



EXTENDED ABSTRACT

Title: A spatial approach for Okun's law in Spain's provinces

Authors and e-mail of all:

Vicent Almenar-Llongo (vicent.almenar@ucv.es)

Celia Melguizo (celia.melguizo@ucv.es)

Raúl Ramos (rramos@ub.edu)

Department:

Economía, empresa y marketing (UCV)

Econometría, estadística i economía aplicada (UB)

University:

Catholic University of Valencia (UCV)

University of Barcelona (UB)

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Abstract:

In the Spanish economy, economic fluctuations have had a great impact on the labour market and especially in unemployment. During the recent economic recession that took place between 2008 and 2013, the reduction in GDP in more than 16 percentage points resulted in an 18 percentage points unprecedented increase in unemployment rate, which reached 26 percent of the active population in 2013. The subsequent period of recovery also implied a strong variation in the unemployment rate that accounted in almost 9 percentage points. But, the Spanish territory has not been affected in a homogeneous way (Buendía-Azorín and Sánchez de la Vega (2017); Porras and Martín-Román (2017); and Bande and Martín Román (2017) and, in addition, a regional spatial dependence in the relationship is acknowledged (Villaverde and Maza, 2015).



The relationship between GDP and unemployment has been traditionally analysed by using the Okun's law. Okun's law was initially formulated by Arthur Okun in 1962, who assigned for the U.S. economy approximately a 3 percentage point of GDP decrease to a 1 percentage point of unemployment rate increase. This empirical relationship, considered as a rule of a thumb by many economists, was applied to different countries, regions and time periods and it was showed that whereas a negative relationship between the aforementioned variables could be stated, the magnitude of the impact differed among territories and time periods.

The initial versions formulated in Okun's (1962) were applied indistinctly to compare labour market performance of countries (Moosa, 1997; Lee, 2000; Ball et al. 2017), and regions (Freeman, 2000; Aspergis and Rezitis, 2003; Christopoulos, 2004; Adanu, 2005; Villaverde and Maza, 2007, 2009; Binet and Facchini, 2013; Clar-López, 2014) and the relationship was also subjected to numerous transformations. New variables were added to the original formula. For instance, Gordon (1984) introduced as explanatory variables the changes in capital and technology regarding their potential level, in addition to unemployment variations. Prachowny (1993) also considered labour supply, workers weekly hours and capacity utilization deviations from the equilibrium. An additional transformation regarded to the inclusion of the unemployment as an endogenous variable, which contrast with Okun's seminal study, which considered it exogenously. Additionally, dynamic versions with different lag lengths were considered. Evans (1989) introduced three lagged periods to observe how past variations in Gross National Product (GNP) and unemployment influenced quarterly values of these variables and Moosa (1999) considered a dynamic version with different lag lengths to check the results obtained for the U.S. economy. Studies such as Harris and Silverstone (2001), Holmes and Silverstone (2006) Crespo-Cuaresma (2003), Knotek (2007), Owyang and Sekhposyan (2012), and Canarella and Miller (2016) assumed the existence of a nonlinear relationship. Finally, a recent group of analyses (Oberst and Oelgemöller, 2013; Pereira, 2014; Montero, 2014; Kangasharju et al, 2012; Palombi et al., 2017; Villaverde and Maza, 2005) introduced spatial spillovers in the relationship between GDP and unemployment as countries and regions are not isolated



territories, but migration and trade flows as well as the social system connect geographical areas and the social system favours the resources transfer and we may provide biased estimations. whether these effects are not considered.

This work aims to contribute to previous literature by determining the effect of spatial spillovers in the relationship between GDP and unemployment rate for the Spanish provinces (NUTS-3 regions). In this regard, the work is an extension of the Villaverde and Maza (2015) and Melguizo (2017) studies as it considers the spatial dimension, which was overlooked in Melguizo (2017), but resorts to the provincial units to identify which provinces are affected by the economic and labour market circumstances of closer territories, which was neglected in the spatial panel analysis previously performed by Villaverde and Maza (2015). The relevance of this analysis lies in the strong influence that economic shocks have on the labour market in Spain, especially in the unemployment variable. As noted above, Melguizo (2017) analyses this relationship for the Spanish provinces and it is shown that those provinces with a higher level of participation in the labour market, less diversified industries and a higher share of employment in services are the ones suffering a greater unemployment sensitivity. However, despite the fact that there is a greater sensitivity of unemployment in the coastal and southern provinces, nothing is said about the existence of a spatial pattern. The spatial pattern is confirmed in Villaverde and Maza (2015) for the panel composed by the Spanish autonomous communities (NUTS-2 regions), but the lack of disaggregation does not allow to know which territories are affected by the economic and labour market fluctuations of other areas.

This analysis considers all Spanish provinces for the period that ranges from 1985 to 2015 to determine to what extent labour market performance of some areas is affected by economic and unemployment rate variables of closer territories. In order to perform the analysis, we check the stationarity of the provincial variables as a first step. We perform the Augmented Dickey Fuller and Philips Perron tests and also the Clemente-Montañes and Reyes test that assume the existence of endogenous structural breaks. Then, we estimate a dynamic Okun's extended model that includes spatial spillovers. Different methods have been considered to carry out the analysis. First, we just estimate a dynamic model for all Spanish provinces without considering the effect



of spatial contingencies. Then, we perform the Spatial Autoregressive Model (SAR), which only considers the endogenous variable spatially lagged but with non-spatial effects in the GDP variable. Later on, besides the spatial influence of unemployment rate of the other provinces, a spatial effect of the GDP variable is also included. Therefore, a Spatial Durbin Model (SDM) is applied. This last model is the preferred one for most provinces attending the likelihood ratio (LR) test and the AIC and BIC criteria. With respect to the distance matrix, we consider initially a contiguity matrix but then, we check the robustness of our results by considering different alternatives. Among them, we firstly use a distance matrix based on the inverse of the distance between the provincial capitals and later on, we consider the inverse of the square distance.

Preliminary results provide interesting findings. From the dynamic model, we obtain that for most provinces GDP mostly affects unemployment on the same period, especially in provinces with higher economic activity. The use of the spatial Durbin model provide us additional findings. Whereas unemployment rate of closer provinces significantly affect unemployment rate of most provinces but with a magnitude lower than predicted by previous works, the effect of economic fluctuations of nearby territories reflect that for some provinces that show a coefficient of current GDP $\beta_1 \geq -0.2$ and for all which show a positive coefficient in the dynamic model, relationship in the SDM between the current GDP and unemployment rate variations turns out insignificant. Besides, the spatial effect is insignificant for the provinces that show a high Okun's coefficient. However, for most provinces in which Okun's relationship turns out insignificant, spatial effect has a significant influence.

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