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Spatial analysis of European employment policies at regional level.

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Abstract

The employment policies implemented in Asturias, a NUTS II region of the EU, under the European Social Fund for the period 2007-2013, are analyzed under the approach of spatial econometrics. The use of micro-territorial data is adjusted to the needs of a territory with an administrative distribution adapted to a mountainous orography that requires considering the possible relationships of spatial dependence between its territorial units, thus allowing an accurate analysis of the impact on employment that considers the diversity, from the economic point of view, of its counties and municipalities. A spatial analysis, with cross-sectional data, determining the possible relationship between European Social Fund public investment and employment levels, considering the possible effects of spatial dependence between the different municipalities and the concentration of clusters in the different regions, seems to us to be the first step to be able to analyze the possible impact of some of the EU employment policies in their regions. The results do not seem to allow us to conclude that the investment made has led to an improvement in the variation of employment, highly conditioned by the variations of the population during the period in the reference municipalities.

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1 Introduction

Asturias is a mountainous region, with the central area more populated and industrialized to the detriment of the region's wings, which suffer significant depopulation. The behavior of employment may be conditioned by these circumstances of variability between territories. Therefore, a more specific territorial analysis seems advisable to study its behavior, as well as the possible impacts on employment levels of the policies developed in the 2007-2013 programming period, the last one implemented in its entirety under the European Social Fund.The analysis of the impact of economic development policies acquires special relevance, especially for policy makers, as it makes it possible to determine the degree to which objectives have been achieved and to analyze their development and evolution.

The implementation of EU policies at the level of NUTS II regions requires a territorial and regional analysis, and such analysis, if carried out in quantitative terms, needs to consider possible spatial dependence effects to ensure that the statistical results are not affected by the non-compliance with the necessary independence of observations. Elhorst et al. (2013) distinguishes three types of interaction effects, on the one hand, endogenous interaction effects between the dependent variable (Y), on the other hand, exogenous interaction effects between the independent variables (X) and, finally, interaction effects between the error terms (ϵ). We will focus on the joint analysis of all of them from an approach with cross-sectional data, which gives validity or not to the hypothesis on which the EU employment policy is based by which public investment or expenditure in a specific territory incentivizes job creation in the same.

Models should not be estimated without a theoretical basis, but neither do we believe it is convenient to extend extensions of previous theoretical models to the spatial context without considering all the empirical problems they may present. Pinkse and Slade (2009) propose the development of spatial econometrics by taking advantage of the solutions proposed by recent advances and adapting the theoretical models to them, and not the other way around, in order to provide a direct solution to the problems that may arise. Mohl and Hagen (2011) consider that from a theoretical point of view European structural fund payments can affect employment through labor demand by increasing the endowment of public and private capital in the region. Another channel of influence would be through increased technological progress. We will contrast economic relationships based on economic theory but also arising from spatial econometric analysis. The causal relationship between public investment and employment generation is the premise prefixed by economic policy measures

and is what we will model. Models are posed with cross-sectional data with the approach called from the specific to the general Paelinck and Trívez (2015).

We will then conduct a brief literature review, based primarily on studies that analyze economic policy impacts with a spatial econometrics approach. We will continue by presenting and justifying the methodology used, and then present the results obtained and the derived discussion topics. Finally, we will conclude with the conclusions.

2 Brief Literature Review

Work on measuring the impacts of economic policy measures has been addressed in the scientific literature in many different ways. We could highlight different classifications made by some authors such as López-Rodríguez (2014) or Boscá et al. (2011), but if something is common to all of them is the consideration of the econometric model approach in general and spatial econometric models in particular, as one of the main methodological lines of study. Pieokowski and Berkowitz (2015) review some of the most relevant publications (spatial and non-spatial) that fundamentally analyze the evolution of magnitudes such as Gross Domestic Product for the set of European regions, trying to determine the contribution of public capital to economic growth.

Most of them, in the cases where the spatial approach is contemplated, have been extensions to that field of economic growth models or regression discontinuities, but, in addition, there have been cases in which employment has been the subject of study in the field of spatial econometrics, such as Mohl and Hagen (2011) or Vega and Elhorst (2017).

Mohl and Hagen (2011) do not obtain clear results that allow us to conclude that the funds analyzed promote employment, since, although they obtain statistically significant results in territories with a low percentage of low-skilled population, this is not the case in places where the low-skilled population accounts for a high percentage of the population, where the impact of the funds is negative. Vega and Elhorst (2017) evidence the importance of neighboring regions and their characteristics in determining the distribution of the labor force at the regional level in the European Union.

Also O'Connor et al. (2018) find geography and regional spillover properties relevant in contributing to employment growth in Irish territories, although the influence is greater on spillover between sectors in areas where internal sectoral diversity is higher.

Alonso and Otero (2022) propose a study from the spatial econometric approach in which they analyze the impact on employment creation of Common Agricultural Policy funds, at the regional level. This approach considers both cross-sectional and panel data to conclude that the policies implemented should consider territorial aspects in their design, given the heterogeneous distribution of the different areas considered, as well as a clear definition of objectives that distinguish between mere compensatory subsidies, where they do seem to be more effective, and genuine economic development policies where their results are very limited.

The spatial econometric approach therefore becomes necessary for the handling of territorial data in the analysis of the regional-level impact of employment policies and highlights the need to test their expected usefulness and the justification for their desirability in terms of effectiveness.

3 Methodology

We will analyze, with spatial econometric techniques, the available variables and their correlation in order to select the best models that incorporate the correction of both spatial autocorrelation and spatial heterogeneity when appropriate, with the most appropriate techniques, which will allow us to verify the existence of the relationships from which the economic development policies under study are based Alonso (2019).

In order to design the models and determine the possible variables to be introduced, we calculated the corresponding correlation coefficients (Spearman, Kendall, and R Pearson) and performed the corresponding hypothesis testing to verify whether the linear correlation is significant or not. In addition, it has been complemented with the Shapiro-Wilks test to analyze the normality of the variables, since when the sample is small, normality can be contrasted with the Shapiro-Wilks test and the null hypothesis that the sample has been drawn from a population with a normal probability distribution can be tested, although in large samples the normality of the variables can be considered.

Table 1: Test Shapiro-Wilks

	Variable	W	Normality hypothesis
Public money ESF co-financed in 2007-2013	INVFSE13.07		
Social Security registrations 2014	ALTSS14	0,2905	Reject
Population 2014	POBPAD14	0,3158	Reject
Population variation between 2007 and 2014	VPOBP14.07	0,5763	Reject
Contracts signed 2014	CONTRAT13	0,2801	Reject
Registered unemployment 2014	PAR 14	0,31	Reject
Unemployment variation between 2007 and 2014	VPAR14.07	0,3136	Reject
Employment in 2013	EMP13	0,3066	Reject
Employment variation between 2007 and 2014	VEMP13.07	0,2763	Reject
Adjusted net household income 2010	RTAFAMNET10	0,9545	Reject
Gross value added 2010	VAB10	0,305	Reject
Industrial area 2012	SIND12	0,3908	Reject
Works and buildings rehabilitated 2013	EDIFOBRH	0,7072	Reject
Licenses for economic activities 2013	LICIAE13	0,3362	Reject
Tourist establishments 2013	ESTTUR13	0,5546	Reject
Restaurants 2013	REST13	0,3586	Reject

The initial exploratory spatial analysis indicates that the variables are possibly affected by spatial dependence relationships. The Moran index has been found to be significant for most of the variables initially considered (see table 2).

Based on these data, and taking into account, on the one hand, the existing correlation between the available variables and on the other, suppressing the possible relationships between variables that have a level of correlation close to unity in order to avoid future problems of multicollinearity, a series of models have been proposed.

Table 2: Moran index and hypothesis testing

Variable	Moran I	Spatial autocorrelation SIGNIFICANCE
INVFSE13.07	0,1025	Yes
ALTSS14	0.09	Yes(90%)
POBPAD14	0,072	Yes(90%)
VPOBP14.07	0,04	Not significant
CONTRAT13	0,077	Yes(90%)
PAR 14	0,074	Yes(90%)
VPAR14.07	0,08	Yes(90%)
EMP13	0,10	Yes(90%)
VEMP13.07	0,05	Yes(90%)
RTAFAMNET10	0,03436	Yes
VAB10	0,11	Yes(90%)
SIND12	0,279	Yes
EDIFOBRH	0,0239	Not significant
LICIAE13	0,009	Yes(90%)
ESTTUR13	0,2482	Yes
REST13	0,07	Yes(90%)

Therefore, we will try to analyze through the different models specified, the possible influence of the Public Investment ESF-Asturias, among others, on the available variables that provide us with information on ESF priority issues such as: promotion of entrepreneurship and innovation and population fixation in the territory, thanks to the support to self-employment and business creation, restructuring of sectors and companies, and other possible economic variables. In addition to the theoretical causality, the result of the significance and multicollinearity analysis provides us with the possible relationships that can see in table 3.

Therefore, we have analyzed the possible relationships between the variables initially considered, then we have calculated the correlation between them and contrasted their significance. The results obtained will guide us to specify the explanatory model. Spatial autocorrelation will be included in the model in the best possible way. To do this, we will start with an OLS regression analysis, which will include those significant variables (for which the hypothesis that they have a non-zero coefficient in the regression has been accepted). And after performing the spatial tests on the spatial autocorrelation to the residuals, the autocorrelation will be introduced into the model in the most suitable way possible (substantive, residual or mixed), since the possible existence of lagged variables means that the OLS estimation method produces unbiased and inconsistent estimators of the regression parameters. For this reason, it will be estimated either by instrumental variables or by maximum likelihood, depending on the normality of the residuals. For the specification of the model we will follow the spatial regression decision process recommended by Anselin (2005), from the specific to the general, typical of the analysis with cross-sectional data that concerns us.

Table 3: Possible relationships between study variables

Dependent	Independent
	VPOBPAD
	RTAFAMNT
VEMP	SIND12
	EDIFOB
	ETUR13
	ALTSS[1]

[a]To avoid multicollinearity problems, explanatory variables with absolute correlation coefficients close to unity are not included in the mode, considering those that after estimation of the models without their simultaneous consideration have shown better statistical properties in these models.

For this section we will use the Geoda Space program Anselin and Rey (2014).

4 Results and Discussion

Autocorrelation

The model proposed aims to determine the influence of the Public Investment ESF-Asturias and certain variables on the variation of employment in the programming period considered (2007-2013), being VEMP07-13 the dependent variable and IPFSE, and some others to be introduced, the independent ones.

We have included in the model those variables that can be considered explanatory of the variation in employment, avoiding those that are completely correlated with the rest of the independent variables, in order to avoid multicollinearity problems. Once the OLS model is obtained, and removing the non-significant variables, we are left with Public Investment-ESF, Social Security registrations and population variation as the only significant variables, both with the rook matrix and the queen matrix.

It is verified that both the White Test and HAC (robust to Heterocedasticity) and all the tests indicate spatial dependence, and as we have detected the presence of spatial autocorrelation in the residuals, (in addition through the Jarque-Bera test we observe the non-normality of the residuals), we will resort to estimating by the Instrumental Variables method.

We test to estimate the spatial model for Spatially Weighted Least Squares Error with Heteroskedasticity (SWLS) introducing the spatial lag. This method does not include endogenous regressors, with a first step that performs a transformation that is equivalent to using feasible least squares and uses the generalized method of moments (GMM), which is more complete than the instrumental variables method and robust to heteroscedasticity.

If we compare the goodness of fit of the different models based on the Akaike, Loglikelihood and S information criterion we can see that it gets worse. Also, we can see that λ is significant and the rest of the variables are also significant. Although this model meets certain required conditions, we are going to estimate by means of the lag model to see if it explains better (S2SLS LAG), observing that all the variables are significant. If we look at the diagnostics for spatial dependence via the Anselin Kelijian (A-K) test (Anselin and Rey, 2014) it is rejected, so there is still spatial dependence. Therefore, we try estimating the COMBO model, which includes spatial lag in the dependent variable and in the residuals. We observe, on the one hand, positive significance for both λ and lag W-EMP and also, the two explanatory variables are significant, so that of all the models considered (ordinary least squares, substantive spatial autocorrelation, residual spatial autocorrelation and the combined models), the one that best explains the variation of the employment variable and also manages to eliminate at the same time the spatial autocorrelation of the residuals is the MIXED model.

Table 4: Regression results

Variable	Coefficient	Std. Error	z-Statistic	Probability
CONSTANT	−22.7441395	58.4304500	−0.3892515	0.6970901
IPFSE	−0.0011266	0.0000165	−68.4311445	0.0000000
VPOBP	−0.4544492	0.0369512	−12.2986460	0.0000000
WVEMP	−0.0887039	0.0328741	−2.6982906	0.0069697
lambda	0.5117730	0.1166878	4.3858302	0.0000116

Instrumented: WVEMP
Instruments: WIPFSE, WVPOBP

Therefore, we can say that the specified model shows an inverse relationship between the dependent variable (endogenous), i.e. the variation in employment in the programming period considered and the independent variables (exogenous). This may be due to the fact that it is not public investment that has promoted employment, but rather the other way around, with poor employment data conditioning the investment made, i.e. the greater the destruction of employment, the greater the public spending on employment policies to compensate for it. In addition, a lower degree of influence of the Public Investment of the European Social Fund on the variation of employment is detected than that of the variation of the population on employment. This inverse relationship may be due to the fact that the municipalities with the highest population are at the same time those that have lost the most employment during the period. High levels of population loss, accompanied by an aging population, added to the injection of public funds that increase income, but in an artificial way, not based on job creation, are typical of rural areas in the wings of Asturias or of industrial areas in the process of reconversion, as is also the case in a large part of central Asturias, and could help explain the results of our quantitative analysis. In addition, it is observed in the lag of the dependent variable that the spatial autocorrelation is negative, i.e., that increases in employment in neighboring municipalities have a negative influence on that council. The employment of a council would therefore be negatively conditioned by

increases in employment in neighboring councils.

$$VEMP = 22.7441 - 0.0887WVEMP - 0.0011IPFSE - 0.4544VPOB + \mu \quad (1)$$

$$\mu = 0.0511W\mu + \epsilon \quad (2)$$

where,

- W rook type contiguity matrix.
- VEMP, IPFSE and VPOB are the (78,1) dimensional vectors of the exogenous variables.
- μ is the vector of model residuals.
- $\lambda_1 = -0.0887$ is the autoregressive parameter.
- ε is the white noise random perturbation term.
- $W\mu$ is the spatial lag of the perturbations.
- $\beta_1 = -0.0011$ and $\beta_2 = -0.4544$ are the respective parameters of the independent variables.
- $\lambda_2 = 0.5117$ is the parameter of the spatial lag of the perturbations.

Heterogeneity

Spatial heterogeneity may be caused by:

- Structural instability (parameters assuming different values according to different geographical study areas).
- Presence of heteroscedasticity (errors caused by incorrect model specifications). Heteroscedasticity implies that the variance of the residuals is not constant at all points of the territory.

We are going to specify models that will incorporate spatial heterogeneity, through models in which there is structural instability (variation of the coefficients of the functional relationship throughout the territory), and specifically, models of switchings regressions. This specified model therefore assumes the existence of structural instability with discrete variation of coefficients, i.e. there is a series of municipalities in which the structure is different.

In order to estimate the model, each of the variables is divided into as many "zones" with different structures as we have established in the Autonomous Community of the Principality of Asturias. Each of the new dummy variables is associated with one of the new zonings made in the territory and will only take non-zero values for those points that are included in it. Once the new model has been estimated by this method of switching regressions, the

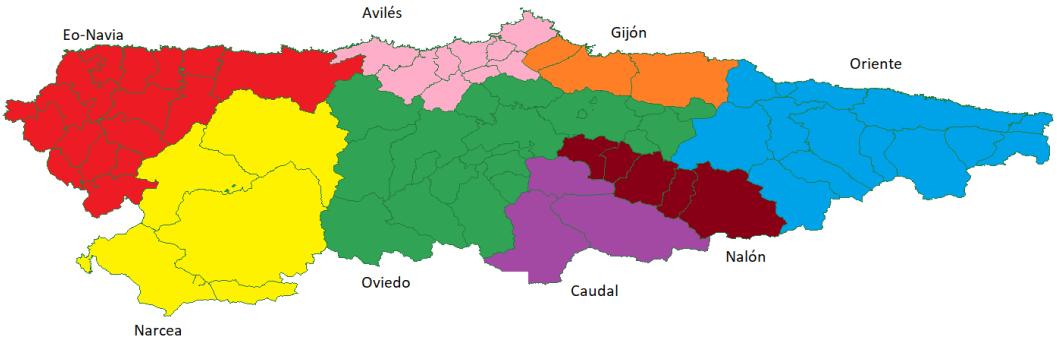

Figure 1: Territorial demarcation map.

disparity of the coefficients of the dummy variables associated with the different zonings will indicate the presence of structural instability and whether or not this territorial division is appropriate through a series of contrasts, such as the Chow test. Therefore, we will explicitly incorporate spatial heterogeneity into the models to correct for this other spatial effect. For this purpose the map of counties of the Principality of Asturias has been divided into three large zones or counties.

- Region 1 "Center": will be the sum of Avilés, Gijón, Oviedo, Caudal and Nalón. It includes 42 councils.
- Region 2 "East". Includes 14 councils.
- Region 3 "West": will be the sum of Narcea plus the region of Eo-Navia. It includes 22 councils.

For the model specified we have divided each of the variables into 3 "zones" with different structures, which we have established for the whole territory of the Principality of Asturias. Each of the new dummy variables is associated with one of the three new districts created in the territory and will only take non-zero values for those points that are included in it.

The switchings regression model shows the relationship between the variation of employment with public investment and the variation of population in the programming period considered (2007-2013), with VEMP07-13 as the dependent variable and IPFSE and VPOBP as the independent ones.

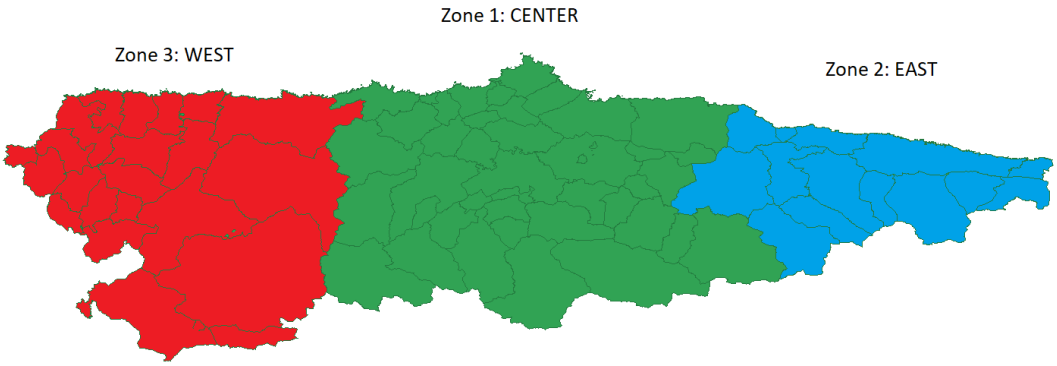

Figure 2: Map of zones considered for estimation by switchings regressions.

$$VEMP1 = 11.422 - 0.071WVEMP1 - 0.001IPFSE1 - 0.484VPOB1 + \mu \tag{3}$$

$$\mu = 0.562W\mu + \epsilon \tag{4}$$

$$VEMP2 = 47.833 - 0.023WVEMP2 - 0.001IPFSE2 + 0.508VPOB2 + \mu \tag{5}$$

$$\mu = -0.912W\mu + \epsilon \tag{6}$$

$$VEMP3 = 32.007 + 0.058WVEMP3 - 0.001IPFSE3 + 0.199VPOB3 + \mu \tag{7}$$

$$\mu = -0.829W\mu + \epsilon \tag{8}$$

Where each variable and parameter represent the same as in equations (1) and (2) but for each of the three zones considered.

Once we start from the OLS model, we observe that the Chow test is significant for all the variables individually and also for the global one (except for the constant). The

model also shows global spatial autocorrelation in the residuals, although not individually in the three new zones. We estimate the spatial error model by the method of generalized moments, showing us how λ is significant for the first and second regime, i.e. for the Central and Western regions, and not for the Eastern region of Asturias. The LAG model is also estimated, and the lag is significant for the Central Asturias area, but not for the Eastern Asturias area. Therefore, the MIXED model is estimated (equations three to eight), being this, of all the models tested, the one that best explains a priori, being both λ and the lag of the endogenous significant for the Central zone and also significant λ in the Western zone, there being no spatial dependence for the Eastern region. We can also see how the independent variables in regime 1 "Center" have an inverse influence on the variation of employment in the period. And inversely the IPFSE in the East and West zones, but directly, the variation of the population on the variation of employment in these two counties.

Furthermore, if we look at the Chow test, it shows both the individual and global significance of the variables (with the exception of lag), so we can conclude that the division carried out in these three counties, with different structures, is appropriate.

Table 5: Zone 1: Center

Variable	Coefficient	Std. Error	z-Statistic	Probability
1-CONSTANT	11.4219924	121.5925004	0.0939367	0.9251595
1-IPFSE	−0.0011193	0.0000178	−62.9882757	0.0000000
1-VPOBP	−0.4840518	0.0343603	−14.0875448	0.0000000
1-WVEMP	−0.0712669	0.0312688	−2.2791675	0.0226571
lambda	0.5621406	0.1375270	4.0874931	0.0000436

Instrumented: WVEMP
Instruments: WIPFSE, WVPOBP
Regimes variable: DUMMY

Table 6: Zone 2: East

Variable	Coefficient	Std. Error	z-Statistic	Probability
2-CONSTANT	47.8332246	133.8972028	0.3572384	0.7209133
2-IPFSE	−0.0008750	0.0001594	−5.4888943	0.0000000
2-VPOBP	0.5080719	0.1747539	2.9073558	0.0036450
2-WVEMP	−0.0232608	0.4467073	−0.0520717	0.9584715
lambda	−0.9119464	0.6857033	−1.3299432	0.1835370

Instrumented: WVEMP
Instruments: WIPFSE, WVPOBP
Regimes variable: DUMMY

We can conclude after the analysis of the spatial regimes that, for the three defined areas, the variable Public Investment-ESF has been significant, even the intensity of the

Table 7: Zone 3: West

Variable	Coefficient	Std. Error	z-Statistic	Probability
3-CONSTANT	32.0068842	10.8425060	2.9519821	0.0031574
3-IPFSE	−0.0006109	0.0000832	−7.3462292	0.0000000
3-VPOBP	0.1997019	0.0437692	4.5626134	0.0000051
3-WVEMP	0.0588531	0.1065941	0.5521234	0.5808638
lambda	−0.8297090	0.2917005	−2.8443862	0.0044497

Instrumented: WVEMP
Instruments: WIPFSE, WVPOBP
Regimes variable: DUMMY

Table 8: REGIMES DIAGNOSTICS-CHOW TEST

VARIABLE	DF	VALUE	PROB
CONSTANT	2	0.043	0.9789
IPFSE	2	37.669	0.0000
VPOBP	2	168.098	0.0000
WVEMP	2	1.379	0.5018
lambda	2	21.696	0.0000
Global test	10	256.301	0.0000

influence or the sense changes from one region to another, since they have very different structures as we have been able to observe. It is worth noting a greater difference in the central area of Asturias (Zone 1-Center) with respect to the other two comarcas analyzed (Eastern and Western) located in the wings of the region. It can be affirmed that the models specified through the method of switchings structures show, as in the previous model, the significance of the Public Investment - ESF for the programming period considered, also with a negative sign, i.e. inverse relationship. Moreover, the problem of heteroscedasticity is solved in most cases with this method of spatial regimes. Therefore, we can conclude that both spatial autocorrelation and heterogeneity have been explicitly incorporated into the specified models, which are suitable for representing the different relationships between the proposed variables, or even that part of the spatial autocorrelation presented by the models was a direct consequence of the parametric instability of these variables.

Discussion

On the basis of the results of the confirmatory analysis, different scenarios and hypotheses can be put forward for discussion, since they are affected by different factors, typical of a chain with multiple agents participating in both the design and execution of the employment policies under study.

On the one hand, it seems that the significant but inverse relationship between the funds

executed and the variation in employment is typical of a scenario in which more funds have been allocated to those areas where the destruction of employment has been greater, when the opposite would be desirable, i.e. that a high execution of public funds during the programming period should translate into a higher level of employment in the last year of the programming period compared to the first.

We must consider the difference between economic development plans, which are those that contribute to the development of activity and employment, and between subsidy plans, which are intended to help, compensate or alleviate crisis situations, without more. The results obtained seem to us to be more typical of the second case.

On the other hand, the need for the application of models that correct the spatial effects of autocorrelation and spatial heterogeneity has been evident, also making clear the different evolution in terms of employment between the central area of Asturias with respect to the areas of the eastern and western wings. This difference originated by parametric structural instability seems to be related to the different economic structure of the three territories considered. It seems appropriate, therefore, to take territorial differences into account when establishing employment policy measures, giving priority to local, bottom-up approaches that obtain results in terms of dynamization actions, which are necessary for a solid and lasting job creation.

5 Conclusions

We have proposed a study that aims to contrast the starting hypothesis of many economic development policies, which are based on the assumption that the injection of public funds contributes to correcting imbalances and generating economic development. We have focused on the financing of employment policies under the ESF at the NUTS II region level, specifically in the Principality of Asturias, using data with a very high level of disaggregation, one of the most appropriate given the geographical and administrative characteristics of this region. This approach, which uses cross-sectional data, required consideration of the possible existence of spatial effects that could condition the data Otero (2020)). Spatial autocorrelation and spatial heterogeneity have been considered and their correction applied to the models. After a review of the literature, which has not always given the same results, but always qualifying that the possible benefits must be contextualized either by sectors or by territories, depending on their characteristics, in general terms the existence and consideration of spatial effects has been shown, which determine the convenience of use of spatial econometric techniques.

Once the adequacy of the methodology has been determined, techniques to correct spatial autocorrelation are proposed, specifically selecting the most appropriate variables in terms of theoretical approach and statistical analysis of the correlation, together with the corresponding spatial tests, the most appropriate being a mixed model that includes spatial lag in the dependent variable and in the residuals. For spatial heterogeneity, given the possibility of its existence, the method of switching regressions is proposed, defining three zones in the study region, which are shown to be appropriate, given the statistical significance of the models, which again are more appropriate those that follow a specification that includes spatial lag in the dependent variable and in the residuals. The estimation method follows the proposal

formulated by Anselin and Rey (2014).

The results are in line with other similar studies where statistical significance must be taken into account in context. In our case the need to determine the difference between economic development policy and subsidy that simply alleviates and compensates unfavorable situations seems to us an element of discussion to be considered, as in Alonso and Otero (2019). The consideration of different areas and the clear evidence of considering different territorial characteristics when designing employment policies also seems necessary. Different authors have concluded the need for the consideration of territorial characteristics when determining economic development processes, such as Furková and Chocholatá (2021) who determine the heterogeneity of territories when studying the innovation of European regions or Gurgul and Lach (2019) who distinguish according to the type of region the results on technological process of public policies in Poland.

A local approach with tailor-made solutions seems to us appropriate as a consideration to be taken into account by policy makers in the design of public employment policies to go beyond mere compensation and subsidies in favor of a more comprehensive economic policy.

Declarations

- Funding

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- Conflict of interest/Competing interests

  The authors declare that they have no conflicts of interest.

- Availability of data and materials

  The data used is public, comes from the official statistical information agencies, available almost entirely on its web pages, and the software used is mainly free and open source. In the article, the data sources and software used are clearly detailed and easily accessible to anyone interested. The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

- Code availability

  The data used is public, comes from the official statistical information agencies, available almost entirely on its web pages, and the software used is mainly free and open source. In the article, the data sources and software used are clearly detailed and easily accessible to anyone interested. It is available from the corresponding author on reasonable request.

- Authors' contributions

  The authors contributed equally to this work.

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