

Unemployment Duration and Migration in Mexico after the Financial Crisis

Duración del desempleo y la migración en México ante la crisis financiera

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ABSTRACT

This article examines structural breaks in the effect of the unemployment duration for the population of Mexico on the probability of migrating, both internal and internationally. Data from the National Survey of Occupation and Employment for 2007, 2008, and 2010 is used, and estimations are made from both binary and multinomial response models. Furthermore, a Chow-type test is used to estimate structural breaks in the unemployment duration effect after the financial crisis, and sensitivity tests are carried out using different specifications of the migration and unemployment duration variables. The results show that after the crisis the unemployment duration effects on the probability of migrating have been reduced, leading to restrictions on the free mobility of the labor factor.

Keywords: 1. emigration, 2. employment, 3. recession, 4. Mexico, 5. Latin America.

RESUMEN

El artículo examina quiebres estructurales en el efecto de la duración del desempleo sobre la probabilidad de migrar nacional e internacionalmente para la población de México. Para ello se utilizan datos de la Encuesta Nacional de Ocupación y Empleo del 2007, 2008 y 2010, y se realizan estimaciones a modelos de respuesta cualitativa binomial y multinomial. Se utiliza una prueba tipo Chow para estimar quiebres estructurales en el efecto de la duración del desempleo a partir de la crisis financiera, y se realizan pruebas de sensibilidad mediante distintas especificaciones de las variables de migración y duración del desempleo. Los resultados muestran que a partir de la crisis los efectos de la duración del desempleo en la probabilidad de migrar se redujeron, lo que conlleva restricciones a la libre movilidad del factor trabajo.

Palabras clave: 1. emigración, 2. empleo, 3. recesión, 4. México, 5. Latinoamérica.

Date received: April 30, 2020

Date accepted: October 22, 2020

Publishd online: September 30, 2021

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INTRODUCTION

The literature on migration in Mexico has primarily focused on studying the effects of various determining factors on a scenario of stability in these effects. Broadly speaking, studies on migration flows within Mexico analyze differences of these determining factors both in destination and origin, including variables such as salary (Flores, Zey, & Hoque, 2013; Villarreal & Hamilton, 2012), GDP levels (Soloaga, Lara, & Wendelspiess, 2010), unemployment rates (Quintana & Salgado, 2016), foreign direct investment level (Flores et al., 2013), the border with the United States (Villarreal & Hamilton, 2012), unemployment in the manufacturing sector, the proportion of migrant population and distance (Peeters, 2012), education levels (Aguayo-Téllez & Martínez-Navarro, 2013), population size (Soloaga et al., 2010), and violence levels (Ybáñez & Alarcón, 2014). Since these factors relate to various macroeconomic variables, it can be expected that these differences could be modified or aggravated by negative external impacts, specifically due to financial crises. However, not much analysis has been carried out on the influence of structural changes caused by these events, a matter re-gaining relevance given the recent global recession state of things and expectations.

For its part, the literature that examines the effects of financial crises shows that these events can influence various migration determinants, and therefore their effects, to an important extent. In general terms, Reinhart and Rogoff (2009) state that financial crises affect various macroeconomic variables, including growth—through public debt (higher taxes)—, the asset market, as well as production and employment. Likewise, Colombo, Menna, and Tirelli (2019) argue that financial crises are different (more severe) than “regular” economic recessions. The authors stress that these are important asymmetric impacts causing a quite noticeable reallocation of productive factors from the formal to the informal sector, specifically when it comes to labor, which in turn causes downward trends in production and investment, increasing unemployment. Based on the Mexican experience and the tequila crisis, Pratap and Quintin (2011) argue that financial crises decrease factual productivity, given how the 1995 crisis impacted the labor market (movements between industries and occupations), and therefore labor productivity.

These macroeconomic affects—primarily those related to employment— have been examined in the context of the recent 2008 financial crisis. For example, in an analysis from 61 countries, Oulton and Sebastián-Barriel (2017) found that the financial sector crisis-affected total factor productivity (TFP) and GDP through the effect of low real interest rates and high unemployment rates. For their part, Fernandes and Ferreira (2017) argued that the crisis imposed financial restrictions that affected employment in Portugal. Popov and Rocholl (2018) examined the characteristics of companies and thus found that the financial crisis indeed affected employment in Germany; they specifically observed how employment was affected depending on the size of the company, and whether it had credit relationships with banks in good or bad standing.

Thus, we can see how the literature has provided evidence reinforcing the need to consider the effects of this crisis in the analysis of internal migration, which is the main hypothesis outlined in this paper.

As for the studies addressing the financial crisis of 2008 and its effects in Mexico, these focus mainly on the labor market, as well as on socioeconomic variables such as income, poverty

levels, and education. In this regard, Kemme and Koleyni (2017) argued that the financial crisis would have impacted productivity in Mexico, with temporary effects on various macroeconomic variables that depend on the exchange rate regime. Likewise, Cabral and Mollick (2017) found that the financial crisis changed the effects of U.S. education and real GDP on real wages in Mexico.

Because of the 2008 financial crisis on unemployment, and therefore on migration flows, the goal of this paper is to analyze the effect of unemployment duration on the probability of migrating within Mexico or abroad. It is worth mentioning that some previous studies have found no significant relationship in this regard, which is primarily due to the context of the country where such analyses are carried out (e.g. whether there is unemployment insurance or benefits). For example, Ahn, de La Rica, and Ugidos (1999) made use of the inhabitants of Spain's willingness to migrate for work (not full migration) as a dependent variable. These authors found that family responsibility, age, and level of education are some important determining factors on the willingness to migrate, but they do not find unemployment duration to be significant (possibly due to cultural or lifestyle reasons) unless unemployment benefits are cut off or other family members become unemployed.

In terms of the problem presented previously, this analysis aims at filling a gap in the literature, and so it will analyze the structural changes that the 2008 financial crisis caused in the relationship between unemployment duration and the probability of migrating for the population of Mexico. For this purpose, data from the National Occupation and Employment Survey of 2007, 2008, and 2010 (INEGI, 2021) were used; the effects of unemployment duration on the probability of migrating (internally or externally) are also estimated through a qualitative response model. Likewise, a Chow-type test is used to estimate structural breaks in the effect of unemployment duration after the 2008 financial crisis.

The next section addresses relevant theoretical aspects on microeconomic determining factors of the decision to migrate and unemployment duration. Subsequently, the proposed methodological strategy to estimate structural changes in the effect of unemployment duration on the probability of migrating is presented, as well as the description of the data. The following section will present the results of the empirical analysis; finally, the last section provides some conclusions.

THEORETICAL ASPECTS

Microeconomic Determining Factors of the Decision to Migrate

Bodvarsson and Van den Berg (2009) point out that the classical migration theory starts from Adam Smith's observation regarding the spatial disparity between labor markets of two regions. In this regard, Ravenstein (1889) postulates several migration principles or laws based on his observations on data from various European and North American countries, summarizing that in addition to the potential benefit in labor salary, migration is determined by other regional characteristics such as institutional quality, taxes, and the social context. This author enumerates, among other determining factors, the distance between regions and the sex of individuals.

Bean and Brown (2015) state that microeconomic theories on the determining factors of migration generally analyze the returns on labor, the cost-benefit analysis of moving, the risk of death, and the costs of living at destination. From the neoclassical approach assumed by Borjas (1987), which seeks to maximize individual utility, the decision to migrate is primarily a function of wage differentials between regions of origin and destination, as well as mobility costs; furthermore, education levels and age (individual skills) also influence this decision. Therefore, it is inferred that the decision to migrate in general may be determined by the socioeconomic characteristics of individuals. On the other hand, Harris and Todaro (1970) assume that individuals consider the expected salary at their destination to decide to migrate.

Given that the decision to migrate implies accepting a job elsewhere, its analysis can be carried out under an extension of the classic job-search model, which is based on salary. In this sense, Bodvarsson and Van den Berg (2009) stated that models are explaining the decision to migrate based on a process of sequential search for an expected income at the destination, contrasted with the reservation wage. In this regard, Constant, Krause, Rinne, and Zimmermann (2010) assume that the reservation wage is assessed in relation to the individuals' estimation regarding the distribution of wages offered, which are strongly influenced by reference groups (place of origin of the migrant). In this regard, Ahn et al. (1999) stated that the willingness to accept a job depends on the reservation wage, in turn depending on individual characteristics, family situation, and regional economic situation.

Although the microeconomic approach to migration has focused on the maximization of individual utility, Bodvarsson and Van den Berg (2009) argued that these theories ignore other important determining factors such as family reunification, the search for political asylum, a more attractive culture or religion, and even better weather conditions. For their part, Goldin, Reinert, and Beath (2007) clarified that theories are extending the decision to migrate to a group of individuals. Since migration can involve taking risks, as well as incurring social costs or benefits, Stark and Bloom (1985) argue that the decision to migrate is made within the family or group of individuals potentially affected by the migration of any of its members. In this regard, Anam and Chiang (2007) based their analysis on the assumption that migration is determined by the goal of maximizing family income (minimizing risks) through diversifying the portfolio of "assets" (family members) throughout various labor markets. On the other hand, Bean and Brown (2015) argued that informal connections with migrant individuals (family, friends, or employers) provide social capital that minimizes risks for future migrants. In addition, Fitzgerald (2015) states that the forced migration theory concerns itself with natural causes (such as natural meteorological disasters) or social causes (such as violence and persecution) that force certain people to emigrate.

Duration of Unemployment

In overall terms, long-term unemployed individuals are less likely to find work than short-term unemployed ones (Jackman & Layard, 1991), which highlights the importance of considering the temporary nature of unemployment in the possibilities of positioning in a new job (Rodríguez-Oreggia, 2002).

To a large extent, this is because prolonged periods of unemployment tend to affect the self-esteem of the seekers, discouraging them from furthering their goal, who collectively constitute themselves into a group of discouraged workers who cease to be part of the workforce, otherwise turning to informal work (Ramoni, Orlandoni, Prasad, Torres, & Zambrano, 2017).

In Mexico, unemployment and its duration have not been widely studied; this is because overt unemployment rates are low compared to other countries with similar development conditions, even in the same region.

The incidence and duration of unemployment in Mexico presents variations under certain individual characteristics such as age, sex, schooling, marital status, number of children, and position within the household, as well as by conditions pertaining to the local development of the different regions (Marquez-Scotti, 2015; Rodríguez-Oreggia, 2002; Garro & Rodríguez-Oreggia, 2002).

Hernández-Licona (1997) analyzed the average time of unemployment in Mexico for the period 1987-1993 every quarter, detecting that the duration ranged between 4.5 and 8.7 weeks of inactivity, while for the United Kingdom the corresponding figure was 65 weeks. The aforementioned study also found that unemployment duration is increased by the patrimonial income of the household, and to an even greater extent for men and those who are not household heads, thus demonstrating the importance of the family in job-related decisions.

According to Rodríguez-Oreggia (2002), being unemployed for a long period could reduce the effectiveness of people due to the interruption of their work career; in the same way, the emotional and psychological consequences of a long-lasting job search tend to discourage the seeker, reducing their job placement probabilities and leading them into a scenario of long-term unemployment. In this regard, the author analyzed the variables that affect the probability of short- and long-term unemployment (greater than six months) in Mexico. The main findings for this last period show that the higher the level of education and older age, the greater the probability of remaining unemployed for a long time, while the differentiated effects between men and women disadvantage the latter to a greater extent since for women being married and having children increases the probability of being unemployed for a period greater than six months.

Garro and Rodríguez-Oreggia (2002) stated that unemployment duration is shorter for young people than for other age groups, while older job seekers are identified as long-term unemployed.

This matches the evidence found by Márquez-Scotti (2015) when analyzing the determining factors of unemployment in Mexico, showing that the highest incidence of unemployment in the country occurs among young people. Likewise, she notes that low levels of education are associated with unemployment and a longer permanence in this situation. For their part, the findings in this paper indicate a lower correlation between unemployment and being the household head, matching the findings by Hernández-Licona (1997).

For their part, Hernández and García (2017) found that unemployment duration depends on education (inverted “u” ratio), age, if the individual states to be the head of the household, the number of underage children, if they have other unpaid activities, and time (duration). These authors stated that geographic heterogeneity determines unemployment duration. They also

found that there were different effects before and after the financial crisis, as well as by sex, education, work experience, and marital status. Along the same line, Mora, Caicedo, and González (2017) stated that unemployment duration is influenced by migration status, socioeconomic level (reservation wage), sex, schooling, and ethnicity.

METHODOLOGY

To test the presence of a structural break in the relationship between unemployment duration and migration caused by the 2008 financial crisis, this study considers the econometric qualitative response model expressed in equation 1.

$$migrates_{it} = \alpha + \beta duration_{it} + C_i' \gamma + u_{it} \quad 1$$

Where *migrates* is a qualitative response variable equal to one if individual *i* is a household member in quarter *t* but becomes permanently absent (emigrates) in quarter *t + 1*. Given that the regressors data are collected in quarter *t*, the specification of the *migrates* variable controls the endogeneity of unemployment duration highlighted in the literature. The *duration* variable is the days that person *i* stated to be unemployed and looking for a job, *C* is a vector of control variables of characteristics of individual *i*, *u* is the error, and α , β , and γ are parameters to be estimated. Specifically, vector *C* includes age, a dichotomy equal to one if female (*female*), a dichotomy equal to one if the person is married (*married*), age (*age*), the person's monthly income (*ocupinc*), schooling (*educ*), the monthly minimum wage of the area of residence (*salary*), and the region of residence of the individual *i*. To this end, state dichotomies (*state*), and border region dichotomies (*border*) are included if they reside in the states of Baja California, Baja California Sur, Sonora, Chihuahua, Coahuila, Nuevo León, or Tamaulipas; or from the south of the country (*south*) if they reside in Chiapas, Oaxaca, Guerrero, or Michoacán.

To estimate structural changes, a Chow test is performed on the coefficients of the model of equation (1) under the context of a natural experiment. Specifically, the significance of the interactive variables of the duration of unemployment and additional dichotomous time (post-crisis) variables are tested in model 1. To collect pre-and post-crisis information, data from three independent samples corresponding to three periods are used: *before*, *during*, and *after* the financial crisis. Furthermore, the validity of a natural experiment requires the correct specification of the control and treatment groups before and after the event; in this case, the treatment group is the migrant population and the event is the financial crisis.

Therefore, to obtain robust results, the periods are chosen considering two aspects. On the one hand, given that the most significant stage of the financial crisis spans from the third quarter of 2007 to the first quarter of 2009, the samples for the periods before and after the crisis are taken from outside of this stage. On the other hand, so as the interactive variables capture as little as possible the influence of the war on drugs (an event that increased the levels of violence in the country), information is analyzed from the beginning of such war, i.e. the year of 2006.

Data

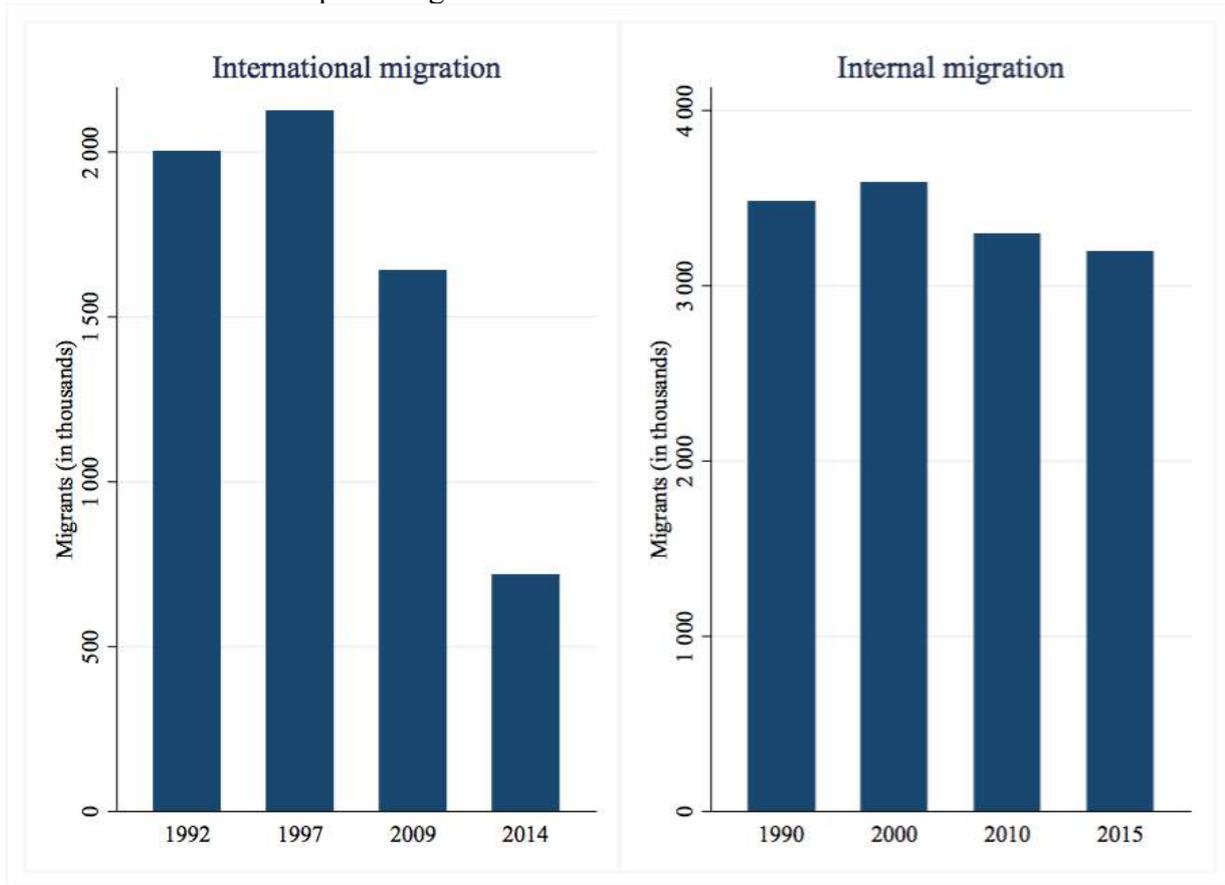
In the present study, data of people between ages 15 and 65 are analyzed, since this subgroup of the population is considered as that of working age, as well as data from the National Occupation and Employment Survey (ENOE) applied by the National Institute of Statistics and Geography (INEGI, 2021). Such survey is carried out quarterly and covers statistical information related to socioeconomic characteristics of household residents, as well as their occupational status. It is important to note that the households surveyed in a quarter constitute five independent subsamples of households that are visited for five consecutive quarters, and are then replaced asynchronously: each quarter 20% of the households are visited for the first time, 20% are visited for the second time, and so on. In this way, ENOE allows examining short-term migration flows, as it provides information on individuals who leave home from one quarter to another (called permanent absentees), as well as on those individuals who arrive at home in a given quarter period (new residents).

To estimate structural breaks in model 1, and to avoid endogeneity problems caused by unobserved heterogeneity of household residents, ENOE data for quarters 2007-I (before the financial crisis), 2008-III (during the financial crisis), and 2010-I (after the financial crisis) are employed. Additionally, to test whether the results are sensitive to various specifications of the independent variable of interest, unemployment duration is estimated considering as starting date the one reported by the interviewee (RD duration) and the end date as that of the interview (variable approach built-in ENOE: ID duration). Finally, a multinomial model is estimated to contrast differences between the probability of migrating internationally or domestically.

RESULTS

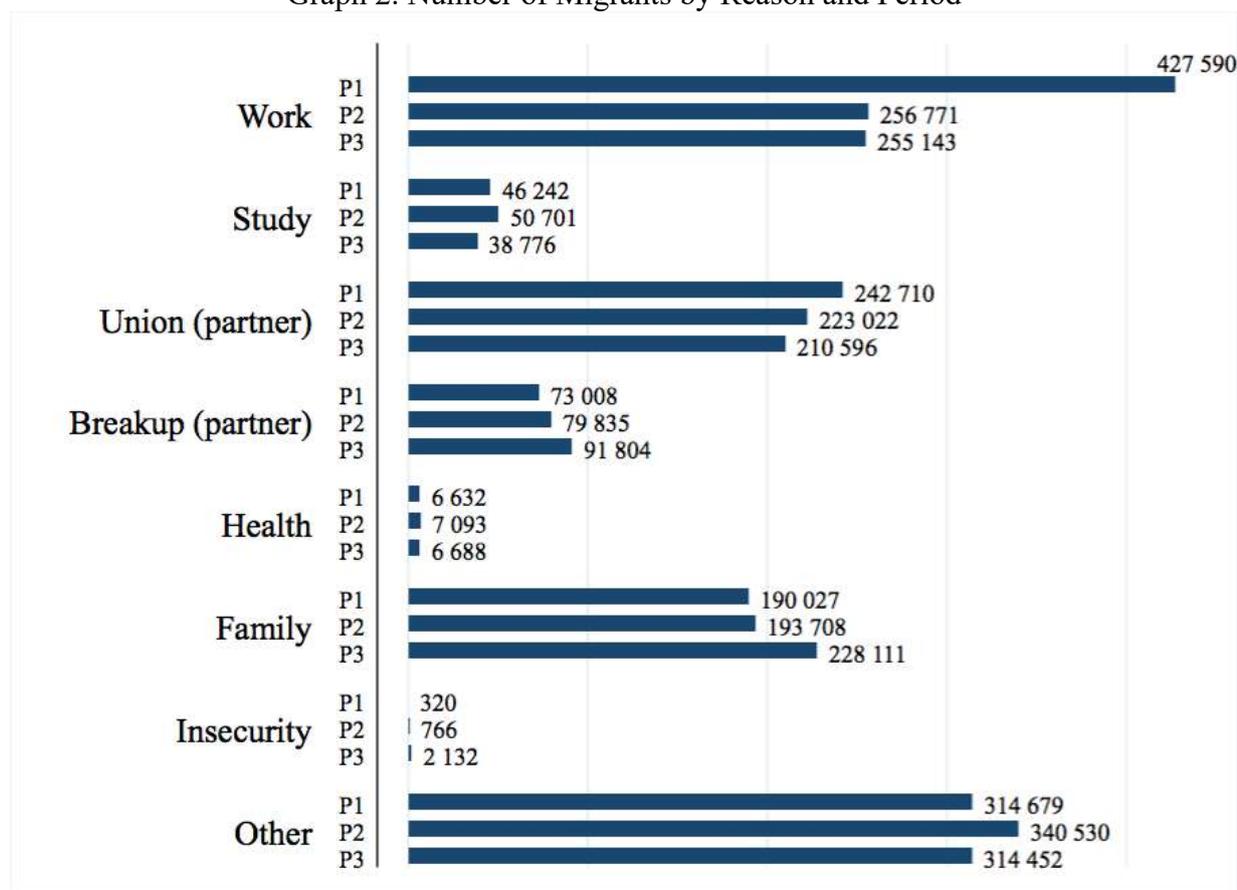
Table 1 shows that the proportion of migrants (in terms of the total population between ages 15 and 65) decreased between the first quarters of 2007 and 2010, going from 2.5 to 2%. It is worth mentioning that this negative trend was present in general since the end of the 1990s in the case of international migration, and since the 2000s for internal migration, as shown in Graph 1. In relation to the above, this drop in migration flows was considerably greater among those people who changed residence for working reasons (Graph 2).

Graph 1. Migration Flows Within Mexico and Abroad



Source: Own elaboration with information on international migration taken from the National Population Council (CONAPO, acronym in Spanish, 2016), and with information on migration within Mexico taken from the 1990, 2000, and 2010 population censuses (INEGI, 2020a), and the Intercensal Survey 2015 (INEGI, 2020b).

Graph 2. Number of Migrants by Reason and Period

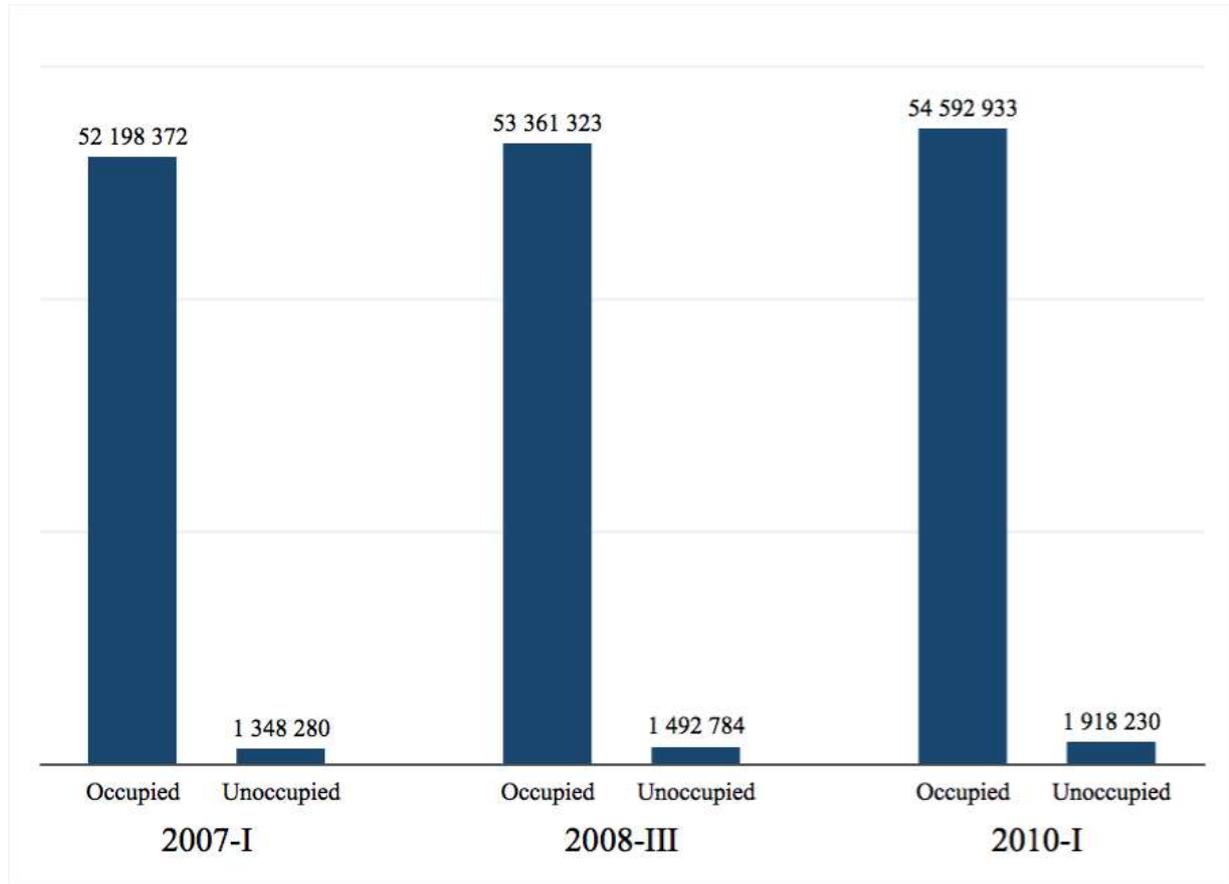


Note: The periods are P1: 2007-I, P2: 2008-III, P3: 2010-I.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

On the other hand, when accounting for the total population, the mean duration of unemployment (*ID duration*) increased by approximately one day (although if only the population group with a positive duration is considered, the mean *ID duration* goes from 55 days in 2007-I to 74 in 2010-I), and the maximum values increase by more than 28% (698 days) for the 2008-III quarter and more than 50% (1,292 days) for the 2010-I quarter. It is worth mentioning that the number of unemployed people (those who presented positive unemployment duration) increased along the three periods in absolute terms and with respect to the number of employed people, representing 2.58% in the first period, and subsequently 2.79% and 3.51% in periods two and three (see Graph 3).

Graph 3. Number of People by Occupational Status and Period



Note: These values represent the total estimates of individuals.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

In the same way, the means of age and education increase, and the proportion of women and married people decreases slightly in the observed period. Finally, the monthly minimum wage means increases, reflecting the increases in the minimum wage in the period. Also, the average monthly income increased slightly between 2007-I and 2008-III, but decreased for 2010-I; interestingly, the maximum value was lower in the periods following 2007-I.

Table 1. Descriptive Statistics

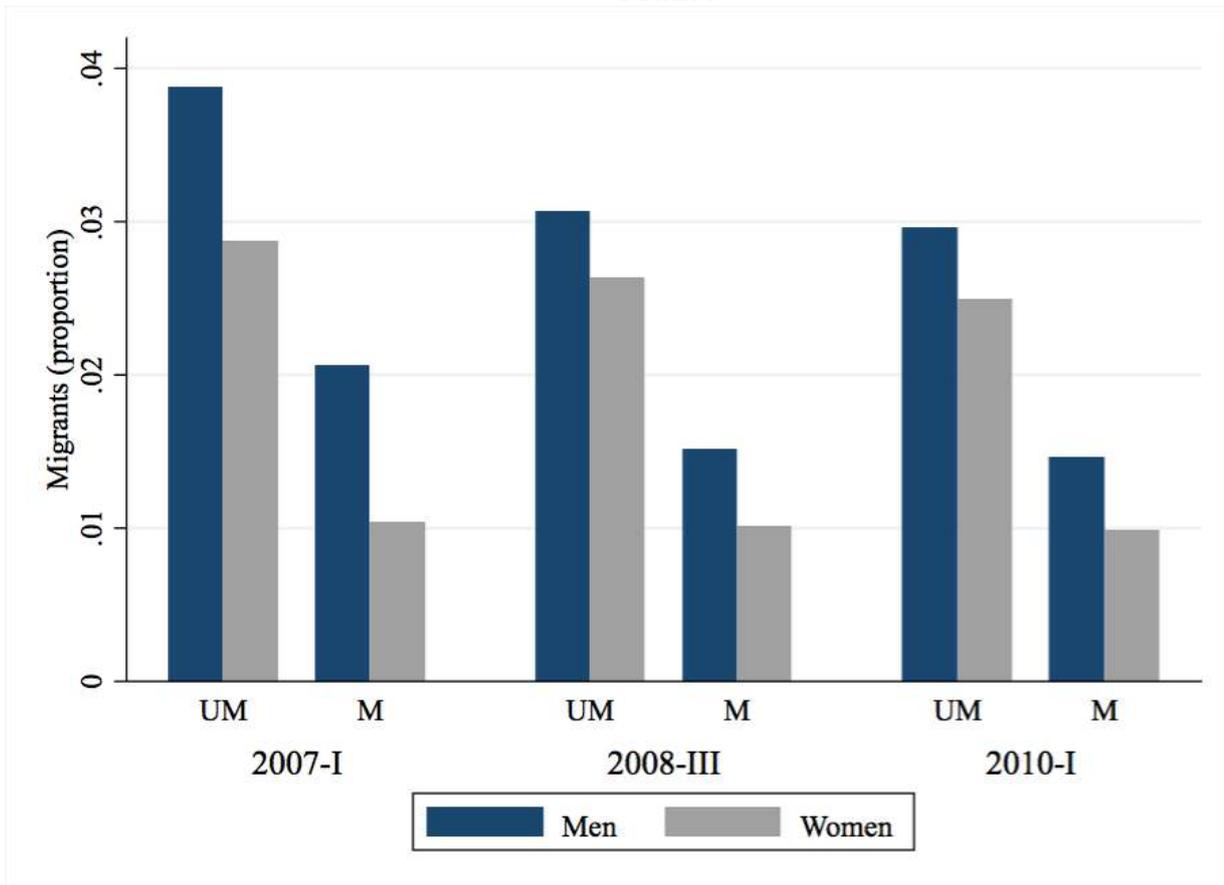
Variable	2007-I				2008-III				2010-I			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
migrates	0.025	0.155	0	1	0.021	0.144	0	1	0.020	0.141	0	1
ID duration	1.319	20.498	0	2430	1.459	23.575	0	3128	2.363	35.751	0	3722
RD duration	1.080	19.340	0	2427	1.269	22.920	0	3119	2.129	35.252	0	3718
age	34.97	13.80	15	65	35.15	13.85	15	65	35.29	13.95	15	65
educ	8.6	4.4	0	24	8.7	4.4	0	24	8.9	4.3	0	24
woman	0.532	0.499	0	1	0.530	0.499	0	1	0.526	0.499	0	1
married	0.472	0.499	0	1	0.461	0.498	0	1	0.449	0.497	0	1
salary	1 456	39	1 428	1 517	1 514	40	1 485	1 578	1 662	39	1 634	1 724
ocupinc	2 224	4 556	0	400 000	2 251	4 239	0	322 250	2 155	4011	0	365 502

Note: By means of the expansion factor, the observations calculated for each period are N = 53,546,652 (2007-1), N = 54,854,107 (2008-III), and N = 56,511,163 (2010- I).

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Graph 4 shows that on average there is a lower proportion of married migrants than unmarried ones, in addition to the fact that men migrate more than women. It also shows that the proportion of migrant married women almost did not change compared to 2007-I, but the rest of the subgroups had the largest drop in 2008-III.

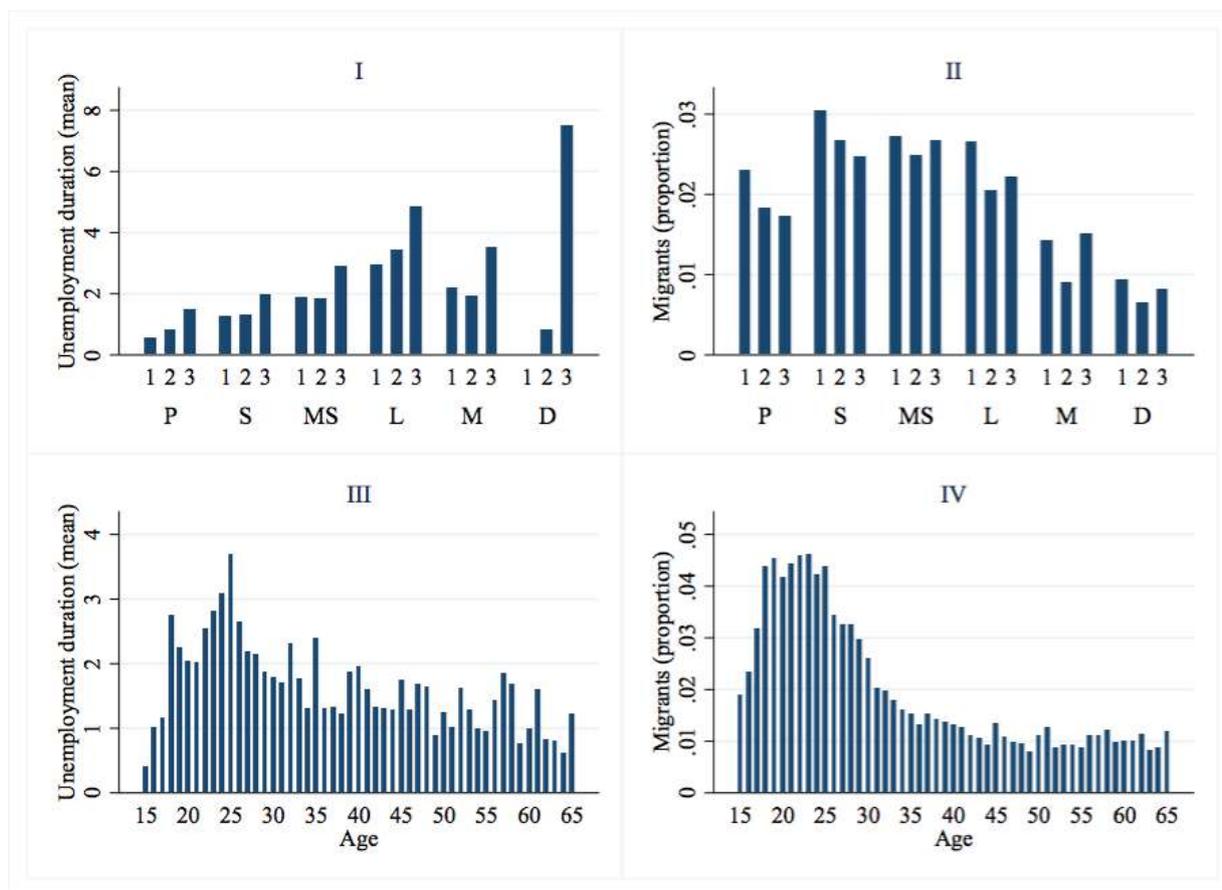
Graph 4. Proportion of Migrants by Marital Status, Sex, and Period in Mexico



Note: UM indicates unmarried persons and M indicates married persons.
 Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

On the other hand, Graph 5 (quadrant I) shows that in the first period (2007-I) unemployment duration increased with educational level up to the undergraduate level, and then decreased for the postgraduate levels, being practically nil at the Ph.D. level; these findings being similar to those of Hernández and García (2017). However, the graph shows diverse pre-and post-crisis changes: for the second period, unemployment duration remained almost the same for the population with secondary and high school, decreased for those with a master’s degree, and increased for those with primary, undergraduate, and Doctorate education. In the third period, unemployment duration increased again for all educational levels, in addition to being higher on average at higher educational levels (except master’s degree). This may support the argument that educational attainment raised the expected reservation wage as the crisis increased unemployment duration for the best-prepared.

Graph 5. Proportion of Migrants and Duration of Unemployment by Education and Age in Mexico



Note: Quadrants I and II show data for the periods 2007-I (1), 2008-III (2), and 2010-I (3), and the primary (P), secondary (S), high school (MS), professional (L), master's (M), and Doctorate (D) educational levels.

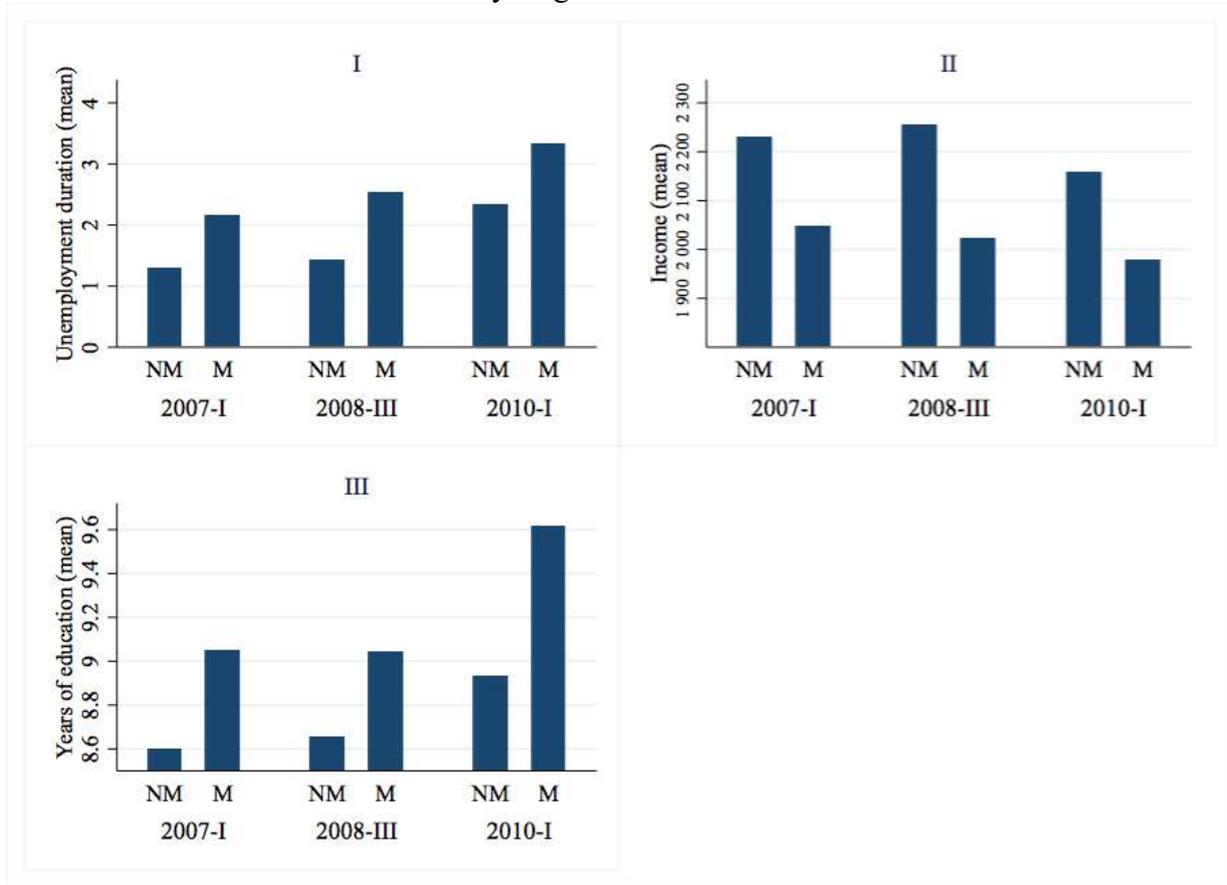
Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

On the other hand, quadrant II of Graph 5 indicates that the intermediate educational levels (secondary and high school) had, on average, the highest percentages of migrants. In this case, there were also post-crisis changes: for example, in 2008-III and 2010-I the proportions of migrants decreased for all levels (except master's degree in 2010-I); then the proportion of migrants decreased in 2010-I for the primary and secondary levels, but increased for high school, undergraduate and graduate. Finally, quadrants III and IV of Graph 5 show that as age increased (from ages 15 to approximately 25) the proportion of migrants and unemployment duration increased, and subsequently began to decrease.

Graph 6 (quadrant I) indicates that unemployment duration on average was greater for migrants than non-migrants, and it increased over time. On the other hand, although the non-migrant population reported higher average income than migrants (quadrant II), there were interesting changes in the post-crisis periods: average income decreased for migrants, but for those who did not migrate firstly it increased by 2008-III and then decreased in 2010-I. Finally, quadrant III of Graph 6 shows that the level of education on average increased over time for both

groups (migrants and non-migrants), and migrants presented higher education levels than non-migrants, although in 2008-III the education level of migrants was lower than in the previous period.

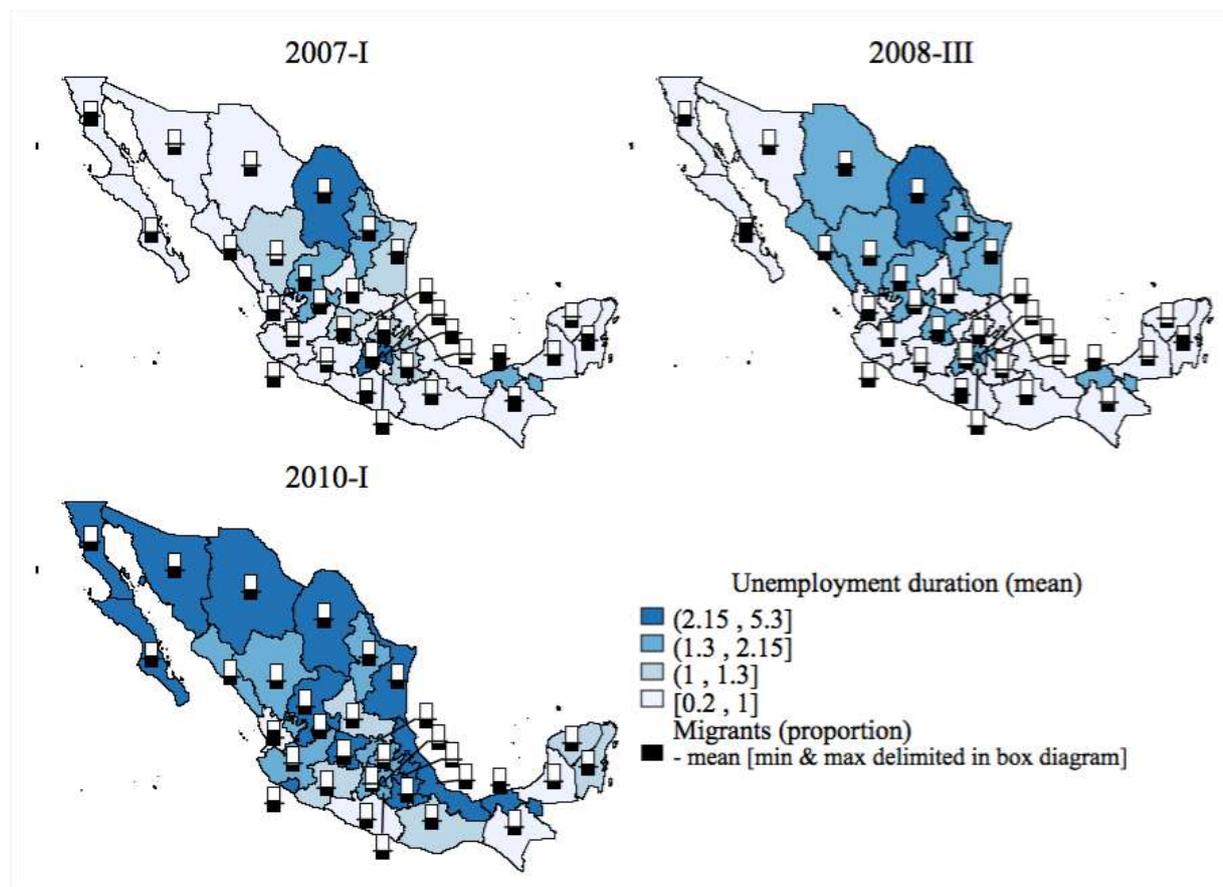
Graph 6. Duration of Unemployment, Average Income, and Years of Education by Migration Status in Mexico



Note: The graph shows values for the migrants (M) and non-migrants (NM) subgroups.
 Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Map 1 confirms that unemployment duration increased in the period analyzed. Furthermore, unemployment duration appears to have increased in the northern states and remained low in the states of the southern region. This suggests particular effects by region and/or state, which justifies including variables that capture these characteristics in model (1). Moreover, the proportion of migrants by state does not seem to reflect a regional pattern, except for some central states that show approximately constant proportions below the mean.

Map 1. Duration of Unemployment and Migration in Mexican States



Note: The range of the box plots (0.01-0.05) includes the min-max values of the migrates variable and is crossed by the mean (0.02).

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Table 2 shows the estimation of model 1 with pooled data and the three periods separately. Overall, the results in all the estimates show that unemployment duration and the minimum wage in the area of residence had a positive effect on the probability that a person would migrate; on the contrary, this probability was lower if the person was married, female, or with a higher income. The estimates of unemployment duration and being a woman are quite different for the three periods; given such low standard errors, these coefficients seem to indicate that their effect on the probability of migrating decreased after the crisis, although this is subsequently proven. On the other hand, the coefficients of periods 2 and 3 in the pooled model show a decrease in the probability of migrating after the crisis.

The differences in the signs of the other covariates can be explained by the restriction of the pooled model on the regressors to be constant in the three subsamples, allowing us to identify the direction and significance of changes in the probability of migrating over time. On the other hand, the estimates for each period relax the restriction imposed by the pooled regression, yet provide limited information on the significance of the changes in the effects caused by the crisis. Even so, these differences show that in addition to changes in the magnitudes, there were some

changes in the direction of the effects of some determining factors after the crisis. For instance, the pooled estimate and that of the third period show an inverted *u-shape* relationship between education and the probability of migrating, i.e. at the beginning higher education increases the probability of migrating, but upon reaching 15 years of education, such probability decreases. However, in the estimates of period 1, education has an *u-shape* relationship, indicating that the probability of migrating increased with education until approximately secondary education; yet the effect was entirely negative for the period in which the crisis began.

Finally, the coefficients of *border* and *south* show that after the crisis, the probability of migrating increased among residents of these regions, considerably for those from the *border* in period 2, and for those from the *south* in period 3. It is worth noting that the low level of adjustment of the models reflects the low proportion of individuals who decided to migrate (less than 3% of the total observations); still, this result does not disregard the goal of this study since we do not intend to explain migration as such, but rather evaluating how the financial crisis affected the causal relationship between unemployment duration and migration, for which it suffices to examine the statistical significance of the estimates.

Table 2. Logit Estimates, Pooled, and by Period

Ind. Var.	Pooled	P1	P2	P3
duration	0.00049 (0.00001)**	0.00087 (0.00003)**	0.00068 (0.00002)**	0.00026 (0.00002)**
age	0.01710 (0.00027)**	0.00813 (0.00045)**	0.00728 (0.00048)**	0.03843 (0.00049)**
age ²	-0.00074 (0.00000)**	-0.00060 (0.00001)**	-0.00062 (0.00001)**	-0.00104 (0.00001)**
educ	0.00587 (0.00049)**	-0.01220 (0.00078)**	-0.00456 (0.00085)**	0.04576 (0.00093)**
educ ²	-0.00025 (0.00003)**	0.00059 (0.00004)**	-0.00022 (0.00005)**	-0.00167 (0.00005)**
woman	-0.27402 (0.00110)**	-0.40098 (0.00183)**	-0.20069 (0.00194)**	-0.20504 (0.00194)**
married	-0.44611 (0.00138)**	-0.43190 (0.00228)**	-0.44633 (0.00245)**	-0.46028 (0.00245)**
ocupinc	-0.000003 (0.00000)**	-0.000002 (0.00000)**	-0.000002 (0.00000)**	-0.00001 (0.00000)**
salary	0.00093 (0.00002)**	0.00076 (0.00004)**	0.00003 (0.00004)	0.00219 (0.00005)**
border	0.00689 (0.00549)	-0.12522 (0.00882)**	0.27849 (0.00956)**	-0.13272 (0.01041)**
south	0.03319 (0.00522)**	-0.16949 (0.00846)**	0.02634 (0.00935)**	0.27656 (0.00956)**
P2	-0.22080 (0.00192)**			
P3	-0.39763 (0.00521)**			

N	165 000 064	53 572 048	54 880 874	56 547 142
Ll	-17 188 161.05	-6 086 146.45	-5 497 449.18	-5 566 030.74
Chi ²	1 194 329.75	450 388.53	409 061.95	385 797.06
Pseudo-R ²	0.03	0.04	0.04	0.03

Note: The columns show the estimates for the total observations (Total), for period 1 (P1) corresponding to 2007-I, period 2 (P2) corresponding to 2008-III, and period 3 (P3) corresponding to 2010-I. N = number of observations (accounting for the expansion factor), Ll = log-likelihood, Chi2 = statistic of the joint significance test of the model (likelihood ratio). The coefficients of the state dummies and the constant are omitted. Standard errors in parentheses. **, * mark significance at 99% and 95% respectively.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

To prove that changes in the effects of the explanatory variables are significant, the model is estimated with interactions of the explanatory variables with the temporal dichotomies P2 (corresponding to the 2008-III quarter) and P3 (corresponding to the 2010-I quarter). The results in Table 3 show that the effect of unemployment duration on the probability of migrating changed as of the financial crisis, since in the 2008-III and 2010-I quarters the interactive coefficients were negative and significant, indicating a lesser effect. When only the unemployed are included, the coefficient of the interactive term of duration and period 2 is positive (although less statistically significant), suggesting that in period 2 the effect on the probability of migrating was greater for these individuals (these results are not shown, but are available upon request).

Table 3. Logit Estimation of the Model with Interactive Terms

Ind. Var.	AD	I*P2	I*P3
duration	0.00087 (0.00003)**	-0.00019 (0.00003)**	-0.00061 (0.00003)**
age	0.00813 (0.00045)**	-0.00085 (0.00065)	0.0303 (0.00067)**
age ²	-0.0006 (0.00001)**	-0.00002 (0.00001)	-0.00043 (0.00001)**
educ	-0.0122 (0.00078)**	0.00765 (0.00115)**	0.05797 (0.00121)**
educ ²	0.00059 (0.00004)**	-0.00081 (0.00006)**	-0.00226 (0.00006)**
woman	-0.40098 (0.00183)**	0.20029 (0.00267)**	0.19594 (0.00267)**
married	-0.4319 (0.00228)**	-0.01444 (0.00335)**	-0.02838 (0.00335)**
ocupinc	-0.000002 (0.00000)**	-0.00000 (0.0000)	-0.000003 (0.00000)**
salary	0.00076 (0.00004)**	-0.00073 (0.00006)**	0.00143 (0.00006)**
border	-0.12522 (0.00882)**	0.40371 (0.01301)**	-0.0075 (0.01364)
south	-0.16949	0.19582	0.44604

	(0.00846)**	(0.01261)**	(0.01276)**
P2	0.73476		
	(0.08609)**		
P3	-3.73972		
	(0.09549)**		
constant	-3.66007		
	(0.05925)**		
<hr/>			
N		164 911 922	
Ll		-16759513	
Chi ²		1 400 220.00	
Pseudo-R ²		0.04	

Note: The results correspond to the estimation of a single model that includes interactive terms of each independent variable (including state dichotomous variables) with the dichotomous variables of period 2 (P2) corresponding to 2008-III, and period 3 (P3) corresponding to 2010-I. The coefficients of the interaction with the dichotomy of period 2 are shown in column I * P2, and those corresponding to period 3 in column I * P3. N = number of observations (considering the expansion factor), Ll = log-likelihood, Chi2 = statistic of the joint significance test of the model (likelihood ratio). The results of the coefficients of the state dummies and their interactions are omitted due to space. Standard errors in parentheses. **, * mark significance at 99% and 95% respectively.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Among other results, the age coefficients show that there was no significant change in the effects of education on the probability of migrating between the first and second period, such effect being primarily negative; yet, for the third period, the inverted *u-shape* relationship was modified in such a way that age had a positive effect on the probability of migrating up to approximately age 35. On the other hand, after the crisis, women continued to be less likely to migrate than men, although the gap narrowed. The probability of a married person migrating further decreased after the crisis, and the effect of income became more negative upon the third period. The effect of the monthly minimum wage became almost zero in the second period (it remained positive) but increased considerably in the third period. Finally, after the crisis, the probability of migrating changed direction (became positive) for border and southern states residents, but in the third period, it turned negative again for those living in border states.

The above results support the argument that the effect of duration changed after the crisis: it remained positive but decreased in magnitude. To observe the detail of this change, the marginal effects for a representative individual were calculated, obtained from two models: one estimated from the pooled column of Table 2, which assumes constant coefficients for the regressors in the period analyzed, but which now allows changes in the effect of unemployment duration; and the estimate in Table 3 that assumes changes in all explanatory variables. Based on some national averages, the representative individual was chosen as one who is 35 years old and has 9 years of education, is a married man, lives in an area with an average minimum wage of 1,405 MXN per month, has been unemployed for two thousand days, and does not live in the border region or the south.

Table 4 shows several important aspects. On the one hand, given that the values of the temporal dichotomies were set at zero, the marginal effects and the expected probability correspond to the representative individual in the first period; these individuals, with average values matching the representative individual, and a high level of unemployment duration (approximately five and a half years) have a relatively low probability of migrating (14%), which decreases in the following periods. It should be noted that the disproportionate magnitude of the marginal effects of P2 and P3 in the I-T Pooled column should be interpreted as the change in the probability of migrating if a representative individual in period 1 changes into an individual with values of zero in all covariates, which makes no sense. However, although the characteristic variables of the individual with the greatest marginal effects are marital status and sex, the dichotomies of the periods shown in the I-D Pooled column also show considerable marginal effects, suggesting that the probability of migrating, in general, changed according to the characteristics of these periods, possibly due to the financial crisis.

Table 4. Marginal Effects

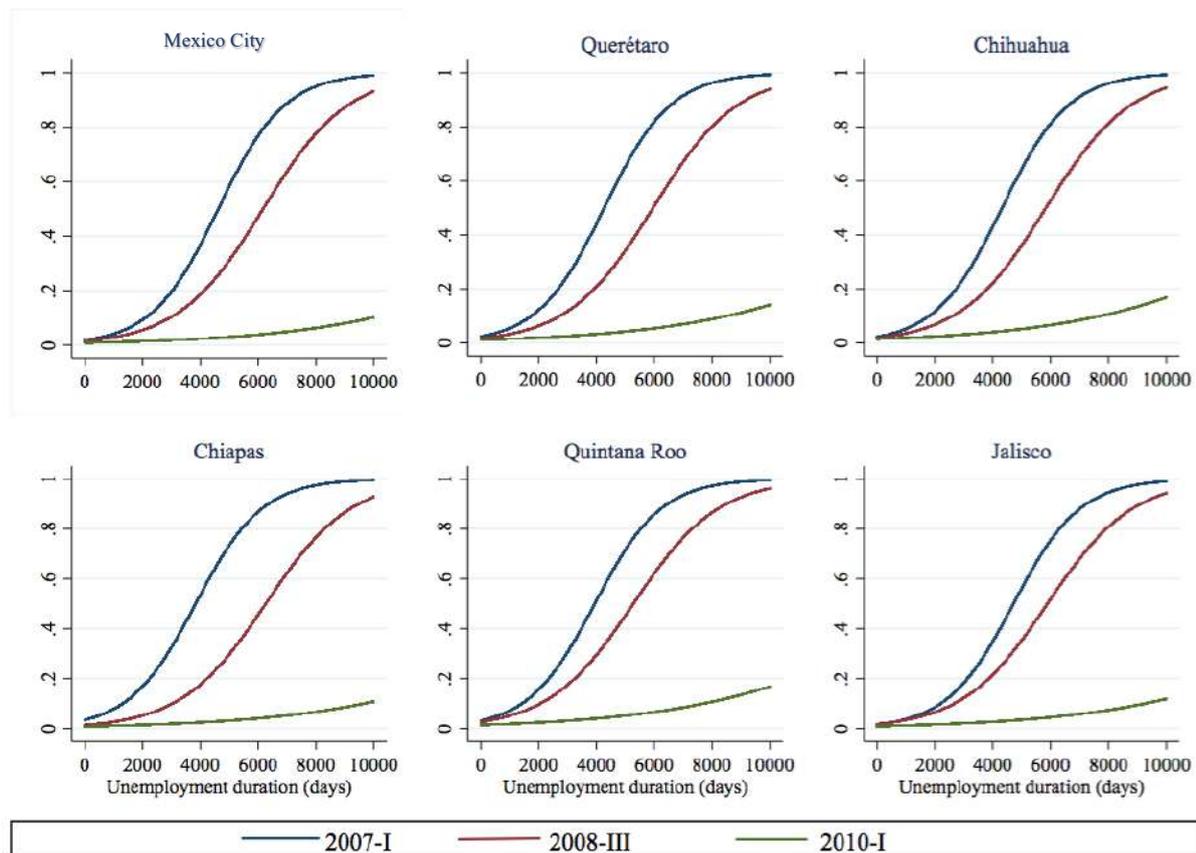
Ind. Var.	I-D Pooled	I-T Pooled	Values
duration	0.000113	0.000106	2000
P2*	-0.024700	0.1143666	0
P3*	-0.041603	-0.1377809	0
P2.duration	-0.000035	-0.000023	0
P3.duration	-0.000079	-0.000074	0
age	0.002079	0.0009882	35
age ²	-0.000090	-0.0000735	1225
educ	0.000714	-0.001484	9
educ ²	-0.000031	0.0000718	81
woman*	-0.030143	-0.0421459	0
married*	-0.063280	-0.0610217	1
ocupinc	-0.0000004	-0.0000003	0
salary	0.000113	0.0000922	1405
border*	0.000082	-0.0145561	0
south*	0.004046	-0.0193878	0
State dichotomies	Yes	Yes	0
Interactions with other covariates	No	Yes	0
Pr (migrates=1)	0.1415	0.1416	

Note: The I-D Pooled column corresponds to the logit estimate of the combined model (Pooled column of Table 2) including only the interaction of the temporal dichotomies with unemployment duration variable; the I-T Pooled column corresponds to the logit estimate of the combined model that includes the interaction of the temporal dichotomies with all the regressors (estimate from Table 3). The Values column shows the values of the variables for which the marginal effects were calculated. * marks dichotomous variables, so the marginal effect shows the change in probability when the variable changes from 0 to 1. P2 is a dichotomy equal to 1 if it is the 2008-III quarter, and P3 if it is quarter 2010-I. Effects in bold are not significant at 95%.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

In relation to the interest variable, Table 4 shows that if unemployment duration of the representative person increases by one day, the probability that they will migrate increases by approximately 0.0001 in the case of the 2007-I semester, yet only by 0.00008 if it concerns the 2008-III semester, or 0.00003 if it is the 2010-I one, that is, the effect decreases after the crisis by almost 30%, and then by 70% compared to 2007-I. Considering that the marginal effects and the expected probability depend on the characteristics of the representative individual, it is interesting to analyze how the effect changes for different lengths of unemployment duration. To do this, from the coefficients obtained in the model in Table 3, the expected probabilities of migrating for the representative individual defined above are calculated for a range of unemployment duration between 0 and 10,000 days, keeping the values of the other covariates constant.

Graph 7. Estimated Effect of Unemployment Duration on the Probability of Migrating by Period and Selected States



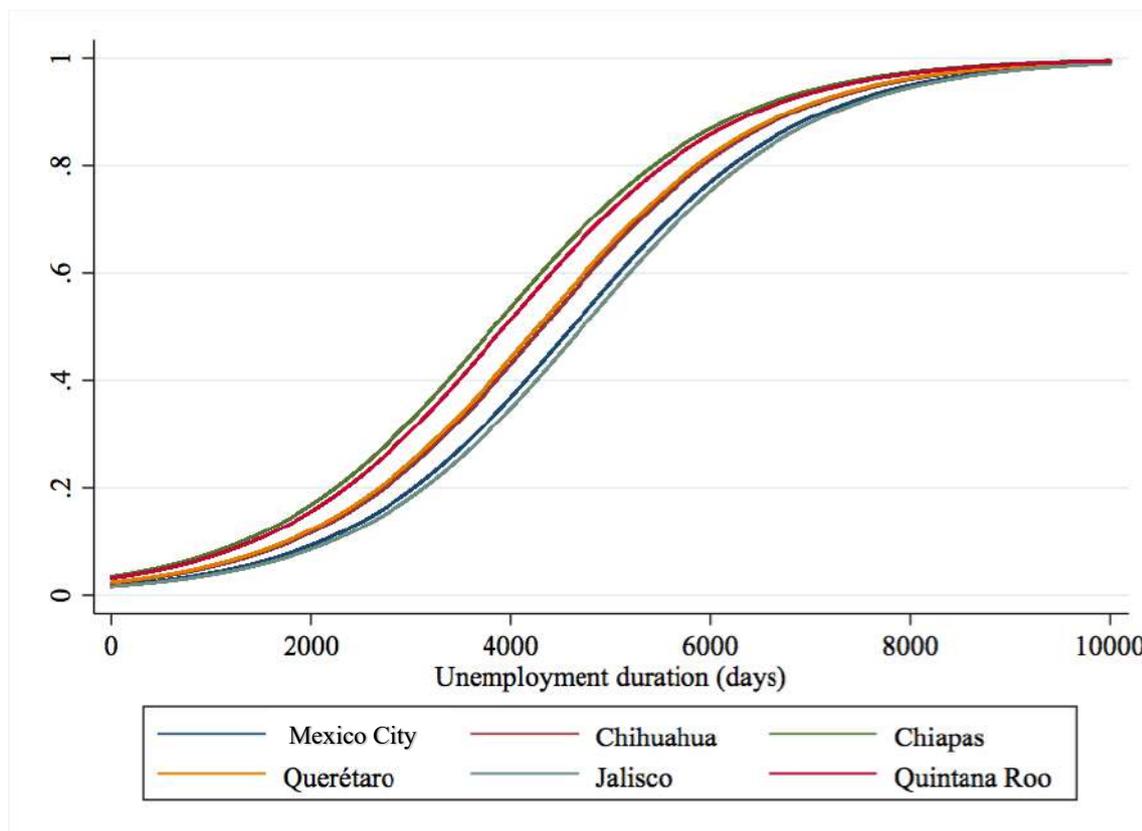
Note: States were selected at random, making sure there was at least one from each region of the country, including the capital.

Sources: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

From the sample of states shown in Graph 7, it can be noticed that the estimated probability of migrating increases with unemployment duration, although the largest marginal effects occur at very high unemployment levels, above the maximum level stated in the samples examined (see Table 1). As argued above, it is clear that the effect of unemployment duration decreases

considerably after the financial crisis, primarily for the period 2010-I. Considering the sample of states selected, the largest drop in the effect of unemployment duration occurred in Chiapas, and the lesser occurred in Quintana Roo.

Graph 8. Comparison of the Estimated Effect of Unemployment Duration on the Probability of Migrating for Selected States (2007-I)



Note: States were selected at random, making sure there was at least one from each region of the country, including the capital.
 Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

On the other hand, Graph 8 shows that the estimated effect of unemployment duration on the probability of migrating can vary between states. Considering the selection of states shown in the graph, Jalisco and Mexico City show the least effect on the probability of migrating for the same level of unemployment duration; this result was expected, as these are two of the three most economically important states in the country, which makes them poles of labor attraction. On the contrary, the states of Quintana Roo and Chiapas showed the most noticeable effects.

Sensitivity Test

Returning to what was stated in the methodological section, the model estimates are made taking into account unemployment duration as the time that the unemployed individual spends looking

for work, until the moment that they report the end date (reported duration), instead of the time of the interview (see Table 4). As shown in Table 5, under this specification of the RD duration explanatory variable, the estimates show some slight differences when it comes to the ID duration specification. For example, the probabilities of migrating are relatively higher for the representative individual, but the marginal effects are proportionally the same, i.e. the effects of temporal dichotomies as well as of sex and marital status continue to be greater.

Table 5. Marginal Effects of the Reported Duration of Unemployment

Ind. Var.	I-D Pooled	I-T Pooled	Values
RU duration	0.000133	0.00013	2000
P2*	-0.027201	0.12257	0
P3*	-0.045937	-0.15412	0
P2.duration	-0.000052	-0.00004	0
P3.duration	-0.000098	-0.00009	0
age	0.002284	0.00108	35
edad ²	-0.000099	-0.00008	1225
educ	0.000784	-0.00163	9
educ ²	-0.000033	0.00008	81
woman*	-0.033241	-0.04652	0
married*	-0.068866	-0.06639	1
ocupinc	-0.0000005	-0.000003	0
salary	0.000124	0.00010	1405
border*	0.000889	-0.01601	0
south*	0.004421	-0.02136	0
State dichotomies	Yes	Yes	0
Interactions with other covariates	No	Yes	0
Pr (migrates=1)	0.1585	0.1585	

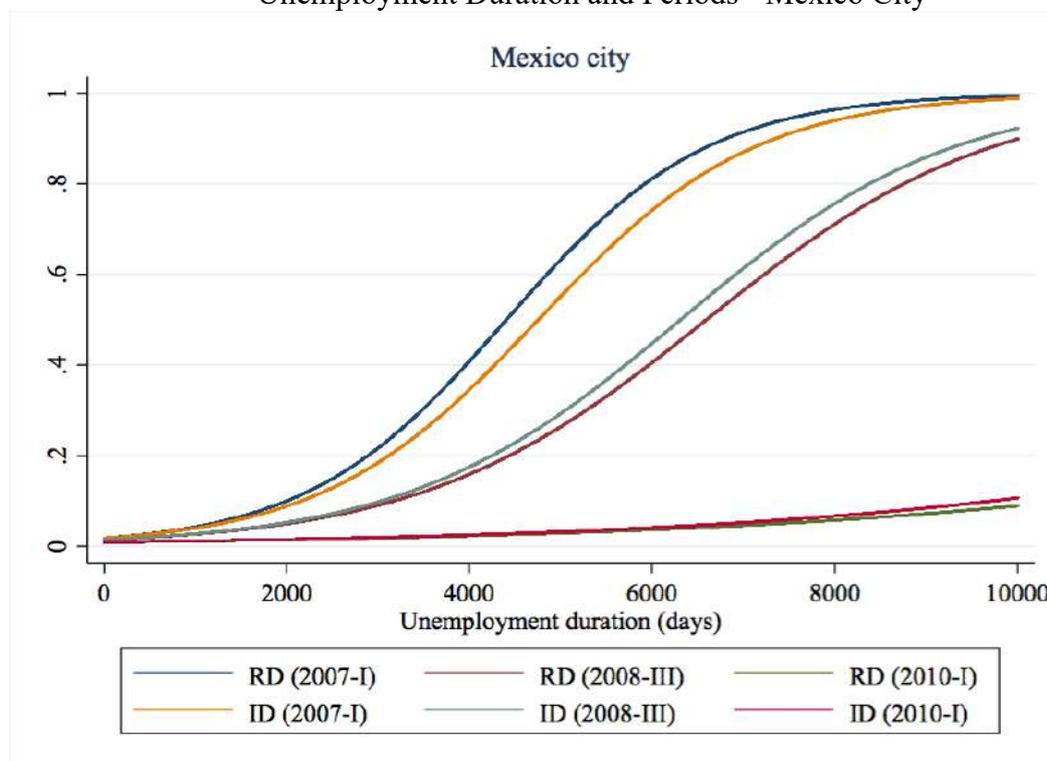
Note: The I-D Pooled column corresponds to the logit estimate of the pooled model (Pooled column of Table 2) including only the interaction of the temporal dichotomies with unemployment duration variable; the I-T Pooled column corresponds to the logit estimate of the pooled model that includes the interaction of the temporal dichotomies with all the regressors (estimate from Table 3). The Values column shows the values of the variables for which the marginal effects were calculated. * marks dichotomous variables, so the marginal effect shows the change in probability when the variable changes from 0 to 1. P2 is a dichotomy equal to 1 if it is the 2008-III quarter, and P3 if it is quarter 2010-I. Effects in bold are not significant at 95%.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

In relation to unemployment duration, the reported specification (RD duration) shows a slightly higher probability of migrating, compared to the specification of the interview (ID duration), for a certain level of unemployment duration. Graph 9 exemplifies the differences in the effect of unemployment duration for both specifications and the three periods for a representative individual living in Mexico City. Based on this graph, it is evident that for the three periods the specification of the duration of reported unemployment (RD duration) has a greater effect on the probability of migrating, especially on the mean values of the distribution (between 3,000 and 8,000 days). However, given that 99% of individuals who report a positive

duration of unemployment do not last more than 500 days unemployed, the real differences are not significant.

Graph 9. Estimated Probability of Migrating by Different Specifications of Unemployment Duration and Periods - Mexico City



Note: RD: Reported duration of unemployment (end-date stated by individual).
 ID: Interview duration of unemployment (end date is that of the interview).
 Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Multinomial Logit

To test whether there are differences in the effect of unemployment duration on the probability of migrating abroad or within the country, a multinomial logit model is estimated in which the dependent variable represents one of three mutually exclusive alternatives: does not migrate (base alternative), migrates internally (within Mexico), or migrates internationally; the explanatory variables of the model are the same as in the model shown in Table 3, i.e. equation 1 is complemented with interactions of the temporal dichotomies with the other covariates, including state dummies. It is worth noting that this estimate assumes the alternatives to be independent, i.e. there is no correlation among them.

One concern pertains to the assumption that individuals perceive the three alternatives as different. A more relaxed assumption is that individuals view the migration alternatives as similar, in which case it would be more appropriate to estimate a nested logit. In this sense, the justification of the assumption can relate to the difference in the costs of migrating

internationally (within Mexico) or internally, that is, to the extent that the costs of migrating abroad are much higher than the costs of migrating internally, the alternatives become more independent and therefore the results of the multinomial logit are valid.

In correspondence with the previous results, Table 6 shows that a longer unemployment duration increases the probability of migrating, regardless of the destination (within Mexico or abroad). Additionally, the results show that for the first period (2007-I) a longer duration of unemployment increased the probability of migrating abroad to a relatively greater extent than within the country, both alternatives contrasted against the option of not migrating.

Table 6. Multinomial Logit

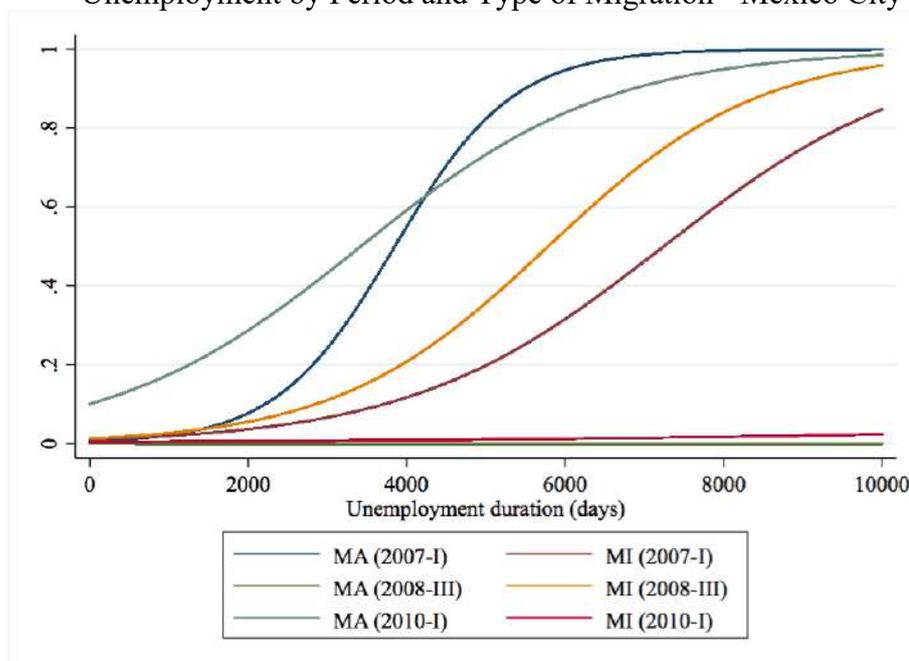
Ind. Var.	Migrating internally	Migrating abroad
Duration	0.00062 (0.00003)**	0.00134 (0.00004)**
Period2	2.96931 (0.09337)**	-2.33212 (0.28722)**
Period3	-4.49196 (0.10203)**	11.71601 (0.31823)**
P2.duration	0.00013 (0.00004)**	-0.00537 (0.00034)**
P3.duration	-0.00045 (0.00004)**	-0.00070 (0.00005)**
Age	-0.00275 (0.00050)**	0.05838 (0.00109)**
age ²	-0.00051 (0.00001)**	-0.00108 (0.00001)**
Educ	-0.02605 (0.00086)**	0.13093 (0.00212)**
educ ²	0.00181 (0.00004)**	-0.01147 (0.00013)**
Woman	-0.18862 (0.00198)**	-2.03788 (0.00639)**
Married	-0.48443 (0.00255)**	-0.04680 (0.00576)**
Ocupinc	0.00000 (0.00000)**	-0.00013 (0.00000)**
Salary	0.00132 (0.00004)**	-0.00231 (0.00012)**
Border	0.05032 (0.01043)**	-0.48796 (0.01776)**
South	-0.01077 (0.01013)	-0.55247 (0.01540)**
	N	164 911 922
	L1	-17 389 304
	Chi ²	1 946 120**
	Pseudo R ²	0.053

Note: The coefficients of the state dichotomies and the interactions of the temporal dichotomies with the rest of the covariates are omitted. ** marks significance at 99%.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Additionally, our results show that the onset of the crisis had different effects on unemployment duration for the two alternatives since in the second period the duration had a greater effect on the probability of migrating internally, but such effect was considerably lesser on the probability of migrating abroad; later, in the third period, the effect decreased (compared to the previous period) on the probability of migrating internally, but increased on the probability of migrating abroad. Graph 10 shows these effects for a representative individual from Mexico City.

Graph 10. Estimated Probability of Migrating and Duration of Unemployment by Period and Type of Migration - Mexico City



Note: The graph corresponds to probabilities for a representative individual in Mexico City. MA: The probability of migrating abroad. MI: The probability of migrating internally.

Source: Own elaboration based on the National Occupation and Employment Survey (INEGI, 2021).

Graph 10 confirms the general results presented above: the probability of migrating increases with unemployment duration, regardless of whether it is abroad or within the country. In addition to this, taking into account the representative individual living in Mexico City, it becomes evident that the effects are different depending on whether they migrate abroad or within Mexico, and that such differences vary depending on whether the effects are analyzed before or after the crisis. For example, before the crisis, at a given duration of unemployment, the probability of migrating abroad was greater than within Mexico; likewise, the effect of unemployment duration

(represented by the slope of the curve) was greater on the probability of migrating abroad. However, for the second period, the probability of migrating abroad was considerably reduced (compared to the probability of migrating internally) and the effect of unemployment duration on this probability became practically insignificant. The roles later shifted places, since the probability of migrating abroad increased considerably in relation to the probability of migrating internally, the latter practically ceasing to be influenced by unemployment duration.

DISCUSSION AND CLOSING REMARKS

This paper analyzed structural breaks caused by the 2008 financial crisis in the effect of unemployment duration on the probability of migrating. Microdata of the Mexican population was used for three periods between 2007 and 2010, and by estimating binomial and multinomial logit models, the results show that unemployment duration had a positive effect on the probability of migrating, regardless of whether such migration was within Mexico or abroad. In addition, the results of the binomial model show that after the crisis this effect decreased in magnitude, but when differentiated by the type of migration (multinomial model), the effect first increased on the probability of migrating internally and decreased on the probability of migrating abroad, yet later the opposite happened. Likewise, the results show that the probability of migrating upon reaching a certain duration of unemployment varies by state. However and generally speaking, the probability of migrating is explained primarily by factors not accounted for in the models, and the differences found are narrow at short durations of unemployment.

These results suggest that the structural breaks caused by the crisis in the relationship between migration and unemployment duration may be detrimental in the sense that, on the one hand, the crisis reduces the mobility of the productive factor within the country, thus limiting positive socioeconomic effects such as reducing inequality and increasing the efficiency of the labor factor, and on the other hand, it causes a greater probability of migrating abroad. In this sense, given that the probability of migrating of people with higher education increased after the crisis, this may justify the argument that the crisis caused brain drain, although confirming such argument is outside of the scope of this study. Finally, these results gain relevance given the expectations of a world recession caused by recent events (the Great Confinement crisis) and the questions about the expected effects. Although the present crisis is anticipated to have particular characteristics and much more profound socio-economic effects, the experience of the 2008 financial crisis can provide useful information on expected changes in the relationship between unemployment duration and migration in the coming months.

Translation: Fernando Llanas.

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