

On the spatial convergence of (un)employment in Portugal

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Abstract - Regarding the EU policies of territorial cohesion is common to assume that, having the same been successful (in Portugal), regional disparities decreased. The purpose of this article is to assess the veracity of this allegation, for that considering the values of employment and unemployment rates by municipalities, determined in the last two censuses held in Portugal, i.e. 2001 and 2011. In doing so, spatial econometric techniques are used, namely local indicators of spatial association and spatial clusters, in order to better understand the eventual process of spatial convergence that may have occurred in Portugal in that period. The results point towards a spatial convergence of employment rates (both in total and by genres) and also of female unemployment rates but a spatial divergence of male unemployment rates.

Keywords – *Regional disparities; Territorial cohesion; Spatial Convergence; Spatial Econometrics*

1. Introduction

As is known, the cohesion policy of the European Union (EU) established in 1986 at the level of so-called Single European Act, favored the economic and social dimensions. In fact, right from the Treaty of Rome, creating the European Social Fund (ESF) in 1957, the principle of social solidarity was present in Community designs, particularly in terms of management of Structural Funds. Being understood that the main purpose of the ESF corresponds to the increase in employment, this goal has been reflecting the changes imposed by the various phases that the cohesion policy has passed. In

this process that goal gained special relevance, as the main instrument to attain the objectives of economic and social nature associated with the cohesion policy.

The territorial dimension of European cohesion policy became more relevant with the Lisbon Treaty, being at the basis of the Territorial Agendas of 2007 and 2020. In fact, concerns about territorial aspects were, of course, evident with the creation of the European Regional Development Fund (ERDF) in 1975, which, in the 2007-2013 period sought to achieve, among other objectives: creating sustainable jobs (in terms of the convergence objective) and regional competitiveness and employment. This fund, together with the ESF and the Cohesion Fund are thus a structural part of Community policies with territorial incidence.

Simply put, the goal - something diffuse - of territorial cohesion policies is to promote a more balanced development by reducing existing disparities, avoiding territorial imbalances and to increase coherent sectoral policies with territorial impact. Those concerns were, of course, evident even before the Territorial Agenda 2007. For example, the Committee for Economic Policy of the European Commission, in its 2004 Annual Report on Structural Reforms, identified 9 priority reforms that Member States should put into practice, emphasizing:

1. Promoting economic growth strategies, using incentives to increase productivity and employment rates. In fact, Europe, since then, has been growing much less than desired, with all the ensuing

problems.

2. The elimination of the structural problems in the labour market, even as a way to increase the supply of labour, which, for example, was/is reflected in the existence of excessive regional disparities with respect to unemployment levels, as well as the existence of high long-term unemployment rates.

More recently, as acknowledged by the EU Cohesion Policy 2014-2020, (public) policy outcomes are to be emphasised through the establishment of clear and measurable targets in order to provide a greater degree of accountability (transparency and accountability principles). This is a clear recognition that the evaluation, while the terminal phase of any public policy plays a key role, in that it allows to check to what extent the results approached the goals and determine, if needed, the explanatory factors of any (unacceptable) discrepancy between the actual and desired trajectories.

In what concerns employment public policies, it becomes therefore important to assess the results thereof to such extent to which have indeed decreased regional disparities in the rates of (un)employment in Portugal in recent years. This is the objective of this article, which is to be achieved using spatial econometric techniques, namely local indicators of spatial association and spatial clusters, in order to better understand the eventual process of spatial convergence that may have occurred in Portugal in that period.

The rest of the article is structured as follows: section 2 presents and analyzes the data corresponding to the employment and unemployment rates for municipalities, corresponding to the last two censuses in Portugal, i.e. 2001 and 2011; it follows, in Section 3, the application of the spatial econometrics techniques to that data; Section 4 concludes by presenting the main findings and limitations of this study, which may be alleviated in future work, whose perspectives are presented.

2. The data

The data corresponds to the employment and unemployment rates for the (278) municipalities of continental Portugal,¹ as determined in the Censuses

of 2001 and 2011.² To start, Tables 1 and 2 provide some descriptive statistics.

Table 1. Some descriptive statistics for the employment rate

	2001 MF	2011 MF	2001 M	2011 M	2001 F	2011 F
min	27.1	28.4	37.8	35.0	16.7	21.3
1st quartile	41.5	38.8	53.4	46.4	30.3	32.1
median	47.7	44.1	58.8	50.4	37.0	38.5
3rd quartile	53.5	48.7	62.8	54.6	45.0	44.2
max	66.3	57.8	74.9	62.8	61.1	54.6
mean	47.6	43.9	58.4	50.3	37.6	38.1
standard deviation	7.85	6.47	6.80	5.78	9.39	7.60
coefficient of variation	0.16	0.15	0.12	0.11	0.25	0.20
range	39.2	29.4	37.1	27.8	44.4	33.3

Table 2. Some descriptive statistics for the unemployment rate

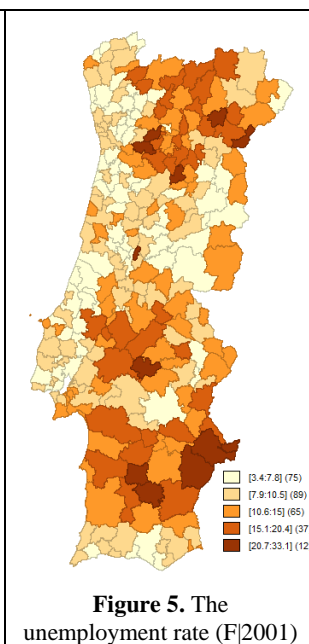
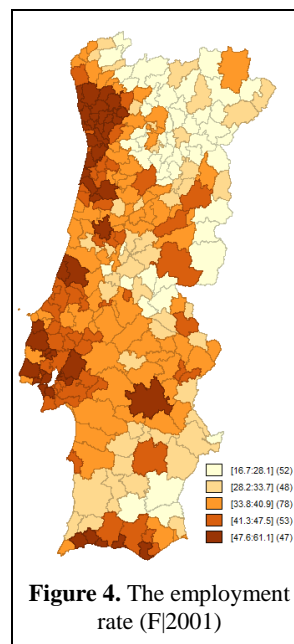
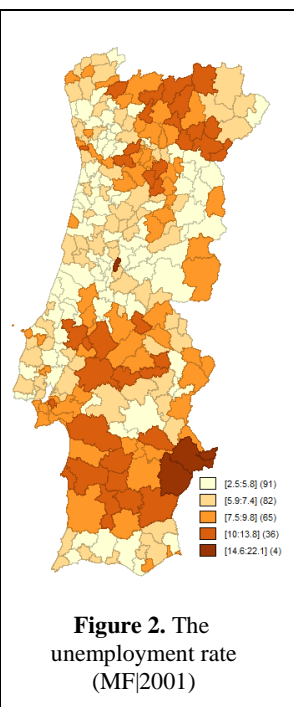
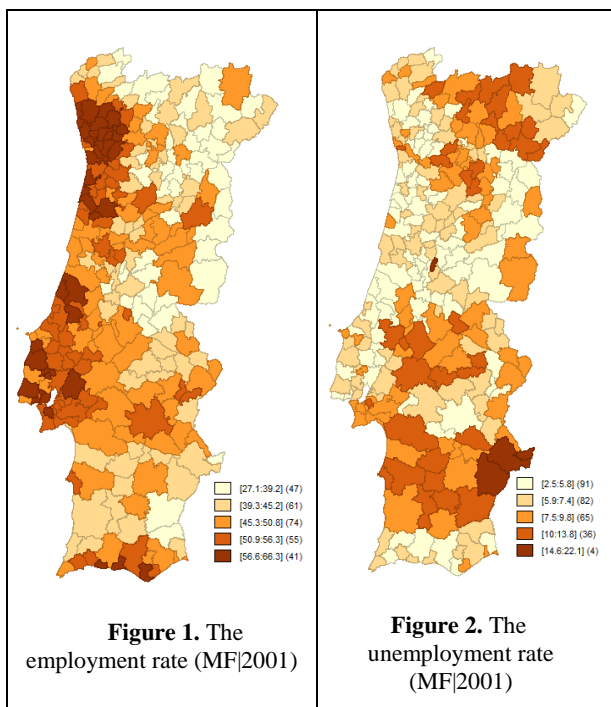
	2001 MF	2011 MF	2001 M	2011 M	2001 F	2011 F
min	2.5	5.1	1.6	4.5	3.4	5.9
1st quartile	5.40	10.2	3.50	9.10	7.63	11.5
median	6.75	12.1	4.45	10.9	9.60	13.7
3rd quartile	8.38	14.3	5.60	12.9	13.2	16.1
max	22.1	22.9	13.6	20.6	33.1	29.5
mean	7.19	12.5	4.65	11.2	10.9	14.2
standard deviation	2.51	2.83	1.64	2.89	4.70	3.70
coefficient of variation	0.35	0.23	0.35	0.26	0.43	0.26
range	19.6	17.8	12.0	16.1	29.7	23.6

Figures 1 and 2 show the maps for 2001, from which it is possible to immediately verify that, in general, the coastal municipalities, particularly around Lisbon, Oporto, Coimbra and almost all the Algarve are those where the employment rates were higher, this being accompanied by lower unemployment rates.³

² Given the level of geographical disaggregation of data, as far as we know, there are no data for other (intermediate) years. So, unfortunately, we could not analyze the data for the years 2004 and 2007, as the suggested by the reviewer.

³ It is important to acknowledge that the maps corresponding to figures 1 to 12 were produced by GeoDA (freely available at <https://geodacenter.asu.edu/>), considering the natural breaks options (for 5 classes).

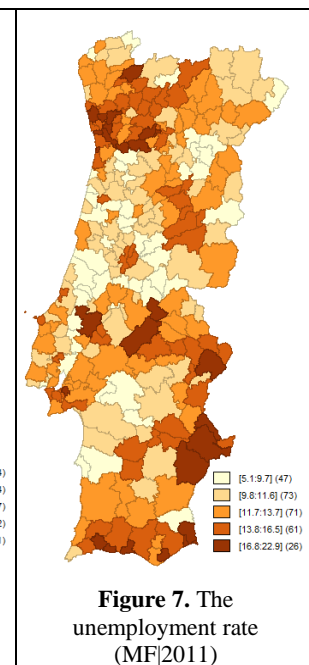
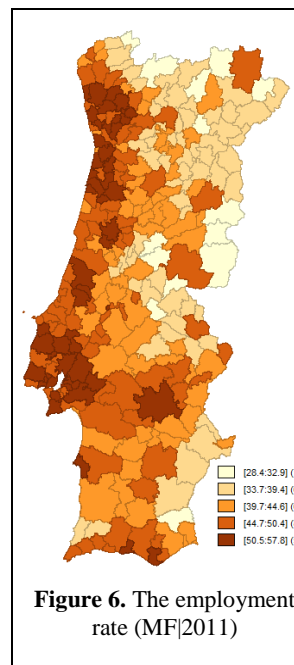
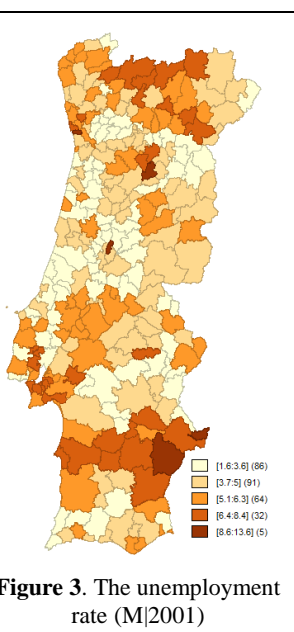
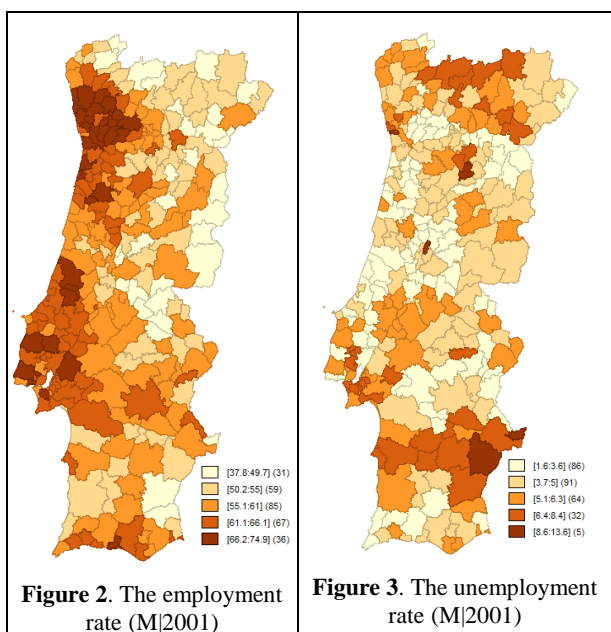
¹ The source of the data is the Instituto Nacional de Estatística.



When comparing employment rates with unemployment rates, one gets the feeling that it becomes easier to identify areas with similar values (especially larger ones) in the case of employment rates.⁴

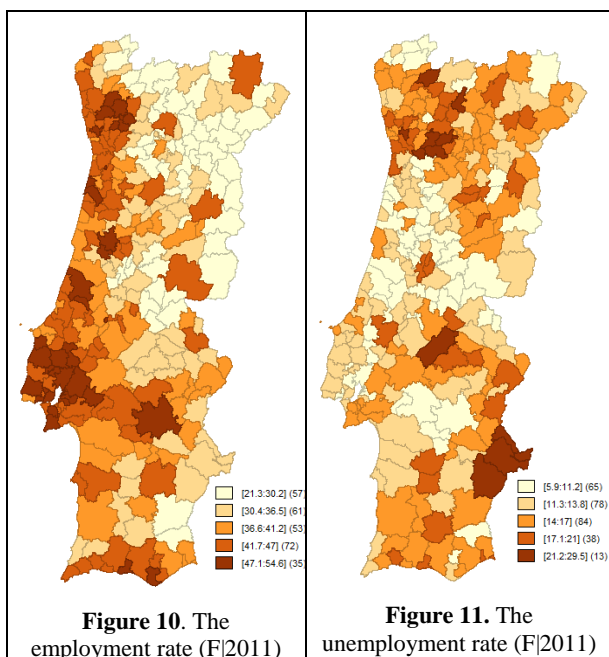
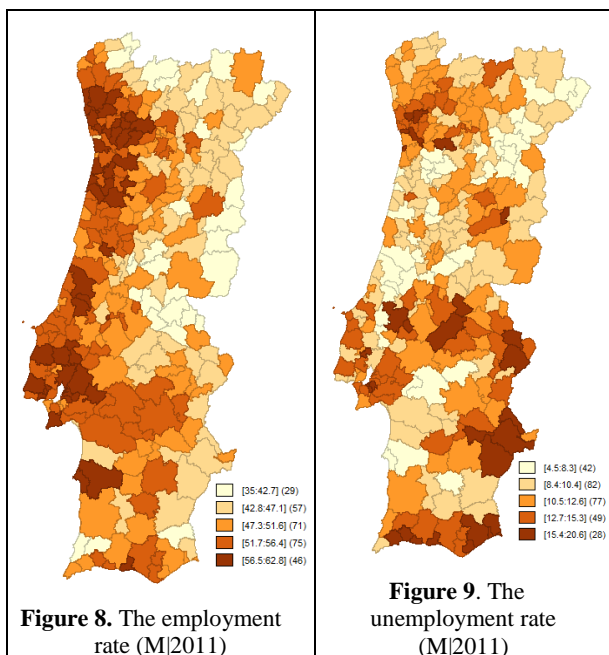
When making the distinction by genre, basically the same pictures occur, despite being evident that, in general, employment rates are higher and unemployment rates smaller for males. See figures 3, 4, 5 and 6.

With regard to the data for 2011, it becomes immediately clear that the values for either the employment rate either to the unemployment rate, are worse than those registered in 2001. See Tables 1 and 2 above. The only exception may be the female employment rate in some particular statistics, such as the minimum and mean values.⁵ Figures 7, 8, 9, 10, 11 and 12 show the maps for these values.



⁴ In a sense, this is in agreement with what the scatter plot matrices for the employment and unemployment rates (see Figures 13, 14 and 15 further below) than one can presume.

⁵ This may be due to the gradual entry of women into the labour market.



For our purposes it is interesting finish drawing attention to the fact that the persistence in employment rates is much higher than that characterizes unemployment rates, which may show that the most favored regions of the resources point of view better resist to fluctuations in employment rates (Caleiro, 2009) and that the Portuguese may be 'voting with their feet' (Caleiro, 2005). See figures 13, 14 and 15.⁶

⁶ It is important to acknowledge that the scatter plot matrices corresponding to figures 13 to 15 were produced by a R (freely available at <https://www.r-project.org/>) script downloaded from

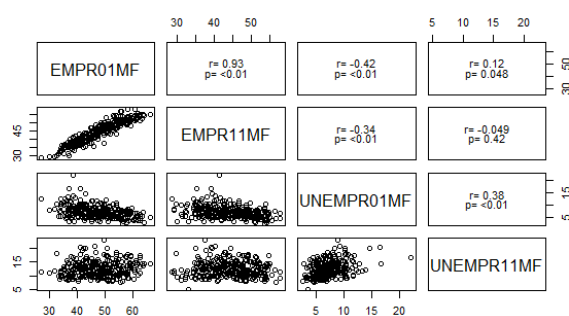


Figure 12. Scatter plot matrix for the employment and unemployment rates (MF|2001vs2011)

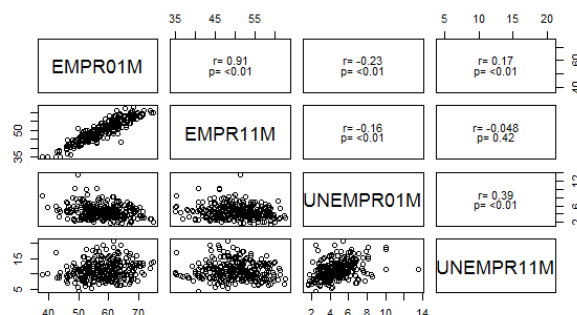


Figure 13. Scatter plot matrix for the employment and unemployment rates (M|2001vs2011)

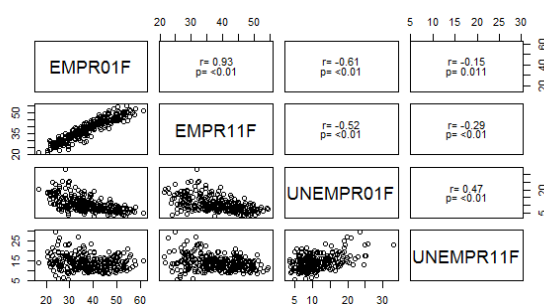


Figure 14. Scatter plot matrix for the employment and unemployment rates (F|2001vs2011)

3. On the spatial convergence of (un)employment in Portugal

In this section we will consider two approaches of spatial econometrics, in complementary terms, which reveal to be appropriate in studying the possible spatial convergence process by which have gone the employment and unemployment rates in Portugal during the period between 2001 and 2011. First we will consider the construction of spatial clusters following the methodology proposed by Duke et al. (2012), followed by the methodology of the local indicators of spatial association proposed by Anselin (1995). By comparing the results it may be

<http://www.r-bloggers.com/scatter-plot-matrices-in-r> on December 13, 2015).

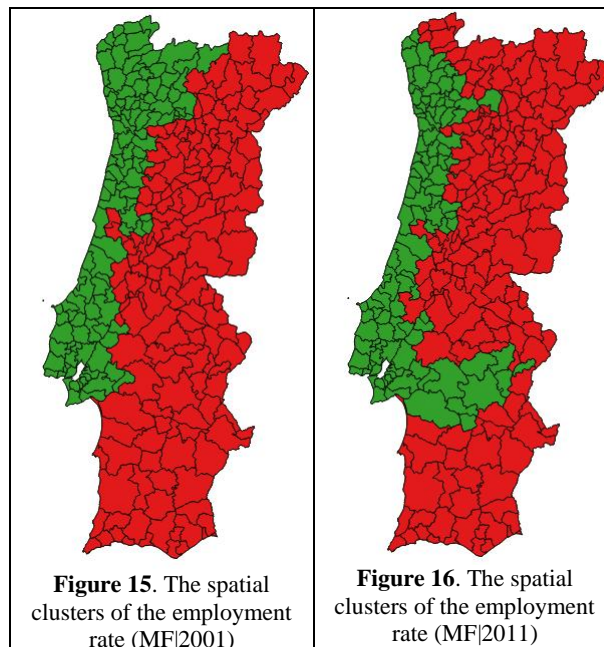
possible to verify if the spatial dispersion of the values, possibly resulting in spatial clusters (of High-High, High-Low, Low, High, or Low-Low types), may indicate a country geographically more or, conversely, less homogeneous (Guerreiro & Caleiro, 2005; Guerreiro & Caleiro, 2012).⁷

Let us first consider the determination of spatially constrained cluster following the methodology of Duke et al. (2012).⁸ Simply put, this spatial clustering methodology consists on the aggregation of a number of areas in a (smaller) unknown number of spatially contiguous areas, that number being determined endogenously depending on the satisfaction of a criterion that one imposes to be satisfied. The endogeneity of the number of spatial clusters, results from the fact that the spatial clustering problem is solved by a mixed integer programming (MIP) model where the objective function consists of two terms: one that controls the maximum number of regions and a second term that controls the heterogeneity defining each cluster. For the technical details, see Duke et al. (2012).⁹

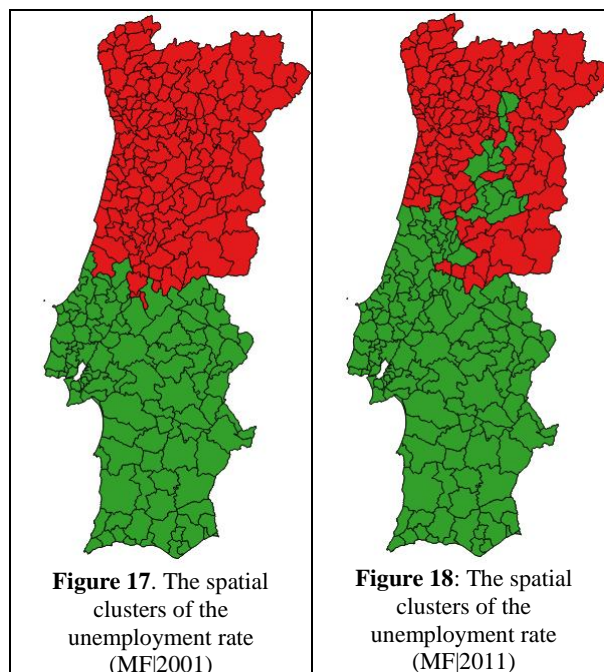
Figures 16, 17, 18 and 19 show the maps after imposing the less restrictive criterion, i.e. a spatial cluster should contain at least two municipalities (cluster 1 – green; cluster 2 – red).

Figure 16 considers two clusters, one made of 123 municipalities, plausibly associated with the higher values for the employment rate, which occupy essential the coastal territories above Lisbon, and another cluster made of 155 municipalities plausibly associated with the lower values for the employment rate. Figure 17 differs in what concerns the division of the number of municipalities in each cluster. The cluster plausibly associated with higher levels of employment is made of less municipalities (114), which resulted from the association to this cluster of some municipalities in the Península de Setúbal and Alentejo Central and the association to the second cluster (164) of some municipalities located in North. This fact does not allow to be

peremptory in what concerns the classification of the process as of being convergent or divergent. In any case, a general impression of a slight convergence seems to be the case, this also being the case when discriminating by genre.



In what concerns unemployment, figures 18 and 19 indicate towards a process of spatial divergence.



Clearly the pattern for the unemployment rate is a division of the country in North-South municipalities, being evident an increase in the number of municipalities in one the clusters (obviously with the correspondent decrease in the other cluster).

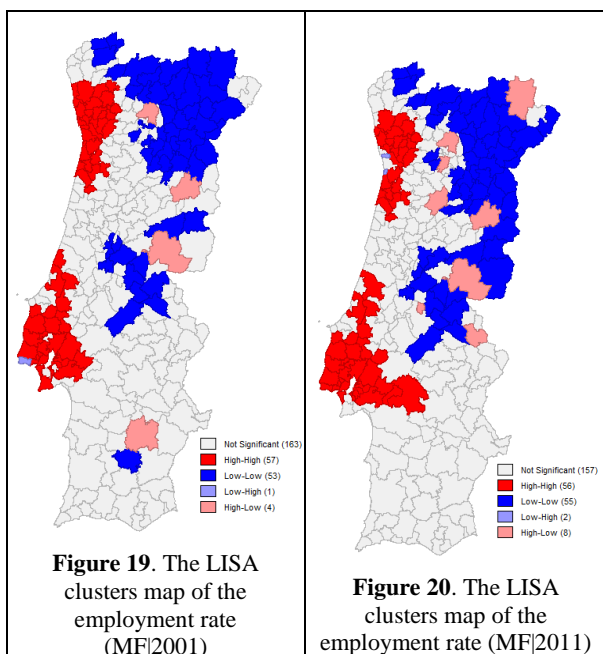
⁷ Plainly, presenting all the figures corresponding to the employment and unemployment rates, in total, by genres and for the two time periods would take up too much space. Hence, all the figures not presented are available from the authors upon request.

⁸ It is important to acknowledge that this part was accomplished by the use of the Clusterpy plugin (see Duque, J.C.; Botero, Sergio (2014). Clusterpy QGIS plugin, Version 1.0 RiSE-group (Research in Spatial Economics). EAFIT University. <http://www.rise-group.org>) version for QGIS (freely available at <http://qgis.org/en/site/>).

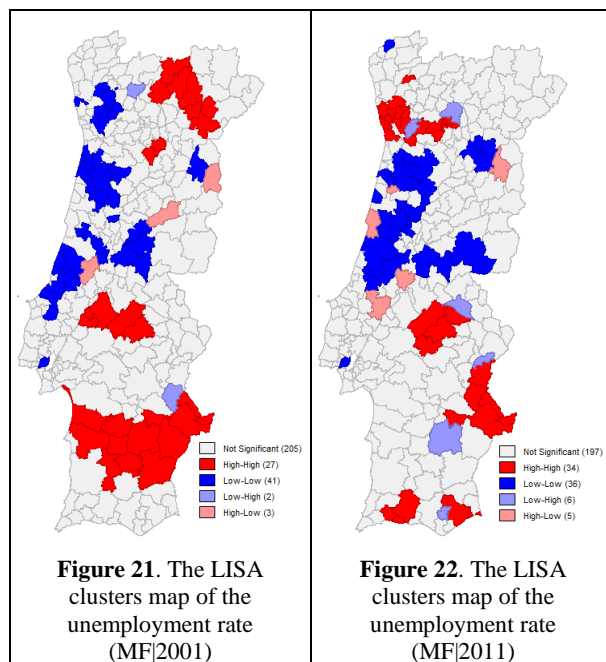
⁹ Given the highly technical nature of the methodology proposed by Duke et al. (2012), a (more) detailed explanation of the same is beyond the scope of this article.

In order to be more peremptory about the results presented below, one may consider the local indicators of spatial association (LISA) *a la* Anselin (1995). Simply put, the LISA for each observation gives an indication of the extent of significant spatial clustering of similar values around that observation, being also verified that the sum of the LISAs for all observations is proportional to a global indicator of spatial association. Local spatial clusters may then be identified as those contiguous locations for which the LISA is significant. For the technical details, see Anselin (1995).

The use of this methodology produced the following results (see figures 20, 21, 22 and 23).¹⁰



Figures 20 and 21 are in general agreement with what was our perception about the process of spatial convergence for the employment rates, i.e. the diminishment of non-significant municipalities (in terms of those four possible categorizations) as the result of a process of spatial convergence on employment, which, in fact, was the result of a process of spatial convergence that characterized both genres.



On their turn, Figures 22 and 23 are also in general agreement with what was our perception about the process of spatial convergence for the unemployment rates, i.e. the diminishment of non-significant municipalities (in terms of those four possible categorizations) as the result of a process of spatial convergence also on unemployment. Notably, this outcome is, in fact, mainly the result of a process of spatial convergence on unemployment that characterized females, as, in fact, in what concerns males, the unemployment rate is not decisive in what concerns the hypothesis of also a process of spatial divergence.

Given that spatial autocorrelation, as measured, for instance by Moran's I, may, in sense, be higher the higher spatial concentration of similar values, Table 3 helps us understand the previous results.

Table 3. Moran's I

	2001 MF	2011 MF	2001 M	2011 M	2001 F	2011 F
employment rates	0.668339	0.623185	0.633107	0.581643	0.663036	0.636722
unemployment rates	0.412297	0.435760	0.294065	0.472556	0.491426	0.424606

4. Conclusion

Regarding the EU policies of territorial cohesion is common to assume that, having the same been successful (in Portugal), regional disparities decreased. The purpose of this article was to assess the veracity of this allegation, for that considering the values of employment and unemployment rates by municipalities, determined in the last two censuses

¹⁰ It is again important to acknowledge that the LISA maps corresponding to figures 20 to 23 were produced by GeoDA (freely available at <https://geodacenter.asu.edu/>).

held in Portugal, i.e. 2001 and 2011. In doing so, spatial econometric techniques were used, namely local indicators of spatial association and spatial clusters, in order to better understand the eventual process of spatial convergence that may have occurred in Portugal in that period. The results point towards a spatial convergence of employment (both in total and by genres), but also a spatial convergence of unemployment, mainly due to female unemployment rates.

Plainly, in what concerns the spatial process of convergence, even if only for (un)employment in Portugal, a number of issues remain to be investigated further. In particular, we would like to distinguish local from global spatial convergence as illustrated by the study of Guerreiro & Caleiro (in this special number).

Acknowledgments

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