La aplicación de la clasificación de áreas urbanas funcionales de la OCDE para el análisis de patrones de empleo local en España

Applying the OECD functional urban area classification to local employment pattern analysis in Spain

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Resumen

El objetivo de este artículo es ilustrar el uso de los SIG en la aplicación de la más reciente definición armonizada de la OCDE de áreas urbanas funcionales a un análisis de los patrones de empleo local en España. Para ello se han creado mapas de empleo municipal con datos obtenidos del Registro de la Seguridad Social y se distingue entre las áreas urbanas centrales, zonas de influencia urbanas y zonas rurales. También se ha realizado un análisis de proximidad para calcular las distancias de los municipios a las aglomeraciones urbanas y a los núcleos urbanos. Un análisis de regresión muestra que el crecimiento del empleo local está relacionado con el tipo de municipio y con su ubicación en relación con las aglomeraciones urbanas y núcleos urbanos.

Palabras clave: SIG, empleo local, rural, urbano, proximidad.

Abstract

The aim of this article is to illustrate the use of GIS in the application of the most recent OECD harmonized definition of functional urban areas to local employment pattern analysis in Spain. For this purpose, maps of municipality employment data from the Social Security Register are created which distinguish between urban core areas, urban hinterlands, and rural areas. Furthermore, a proximity analysis has been carried out to calculate municipalities' distances to urban agglomerations and urban core areas. Regression analysis shows that local employment growth is related to the type of municipality and to its location relative to urban agglomeration and urban core areas.

Keywords: GIS, local employment, rural, urban, proximity.

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1. INTRODUCTION

Geographic information systems (GIS) provide researchers with strong and versatile tools for addressing regional and urban economic issues. GIS not only facilitates the storing and manipulating of large amounts of information but also analysing an array of spatial relationships. Spatial relationships are fundamental in regional and urban economic analysis. Typically, the spatial relationships take the form of costs to access input markets, output markets or labour markets. Such costs are related to distances and will vary according to the type of location and their proximity to centres of economic activity. In this article, three types of locations are considered: urban core areas, urban hinterlands, and rural areas.

The purpose of this article is to illustrate the use of GIS in local employment pattern analysis and their relation to the recent OECD functional urban area classification.

2. MATERIAL AND METHODOLOGY

2.1. Delimitation of Rural and Urban Areas

A logical starting point in the present analysis is defining which areas are rural and which areas are urban. This is not a trivial issue because there is no universal definition. The concept of "rurality" involves a number of socioeconomic local aspects and characteristics which manifest in an urban-rural continuum rather than in discrete categories. Consequently, urban-rural definitions differ widely across countries and most importantly, administrative and functional definitions most often do not coincide (for the U.S definition see for example, U.S. Census Bureau, 2010, for the UK, see for example Bibby and Brindley, 2013).

Recently, the OECD in collaboration with the EU has developed a harmonised definition of functional urban areas (FUA's) for 29 OECD countries. The definition is based in a first step on population grid data from the Corine Land Cover database and the global Landscan (2000) dataset (OECD, 2012; OECD 2013). Based on this information it then defines core municipalities and consequently it identifies their hinterlands on the basis of commuting data including all settlements from where at least 15% of the workers commute to any of the core settlements. The remaining municipalities that neither are core nor urban hinterland are the rural areas. Schmidheiny and Suedekum (2015), for example, have used this classification to compare the European to the US urban system.

For mainland Spain, the OECD classification defines 101 functional urban areas with hinterlands made up by 2,241 municipalities. Figure 1 maps Spanish municipalities according to the OECD classification.

There are some alternative rural-urban delimitations for Spain. The open data project AUDES (Ruiz 2010) provides a typology of Spanish municipalities. AUDES defines 129 urban areas. These include a densely populated central city and its adjacent suburban municipalities which are selected based on land use continuity and commuting data (in total 1,357 municipalities). Again remaining municipalities are defined as rural. Reig Martínez, Goerlich Gisbert and Cantarino Martí (2016) combine land-use based criteria with accessibility and propose a typology that includes six different types of municipalities: open and closed urban municipalities and intermediate open and closed municipalities (where open and closed is defined according to land cover), and accessible and remote rural communities.

Of course, each classification is based on particular choices and there are also other definitions of rurality-urbanity based on, for example, social representations or socio-cultural characteristic. It is not the aim of this article to assess the different classification methodologies.

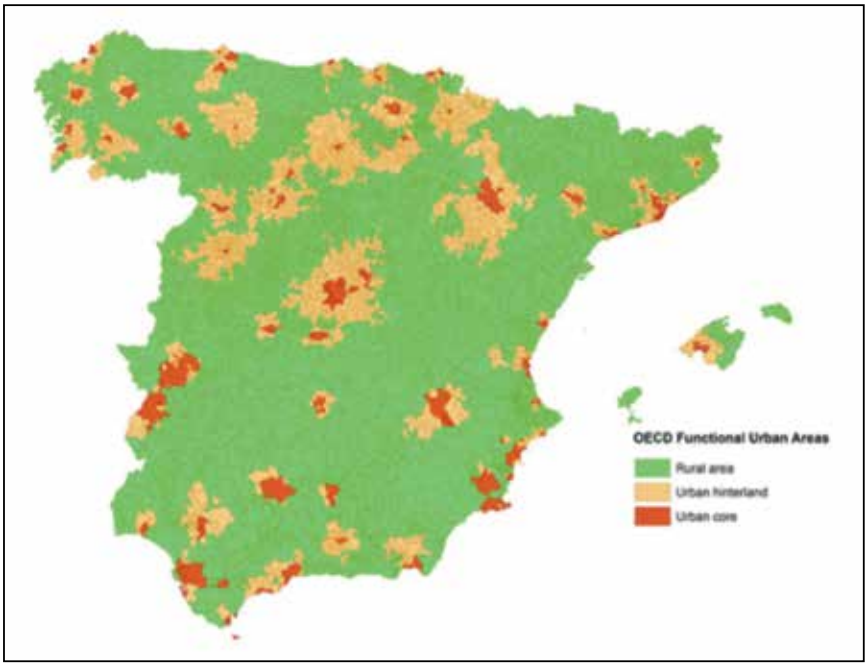

Figure 1. OECD Functional Urban Areas
Source: OECD and own elaboration

The goal here is to illustrate the use of GIS in the application of the most recent OECD harmonized definition to local employment pattern analysis; the advantage of the harmonized OECD definition of FUA's being that it facilitates comparison of research findings across countries.

2. 2. Local employment data

In this work municipality employment data is taken from the Social Security Register which provides local employment data since 1999. The year 2013 was the latest year available for the current analysis. The Social Security Register employment data base provides the municipality where the employees are registered and the data can therefore be assigned to a shape file of municipality spatial areas using the individual municipality identification codes. Of course, this approach assumes that employment is uniformly distributed within municipalities and ignores employment centres within municipalities. This is because the Social Security Register data is a spatially aggregated dataset at the municipality level.

2.3. Methodology

First, the shape file generated from the Social Security Register municipality employment data has been overlaid with the municipality shape file layer of the OECD FUA classification. With these two layers, some employment pattern mapping is carried out.

Next, a proximity analysis is carried out. This allows defining the relationship between a specific location and other locations, points or other features of interest. Two types of distances are calculated: on the one hand, the straight line distance of each rural municipality centroid to its nearest FUA area and on the other hand, the straight line distance from each urban hinterland municipality centroid to the centroid of the nearest urban core municipality.

With the use of GIS, it is possible to combine the information of the different data sets and to generate new data – such as the distances from the proximity analysis - that can be used as input into further statistical analysis. With this information generated it is possible to quantify spatial employment patterns. This could be done using the spatial statistics tools of GIS.

Alternatively, the tabular data for the nearest distance to an FUA area in the case of rural municipalities and the nearest distance to the FUA core municipality centroid in the case of urban hinterland municipalities has been exported. Combined with the original Social Security employment data, the data has then been imported into the statistical program STATA in order to carry out some regression analysis. The aim is to show how the type of

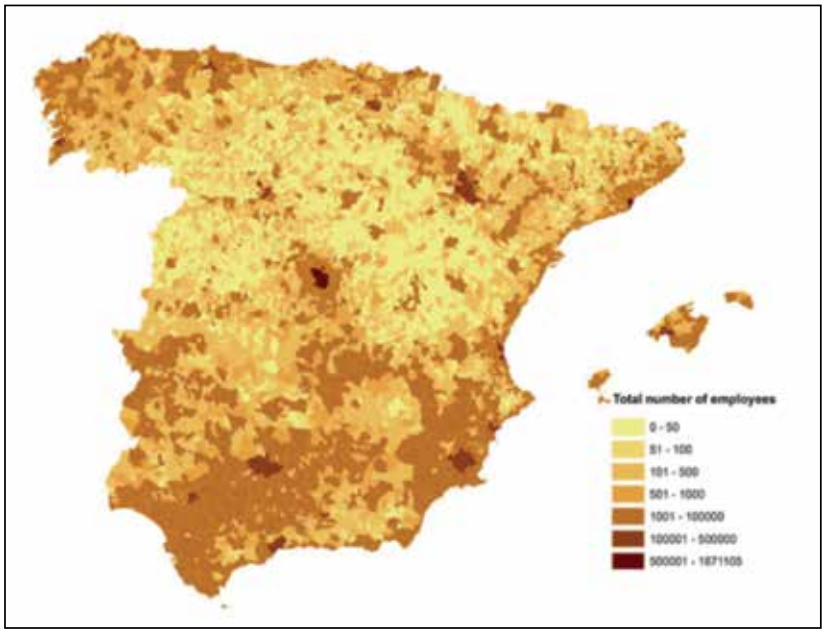

Figure 2. Municipality total employment in 2013

Source: Social Security Register and own elaboration

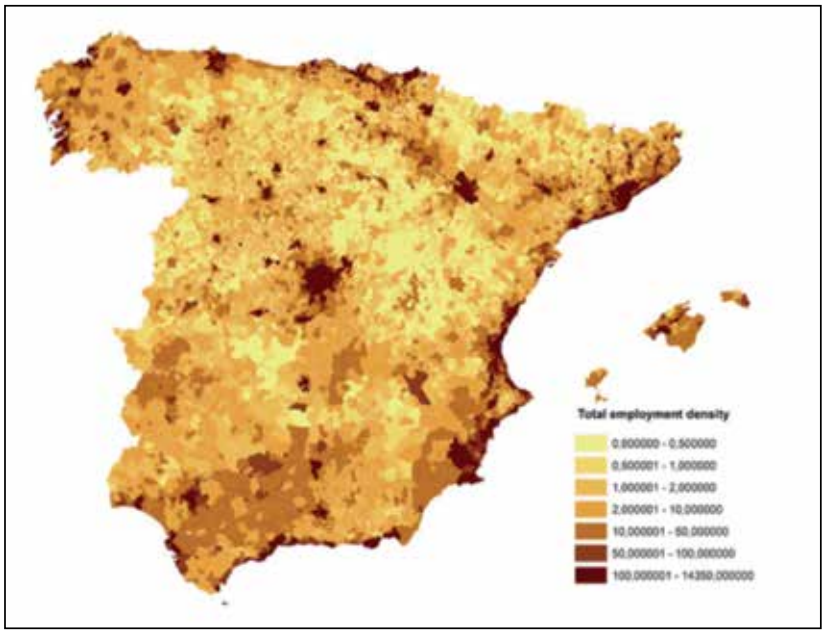

Figure 3. Municipality total employment density in 2013

Source: Social Security Register and own elaboration

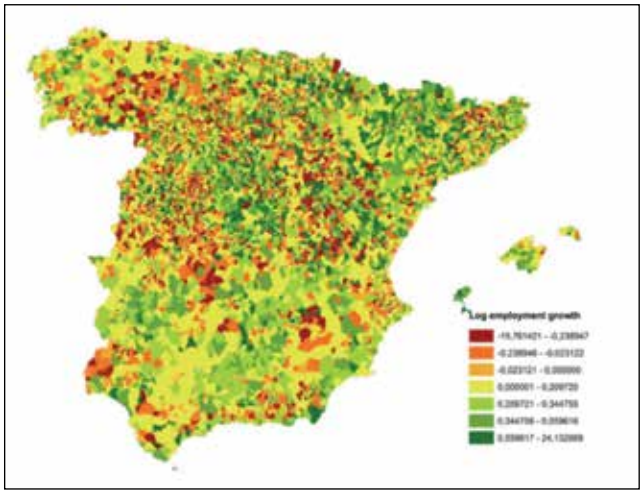

Figure 4. Municipality total employment growth 1999-2013
Source: Social Security Register and own elaboration

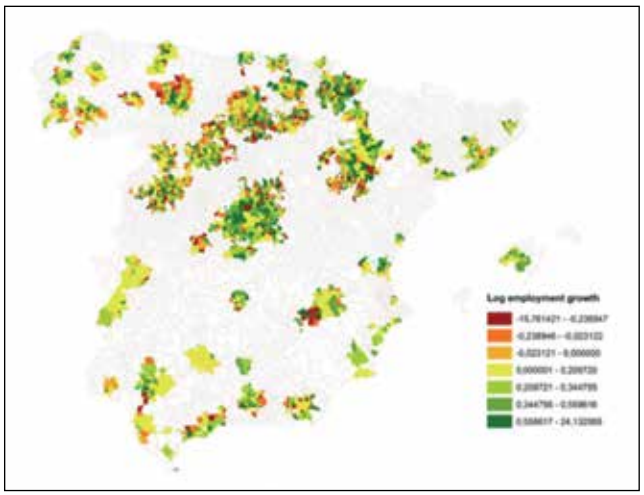

Figure 5. Urban Municipality total employment growth 1999-2013
Source: Social Security Register and own elaboration

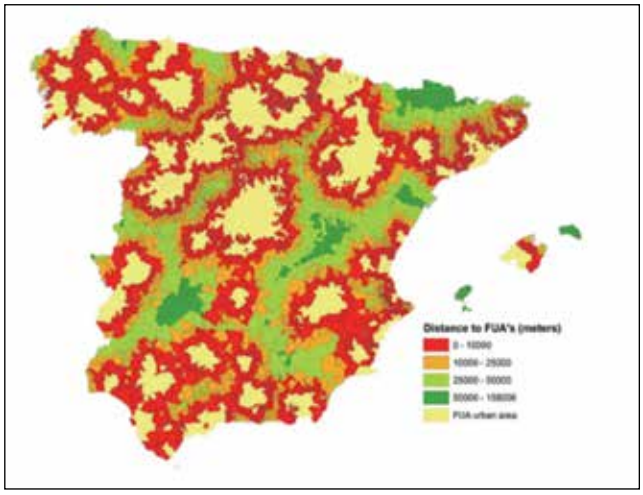

Figure 6. Distance to OECD functional urban areas
Source: OECD and own elaboration

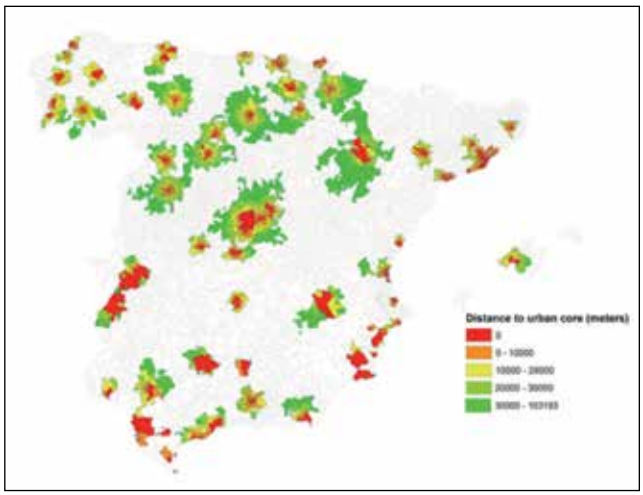

Figure 7. Distance of suburban municipalities to OECD functional urban core municipalities
Source: OECD and own elaboration

municipality using the OECD classification and proximity to the OECD FUA's and FUA's core areas has been related to employment growth over the period of time span of the available employment data: from 1999 to 2013.

For this purpose, cross-section Ordinary Least Square (OLS) regressions have been estimated where the dependent variable is the municipality log employment growth from 1999 to 2013. The municipality log employment growth has been calculated as the difference between the log of employment in 2013 and the log of employment in 1999.

3. RESULTS

Starting with the employment pattern mapping, Figure 2 shows the number of employment in municipalities for 2013. The map reflects a high degree of heterogeneity but urban areas stand clearly out with higher employment and also with higher employment density as shown in Figure 3. The large urban population centres are clearly visible but one can also observe a belt of high employment density along the Mediterranean coast.

Figure 4 shows the changes in employment in Spanish municipalities between 2009 and 2013. Areas shaded in orange to red are those that had experience employment decline over the period of analysis. In contrast, those areas shaded from yellow to green are areas that have experienced employment growth. Visual inspection of the map does not provide a clear pattern. If we look at Figure 5 which shows the employment changes only for urban areas it seems that urban areas have mainly experienced employment growth but there are also some urban municipalities that have seen their employment

dependent variable: log △ 1999.2013 employment			
Type of municipality:	**(1) All**	**(2) Rural**	**(3) Urban hinterland**
Urban dummy	0.184*** (0.043)		
log (distance to FUA)		-0.019*** (0.005)	
log (distance to urban core)			-1.110*** (0.127)
Log (employment1999)	-0.266*** (0.030)	-0.253*** (0.037)	-0.480*** (0.060)
Observations R^2	8103 0.20	5722 0.21	2241 0.37
Note: Robust standard errors are reported in parenthesis. Significant coefficients are indicated by ***, **, *, for significance at the 1%, 5% and 10% level, respectively. All estimations include a constant.			

Table 1. OLS regression estimates

decline over the period of analysis.

Figure 6 shows the results from the proximity analysis by plotting the distance from rural municipalities to FUA's. The most remote rural areas are those plotted in dark green. These municipalities are beyond 50 kilometres from a FUA and are mainly concentrated in the provinces of Badajoz, Cuenca and Teruel, and Huesca and Lleida. Figure 7 shows the distances of urban hinterlands to their nearest urban core municipality. Here the resulting distances depend on the spatial extensions of the FUA under consideration. These distances reflect the potential for interactions between the different locations as the strength of interaction is mitigated by distance.

Table 1 shows the results for the cross-section OLS regressions. In column (1) employment growth is regressed on initial municipality employment size (also measured in logs) together with a dummy for urban areas. Initial employment size is negatively and significantly associated with employment growth as municipalities with more employment tended to grow more slowly. The coefficient for the urban area dummy is positive and significant and indicates that urban areas in comparison to rural areas have indeed experienced a higher employment growth rate. Over the period of 1999-2013 employment in urban areas has grown on average about 18% more than in rural areas.

In column (2) employment growth in rural areas is regressed on their initial municipality employment size together with their log distance to urban areas. The coefficient for distance to the FUA areas is negative and significant. This indicates that conditional on initial employment size, rural areas closer to urban areas have grown more than rural areas far from urban areas; by approximately 0.2 % with each 10 % increase in distance from urban agglomerations. This result highlights that proximity to urban agglomerations is a determinant of economic performance of rural areas.

Finally, in column 3 employment growth in urban hinterlands is regressed on initial municipality employment size together with the log distance of the urban hinterlands to the urban core. The coefficient for the distance to the urban core area is also negative and significant and indicates that conditional on initial employment size, urban hinterlands close to urban core municipalities have grown more than hinterlands far from urban cores. Indeed the estimated coefficient is very high and indicates that a 10 % reduction in the distance of the hinterland municipality to the urban core has increased employment growth from 1999 to 2013 by 11%.

In the case of all three models, F-tests confirm overall significance. Moreover, all individual coefficients are also significant at the 1% level, where significance is based on the robust standard errors reported, which result in a high t-statistics, significantly different from

zero, and p-values of 0.000. Overall the variables included in the models explain a good share of the local variations in employment growth rates over the period from 1999 to 2013.

4. DISCUSSION AND CONCLUSIONS

GIS facilitates many analysis in the field of urban and regional economics and the scope is expanding with now ever more widely available spatially referenced socio-economic data. One of the strengths of GIS is that it makes the integration of spatial data from different sources easy and it facilitates the analysis of spatial relationships. Moroever, GIS is particularly helpful when dealing with data at a highly disaggregated geographical scale.

In this article, the use of GIS in local employment pattern analysis and their relation to the recent OECD functional urban area classification has been illustrated. This has allowed showing some interesting patterns. First, there is a high degree of heterogeneity that would be hidden by using data at a more aggregated geographical scale such as provinces for example. Employment in absolute numbers as well as when defined in densities shows very large variations at the municipality level that are related to the urban-rural hierarchy. Second, the results of this investigation also show that local employment growth over the period from 1999 to 2013 has been significantly related to the type of municipality and to its location relative to urban agglomerations and urban core areas.

The analysis presented shows that employment growth patterns have a clear spatial dimension. The use of GIS made it possible to construct spatial variables that together explain a good share of local variations in employment growth. The question why employment growth is higher in some locations than in others is very important for policy makers and analysts. A better understanding of the relation between local employment growth in urban and rural areas can be useful for designing policies to stimulate local growth or to combat local decline.

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