoring of labor migratory flows at the state level is also essential to adjust public policies more dynamically and effectively, responding to the changing needs of each region. This vigilance would allow the identification of critical areas and the adaptation of strategies to reduce regional disparities. Additionally, fostering interregional coordination through labor agreements and joint economic development programs would facilitate the absorption of internal migrants across different states, generating employment sustainably, reducing the strain on more urbanized areas, and improving regional integration.

Regarding the prevention of international migration, it is crucial to strengthen job opportunities in the regions of origin. Investing in infrastructure, industrial development, and improving the quality of life in these areas would allow people to find better job prospects without needing to migrate abroad. Furthermore, in states with high unemployment rates, such

as Mexico City, the State of Mexico, and Jalisco, inclusive employment policies that prioritize emerging and highly competitive sectors should be implemented to reduce both internal and international migratory pressure. This inclusive approach would contribute to generating quality job opportunities, fostering economic and social growth in key areas, and reducing the need for migration in search of better conditions.

Together, these recommendations aim to address the structural causes of migration by creating employment, redistributing the workforce, and improving living conditions throughout the country, which would help reduce migratory impact and promote a more balanced and sustainable regional development.

Although this study only considers unemployment and total population as variables, this is a deliberate analytical choice to highlight the labor market, specifically employment scarcity, as a fundamental determinant of internal migration. The use of the labor tensor, representing the proportion of unemployed individuals relative to the total population, captures structural labor vulnerabilities and serves as a proxy to identify early signs of future international migration. While individual-level characteristics of migrants remain unexplored, the model offers a strong territorial perspective. Future research should incorporate variables such as education, gender, or occupation to deepen the analysis. Nevertheless, these findings inform key policy recommendations: fostering job creation in states with high labor tension; investing in infrastructure and inclusive economic development in peripheral regions; and implementing interregional mobility programs. These actions could not only redistribute employment opportunities more equitably but also alleviate internal displacement and reduce the drivers of international migration.

In summary, the study not only provides empirical evidence on the influence of unemployment in internal migration but also introduces a methodological innovation by constructing two gravitational models that allow for a comparative analysis between total population flows and flows of the unemployed. This approach enables the formulation of the labor tension index, a novel territorial indicator that reflects how unemployment imbalances drive migratory dynamics. The use of the gravitational model in this context, shifting from its classic physical or logistical applications to a socio-territorial labor framework, marks a conceptual advance in migration studies. By centering the analysis on unemployment, the research bridges economic vulnerability with spatial mobility, offering new insights

and tools for public policy design and early detection of potential international migration triggers.

## References

Albarrán, C. Y. (2017). *Regionalización Funcional*. Facultad de Economía-UAEMéx.

Asuad, N. E. (2001). *Economía Regional y Urbana. Introducción a las teorías, técnicas y metodologías básicas*. BUAP.

Boisier, S. (1980). *Teoría del centro y periferia*. Editorial de la Universidad.

Castillo, J. y García, A. (2017). *Migración interna y urbanización en América Latina*. Editorial Universitaria.

Castles, S. (2003). "The factors driving migration". In *Global Migration Perspectives* (pp. 1–12). International Organization for Migration.

Chiapa Aguillón, R. y Mendoza Meza, E. Y. (2023). "Método gravitacional en el análisis de migración". In *Revista de Investigación Regional*.

Christaller, W. (1933). *Die zentralen Orte in Süddeutschland*. Gustav Fischer.

Durand, J. and Massey, D. S. (2003). "Causation and consequences of migration". In *Migration between Mexico and the United States* (pp. 85–102). University of Arizona Press.

Duranton, G. and Puga, D. (2021). "Labor market dynamics and urban spatial structure". In *Journal of Urban Economics*, 123, 103356. https://doi.org/10.1016/j.jue.2021.103356

González, M. (2015). *Factores sociales en la migración interna*. Editorial Académica.

Harris, J. R. and Todaro, M. P. (1970). "Migration, unemployment and development: A two-sector analysis". In *American Economic Review*, 60(1), 126–142.

INEGI (2020). *Censo de Población y Vivienda 2020*. Instituto Nacional de Estadística y Geografía (INEGI).

INEGI (2023). *Encuesta Nacional de Ocupación y Empleo* (ENOE). Instituto Nacional de Estadística y Geografía (INEGI).

Keynes, J. M. (1936). *The general theory of employment, interest, and money*. Harcourt Brace.

Leontief, W. (1936). "Quantitative input-output relations in the economic system of the United States". In *Review of Economic Statistics*, 18(3), 105–125.

Leontief, W. and Strout, A. (1963). "Multiregional Input-Output Analysis". In Barna, T., *Structural Interdependence and Economic Development*. London. Londres: Macmillan.

Leontief, W. W. (1963). *Input-output analysis: An introduction*. Harvard University Press.

Massey, D. S. and Zenteno, R. M. (2021). "Migration and economic development in Latin America: Current trends and future challenges". In *Journal of Economic Geography*, 21(3), 395–412. https://doi.org/10.1093/jeg/lbab023

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., and Taylor, J. E. (2002). "Theories of international migration: A review and appraisal". In *Population and Development Review*, 28(2), 433–466.

McLeman, R. and Smit, B. (2006). "Migration as an adaptation to climate change". In *The role of migration in climate change adaptation* (pp. 50–60). Routledge.

Miller, R. E. and Blair, P. D. (2012). *Input-output analysis: Foundations and extensions*. Cambridge University Press.

Myrdal, G. (1957). *Economic theory and underdeveloped regions*. Harvard University Press.

OIM (2021). *Glosario sobre migración* (p. 15). Organización Internacional para las Migraciones (OIM). Ginebra

Ortega, F. and Peri, G. (2019). "The effect of labor mobility on regional development: A gravity model approach". In *Regional Science and Urban Economics*, 77, 109–121. https://doi.org/10.1016/j.regsciurbeco.2018.11.002

Perroux, F. (1955). "Note sur la notion de pôle de croissance". In *Économie Appliquée*, 8(1), 307–320.

Piore, M. J. (1979). *Birds of passage: Migrant labor and industrial societies*. Cambridge University Press.

Ravenstein, E. G. (1885). "The laws of migration". In *Journal of the Statistical Society of London*, 48(2), 167–235.

Rodríguez-Pose, A. (2018). "The revenge of the places that don't matter (and what to do about it)". In *Cambridge Journal of Regions, Economy and Society*, 11(1), 189–209. https://doi.org/10.1093/cjres/rsx024

Sassen, S. (1988). *The mobility of labor and capital: A study in international investment and labor flow*. Cambridge University Press.

Smith, R. C. and Espinoza, R. (2010). "The impacts of migration on regional development". In *Migration and development* (pp. 75–90). Springer.

Stark, O. (1991). *The migration of labor*. Blackwell Publishing.

Taylor, J. E. (1999). "Migration and development: Theory and evidence". In *Journal of Development Economics*, 60(2), 277–300.

Theil, H. (1967). *Economics and information theory*. North-Holland Publishing Company.

## Resumen curricular de las autoras y los autores

*Eréndira Yaretni Mendoza Meza*

Doctora en Ciencias Sociales por el Instituto de Ciencias Sociales y Humanidades de la Universidad Autónoma del Estado de Hidalgo (UAEH). Licenciada en Economía, Maestra en Gobierno y Desarrollo Regional, y Especialista en Docencia. Miembro del Sistema Nacional de Investigadoras e Investigadores (SNII) nivel I. Premio ANUIES 2024 a la Innovación en la Práctica Docente. Ha sido promotora de la internacionalización educativa mediante metodologías como COIL y Clases Espejo. Columnista de la Revista Expansión y analista en medios nacionales. Ha colaborado en proyectos estratégicos para el desarrollo territorial en el estado de Hidalgo, como el Plan Estatal de Ordenamiento Territorial, el Plan de la Región de Jacala y el programa "Pachuca Ciudad del Conocimiento y la Cultura". Forma parte del cuerpo académico "Planeación y Análisis Territorial" de la UAEH. Su línea de investigación se enfoca en temas económicos, análisis poblacionales e internacionalización.
Email: mendoza_erendira@uaeh.edu.mx
Registro ORCID: https://orcid.org/0000-0003-4012-9231

*Arturo Torres Mendoza*

Maestro en Ingeniería Industrial por la Universidad Autónoma del Estado de Hidalgo (UAEH), donde también cursó la Licenciatura en Ingeniería Industrial. Cuenta con estudios de Doctorado en Medio Ambiente y Desarrollo por la Universidad Autónoma de Baja California. Desde 1993, ha desarrollado una sólida trayectoria en la UAEH, ocupando diversos cargos académicos y administrativos, entre ellos: Administrador de la Escuela de Trabajo Social, Subjefe Administrativo del Área Académica de Ingeniería, Coordinador de la Maestría en Ingeniería Industrial, y Maestro fundador de la Escuela Superior de Apan. Ha contribuido al diseño y rediseño de programas académicos en la UAEH, como las licenciaturas en Trabajo Social, Ingeniería en Tecnología del Frío e Ingeniería Económica y Financiera. También participó en la creación del Centro de Investigación Avanzada en Ingeniería Industrial (CIAII). Es coautor de un derecho de autor registrado ante INDAUTOR sobre el análisis espacial de residuos sólidos urbanos en Pachuca, Hidalgo. Ha colaborado en capítulos de libro y diversas publicaciones científicas, destacando investigaciones recientes sobre desarrollo económico, turismo, agroindustria y modelación de recursos hídricos

en revistas como Water, Sostener, Boletín de Ciencias Agropecuarias del ICAP y Universita Ciencia.
Email: atorres@uaeh.edu.mx
Registro ORCID: https://orcid.org/0009-0006-2511-2182

*Yamile Rangel Martínez*

Arquitecta por el Instituto Tecnológico Regional, Maestra en Arquitectura y Urbanismo por el ITESM, y Doctora en Ciencias Ambientales por la Universidad Autónoma del Estado de Hidalgo (UAEH). También cuenta con un Doctorado Honoris Causa otorgado por el Instituto Kinneret de México (2022). Reconocida con el Premio al Liderazgo Educativo en América Latina 2024 por SAMEJ Publishing Books. Miembro del Sistema Nacional de Investigadores (SNII) nivel I (2025–2029) y Perfil Deseable PRODEP-SEP (2022–2025). Ha desarrollado una patente registrada ante el IMPI: "Arreglo modular de mobiliario de oficina" (vigente hasta 2028). Desde 2006, se desempeña como docente de tiempo completo en la UAEH, integrándose al Cuerpo Académico Consolidado "Planeación y Análisis Territorial". Su línea de investigación se centra en el urbanismo sustentable y la resiliencia urbana.
Email: profe_6771@uaeh.edu.mx
Registro ORCID: https://orcid.org/0000-0001-8117-3218

*Luis Alberto Quezada Téllez*

Licenciado en Economía por la Universidad Nacional Autónoma de México (UNAM). Cuenta con un diplomado en Regulación por la COFEMER y LATIN-REG. Obtuvo la Maestría en Ciencias con especialidad en Dinámica No Lineal y Sistemas Complejos por la Universidad Autónoma de la Ciudad de México (UACM) y el Doctorado en Ciencias de la Ingeniería por la Universidad Iberoamericana (UIA), Ciudad de México. Miembro del Sistema Nacional de Investigadoras e Investigadores (SNII) Nivel I (2023–2027) y Perfil Deseable PRODEP-SEP (2023–2026). Premio de Investigación por la UIA en 2017. Ha diversificado su labor científica en temas como sistemas dinámicos, modelación matemática, análisis fraccional, economía compleja y gestión de recursos hídricos. Tiene más de 70 publicaciones en revistas nacionales e internacionales como *Fractals*, *Symmetry*, *Water*, *Axioms*, *Applied Economics* e *International Journal of*

*Modern Physics*. Ha dirigido cerca de 50 tesis en instituciones como la UAEH, UNAM, UAM y UIA.
Email: luis_quezada@uaeh.edu.mx
Registro ORCID: https://orcid.org/0000-0002-9262-9951

Artículo recibido el 09 de diciembre de 2024 y aceptado el 29 de abril de 2025
Publicado el 15 de enero de 2026