Interregional Migration and Thresholds: Evidence from Spain*

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Abstract

We analyze the effects of labor market factors on interregional migration in Spain for the period 1988-2010. A basic theoretical framework is developed, suggesting that the effect of labor market variables on migration varies, depending on a certain threshold. The model implications are tested using a new approach based on the presence of endogenous thresholds. We show that Spanish interregional migration can be explained by labor market variables when the labor market conditions at the source region are unfavorable relative to those of the host region. We test the results for several migrant characteristics, such as citizenship, the age range, and return migration.

KEYWORDS: *Interregional migration, Thresholds, Spain.*

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1 Introduction

The empirical literature on migration has extensively analyzed the determinants of the migration decision, with no consensus reached to date. From a microeconomic perspective, neoclassical theories explain the migration decision through income differentials between the origin country and the destination. With this in mind, most studies include salary as an explanatory variable, while other labor market conditions, such as the unemployment rate, are also considered in order to capture the probability of finding a job (Harris & Todaro, 1970). Empirical studies commonly conclude that interregional migration responds to wages and unemployment. For example, Poncet (2006) finds that migration decisions in China are a response to economic conditions, measured by income and unemployment over time. However, such migrations in Spain do not clearly follow this pattern. As Bentolila (1997) highlights, Spanish internal migration flows have been low relative to other developed European countries, and they do not obviously respond to high unemployment in the regions of residence. De la Fuente (1999) finds reduced statistical significance, when income and unemployment rate differentials are included in the specification, for the period 1955-93. Bentolila & Dolado (1991) determine that both real wages and unemployment differentials are statistically significant for the period 1962-86, although they arrive at this conclusion by including several lags, and obtain very low elasticities. Antolin & Bover (1997) conclude that the unemployment rate has no meaningful effect on internal migration, showing that emigration occurs from regions where wages are higher than the average, which seems to contradict many theoretical positions. Jimeno & Bentolila (1998) point out that migration decisions are not particularly sensitive to the unemployment rate and real wages. Maza & Villaverde (2004) capture a null effect of the aggregate unemployment rate on internal migration, for the period 1995-2002. These counterintuitive conclusions are not confined to the case of Spain, since Italian internal migrations also do not react to mass unemployment, as Fachin (2007) found, nor to an increase in GDP, as determined by Biagi & Faggian (2011). Thus, a better understanding of the migration process could explain these striking results and shed more light on the reasons underlying a strongly-fragmented labor market in Spain, whose highest regional unemployment rates are twice the lowest rates. The efficacy of policy measures aimed at reducing regional differentials through augmentation of labor mobility could be improved if the determinants of migration were more precisely identified.

The above-mentioned lack of response of the migration rate to labor market variables could be explained by the preference of unemployed individuals to remain close to family networks, and to the increasing risk-aversion of the employed when the probability of finding another job is low. Nevertheless, under the hypotheses considered in the majority of theoretical models, and tested in Pissarides & Wadsworth (1989), among others, this is a counterintuitive result that has been analyzed with a variety of techniques. Maza & Villaverde (2004) use a semi-parametric model, and Juarez (2000) considers inflows and outflows, for the period 1962 to 1993, rather than net migration flows. This author analyzes a broad definition of migration, and includes pull factors of the receiving region and push factors of the origin region in the model, along with a non-linear effect in the unemployment rate, and concludes that, under a certain specification, gross migration flows respond with the expected sign to both unemployment rates and wage differentials. Similarly, Mulhern & Watson (2012) obtain appropriate signs for the coefficients of unemployment and wages, considering inflows versus outflows, for the period 1990 to 2000, including housing prices, and allowing for the presence of certain structural breaks across the sample. However, the period of change is exogenously selected. A structural break has also been considered in other country studies, such as Patridge et al. (2012) for counties in the US, who include exogenous thresholds in the size of the counties to answer the lack of migration response to various economic shocks.

These recent outcomes encourage us to consider that the pattern of interregional migration in Spain could be nonlinear.

The aim of this paper is to determine the effect of labor market conditions in origin and destination on Spanish internal migrations, in the period 1988-2010. By extending the Harris & Todaro (1970) model, where the expected wage is considered, a simple theoretical framework is developed to demonstrate that, rather than a structural break in a given period, or other exogenously-determined threshold, migration reacts differently, depending on the level of the expected wage. This leads us to empirically test the implications of the model. In fact, as Elhorst (2003) points out, empirical studies achieve a more profound understanding of the explanatory variables. Hence, a model with an endogenous method of threshold value selection is considered in the econometric specification and, following Juarez (2000), migration is defined for every region as an outflow from origin region to destination region. Furthermore, our perspective is that regional flows are not solely caused by labor market variables, since specific regional elements could be key factors in explaining the observed behavior of regional mobility. The current economic crisis, linked to the bursting of the real estate bubble, underlines the importance of this market, so housing prices could be a good proxy for certain economic factors and migration fundamentals, such as the related sunk costs, the cost of living, and the quality of life[1]. Finally, we rely on the gravity equation and include geographical distance between regions as a measure of additional monetary and non-monetary costs. Our study makes it possible to join the three ideas developed in the work of Patridge (2010) on migration determinants. First, the agglomeration mechanism described in the New Economic Geography and considered in our model as regional fixed effects. Second, amenities as drivers

[1]From a different angle, the link between the real estate market and the migration phenomenon in Spain is evidenced in Gonzales & Ortega (2013), who study the causality of the international immigration vis-a-vis housing prices.

of the migration decision (these variables can be characterized by land prices and wages; see Irwin et al., 2010). The third main cause is the extent of job opportunities. Moreover, we consider several endogenous variables in order to characterize migration flows according to migrants' particularities, and we test the robustness of our general results. Thus, we distinguish between foreigners and Spanish-citizen migrants, returned and non-returned migration flows, and a variety of age ranges.

We select the regions as spatial unities because of the full availability of data considered, and since they are the first level of political division of Spain as a country (the second level for European Statistics, NUTS 2 following the Eurostat definition). The Spanish Constitution of 1978 divided the country into 17 regions, called Autonomous Communities, and two Autonomous Cities, Ceuta and Melilla. These regions have the right of self-government in many public services, which creates an extraordinarily decentralized country. The regional governments are responsible for the administration of schools, universities, health care, social services, culture, urban and rural development and, in some cases, policing. Public spending by the central government on the social security system is approximately 50% of the total public expenditure, while almost 40% goes to the regional governments and around 10% to the local councils. Thus, these territorial entities are significant enough to undergo an analysis at this level. A provincial-level analysis would present similar heterogeneous problems, because many provinces also differ significantly in their population size (e.g. Madrid vs. Teruel). Furthermore, the labor market conditions are not unique to each province, but are determined at the regional level.

Results show that, when the labor market is characterized by worse labor conditions in the origin region, the decision to migrate responds to labor market variables, such as expected wages. By contrast, when labor market conditions are advantageous for the source region, labor market factors are less important, if at all, in the migration decision. This outcome remains, in general, valid when different migrant characteristics are included in the specification. The fact that migration does not always respond to economic conditions brings us to the assumption that migration is not a balancing mechanism between regions and, therefore, we maintain this assumption in the present paper (while noting that its relaxation should be a future extension of our theoretical and empirical research).

The paper is organized as follows. Section 2 presents the theoretical model on which we base our empirical exercise. Section 3 presents certain stylized facts and describes the data employed and our econometric methodology. In Section 4, we show the empirical results obtained, distinguishing between total migration flows and several subsamples. Finally, in Section 5, we summarize our main conclusions.

2 Theoretical model

Our model consists of an economy with two locations, region of origin (i) and host region (j). Each individual lives one period and, at the beginning of the period, faces the possibility of migrating to another region. This decision is taken by comparing the expected utility derived in both places, U_i^e and U_j^e. Thus, the total emigration from the origin region to the destination (M_{ij}) has the following form:

$$M_{ij} = f\left(\frac{U_j^e}{U_i^e}\right) \tag{1}$$

where $\frac{\partial M_{ij}}{\partial U_j^e} > 0$ and $\frac{\partial M_{ij}}{\partial U_i^e} < 0$.

Let us consider an individual deriving utility from expected goods consumption c and the housing good k in region r. In particular, we assume the following expected utility function, which takes a standard Cobb-Douglas form:

$$U_r^e = c_r^{\alpha} k_r^{\beta} \tag{2}$$

with $r = i, j$ and $\alpha, \beta > 0$. The parameter α reflects the elasticity of the consumption good and parameter β reflects the elasticity of the housing good.

The budget constraint considers the consumption good price as a constant equal to 1 in the origin and in the host region. The price of housing, h, is a relative price that is not assumed constant and is different in the origin and host region. The positive relationship between housing prices and wages is presented in Carliner (1973) and Li (2015), among others.

It is assumed that housing prices depend positively on the expected wage in both the origin and the destination, since housing purchases are not exclusive to residents. It also depends positively on amenities, a (see Huang et al., 2015). The expected wage w_r^e is the wage multiplied by 1 minus the unemployment rate in order to capture the probability of finding a job. The importance of using expected wages, constructed as the real wages adjusted by the proportion of employed people, as a determinant of the migration process, was first developed by Harris & Todaro (1970). Our model includes the expected wage in the budget restriction and the migration reacts not only to the expected wage differentials, but also to the utility differential between origin and destination, which broadens the Harris and Todaro model because it allows for the inclusion of other variables, such as housing prices or amenities.

Consequently, the budget constraint is as follows:

$$c_r + h_r\left(w_i^e, w_j^e, a\right) k_r = w_r^e \tag{3}$$

with $\frac{\partial h_r\left(w_i^e, w_j^e, a\right)}{\partial w_i^e} > 0$, $\frac{\partial h_r\left(w_i^e, w_j^e, a\right)}{\partial w_j^e} > 0$, and $\frac{\partial h_r\left(w_i^e, w_j^e, a\right)}{\partial a} > 0$.

Solving the problem of maximizing equation (2) subject to the budget constraint (3), the optimal consumption and housing goods are characterized by the following values, respectively:

$$c_r = \frac{\alpha w_r^e}{\alpha + \beta} \tag{4}$$

$$k_r = \frac{\beta w_r^e}{(\alpha + \beta)\, h_r\left(w_i^e, w_j^e, a\right)} \tag{5}$$

From equations (4) and (5) it is straightforward to check that a higher expected wage in the origin region increases the purchase of consumption goods, but the effect is indeterminate in the case of the purchase of the housing good.

The effect of an increase in the expected wage in region j is negative in the utility of region i, and the effect of an increase in the expected wage in region i on the utility of region i is also negative, if:

$$\frac{w_i^e}{h_r\left(w_i^e, w_j^e, a\right)} \frac{\partial h_r\left(w_i^e, w_j^e, a\right)}{\partial w_i^e} > \frac{\alpha + \beta}{\alpha} \tag{6}$$

In other words, if the elasticity of housing price to expected wage is sufficiently high (greater than 1), which occurs with goods considered luxury goods, the effect of an increase in wages could increase the housing price to the extent that the utility of the region could decrease.

Inequality (6) will be true, the greater are the expected wages in the origin region; in this case, migration does not react conventionally to an increase in the expected wage. If equation (6) is valid, an increase in the income expected in the region of origin could act as a push factor for emigration.

In sum, when the labor market is characterized by low expected wages in the origin region, the migration decision responds to labor market variables. By contrast, when labor market conditions in the origin are sufficiently good, such factors are less important and could even react contrarily to the results derived from neoclassical migration models. Our model also emphasizes that other economic factors, such as housing prices or amenities, are also explanatory elements. The theoretical model allows the decomposition of the expected wage into its two components, real wages and the unemployment rate. However, the analytics force us to make assumptions in order to develop clear conclusions. For this reason, we complement this analysis in the empirical section and both variables will be considered jointly and separately.

3 Data and empirical methodology

The statistical sources of our annual frequency database, which covers the period 1988-2010 for the 17 Spanish regions (autonomous communities), are captured from different databases. Migration flows between regions, that is, the number of outflows from region i to region j, are collected by the Spanish National Statistics Institute (*Instituto Nacional de Estadística*, INE) in the database Residential Variations Statistic (*Estadistica de Variaciones Residenciales*, EVR). The micro-data from EVR published by INE is utilized in our analysis and incorporate information about migrant age, citizenship, and region of birth. Unfortunately, the available data do not include other factors that would be of interest to this study, such as the level of education and the job classification of the migrant. The data on the unemployment rate and the labor force of each region has been obtained from the Economically Active Population Survey (*Encuesta de Población Activa*, EPA) provided by INE. Regional nominal wages are calculated by dividing total employee earnings by the number of employed workers, both series obtained from the statistics of the Spanish Ministry of Economy and Competiveness.

This data has been deflated by the CPI index, which is the only price index disaggregated by region, to obtain real wages. Housing price data is provided by the Spanish real estate valuation society 'Sociedad de Tasación', the only source of information that covers the analyzed period and disaggregates across regions. This database includes real average prices of mid-range new housing in the most important towns and cities of each region, weighted by the population, to obtain a representative price for each autonomous community. Finally, geographical distance is measured in kilometers between the capitals of each region.

We also consider the expected wage as a significant variable, defined as the real wage multiplied by 1 minus the unemployment rate. It is reasonable to consider that potential migrants do not separate both concepts in their decision-making and, therefore, this measure can be an improved measure of labor market conditions, since it jointly takes into account both the potential wage earnings and the probability of finding a job. Expected wages have been considered in many theoretical papers analyzing migration but, although they are implicitly included through the introduction of wages and unemployment rates, empirical papers do not usually capture this concept as a whole. Nevertheless, we consider both variables separately. The series that have a higher frequency have been annualized by taking the annual average value. The list of variables considered and their descriptive statistics are given in Table 1.

Prior results from the literature allow us to intuit that there is not a unique pattern of behavior in the migrants' decisions. The reason for different patterns could be the use of aggregate measures, where it is impossible to determine if the outflows go to regions with lower unemployment rates, housing prices, higher wages and expected wages, which encourages the use of a database where detailed information on origin and destination variables is provided. Other reasons could be the presence of thresholds, that is, different relationships depending on the level of the explanatory variables, as the basic theoretical model highlights.

Our estimation procedure consists of two steps. First, a simple regression with real wages and unemployment as independent variables is made to justify the utility of including the aggregate variable expected wages with the detailed dataset. Apart from using labor market conditions and housing prices to explain migrations, certain other variables have been considered. Based on the gravity equation that has been applied to the study of migration flows (see Greenwood, 1975, or more recently, an extended gravity model used in Etzo, 2011), migrants make their decisions according to two sets of variables: the attractive forces of the destination, and the costs of migration. If the expected value of the first factors, where we can include economic, social, and/or institutional factors, outweighs the latter, the migration will take place. Assuming, as is usual in the related literature, that the labor force size in the origin and in the destination contributes positively to migration derived from the scale effect[2], we will consider higher expected wages in the target region and lower housing prices in the destination region as attractive forces. The costs of moving from the origin to the destination would be related to the distance between regions, which is also a proxy for other costs of migration, higher housing prices in the host region and lower expected real wages in the origin. Other forces, such as differences in living standards, are gathered by housing prices rather than price indices, allowing us to include monetary variables in real terms. Against this background, we can initially propose Model I:

$$\begin{aligned} \ln M_{ij,t}^{T} &= \delta_0 + \delta_1 \ln n_{i,t} + \delta_2 \ln n_{j,t} + \delta_3 \ln h_{i,t} + \delta_4 \ln h_{j,t} + \delta_5 u_{i,t} + \delta_6 u_{j,t} + \\ &+ \delta_7 \ln w_{i,t} + \delta_8 \ln w_{j,t} + \delta_9 \ln d_{ij} + D'_{ij,t}\theta + \epsilon_{ij,t} \end{aligned} \tag{7}$$

where $M_{ij,t}^{T}$ represents the total migration flow, that is, the number of those who migrate

[2]The so-called scale effect is formally studied in Reichlin and Rustichini (1998) and empirically tested for the Spanish data in Clemente et al. (2013).

from region i to region j at time t, n is the labor force, h is the housing price, u is the unemployment rate[3], w is the real wage, d_{ij} is the geographic distance between region i and j, and $\epsilon_{ij,t}$ represents the perturbation of the model. We have additionally included 16 origin and 16 destination dummies, reflected in the matrix $D'_{ij,t}$, to capture the idiosyncratic effect of each autonomous community as home and host region. We expect that these dichotomic variables capture factors such as the amenities of each region and other fundamentals, such as the technology level and the economic structure. Moreover, we do not include factors relating to unemployment benefits because they are the same in all the Spanish regions.

To test whether the model specification is improved when the expected wage variable is introduced, rather than unemployment and wages separately, we propose Model II:

$$\begin{aligned}\ln M^T_{ij,t} &= \delta_0 + \delta_1 \ln n_{i,t} + \delta_2 \ln n_{j,t} + \delta_3 \ln h_{i,t} + \delta_4 \ln h_{j,t} + \delta_5 \ln w^e_{i,t} + \delta_6 \ln w^e_{j,t} + \\ &\quad + \delta_7 \ln d_{ij} + D'_{ij,t}\theta + \epsilon_{ij,t}\end{aligned} \quad (8)$$

where $w^e_{ij,t} = w_{ij,t}\left(1 - u_{ij,t}\right)$ is the expected real wage.

It would seem reasonable that, when the relative opportunities in the labor market of the destination region are greater, the decisions of migrants will fit traditional patterns while, if the economic gain of moving is relatively low, migrants pay attention to other factors, making the labor market variables less decisive. Thus, and relying on our theoretical model, the relationship could be nonlinear. In order to capture this possible nonlinearity, in a second step, a model with an endogenous method of selection of the thresholds is considered, and we specify:

$$\ln\left(M^T_{ij,t}\right) = x'_{ij,t}\beta_1 + \epsilon_{1,ij,t} \qquad \text{if} \qquad q_{ij,t} \leq \gamma \quad (9)$$

[3]We do not include the unemployment rate in logs because it is a bounded variable.

$$\ln\left(M^T_{ij,t}\right) = x'_{ij,t}\beta_2 + \epsilon_{2,ij,t} \qquad \text{if} \qquad q_{ij,t} > \gamma \tag{10}$$

where $x'_{ij,t} = \left[z'_{ij,t}, D'_{ij,t}\right]$, being $z'_{ij,t} = [1, u_{i,t}, u_{j,t}, \ln(n_{i,t}, n_{j,t}, h_{i,t}, h_{j,t}, w_{i,t}, w_{j,t}, d_{ij})]$, Model III, or $z'_{ij,t} = [1, \ln(n_{i,t}, n_{j,t}, h_{i,t}, h_{j,t}, w^e_{i,t}, w^e_{j,t}, d_{ij})]$, Model IV. β_1 and β_2 are vectors of parameters of dimension 24, and $q_{ij,t}$ is the threshold variable. If the parameter γ were known, we could easily test for the linearity null hypothesis and estimate the system by simply applying the standard OLS. However, this parameter is unknown and, consequently, we should first carry out an estimate, which we do by following the method first developed in Hansen (1999)[4], which has been broadly applied in the literature. This method is based on the least squares estimation of the system for different values of the threshold variable $q_{ij,t}$. Following this procedure, we perform a grid search, using a 15% trimming in order to exclude extreme values at the beginning and at the end of the sample of variable $q_{ij,t}$. Then, the estimated value of the parameter γ is the value of $q_{ij,t}$ that maximizes the statistic for testing the $\beta_1 = \beta_2$ null hypothesis for all the possible observations, with this statistic being defined as the difference between the sum of squared residuals of the model for a generic value of the threshold, and the sum of squared residuals corresponding to the estimated threshold (scaled by the variance of the sample residuals). Hence, this methodology allows us to test whether interregional migration flows in Spain are better explained by the explanatory variables, regardless of their levels or, rather, the response of internal migration depends on the value taken by certain exogenous variables. If there is a level of $q_{ij,t} = \gamma$ for which this likelihood ratio (LR) statistic is maximized, nonlinearities in the migration process would be found.

[4] Another methodology that tests for this kind of nonlinearity is the semiparametric analysis implemented, among others, in Maza and Moral-Arce (2006) for the wage-productivity relationship.

4 Results

In this section, we detail our econometric outcome. Results for total migration flows are displayed in the first subsection, while the second subsection is devoted to the same analysis, differentiating the outflows by citizenship, age, and returned and non-returned migration, which will serve as a robustness analysis. To that end, we include several subsamples as endogenous variables: foreigners/migrants with Spanish nationality, returned/non-returned migration, and the 18-30/30-60/>60 age ranges.

4.1 General results

We show the results of the estimation of Models I and II in Table 2, in which we present the elasticity coefficients of each variable. We should note that the t-ratios are computed using the heteroskedastic robust standard errors. In Model I, wages at the origin and at the destination are not statistically significant in explaining interregional migrations in Spain, and the unemployment rates produce very low elasticities. These results are contrary to what was expected and similar to those found in the literature cited in the introductory section. This unexpected outcome has been corrected in Model II by introducing expected wages as an aggregate variable. The total working population in both origin and destination regions positively affects the migration flow, as the scale effect predicts. Though housing prices in the destination region are not statistically significant, housing prices in the source region have a positive relationship with migration outflows[5], since migrants try to minimize that cost, and owners can make use of this source of wealth to overcome the sunk costs of migration. Thus, this kind of effect exceeds the impact of housing prices as a measure of the quality of life (examined in Rodriguez Pose & Ketterer, 2012). Our results for housing

[5] Elasticity of the housing price in the source region is near the limit of acceptance.

prices are in line with Mulhern & Watson (2012). Furthermore, the estimation results of Model II lead us to conclude that a 1% increase in the expected wage at the origin reduces emigration from this region by 0.68%, while the pull factor of the expected wage in the host region is greater, as immigration would rise by 0.92%. Finally, geographic distance negatively influences migration flows.

Following the results derived from the theoretical framework, a threshold in expected wages is considered but, as this variable is built with regional real wages and unemployment rates, both variables are considered separately as thresholds. Thus, we consider three labor market gaps as threshold variables ($q_{ij,t}$) in order to consider nonlinearities in the migration phenomenon: the unemployment rate, the real wage, and the expected wage gaps.

We now carry out the analysis including thresholds with the specification of Models I and II. The two new models will be referred to as Model III and IV, respectively. We display the estimation results in Tables 3 and 4. In these tables, the upper section corresponds to the estimation of the value of the threshold γ, the value of the LR statistic that tests for the null hypothesis of no presence of threshold, and the joint model R^2, while the lower section exhibits the elasticities for $q_{ij,t} \leq \gamma$ and $q_{ij,t} > \gamma$, as well as the number of observations and the coefficient of determination of each sub-sample. We estimate γ and then test the null hypothesis of no presence of threshold. To test for the non-linearity hypothesis, we calculate the critical values of the distribution by way of bootstrap techniques. In order to ensure that the critical values provide sufficient reliability, we have conducted 500 replications, obtaining the critical values shown in Table 5. Thus, in all cases, we can reject the null hypothesis of linearity, and we confirm the existence of differential behaviors, depending on the value taken by the threshold variable considered.

Focusing on the results of Model IV, we begin by considering the case of the unemployment rate gap as the threshold variable, so $q_{ij,t} : \frac{u_{i,t}}{u_{j,t}}$. Table 4 shows that migration takes two different behaviors when the unemployment rate in the origin region surpasses by 8% the unemployment rate of the host region ($\gamma = 1.0799$). When the unemployment rate gap is below that threshold, the estimated coefficient of the expected real wage in the origin region is not significant at the 10% level of confidence but, when the unemployment gap exceeds that threshold, the coefficient is high and statistically significant. As for the wage in the destination region, the coefficient has the theoretically-expected sign below and above the threshold; however, the elasticity is much greater when the unemployment gap is above the threshold. Hence, we conclude that labor factors are less decisive, if at all, when labor market conditions are favorable in the source region. Regarding real estate variables, housing prices in the origin region are statistically significant in the first subsample, but those in the destination region are not so for any level of the unemployment gap.

We now analyze the estimation of the model, allowing for thresholds, depending on the real wage gap. We should note that the interpretation in this case is contrary, because the subsample for $q_{ij,t} \leq \gamma$ refers to less favorable labor conditions in the origin region. The value of the threshold for which migration movements change the response to the explanatory variables is $\gamma = 1.0053$, corresponding to very similar levels of real wages in both regions. In this case, the coefficients of the expected wage in the origin and in the destination are statistically significant, but considerably lower when labor market conditions are favorable to the source region, especially for the real wage in the source region. This outcome is in line with the previous result. In addition, housing prices in both regions are not decisive for migration flows, regardless of the level of the real wage gap.

The last threshold variable considered is the gap in the expected real wages. This case is similar to the previous one in terms of interpretation, but the threshold value is higher, as the behavior changes when the expected wage in the origin region is 1.5% greater than in the host region ($\gamma = 1.0157$). The above conclusions remain valid because the expected wage in the origin region is not statistically significant, and the coefficient of the expected wage in the host region is lower when labor market conditions are favorable to the source region. The same effect is found for housing prices in the source region, although housing prices in the destination region are not statistically significant for any subsample.

The global interpretation of Table 4 yields some interesting results that can be helpful in understanding interregional migration flows in Spain. The estimated coefficients indicate that the influence of migration fundamentals can vary, depending on the absolute value of the labor market conditions, as the theoretical model predicts. The effect of the size of the labor force in both regions is positive, and housing prices in the destination region are not decisive for migration flows. Nevertheless, expected wages in both regions are irrelevant, or, at least, significantly less relevant, when the conditions in the origin region are better than in the destination region. Geographical distance is more significant when the conditions in the origin region are favorable. Thus, better labor conditions at the origin lead migrants to place less weight on the associated costs of moving. This non-linear effect is more pronounced when the unemployment rate gap is set as the threshold variable. In fact, threshold values for wages and real wages gaps are very close to 1.

Finally, the estimation results of Model III are detailed in Table 3, which reinforces our previous conclusions but, as we have explained, this specification is somewhat less satisfying to us. Focusing on the results regarding the real wage, our above conclusions are valid because wages are not conclusive for the migration decision when labor market conditions are favorable in the origin region.

Nonetheless, this set of results could vary depending on migrant characteristics, and we explore this issue in the next subsection.

4.2 Specific results

In order to identify the migration process depending on migrant characteristics, which will test the robustness of the previous results, we replicate the estimation steps, replacing the endogenous variable, total migration flows ($M^T_{ij,t}$), with other subsamples. We distinguish flows of foreigners ($M^f_{ij,t}$) and Spanish natives ($M^n_{ij,t}$), returned ($M^r_{ij,t}$) and non-returned migration ($M^{nr}_{ij,t}$), and the age ranges 18-30 ($M^y_{ij,t}$), 30-60 ($M^a_{ij,t}$) and >60 ($M^e_{ij,t}$). Our preferred specification with thresholds, Model IV, covers 7 sub-sampled models: Models IVk, with $k = \{f, n, r, nr, y, a, e\}$. The coefficient estimates are presented in Table 6. The explanatory variables refer, as in the previous estimations, to the total regional population, because it is not possible to disaggregate these variables for different types of migration. We have carried out the estimations for the three threshold variables but, for reasons of space, and considering that results are similar, we only report the results for the unemployment rate gap as threshold variable[6].

Focusing on Models IVf and IVn, Table 6 shows that the results are in line with the previous outcomes. When labor market conditions in the origin region are favorable, the coefficient of the expected wage in that region has the unexpected sign for the foreign-born, and is not statistically significant for natives. The expected wage in the destination region is less of a determinant, especially for Spanish migrants, since for foreigners those coefficients are high under any scenario. When labor market conditions in the origin are unfavorable, the elasticities for both subsamples are statistically significant and have the expected signs. We should note that the level of the threshold variable differs between subsamples. Foreign-born migrants react differently when the unemployment rate in the origin region surpasses the rate in the destination region by 13.4%, while for native migrants, the threshold is around 8%.

[6] Results for the three threshold variables are available from the authors upon request.

We now consider returned and non-returned migration flows, where return migration is defined as migrants who move from another region, back to their birth region. Models IVr and IVnr show that the results for non-return migration support our conclusions, since the elasticities of the expected wages when labor market conditions are favorable to the origin region are much lower than in the other scenario. Regarding return migration, when labor market conditions in the origin region are favorable, those flows increase when the expected wage in the source region rises, and decrease when the expected wage in the destination region rises, thus contradicting theory. Under the other scenario, the coefficients have the theoretically-expected sign, or are not statistically significant. This outcome implies that return migration does not change because of work factors, but is subject to other forces, such as family networks, or other factors. As in the previous case, the thresholds differ between sub-samples; behavior changes when the unemployment rate in the origin region is 11.1% below the rate in the destination region for returned migrants, and 12.7% above it for the non-returned.

Finally, we study migration flows relative to migrants' age. We divide flows among young migrants (18-30 years old), adults (30-60 years old), and elder migrants (>60 years old). Table 6 presents the coefficient estimates of Models IVy, IVa and IVe. Young migrants place less importance on the expected wages in both regions when labor market conditions are favorable in the origin, with all coefficients being statistically significant, and with the theoretically-predicted sign. Middle-aged migrants maintain the pattern of the younger migrants, but the elasticity of the expected wage in the source region, when labor market conditions in the origin region are favorable, is not statistically significant. Regarding elder migrants, when labor market conditions in the source region are favorable, the coefficient of the expected wage in the origin region contradicts the theoretical inference, and the coefficient in the host region is not statistically significant. In the alternative scenario, the coefficients have the theoretically-predicted sign. The threshold levels are 12.8%, 8.1%, and 13.6% for young migrants, adults, and elder migrants, respectively.

In summary, when total migration flows are divided into subsamples, the results strongly support our conclusions. Specifically, we find that work-oriented migrants (foreign-born and Spanish natives, as well as non-returned migrants, and age ranges 18-30 and 30-60) place less weight on the expected wage in the source region and in the host region, (and may even disregard those rates, or respond contrary to the theoretical inference), when labor conditions in the origin region are favorable. In the alternative scenario, the coefficients are statistically significant and have the theoretically-expected sign. For those migrants with, presumably, other motivations to move, such as returned migration, and migrants aged over 60, the coefficients of expected wages are counterintuitive when labor conditions in the origin region are favorable, but are in line with theoretical outcomes when labor conditions are unfavorable in the source region.

5 Conclusions

We analyze interregional migration in Spain during the period 1988-2010. The prior literature finds no clear relationship between wages and unemployment, and interregional migrations, in the Spanish case. We have tackled this striking result by considering, first, expected wages rather than the unemployment rate and wages separately and, second, by potential nonlinearities in the response of migration flows to exogenous variables.

A simple theoretical model is developed to capture the notion that migration reacts differently to different levels of expected wages, rather than to structural breaks or exogenously-determined thresholds. The main implications of the model are tested empirically through a gravity equation that includes housing prices, and a technique in which thresholds in labor market variables are endogenously determined. Our results indicate that, when labor market conditions are unfavorable in the origin region, relative to the host region, migrants base their decisions on labor market conditions in both origin and destination regions. However, when relative labor market conditions in the source region are sufficiently good, migration flows are less responsive, or even indifferent, to expected wages, suggesting that migrants are less sensitive to labor market variables. Moreover, we have tested these results for several subsamples, distinguishing between foreigners and Spanish migrants, returned and non-returned migrants, as well as migrants in different age ranges. We find that the results for migrants of any nationality, non-returned migrants, and working-age migrants support our main findings. Meanwhile, migrants with, presumably, other motivations to move, such as returned and elder migrants, contradict the theoretical predictions when labor market conditions are favorable in the origin region. All subsamples are generally consistent with the theoretical predictions when labor market conditions are unfavorable in the origin region. This outcome could explain the theoretically-inconsistent results found so far in the literature on Spanish interregional migrations.

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Table 1. Descriptive statistics

	Mean	Standard deviation	Minimum	Maximum
Migration_{ij}	1,252.1	2,254.5	3	36,680
Foreigners_{ij}	271.1	717.6	0	10,773
Natives_{ij}	981.0	1,697.2	3	26,962
Returned_{ij}	307.3	608.8	0	7,767
Non-returned_{ij}	944.7	1,788.8	1	31,570
18-30_{ij}	437.2	748.0	0	10,579
30-60_{ij}	477.8	907.1	1	16,363
$>60_{ij}$	123.9	270.1	0	3,790
Labor force (Thousands)	907.4	823.8	83.4	3,510.6
Unemployment Rate (%)	14.8	6.4	4.5	34.6
Wage (constant €)	21,773.4	4,702.4	11,111.3	35,425.9
Housing price (constant €)	126,369.2	73,585.1	39,900	411,400
Expected wage (constant €)	18,657.7	4,710.8	8,198.5	31,228.8

This table shows the descriptive statistics of the data for all Spanish regions.

Table 2. Models without Thresholds

	Model I	Model II
δ_0	-3.08	-2.19
	(-6.74)	(-4.99)
n_i	1.36	1.14
	(14.83)	(13.01)
n_j	0.63	0.65
	(7.14)	(7.57)
h_i	0.11	0.10
	(1.71)	(1.61)
h_j	0.07	0.05
	(1.06)	(0.73)
u_i	0.02	
	(9.95)	
u_j	-0.02	
	(-6.99)	
w_i	0.00	
	(0.00)	
w_j	0.19	
	(1.08)	
w_i^e		-0.68
		(-5.27)
w_j^e		0.92
		(7.26)
d_{ij}	-1.23	-1.23
	(-68.05)	(-67.83)
R^2	0.87	0.87
N^o Observations	6256	6256

This table presents the estimation results of Models I and II (equations 7 and 8). t-ratios in parentheses.

Table 3. Total migration flows. Model III

	$q_{ij,t}$: $\frac{u_{i,t}}{u_{j,t}}$		$q_{ij,t}$: $\frac{w_{i,t}}{w_{j,t}}$		$q_{ij,t}$: $\frac{w^e_{i,t}}{w^e_{j,t}}$	
γ	1.1341		1.0053		1.0157	
LR test	882.79		1000.48		1273.64	
Joint R^2	0.87		0.87		0.87	
	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{w_{i,t}}{w_{j,t}} \leq \gamma$	$\frac{w_{i,t}}{w_{j,t}} > \gamma$	$\frac{w^e_{i,t}}{w^e_{j,t}} \leq \gamma$	$\frac{w^e_{i,t}}{w^e_{j,t}} > \gamma$
δ_0	-3.34	-4.00	-3.42	-3.26	-3.77	-3.81
	(-5.70)	(-5.50)	(-5.52)	(-4.97)	(-6.15)	(-6.04)
n_i	1.29	1.50	1.71	0.97	1.70	0.92
	(10.69)	(10.82)	(14.73)	(7.03)	(14.70)	(6.96)
n_j	0.64	0.97	0.60	0.89	0.72	0.83
	(5.99)	(6.72)	(4.81)	(7.31)	(5.79)	(7.09)
h_i	0.21	0.15	0.12	0.10	0.12	0.16
	(2.81)	(1.50)	(1.42)	(1.09)	(1.38)	(1.90)
h_j	0.04	0.15	-0.02	0.01	0.01	0.10
	(0.48)	(1.60)	(-0.23)	(0.08)	(0.17)	(1.13)
u_i	0.02	0.05	0.03	0.02	0.04	0.02
	(5.04)	(12.03)	(9.51)	(5.60)	(11.72)	(5.09)
u_j	-0.01	-0.05	-0.02	-0.01	-0.03	-0.01
	(-1.91)	(-8.20)	(-6.98)	(-3.63)	(-8.59)	(-1.84)
w_i	-0.02	-0.36	-0.81	0.17	-0.88	0.01
	(-0.10)	(-1.25)	(-2.85)	(0.54)	(-3.20)	(0.05)
w_j	0.26	0.30	0.96	0.17	1.00	0.28
	(1.14)	(1.03)	(3.25)	(0.57)	(3.51)	(1.03)
d_{ij}	-1.36	-1.18	-1.19	-1.22	-1.24	-1.29
	(-68.47)	(-38.77)	(-51.98)	(-51.81)	(-53.63)	(-54.36)
N^o Observations	3911	2345	3207	3049	3172	3084
R^2	0.88	0.89	0.89	0.89	0.89	0.89

This table shows the estimations results of Model III (equations 9 and 10).

t-ratios in parentheses.

Table 4. Total migration flows. Model IV

	$q_{ij,t}$:$\frac{u_{i,t}}{u_{j,t}}$		$q_{ij,t}$:$\frac{w_{i,t}}{w_{j,t}}$		$q_{ij,t}$:$\frac{w^e_{i,t}}{w^e_{j,t}}$	
γ	1.0799		1.0053		1.0157	
LR test	831.96		1013.12		1260.15	
Joint R^2	0.87		0.87		0.87	
	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{w_{i,t}}{w_{j,t}} \leq \gamma$	$\frac{w_{i,t}}{w_{j,t}} > \gamma$	$\frac{w^e_{i,t}}{w^e_{j,t}} \leq \gamma$	$\frac{w^e_{i,t}}{w^e_{j,t}} > \gamma$
δ_0	-1.88	-2.38	-3.33	-1.57	-3.96	-1.70
	(-3.11)	(-3.52)	(-5.98)	(-2.60)	(-7.19)	(-2.81)
n_i	1.14	1.14	1.55	0.74	1.47	0.70
	(9.69)	(9.14)	(13.80)	(5.83)	(13.42)	(5.61)
n_j	0.45	1.18	0.65	0.84	0.74	0.80
	(4.27)	(8.84)	(5.45)	(7.09)	(6.31)	(7.16)
h_i	0.24	0.02	0.14	0.07	0.16	0.07
	(3.13)	(0.24)	(1.63)	(0.82)	(1.87)	(0.88)
h_j	-0.02	0.11	-0.08	0.02	-0.02	0.11
	(-0.19)	(1.30)	(-0.94)	(0.25)	(-0.25)	(1.15)
w^e_i	-0.06	-1.67	-1.49	-0.46	-1.79	-0.25
	(-0.32)	(-7.70)	(-7.96)	(-2.36)	(-9.07)	(-1.26)
w^e_j	0.35	1.73	1.74	0.78	2.03	0.56
	(1.95)	(8.42)	(9.48)	(4.10)	(10.53)	(2.84)
d_{ij}	-1.37	-1.20	-1.19	-1.22	-1.25	-1.30
	(-64.50)	(-43.03)	(-51.81)	(-51.59)	(-54.84)	(-53.93)
N^o Observations	3624	2632	3207	3049	3285	2971
R^2	0.88	0.88	0.89	0.89	0.89	0.90

This table shows the estimations results of Model IV (equations 9 and 10).

t-ratios in parentheses.

Table 5. Bootstrap Results

	$q_{ij,t}$: $\frac{u_{i,t}}{u_{j,t}}$	$q_{ij,t}$: $\frac{w_{i,t}}{w_{j,t}}$	$q_{ij,t}$: $\frac{w^e_{i,t}}{w^e_{j,t}}$	$q_{ij,t}$: $\frac{u_{i,t}}{u_{j,t}}$	$q_{ij,t}$: $\frac{w_{i,t}}{w_{j,t}}$	$q_{ij,t}$: $\frac{w^e_{i,t}}{w^e_{j,t}}$
Significance Level	Model III			Model IV		
1%	41.7977	39.6004	44.8362	41.5995	40.8604	41.5590
5%	39.1291	36.2894	40.7455	39.4250	37.1849	39.3489
10%	34.9389	33.2856	33.0052	35.4078	33.8139	32.4699
	Model IVf			Model IVn		
1%	41.2957	37.5688	40.6907	41.5552	36.5913	41.4718
5%	36.4752	33.8621	37.3629	37.9069	33.0752	39.7304
10%	28.8194	29.1146	34.0034	32.0501	27.5051	37.3050
	Model IVr			Model IVnr		
1%	40.3437	38.6265	41.3889	31.5631	39.2409	40.3741
5%	35.7174	35.9744	38.7620	37.0169	35.7777	37.3592
10%	33.5634	32.5687	36.2318	40.3417	34.1345	33.7528
	Model IVy			Model IVa		
1%	41.2355	37.0311	41.2880	40.4092	37.2683	41.5834
5%	38.7223	34.6447	39.2163	38.7815	33.9227	39.1051
10%	34.4980	29.2261	36.0225	36.6406	32.0550	33.4569
	Model IVe					
1%	40.6041	39.0096	40.6787			
5%	37.1181	36.3756	38.1221			
10%	35.0966	29.9684	35.3842			

This table shows the estimated critical values for the LR statistic. More details in the main text.

Table 6. Subsampled migration flows. Models IVk

	Foreigners		Natives		Returned		Non Returned		[18-30)		[30-60)		≥60	
γ	1.1341		1.0799		0.8865		1.1275		1.1280		1.0809		1.1364	
LR test	400.49		886.95		900.82		844.45		697.17		787.47		614.83	
Joint R^2	0.89		0.86		0.86		0.88		0.85		0.88		0.82	
	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$	$\frac{u_{i,t}}{u_{j,t}} \leq \gamma$	$\frac{u_{i,t}}{u_{j,t}} > \gamma$
δ_0	-40.23	-41.41	3.96	3.80	-0.81	3.63	-4.36	-5.20	-1.75	-3.08	-6.40	-7.73	-4.87	-4.56
	(-55.79)	(-44.64)	(6.58)	(5.42)	(-0.89)	(5.53)	(-8.09)	(-7.42)	(-2.92)	(-3.98)	(-10.98)	(-11.49)	(-6.25)	(-4.43)
n_i	2.06	2.50	0.96	0.45	1.22	0.50	1.29	1.58	0.98	1.25	1.39	1.24	0.97	0.35
	(13.05)	(13.51)	(8.05)	(3.64)	(7.74)	(4.41)	(11.93)	(12.86)	(7.94)	(8.50)	(11.88)	(10.01)	(6.65)	(2.00)
n_j	1.97	2.24	-0.01	1.07	-0.40	0.65	0.47	1.04	0.55	1.02	0.66	1.43	0.57	1.68
	(13.47)	(11.83)	(-0.11)	(7.85)	(-2.66)	(5.00)	(4.75)	(7.86)	(4.92)	6.77	(6.37)	(10.89)	(4.20)	(9.18)
h_i	0.46	0.01	0.14	0.04	0.44	0.01	0.24	0.02	0.23	0.06	0.17	-0.05	0.04	0.04
	(4.47)	(0.04)	(1.84)	(0.37)	(4.00)	(0.14)	(3.25)	(0.21)	(2.87)	(0.54)	(2.13)	(-0.47)	(0.44)	(0.25)
h_j	-0.04	0.37	-0.08	-0.00	-0.01	-0.02	0.02	0.14	0.01	0.14	-0.08	0.10	-0.25	-0.13
	(-0.39)	(2.87)	(-0.86)	(-0.03)	(-0.09)	(-0.28)	(0.30)	(1.62)	(0.07)	(1.42)	(-0.96)	(1.12)	(-2.29)	(-1.00)
w_i^e	0.71	-0.63	-0.17	-1.73	1.98	-0.22	-0.76	-2.22	-0.56	-1.88	0.27	-1.30	1.04	-0.87
	(3.23)	(-2.07)	(-0.96)	(-7.90)	(7.76)	(-1.04)	(-4.64)	(-10.02)	(-3.07)	(-7.56)	(1.56)	(-6.15)	(4.38)	(-2.84)
w_j^e	1.77	2.88	0.36	1.68	-1.78	0.42	1.15	2.33	0.76	1.82	0.32	1.73	-0.12	1.38
	(8.12)	(9.84)	(1.98)	(8.11)	(-7.12)	(2.08)	(7.00)	(11.06)	(4.06)	(7.69)	(1.85)	(8.41)	(-0.52)	(4.57)
d_{ij}	-1.16	-0.92	-1.40	-1.28	-1.45	-1.65	-1.36	-1.13	-1.39	-1.15	-1.36	-1.19	-1.46	-1.35
	(-47.07)	(-25.13)	(-64.86)	(-45.62)	(-45.25)	(-68.90)	(-68.42)	(-37.56)	(-65.0)	(-36.3)	(-62.4)	(-41.6)	(-61.6)	(-34.7)
N^o Obs.	3793	2271	3624	2632	2370	3868	3882	2374	3882	2373	3630	2626	3866	2308
R^2	0.89	0.90	0.87	0.88	0.89	0.87	0.90	0.90	0.86	0.88	0.89	0.89	0.84	0.84

This table shows the estimation results for Models IVf, IVn,IVr, IVnr,IVy, IVa, IVe. t-ratios in parentheses.