Artigo submetido a 22 de Fevereiro 2021; versão final aceite a 26 de Dezembro de 2021
Paper submitted on February 22, 2021; final version accepted on Dezember 26, 2021

Economic Crisis and Household Formation in the Iberian Peninsula (2003-2017)

Crisis Económica y Formación de Hogares en la Península Ibérica (2003-2017)

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Abstract

This paper studies the effects of a negative economic shock on household formation in Spain and Portugal over the period 2003-2017 and for how long these effects last. We use a Vector Autorregressive (VAR) model with different variables that, according to academic literature, might affect the creation of households. The results show that the negative impact on household formation has different effects in both economies: while in the Portuguese case there is an immediate impact which lasts for six quarters, in Spain the effect becomes visible from that moment on. It can also be established that household formation in Portugal shows a higher sensitivity to the conditions of the real-estate market offer than in Spain. Also, in this last country the variables related to real-estate market may explain more than 60% of this variance, while in Portugal the unemployment rate and housing prices are those which gain a greater significance.

Keywords: Unemployment rate; VAR; household formation; economic crisis; Spain; Portugal.

Classification JEL: R21, J11, D10

Resumen

Este artículo toma el caso de España y Portugal durante el periodo 2003-2017 para investigar el efecto que tiene un shock económico negativo sobre la formación de hogares y la duración de dichos efectos. Para ello se estima un modelo VAR en el que se incorporan diversas variables que inciden sobre la creación de nuevos hogares. Los resultados indican que el impacto negativo tiene efectos diferenciales en ambas economías: mientras que en el caso portugués el impacto es casi inmediato y se prolonga durante seis trimestres, en España se manifiesta precisamente a partir de ese momento. También se constata cómo la formación de nuevos hogares en Portugal presenta mayor sensibilidad a la de oferta en el mercado inmobiliario que en España. Además, a largo plazo el peso de las variables relacionadas con el mercado inmobiliario español pueden llegar a explicar más del 60% de esa variabilidad, y en Portugal son la tasa de desempleo y el precio de la vivienda las que adquieren una mayor relevancia.

Palabras Clave: Tasa de desempleo; VAR, formación de hogares; crisis económica; España: Portugal

Clasificación JEL: R21, J11, D10

1. INTRODUCTION

Household formation does not follow any similar pattern in all European countries and shows significant differences among themselves (Walther, 2009). The reasons that explain these differences vary widely, and they depend mainly on both particular structural factors, highlighting the socio-economic conditions that exist in order to access to a property and the legal and institutional framework that controls the housing market in every country, as well as on the general sociological elements, together with individual psychological behaviours (Jurado Guerrero, 2003).

This is the reason why different investigation[1] have analysed the main characteristics of household formation in all European countries on the basis of the welfare-system distinction developed by Esping-Andersen (1990), also including the late classification extension made by Leibfried (1992) and Kornai (1992).

One of the most common conclusions about these studies is that the Southern European countries, which are framed within the so-called *Mediterranean* or *rudimentary* model, are those countries in which the delay of young people leaving the parental home and forming a new one is longer (Bosch Meda, 2017). The reasons that explain this delay are diverse.

The reasons that explain this delay are diverse. The model is characterized by individual strategies that prioritize achieving a degree of economic stability before leaving the parental home (Emmanuel, 2013); by low levels of public spending on active employment policies and high rates of youth unemployment; by the significant role the family plays in providing support to access housing (Anxo *et al.*, 2010); by the vigorous promotion of property as the primary tenure system of political authorities (Allen *et al.*, 2004) within the framework of a housing stock characterized by a low proportion of social housing and renting; and by a high proportion of secondary housing (Bosch, 2017).

In addition to these already mentioned structural factors, it must be taken into account certain circumstantial factors. Particularly, the delicate economic situation that countries from the South of Europe went through after the beginning of the economic crisis in 2008, especially if we consider that the economic literature agrees on the fact that economic conditions, both on a general and individual level, shape the patterns of household formation, and thus, an economic recession may cause a delay in this process (Lee & Painter, 2013).

Considering the particularities of the Social Welfare that the Mediterranean model (Leibfried, 1992) go through in terms of household formation together with the effects that the recent economic downturn has had on this development, a comparative analysis has been carried out between the household formation of the two countries under study that, since they are bordering, should present similar trends and are part of the same geographic area, the Iberian Peninsula.

In fact, this paper studies the impact that the economic crisis had on the household formation rhythm in Spain and Portugal. Furthermore, of conforming the Iberian Peninsula, both countries joined the European Union in 1986, and started the transition to the Euro simultaneously. In addition, the turning points of the household market and the economic cycles present certain cohesion between both countries between 1970 and 2013, except that Portugal did not experienced a housing bubble so large at the beginning of the crisis in 2008, as it took place in Spain (Fradique and Rodrigues 2014).

In order to analyse this issue, we have applied a vector autoregressive (VAR) model similar to the one that Choi and Painter (2015) used in the United States case. The objective is to analyse, by impulse and reaction functions as well as the decomposition of variance, which is the temporal impact of an increase in household formation and for how long it lasts. Likewise, this model allows to estimate the contribution of each endogenous variables that influence on the variation of new households[2], both in short and long term.

The following section explains the recent evolution in household formation in these two countries between 2003-2017 together with the development of the variables that affects it. The third section reviews relevant academic literature for Europe and the United States and their results. The

[1] In this sense, it is to be noted those works that study the features that affect household formation in the diverse Welfare regimes by Breen and Buchmann (2002); Iacovou (2002); Mandic (2008); Buchmann and Kriesi (2011); Bosch (2017).

[2] Formation of a human group made up of one or more people who habitually reside in a family housing that was not previously registered in official statistics.

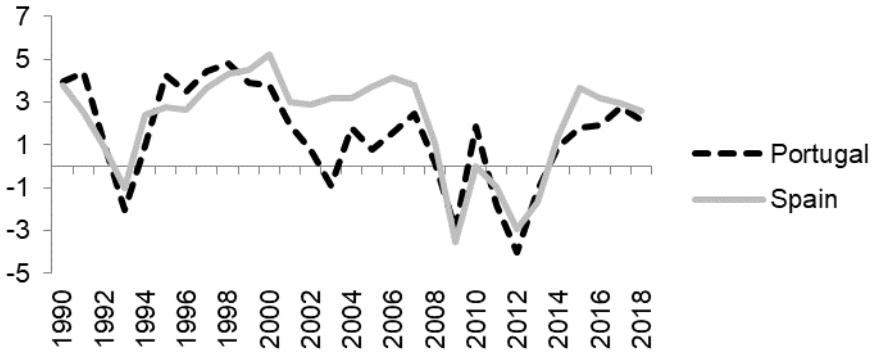
fourth section describes the data used and the estimation method. The fifth section presents the main results and the final section shows the conclusions of this research.

2. HOUSEHOLD FORMATION AND ECONOMIC CYCLE IN SPAIN AND PORTUGAL (2003-2017)

The progression of the Spanish and Portuguese economic cycles seemed to be very similar in the 1990's until the incorporation of both economies to the Euro (Figure 1). Thereafter, and until the economic downturn of 2007, both cycles split and the Spanish economy, which was highly supported by the construction industry and real estate sector, had a positive differential growth with regard to the Portuguese economy. This evolution is also underscored by Fradique and Rodrigues (2014), who highlight it as an element that explains the differential evolution of the Spanish economy growth with regard to the Portuguese. Thus, even the economic feeling between both economies were similar, the business confidence in the real estate sector was quite different and higher in the Spanish case, causing a significant increase in the number of housing permits between 2000 and 2006 in Spain, while in Portugal it decreased from the end of the 90's (Tavares et al., 2014).

However, the outbreak of the so-called *subprime* crisis in the United States at the end of 2007 caused the drying up of international economic circuits which affected to a large part of the developed economies, making way to a long economic recession. After several years of positive GDP growth rates both in Spain and Portugal (OECD), the crisis implied a significant economic slowdown, the appearance of negative growth rates until the beginning of the recovery period in 2012, and back to its business cycles synchronisation.

Figure 1: Annual Growth Rate[3] GDP in Spain and Portugal (1990-2018)



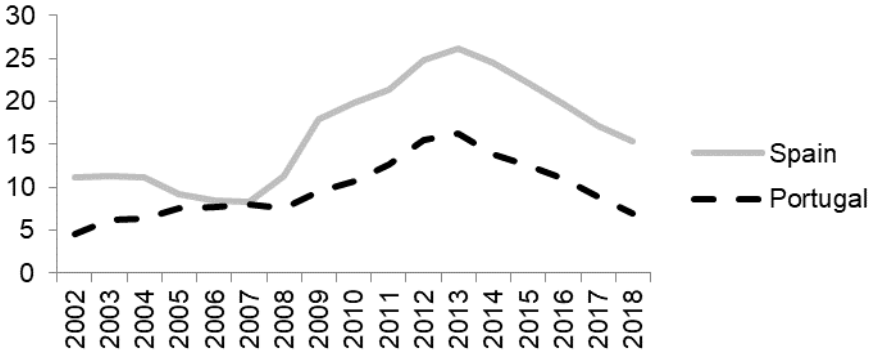
Source: *OECD.* Own elaboration.

Employment was one of the most affected variables by the economic crisis and, subsequently, by the austerity policies designed by TROIKA to face the crisis. The downturn in both economies caused an increase in the unemployment rates that reached in 2013 its maximum rate, being the Spanish case the most affected (Figure 2), especially due to his labor specialization in the construction and tourism sectors (Barroso, 2017). So, in that year the unemployment rate reached the 26.1% in the Spanish case and a 16.2% in the Portuguese economy.

From 2014, the change on the business cycle that began in 2012 had finally a positive impact on employment, causing the drop of the unemployment rates in both economies and, even though both reached similar levels when the crisis broke out, the Spanish remained systematically higher than the Portuguese. In any case, it is important to highlight that the employment recovery happened at the same time that the working conditions and the wage stagnation were worsened in both countries, according to Barroso (2017).

[3] GDP growth percentage of the reference year minus the percentage of the previous year.

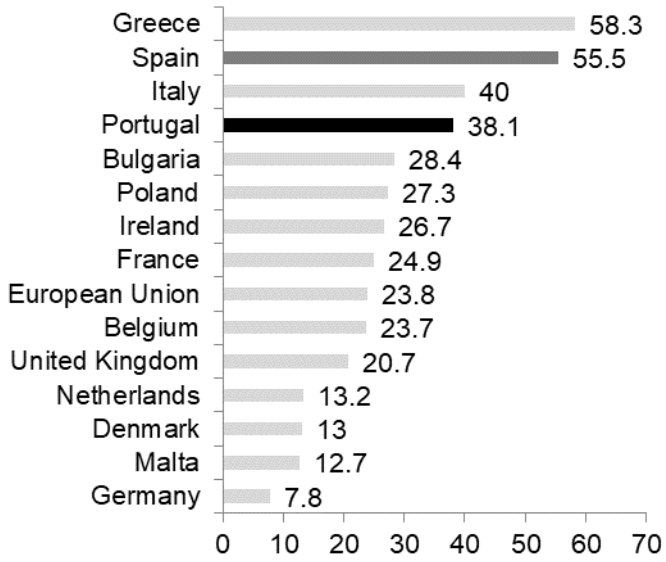
Figure 2: Unemployment (in percentage) in Spain and Portugal (2002-2017)



Source: *Bank of Portugal and Bank of Spain*.

This research's approach pays particular attention on the evolution of the unemployment rate in young adults from both countries, since this group is the most prone to create new households, also being one of the most affected by unemployment after the crisis, to the extent that they had the highest unemployment rates from all the European Union (Figure 3).

Figure 3: Youth Unemployment Rate in Europe (2013)



Source: *Eurostat*. Own elaboration.

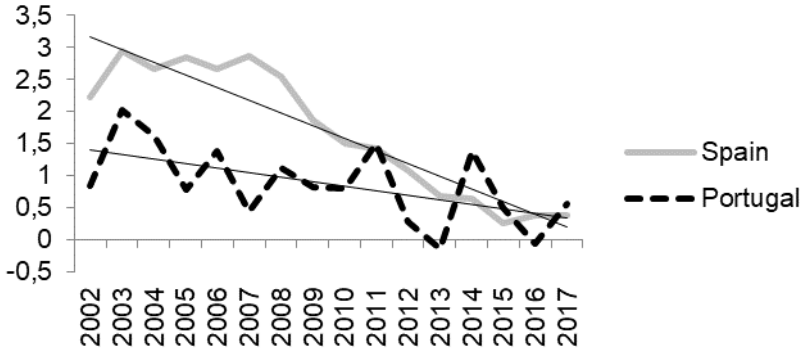
The youth unemployment is particularly important since it delays the age of entry into the labour market, and hence it has negative effects on their residential independence, causing declines in household formation in young adults (Lee and Painter, 2013).

In short, both the increase of the unemployment rate for the total workforce as well as the one for young people, suggest that household formation suffered a slowdown in recent years in both countries due to economic shortcuts. This is because the consumption decisions of a household, and especially those decisions related to housing access, are strongly influenced by family incomes (Tavares et al., 2014). Therefore, unemployment situations or job insecurity in the workplace have a negative impact on emancipation and household formation decision (Becker et al., 2010; Barceló and Villanueva, 2018).

In fact, as can be seen in Figure 4, the household growth rate in Portugal keeps a decreasing trend from the beginning of the 21st century, together with the lower GDP growth rates and the progressive unemployment growth; one of the reasons that help explain this drop in household formation is the decline in the resident population: between 2009 and 2018, the country's resident population decreased by nearly 300,000 people. This reduction was due to a negative natural balance and, especially, to a negative migratory balance, where the sovereign debt crisis of 2011 and 2012 produced both a notable departure of Portuguese and a reduction in the entry of people, re-

flecting the sensitivity of migratory flows to the economic cycle. In the Spanish case, household formation slows down once the crisis broke; up to that moment, the household growth rate was around a 3% annually, the highest in the last twenty years.

Figure 4: Household Growth Rates (2002-2017)

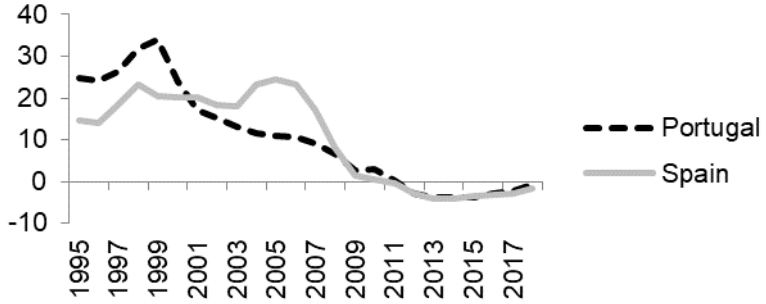


Source: *Portugal Statistical Office (INE)*; *Spanish Statistical Office (INE)*. Own elaboration.

On the other hand, together with the influence that the variables related to labour market, the academic literature also indicates the economic conditions effect, and more specifically, the access to finance for creation of new households (Poggio, 2008). This influence is more significant as higher is the population tendency on housing purchasing against the renting option as an emancipation way, since the economic effort to buy a housing is much greater.

In this regard, the crisis saw a reduction in mortgage offers together with the imposition of higher requirements and tighter conditions in order to secure a loan due to liquidity problems that Portuguese and Spanish bank systems had (Correia and Santos, 2014; Ahn and Sánchez-Marcos, 2017). This toughening up with regard to accessing credit is a crucial and distinguishing factor in the countries of the Southern European region, since the access to the housing market often occurs by purchasing, and it depends in turn on the access to a mortgage loan[4] (Poggio, 2008).

Figure 5: Growth of Mortgage Rates[5] in Spain and Portugal (1995-2018)



Source: *Bank of Portugal and Bank of Spain.*

As can be noted in Figure 5, both countries got high growing mortgage rates until joining into the Eurozone in 1999. However, from then on, the patterns of mortgage trends begun to diverge. In the case of Portugal, the join into the Euro area caused a progressive decreasing of this rate, reaching negative levels from 2011. In any case, the average annual growth of this indicator between mid 1990s and the year preceding the crisis was around a 16%, as a result of the low market interest rates that banks offered, together with the general familiar wage increase (Fradique and Rodrigues, 2014). On the other hand, Spain had one of the most modest annual growth rates and kept them for a longer period, and what is more, the entry into the eurozone caused an upturn on mortgage loans, unlike in Portugal. The reason is that the residential investment significantly raised in a context of low interest rates and important flow of immigrants. Clearly, the crisis had a significant

[4] In this sense, Martins and Villanueva (2009) confirm that the access to a morgage loan in Portugal is a key factor for household formation in young adults.

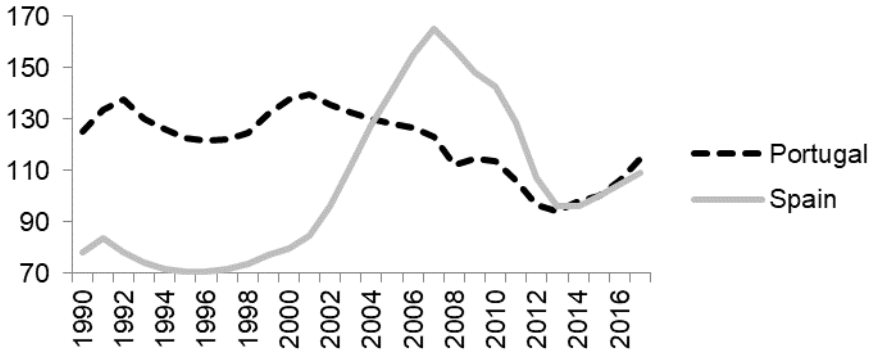
[5] Mortgage growth percentage of the reference year minus percentage of the previous year.

impact on mortgage loan business and its growth rates quickly dropped off into negative levels in both economies.

In spite of this differentiation in mortgage trends, most of the countries on the periphery experienced a common feature: a huge familiar over-indebtedness. Thus, in the course of 10 years, both the Spanish and the Portuguese households experienced a level of debts growth which increased from 25 percent of the country GDP to over 90 percent in 2006 (Fradique and Rodrigues, 2014).

Lastly, it has also to be taken into account the evolution of housing prices when the process of household formation in the Mediterranean model is analysed, since this process frequently occurs by property purchasing rather than by renting (Giannelli and Monfardini, 2003; Ahn and Sánchez-Marcos, 2017).

Figure 6: Real House Prices Index (2015=100)



Source: *OECD.*

In the Portuguese case, the housing prices index gradually fell from its joining into de eurozone and it only bounced back from 2013, when the economic bailout was already well-established and an economic recovery process begun (Figure 6). Spain, for its part, had a great annual growth on housing prices from 1999 to 2008, when the bursting of the housing bubble, but this increase changed its tendency abruptly and began to fall. It is not until 2014 when the Spanish economy starts to recover in the real estate market and prices get stabilised and recovers its growing tendency, although in a safest way.

As can be seen, there are several factors that can affect new household formation; however, there is little economic academic literature discussing this issue (Iacovou, 2010; Wiemers, 2014; Moreno Mínguez, 2016). Also, there are fewer studies concerning the impact that the deterioration on economic conditions has on the creation of new household. Consequently, we will review in the next section the existing academic literature in order to know the current state of the art and subsequently, present the empirical analysis of the Iberian Peninsula case.

3. REVIEW OF ACADEMIC LITERATURE

The approaches used in studies on household formation and in the literature differ between Europe and the US. In Europe, for example, the studies focus on the differences among countries and among welfare systems due to their institutional, economic and social characteristics. (Aassve et al., 2002; Iacovou, 2010). In contrast, as Wiemers (2014) points out, US-focused research places greater emphasis on economic factors as the main determinants in explaining the formation of new households.

In both cases, research on how adverse economic conditions affect household decision-making after a financial shock is much scarcer (Choi & Painter, 2015). Kaplan (2009; 2010) analyzed the adjustments young Americans made to their living conditions after the labor market crisis, and demonstrated that labor market disruptions are an explanatory factor underlying the return of young people to the parental home after a first emancipation attempt. A recent study by Cooper and Luengo-Parado (2018) concluded that demographic factors, house prices and the economic cycle explain 70% of the household formation rate among young North Americans.

Another important United States' study is Wiemers (2014), who showed that job losses during recessions increases three times the probability of house-sharing to reduce expenses. This was also investigated by Mykyta and Macartney (2011) in the United States, who concluded that during

recessions the percentage of the population house-sharing is above 6% compared to the usual 2% average. Furthermore, Lee and Painter (2013) found that a 2% increase in the unemployment rate decreased the creation of new housing by 1%. Subsequent work by Choi and Painter (2015) showed that it takes ten quarters for the rate of household growth in the United States to return to its original value. Similarly, Paciorek (2016) also concluded that as the US labor market recovers, household formation increases.

In the European context, Aassve et al. (2013) analysed the economic difficulties that young people from 24 European countries experienced, concluding that the rates of young people living with their parents increased. However, it should be pointed out that on the other hand, in Ireland the household formation rate increased in those years following the crisis, since the fall in renting prices caused a more affordable housing market (Byrne et al., 2018).

As far as the Spanish and Portuguese literature are concerned with household formation, these two cases have been mainly focused on the delay in leaving the parental home in both the Spanish (Martínez-Granado and Ruíz-Castillo, 2002; Jurado Guerrero, 2003; Moreno Mínguez, 2016; Echaves, 2017) and the Portuguese society (Machado Pais, 2001; Guerreiro and Abrantes, 2005; Machado and Silva, 2009; Martins and Villanueva, 2009; Magda, 2011).

Nevertheless, there is an even smaller bibliography about the last housing market crisis in household formation in these two countries, to the point of finding just a few references to the Portuguese case in some studies about some European states (Aassve et al., 2013; Lennartz et al., 2014; Arundel and Ronald, 2015).

There are more works for the Spanish case, such as the papers of Módenes et al. (2013) and Módenes and López-Colás (2014) who study household formation among young people from the evolution and reconfiguration of the Spanish residential system after the economic crisis. Furthermore, Ahn and Sánchez-Marcos (2017) investigated the household formation of people under 40 during the last Spanish economic boom and subsequent crisis, through a labor market analysis, concluding that during the 2009-2013 period the residential independence of Spaniards under 40 increased by 2%, contrary to expectations..

Another recent study by Barceló and Villanueva (2018) examined how job insecurity influenced the formation of new households in Spain between 2002-2014. They concluded that the 1% increase in permanent employment contracts improves household formation opportunities by 1.2%, confirming that there is an important relationship between job security and household formation.

Nevertheless, none of the previous works, excluding the study by Choi and Painter (2015), have explained whether unemployment have lasting effects in household formation timing, and fewer still in the framework of two countries which share welfare state regimes and experience a similar and concurrent economic crisis.

That is why this paper tries to move forward the research about this subject by analysing the dynamic relationship between unemployment and household formation after a financial downturn for these two Southern European countries that shape the Iberian Peninsula.

4. METHODOLOGY AND DATA

In order to analyse which variables influence household formation in Portugal and Spain, national data has been collected for the period between 2003 and 2017 (Table 1). This period cannot be extended further back in time due to some of the temporal series of the used variables in this analysis do not go beyond 2003, so this year has been considered as the starting year.

Although the main interest of this research is focused on determining the impact the unemployment rate has on household formation (represented by the variation in the number of households in one year with respect to the previous one) and for how long this impact lasts, other variables have been also added to this model since, according to the literature, they may have potentially relevant effects on the evolution of housing numbers. Thus, following Choi and Painter (2015), together with the unemployment rate and the variation in the number of households (which may represent both household formation or its reduction), we incorporate the development of housing prices, the number of housing starts, population, income for households and mortgage interest rates.

These variables are divided into four endogenous and three exogenous variables with the aim of identifying those factors that influence the fluctuations in the number of long-term households. Our four endogenous variables are: the change in the number of households, the unemployment rate, housing prices, and the number of new houses that are built every year thus increasing the total housing supply. Our three exogenous variables are: the changes in the population, the mortgage market interest rate and the average household income. The choice was made on the assumption that while exogenous variables are likely to affect household decisions, the formation of new households is less likely to have an impact on these variables.

The order of endogenous variables within the Vector Auto Regressive (VAR) may affect its results and, therefore, it is necessary a theoretical justification that give a sense to this variable order[6]. The variables have been arranged to allow for the impact that economic conditions can have on new demands for housing to be reflected in the VAR, and from there, to analyze how the demand for new housing and the number of housing starts can influence housing prices. Thus, the order of the variables chosen is as follows: unemployment, changes in the number of households, changes in the number of housing starts and housing prices.

The main problem concerning time series is their availability and different publication frequencies. Table 1 shows data sources and their publication frequency. Both monthly and annual series have been converted to quarterly data using the European Comission's JDemetra+ programme[7].

Table 1: Source and time periodicity of the series (2003-2017)

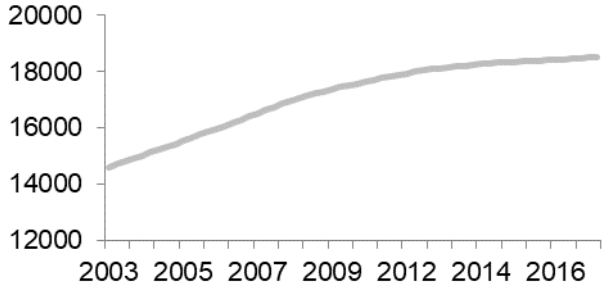
Data	Publication date	Source
Number of households	Annual	INE (Spain); INE (Portugal)
Real housing price	Quarterly	Organization for Economic Co-operation and Development
Unemployment rate	Quarterly (Spain); Monthly (Portugal)	INE (Spain); INE (Portugal)
Population	Six-monthly (Spain); Annual (Portugal)	INE (Spain); INE (Portugal)
Income	Annual	Eurostat
Mortgage interest rate	Quarterly (Spain); Monthly (Portugal)	Bank of Spain; Bank of Portugal
Long term interest rate	Monthly	Organization for Economic Co-operation and Development
Housing starts	Quarterly	Ministry of Public Works and Transport (Spain); European Central Bank (Portugal)

Figures 7 and 8 show the evolution of households in Spain and Portugal for the analysed period. Bearing in mind the difference of population between both countries, it can be confirmed that in Spain (Figure 7) as well as in Portugal (Figure 8), the growth in the number of households follows a growing tendency along the period, being steeper at the beginning, and becoming smoother from 2010, when the financial crisis is a lasting reality in both countries.

[6] Vector autoregressive models possess a well known structure that enables the researcher to capture linear interdependencies among the endogenously related time series variables (Hamilton, 1994).

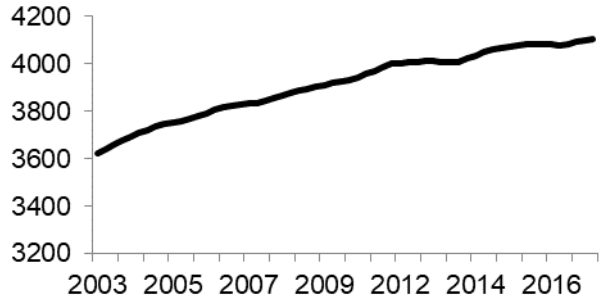
[7] JDemetra+ software is the recommended program by the European Comission in order to create seasonal and calendar adjustments, It can be downloaded in the following webpage:
https://ec.europa.eu/eurostat/cros/content/software-jdemetra_en

Figure 7: Number of households per thousand households in Spain (2003-2017)



Source: *INE*; Own elaboration.

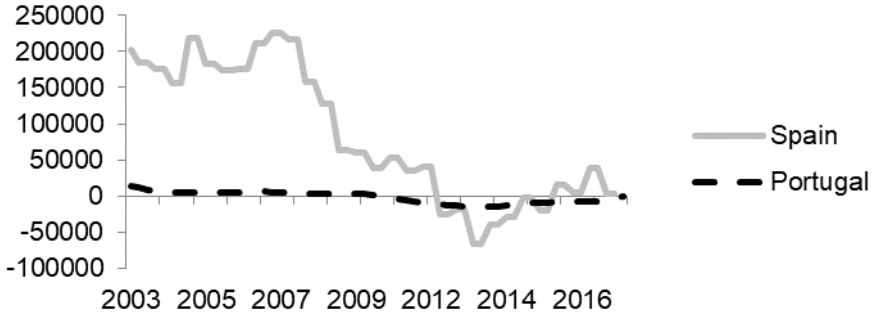
Figure 8: Number of households per thousand households in Portugal (2003-2017)



Source: *INE*; Own Elaboration.

It is important to remark the fact that household formation occurs in a moment in which the Spanish population had a positive growth until 2008 when it became negative, whereas in Portugal, the increase in household formation happened in a context of population stagnation (Figure 9). In any case, we must state that in both cases and during the most difficult years of the economic crisis, there was a net loss of population as a result of emigration.

Figure 9: Population Evolution[8] (absolute terms) in Spain and Portugal

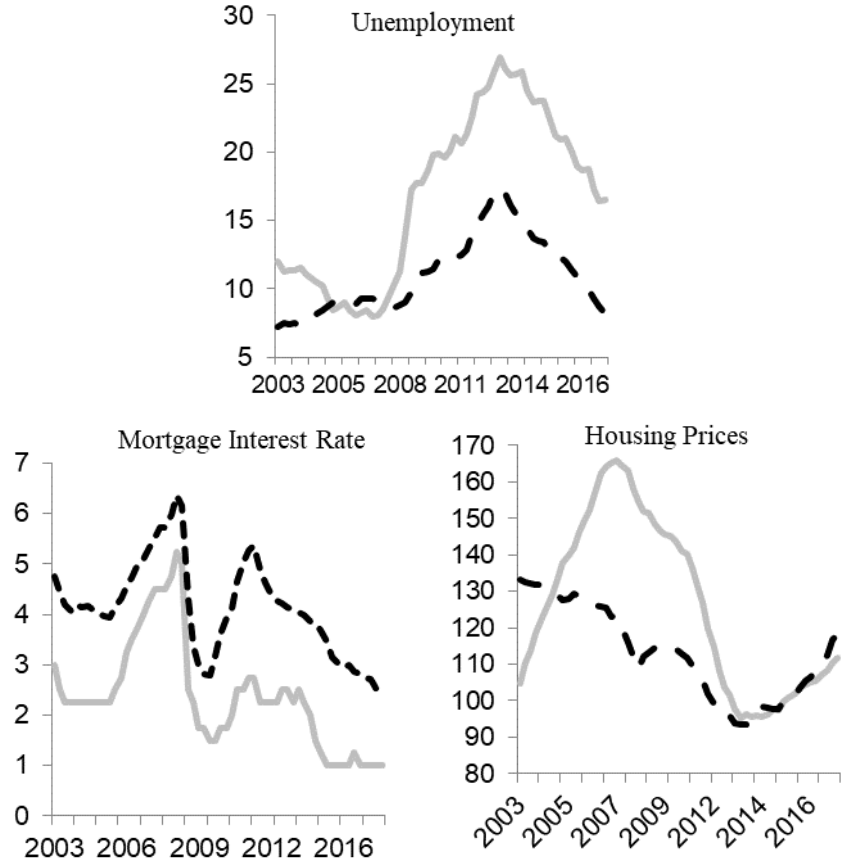


Source: *INE; INE*; Own Elaboration.

Finally, Figure 10 shows the evolution of the rest of the variables remaining that were used in this model, excepting the income and the housing starts. As can be seen, the evolution of the Spanish labour market suffers in a stronger way the crisis impact, with almost 10 points of difference between the unemployment rates of both countries in 2013, the most severe moment of the crisis.

[8] Population of the reference year minus population of the previous year.

Figure 10: Other variables used (Spain colour gray; Portugal colour black)



Source: See Table 1.

Part of this differential performance in labour market is due to the evolution of the construction sector and, thus, of the real estate market in both countries. This performance can be fully appreciated in the evolution of housing prices (following a declining trend in Portugal and shot up in Spain until 2008); or in the differential in mortgage interest rates between both countries, since these were lower in Spain -because of the mortgage borrowing facilities that the banking system offered- than in Portugal (Fradique and Rodrigues, 2014).

4.1. The Vector Autoregressive model

To analyze the relationship between household formation and the rest of the endogenous variables, a Vector Autoregressive (VAR) model has been estimated. Vector Autoregressive models have a well-defined structure that allows the identification of relationships in a time series of endogenously related variables. In a VAR model, each variable is expressed as a linear function of its past values, as well as all their variables (endogenous and exogenous), with a stochastic error term.

We use the following specification of the VAR model

$$Y_{it} = \alpha + \Phi_i \sum_{1}^{n} Y_{it-1} + \beta_{it} X_{it} + \varepsilon_{it}$$

where Y is the vector that represents the four endogenous variables and X is the vector of exogenous and dummy variables that have been used to correct a problem of normality of the initial model.

To estimate the VAR, we use unit root test to analyze the stationarity of time series using Eviews econometric software. For this purpose, we use the extended Dickey-Fuller test. The results are shown in Table 2.

Table 2: Unit root test for individual series

	Unemployment	Housing prices	Δ Housing	Δ Households
ESPAÑA				
ADF-GLS (niveles)	-1,374	-2,755	-2,372	-2,144
ADF-GLS (1ª diferencias)	-2,327	-2,164	-8,016*	-7,963*
PORTUGAL				
ADF-GLS (niveles)	-0,442	0,112	-3,286**	-1,325
ADF-GLS (1ª diferencias)	-3,242***	-3,990**	-3,425**	-6,733*

ADF-GLS is the increased Dickey-Fuller test statistic with GLS DETRENDING.
*,**,*** indicate significance at 1%, 5% and 10%, respectively.

As shown, in the Spanish case, only the change in number of housing starts and the variation in households hold an unit root and are stationary on first differences at 1%. On the other hand, in the Portuguese case, the change in number of housing starts is stationary on levels and the other variables are stationary on first differences (unemployment rate at 10%; housing prices index at 5% and the variation in households at 1%).

According to Choi and Painter (2015), these variables have not been differentiated in order to use the stationary model and, thus, to improve the estimations accuracy, even if there is no possibility of getting the estimate of a Vector-Error Correction Model (VECM) because there is a combination of stationary and non-stationary series (Sims et al., 1990).

Finally, after sorting the endogenous variables according to the criterion stated above, we proceeded to choose the optimal number of lags for endogenous variables in every estimated VAR (see Appendix). As can be seen, in both cases the Information Criterion by Akaike suggests to use the lag length of 5 (Akaike, 1973). This is the main reason why this has been the optimal choice for every endogenous variable.

5. HOUSEHOLD FORMATION IN SPAIN AND PORTUGAL: MAIN RESULTS

For this empiric strategy, a Vector Autoregressive (VAR) has been used to analyse these two countries, trying to reveal which variable explains the best in short-term the variation in household formation and which is the impact that unemployment has on it.

This model is divided, for both countries and same time frame, into four endogenous variables and three exogenous variables. Our four endogenous variables are: the change in the number of households, the unemployment rate, the price of housing and the number of housing starts. And our three exogenous variables are: the changes in the population, mortgage market interest rate and the average income household.

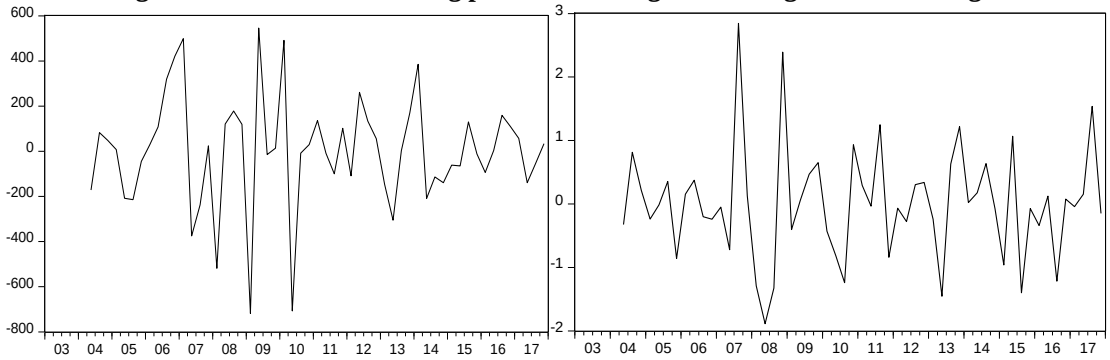
But, also, in the Spanish case we have added a dummy variable in order to fix the existence of any data anomaly in unemployment rate series that affected the normalcy of this model. The introduction of this variable has helped us to solve this problem (Fig. 11 shows the existence of these anomalous data from the residual analysis of this variable).

Figure 11: Residues of unemployment rate in Spain equation

Source: *Author's estimation*.

On the other hand, we have added two dummy variables in the Portuguese case in order to fix the existence of any data anomaly in the housing prices and housing starts series, affecting the normalcy of the Vector Autoregressive model. In particular, as it is shown in Figure 12, the analysis of the residues of both variables shows the existence of some anomalous values for the crisis years that have been solved while using these dummy variables.

Figure 12: Residues of housing prices and change in housing starts in Portugal



Source: *Author's estimation.*

Moreover, 5 lag length were added for each endogenous variables based on the optimal lag length suggested by the Akaike's information criterion. The election of these 5 lag-lengths makes it possible to delete the residual autocorrelation in every equation, and it strengthens the VAR stability allowing every root to remain inside the unit circle and, thus, the condition of stability is satisfied by giving robustness to impulse-response functions and to the analysis of variance.

Likewise, residual elements have been analysed in order to test the stability of these estimated VAR, and it has been shown that there is not any problem of normalcy in a combined test[9]; there are also no problems of autocorrelation nor heteroscedasticity.

Appendix shows the results of the coefficient estimation of different equations for every endogenous variable in these two countries (Table 7 and Table 8). The most relevant results are those obtained for the estimation of the household changes equation (*Dif. Households*) for both countries and, so, we will try to get conclusions about the influence that could have the other variables on it from the variance and impulse-response functions analysis.

5.1. Impulse-response functions

From the impulse-response function analysis derived from the VAR model in Eviews, the speed of the impact that a negative economic shock has on changes in household formation in both countries can be determined. In fact, this is one of the fundamental applications of VAR models and the most relevant to the purposes of this paper.

To that effect, firstly, it has been estimated the impact of an increase similar to a standard derivation in unemployment rate and the other endogenous variables have on household formation in long-term. Figure 13 shows the impact of a shock in unemployment rate on household formation in both countries.

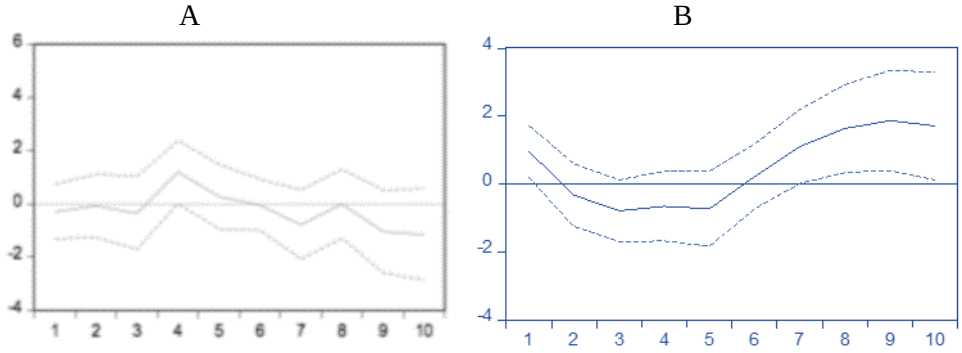
As can be seen, the dynamic that household formation follows after a shock in unemployment rate is very different. While the shock in Spain the is clearly negative from the sixth quarter onwards and there is a noticeable downward trend from the fourth quarter, in Portugal the negative impacts of unemployment rate on household formation seem to be concentrated straight away after the shock, and then these effects are over from the sixth quarter, when household formation recovers the levels prior to the shock and it shows a positive trend during the rest of the period taken into consideration.

The obtained results state that household formation shows a higher sensitivity in short-term to the negative impacts on unemployment rate in Portugal than in Spain. In the case of Spain, the effects present a longer lag-length almost overlapping in time with the moment when these effects became blurred. This may explain the existence of larger mechanisms of protection against unem-

[9] The Portuguese VAR does show normalcy problems in the third equation, which means, housing changes.

ployment in Spain than in Portugal and, as a result, it also means that the effect on household formation in Spain happens once the perception of benefits related to those mechanisms are over.

Figure 13: Impulse-response function of household changes after a shock by standard deviation on unemployment in Spain (A) and in Portugal (B)



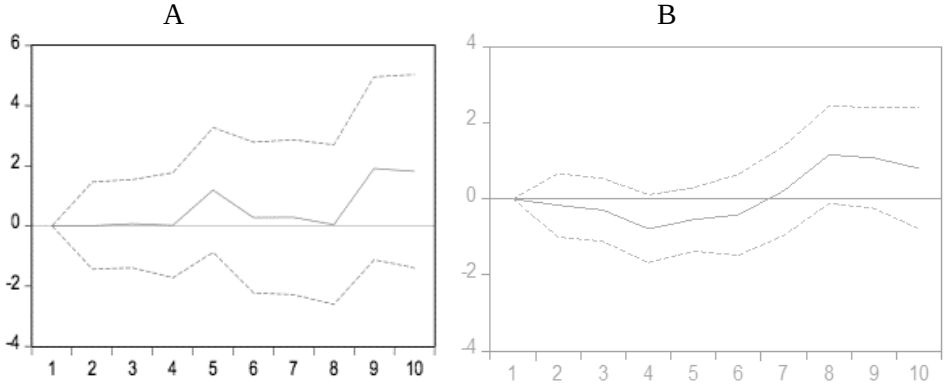
Source: *Author's estimation*.

Thus, there is a solid evidence that affirms that there is a relation between the long-term impact of worsening economic conditions (expressed as an increase in the unemployment rate) on new household in both countries, even they differ at some points. These results are in line with the empirical evidence found for other Western economies as mentioned above (Lee and Painter, 2013; Moreno, 2016; Paciorek, 2016).

On the other hand, the impact on household formation after a shock in the number of housing under construction also shows variation between both countries (Figure 14).

Once again, the short-term impact after a shock in that variable is more severe in Portugal than in Spain; in fact, in this latter country there is no evidence that there is a determinant impact on the evolution of household formation; on the other side, it exists a clear evidence that confirms that the negative effects could cause a drop in household formation for 7 quarters in Portugal.

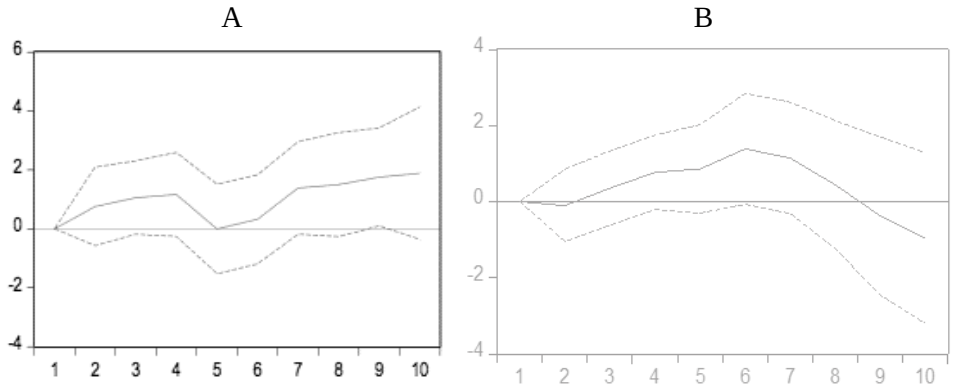
Figure 14: Impulse-response function of household changes after a shock by a standard deviation in the number of new housing in Spain (A) and in Portugal (B)



Source: *Author's estimation.*

Finally, the effect caused by a shock in housing prices on household formation, also presents a negative lag-length effect in Portugal from the seventh month onwards (Figure 15). On the other hand, that variable does not affect that much in Spain and, excepting for a slight tightening between the fourth and fifth quarter, the effect on household formation is not negative as it could be expected, but positive.

Figure 15: Impulse-response function of household changes after a shock by a standard deviation on housing prices in Spain (A) and in Portugal (B)



Source: *Author's estimation.*

The explanation of this dynamic is only possible in the different profiles that the real estate dynamic has followed in both countries, together with the highest adaptability aptitude of the Spanish society in a housing bubble context.

5.2. Variance decomposition

The analysis of the decomposition of the variance allows to get some empiric evidences related to those variables that affect household formation. In fact, the variance decomposition of the endogenous variables in light of the impacts on every variable provides a measurement of its relative importance on the overall VAR dynamic.

Table 3 collects the decomposition of the variance change in household number in Portugal, and as can be seen, the most relevant result is that the lagged values of this variable are those which explain its evolution in time, with a very weak contribution on housing prices or on new housing offer, but with a remarkable impact on the unemployment rate. These results confirm those that the VAR itself provide about the variables that affect household formation.

Table 3: Decomposition of variance for changes in household numbers in Portugal

Period (in quarters)	S.E.	Unemployment	Dif. Households	Dhouse starts	Real prices
1	2.909	10.810	89.189	0.000	0.000
2	3.144	10.392	89.219	0.281	0.106
3	3.286	15.348	82.338	1.050	1.262
4	3.527	16.786	71.464	5.889	5.859
5	3.850	17.702	65.469	6.948	9.879
10	5.971	36.350	34.551	12.356	16.741
20	7.061	29.667	29.830	11.497	29.003
30	7.844	29.921	26.305	11.453	32.319

In any case, if long-term evolution of variables are taken into account together with the effect that these have on household formation, we can see that new housing construction -and, thus, the housing stock expansion- have a minor impact on the formation of households: the impact of the effect of the expansion of the housing stock on the formation of households disappears two years (8 quarters) after this expansion has occurred and is not maintained over time. Therefore, there is little reaction of household formation in light of the conditions of the real-estate market offer.

On its part, housing prices are becoming more important in order to explain household formation, to the point of explaining that the unemployment rate. In any case, these both variables -unemployment rate and housing prices- may explain around 61% of the variability of household formation in long-term in Portugal. This percentage is the result of adding the long-term effects (30 quarters) of the effect that the sum of the variations in the unemployment rate and housing prices has on the variance of household formation.

In the case of Spain, it is confirmed that unemployment rate has a lesser importance than those variables related to housing market, both in terms of housing starts and in housing prices (Table 4). In fact, housing prices explain in long-term more than 40% of the variability of household formation, while new housing offer may explain around a 20%. As a result, it can be concluded that the real-estate market performance during these years mostly explains the dynamic of household formation, while unemployment rate has a great importance in middle and long term, but not at the same level as the real estate market variables in conjunction.

Table 4: Decomposition of variance for changes in household formation in Spain

Period	S.E.	Unemployment	Dif. Households	Dhouse starts	Real prices
1	3.818	0.620	99.379	0.000	0.000
2	4.104	0.572	96.040	0.001	3.386
3	4.273	1.214	89.526	0.032	9.226
4	4.587	7.776	77.752	0.030	14.440
5	4.770	7.496	72.867	6.282	13.353
10	6.709	10.599	39.392	19.015	30.993
20	9.606	16.336	22.134	18.789	42.740
30	10.339	20.097	19.403	16.847	43.651

In any case, in both countries it is important to highlight that the lagged values of household formation explain the evolution of household formation, which means that this variable presents certain persistence.

6. CONCLUSIONS

The analysis of those factors that affect household formation and the different behaviour that they could have in both economies that entail the Iberian Peninsula seem relevant if we bear in mind that both economies severely suffered the effects of the economic crisis, to the point of getting a financial rescue from the European institutions; however, the crisis responded differently in both countries.

In fact, despite the Portuguese economy did not come up from a so remarkable housing market bubble as it happened in Spain, this crisis impact affected the household formation rate and, thus, affected also the new housing demand by those people who left the parental home in order to create their own family circle deepening the downward trend that appears throughout the whole period in both countries.

It is therefore interesting to know how much a worsening in economic conditions and the consequent rise in unemployment may have affected household formation, in order to know if the reasons that explain the economic crisis had a differential effect on this last variable in the Spanish and Portuguese economies.

To that end, on the basis of the analysis of existing academic literature, it has been selected for both countries those variables that are considered decisive on household formation -the same for the two cases- and it has been studied the impact that its evolution could have on household formation. The main findings obtained are the followings.

Firstly, the impact of an economic shock expressed by a permanent increase in unemployment rate has differential effects on household formation in both economies: while in the Portuguese case there is an immediate impact which lasts for six quarters, in Spain the impact becomes visible from that moment on, in other words, there was a significant time lag between the shock and its effects on household formation. As a consequence, it can be affirmed that household formation has a higher and faster sensitivity to the evolution of the unemployment rate in Portugal than in Spain.

Secondly, it can also be established that household formation in Portugal shows a higher sensitivity to the conditions of the real-estate market offer than in Spain. In fact, in the Spanish case the variation of new housing offer -and, even of price evolution- do not show a negative impact on household formation along the time.

And, thirdly, there is also a differential performance between Spain and Portugal when it comes to the variables that explain the household formation variance. While in Spain the variables related to real-estate market may explain more than 60% of this variance, in Portugal the unemployment rate and housing prices are those which gain a greater significance and the sum of both explains 61% of the variance of the formation of new households.

Finally, for future lines of research, after the impact of the COVID crisis, it is of interest to know if its effect on the formation of households has been more or less profound than the effect of the financial crisis, taking into account that in the case of COVID the crisis has been symmetrical on both economies and it may be of interest to know if their effects have been as well.

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APPENDIX

Table 5: Selection criteria for the order of the VAR Portugal

Lag	LR	FPE	AIC	SC	HQ
0	NA	2.79e+08	30.793	31.669	31.132
1	269.255	1273301.	25.392	26.852	25.956
2	65.904	470204.9	24.366	26.411*	25.157
3	18.053	545264.7	24.460	27.088	25.476
4	22.907	532794.5	24.348	27.559	25.590
5	49.891*	195816.9*	23.209*	27.005	24.677*

* indicates delay order selected by the criterion
Acronyms stand for LR: Likelihood Ratio, FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion.

Table 6: Selection criteria for the order of the VAR España

Lag	LR	FPE	AIC	SC	HQ
0	NA	4.35e+12	40.449	41.179	40.731
1	386.539	1.76e+09	32.628	33.942*	33.136
2	33.932	1.44e+09	32.402	34.300	33.136
3	42.306	8.87e+08	31.870	34.352	32.831
4	30.412	7.02e+08	31.558	34.623	32.743
5	34.901*	4.44e+08*	30.976*	34.626	32.388*

* indicates delay order selected by the criterion
Acronyms stand for LR: Likelihood Ratio, FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion

Table 7: VAR for endogenous variables Portugal

	Unemployment	Dif. Households	Dhouse starts	Real prices
Unemployment (-1)	1.109*	-3.213***	236.966	0.324
	(0.154)	(1.850)	(216.357)	(0.650)
Unemployment (-2)	-0.267	2.171	22.664	-0.231

	(0.267)	(3.215)	(375.884)	(1.129)
Unemployment (-3)	0.134	0.661	-277.300	-1.706
	(0.283)	(3.408)	(398.474)	(1.197)
Unemployment (-4)	0.176	0.517	129.105	2.384**
	(0.260)	(3.131)	(366.043)	(1.099)
Unemployment (-5)	-0.421**	3.965***	42.996	-1.156
	(0.202)	(2.435)	(284.727)	(0.855)
Dif. Households (-1)	0.041*	0.431*	22.3901	-0.046
	(0.013)	(0.164)	(19.265)	(0.057)
Dif. Households (-2)	-0.010	0.032	-7.492	-0.003
	(0.014)	(0.176)	(20.667)	(0.062)
Dif. Households (-3)	0.026**	0.049	3.735	-0.010
	(0.014)	(0.168)	(19.689)	(0.059)
Dif. Households (-4)	-0.005	-0.203	-3.134	0.027
	(0.013)	(0.167)	(19.584)	(0.058)
Dif. Households (-5)	0.007	0.269**	-2.038	-0.160*
	(0.012)	(0.147)	(17.238)	(0.051)
Dhouses starts (-1)	0.001	-4.77E-04	1.0537*	0.001*
	(-1E-04)	(1.24E-03)	(0.144)	(4.3E-04)
Dhouses starts (-2)	-4.98E-05	3E-04	-0.238	-9.35E-04
	(1.8E-04)	(0.002)	(0.247)	(7.4E-04)
Dhouses starts (-3)	-1.35E-04	-0.002	-0.060	1.3E-04
	(1.8E-04)	(0.002)	(0.247)	(7.4E-04)
Dhouses starts (-4)	2.33E-04	4.33E-04	-0.454**	3.89E-04
	(1.6E-04)	(1.94E-03)	(0.226)	(6.8E-04)
Dhouses starts (-5)	-1.46E-04***	-6.69E-04**	0.477*	-5.18E-05
	(8.6E-05)	(1.03E-03)	(0.121)	(3.6E-04)
Real prices (-1)	0.028	-0.112	-66.474	1.033*
	(0.043)	(0.518)	(60.582)	(0.182)
Real prices (-2)	-0.053	0.611	103.190	-0.239
	(0.049)	(0.591)	(69.111)	(0.207)
Real prices (-3)	0.016	0.055	-18.245	-0.566*
	(0.053)	(0.647)	(75.670)	(0.227)
Real prices (-4)	-0.091***	-0.128	23.521	0.449**
	(0.054)	(0.657)	(76.912)	(0.231)
Real prices (-5)	0.067***	0.870**	-16.761	0.110
	(0.039)	(0.478)	(55.952)	(0.168)
C	3.450	-225.119*	1716.807	49.834**
	(5.116)	(61.454)	(7184.11)	(21.583)
Mortg. Rate	0.263***	-2.867	-766.389*	-1.631*
	(0.138)	(1.665)	(194.725)	(0.585)
Income	2.01E-04	0.005*	-0.436	-1.5E-03*
	(1.5E-04)	(0.001)	(0.214)	(6.5E-04)
Dpopulation change	-3.98E-05	-1.45E-04	-0.021	2.07E-04**
	(2.9E-05)	(3.5E-04)	(0.041)	(1.2E-04)
Dummy housing	0.136	-2.705	57.896	-0.622
	(0.174)	(2.098)	(245.288)	(0.736)
Dummy prices	-0.298	-1.717	10.511	3.372*
	(0.246)	(2.966)	(346.788)	(1.041)
R-squared	0.995	0.830	0.982	0.995
Adj. R-squared	0.992	0.684	0.967	0.992
Number of obs.	55	55	55	55

*, **, *** indicate significance at 1%, 5% and 10%, respectively.

Table 8: VAR for endogenous variables Spain

	Unemployment	Dif. Households	Dhouse starts	Real prices
Unemployment (-1)	1.005*	0.324	1739.86	-0.967***
	(0.124)	(1.589)	(3728.80)	(0.549)
Unemployment (-2)	-0.521*	-0.402	-4592.387	0.621
	(0.186)	(2.382)	(5589.21)	(0.824)
Unemployment (-3)	0.124	5.750**	6012.355	-0.517
	(0.196)	(2.516)	(5902.83)	(0.870)
Unemployment (-4)	0.312	-4.668***	-9744.586***	0.199
	(0.195)	(2.501)	(5864.99)	(0.864)
Unemployment (-5)	-0.168	1.162	6012.343	-0.011
	(0.131)	(1.683)	(3949.98)	(0.582)
Dif. Households (-1)	0.041*	0.281	583.589	0.069
	(0.014)	(0.185)	(436.149)	(0.064)
Dif. Households (-2)	-0.016	-0.068	28.414	-0.022
	(0.014)	(0.183)	(429.592)	(0.063)
Dif. Households (-3)	-0.008	-0.018	197.483	-0.006
	(0.014)	(0.179)	(420.965)	(0.062)
Dif. Households (-4)	-0.011	-0.090	-584.602	0.013
	(0.015)	(0.198)	(466.165)	(0.068)
Dif. Households (-5)	0.046*	-0.242	698.509**	0.111**
	(0.012)	(0.164)	(386.734)	(0.057)
Dhouses starts (-1)	1.76E-05**	-5.79E-05	0.755*	7.58E-05**
	(7.7E-06)	(9.8E-05)	(0.230)	(3.4E-05)
Dhouses starts (-2)	3.59E-06	-6.92E-05	-0.067	-4.28E-05
	(6.8E-06)	(8.7E-05)	(0.203)	(3.0E-05)
Dhouses starts (-3)	-1.25E-05***	-4.62E-05	0.082	8.51E-06
	(6.6E-06)	(8.5E-05)	(0.199)	(2.9E-05)
Dhouses starts (-4)	-1.29E-05	1.18E-04	0.307	-2.18E-05
	(8.1E-06)	(1E-04)	(0.242)	(3.6E-05)
Dhouses starts (-5)	1.27E-05***	-1.04E-04	-0.142	-9.76E-07
	(7.0E-06)	(9.0E-05)	(0.210)	(3.1E-05)
Real prices (-1)	-0.122*	0.672	-481.376	1.139*
	(0.044)	(0.574)	(1347.29)	(0.198)
Real prices (-2)	-0.093	-0.003	418.016	-0.074
	(0.069)	(0.885)	(2076.89)	(0.306)
Real prices (-3)	0.201*	-0.078	-1152.329	0.117
	(0.066)	(0.853)	(2002.02)	(0.295)
Real prices (-4)	0.009	-0.811	1720.865	-0.453***
	(0.062)	(0.798)	(1872.10)	(0.276)
Real prices (-5)	-0.064	1.544*	-1415.432	0.012
	(0.048)	(0.622)	(1459.63)	(0.215)
C	-39.874**	921.457*	-409441.8	-152.397***
	(19.393)	(248.085)	(581968.)	(85.818)
Mortg. Rate	-0.061	5.680*	-9887.420*	-0.796
	(0.121)	(1.558)	(3656.09)	(0.539)
Income	3.2E-04	-0.003	5.906	-4.75E-04
	(2.4E-04)	(0.003)	(7.317)	(0.001)
Dpopulation change	1.00E-06**	-2.24E-05*	0.009	4.24E-06**
	(4.7E-07)	(6.0E-06)	(0.014)	(2.1E-06)
Dummy unemployment	-1.388*	4.407	-1413.098	0.103
	(0.344)	(4.402)	(10328.7)	(1.523)
R-squared	0.998	0.994	0.918	0.998
Adj. R-squared	0.997	0.989	0.853	0.997
Number of obs.	55	55	55	55

*, **, *** indicate significance at 1%, 5% and 10%, respectively.