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A SPATIAL MODEL BASED ON THE ENDOGENOUS GROWTH THEORY FOR PORTUGAL. ANOTHER ANALYSIS

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ABSTRACT:

We built a model analyzing, through cross-section estimation methods, the influence of spatial effects and human capital in the conditional productivity convergence in the economic sectors of NUTs III of mainland Portugal between 1995 and 2002. Taking into account the estimation results, it is stated once again that the indications of convergence are greater in industry, and it can be seen that spatial spillover effects, spatial lag and spatial error, do not condition the convergence of productivity in the various economic sectors of Portuguese region in the period under consideration. In contrast the human capital condition the productivity convergence.

Keywords: endogenous growth theory; spatial econometrics; Portuguese Regions

1. INTRODUCTION

There are few known studies concerning conditional productivity convergence with spatial effects. Fingleton (2001), for example has found spatial correlation at the level of productivity when, using data from 178 regions of the European Union, he introduced spillover effects in a model of endogenous growth. Abreu et al. (2004) have investigated the spatial distribution of the rates of total productivity growth of factors using exploratory analyses of spatial data and other techniques of spatial econometrics. The sample consists of 73 countries and covers the period from 1960 to 2000. They have found significant spatial correlation in the rates of total factor productivity growth, indicating that high and low values tend to concentrate in space, forming the so-called "clusters". They have also found high indications of positive spatial autocorrelation at the level of the total factor productivity, which has increased throughout the period of 1960 to 2000. This result could indicate a tendency to clustering with time.

There is, on the other hand, a variety of studies analysing conditional product convergence with spatial effects. Armstrong (1995) has defended that the evidence of convergence across European countries as mentioned by Barro and Sala-i-Martin is due to the omission of spatial autocorrelation in their analysis and bias resulting from the selection of European regions. Following on, Sandberg (2004), for example, has examined the hypothesis of absolute and conditional convergence across Chinese provinces in the period from 1985 to 2000 and found indications that there had been absolute convergence during the periods of 1985 to 2000 and 1985 to 1990. He has also found evidence that conditional convergence had been seen in the sub-period of 1990 to 1995, with signs of spatial dependency across adjacent provinces. Arbia et al. (2004) have studied the convergence of gross domestic product per capita among 125 regions of 10 European countries from 1985 to 1995, considering the influence of spatial effects. They concluded that the consideration of spatial dependency considerably improved the rates of convergence. Lundberg (2004) has tested the hypothesis of conditional convergence with spatial effects between 1981 and 1990 and, in contrast to previous results, found no clear evidence favouring the hypothesis of conditional convergence. On the contrary, the results foresaw conditional divergence across municipalities located in the region of Stockholm throughout the period and for municipalities outside of the Stockholm region during the 1990s.

This study seeks to test conditional productivity convergence (using as a proxy the product per worker) for each of the economic sectors of regions (NUTs III) of mainland Portugal from 1995 to 2002, through techniques of cross-section spatial econometrics.

2. MODEL OF CONDITIONAL CONVERGENCE WITH SPATIAL EFFECTS

Bearing in mind the theoretical considerations, what is presented next is the model used to analyse conditional productivity convergence with spatial effects and with human capital, at a sector and regional level in mainland Portugal:

$$(1/T) \log(P_{it} / P_{i0}) = \alpha + \rho W_{ij} p_{it} + b \log P_{i0} + X' \gamma + \varepsilon_{it}, \text{ with } \alpha > 0 \text{ e } \beta < 0 \quad (1)$$

In this equation (1) P is sector productivity, p is the rate of growth of sector productivity in various regions, W is the matrix of distances, X is the vector of variables which represent human capital (levels of schooling – primary, secondary and higher) b is the convergence coefficient, ρ is the autoregressive spatial

coefficient (of the spatial lag component) and ε is the error term (of the spatial error component, with, $\varepsilon = \lambda W\varepsilon + \xi$). The indices i , j and t , represent the regions under study, the neighbouring regions and the period of time respectively.

3. DATA ANALYSIS

The data referring to gross growth value to base prices and employment were obtained in the Regional Accounts of the National Statistics Institute. To carry out the cross-section estimations, the GeoDa¹ software was used. Also used were data concerning the level of schooling – primary, secondary or higher education, obtained from the 2001 Census of the National Statistics Institute.

4. THE LINEAR MODEL

Industry confirms in these estimations the signs of productivity convergence across the NUTs III of mainland Portugal from 1995 to 2002, a fact which is only favoured by higher education (since the effect of higher education is positive and increases convergence). The non-existence of indications of spatial autocorrelation was also confirmed, given the values of the LM tests.

Finally, it should be noted that the greatest marginal effect is through higher education schooling, which indicates that the higher the level of schooling, the greater the growth in productivity. .

5. CONCLUSIONS

This study has sought to test the convergence of productivity for each of the economic sectors (agriculture, industry, services and the totality of services) across the 28 regions (NUTs III) of mainland Portugal in the period of 1995 to 2002, with spillover effects, spatial lag and spatial error. To do so, cross-section estimates (with average temporal values) have been carried out with the OLS and ML estimation methods, following the specification procedures indicated by Florax et al. (2003) who suggest that models are first tested with the OLS method, to test what is the better specification (spatial lag or spatial error) and then the spatial lag or spatial error is estimated with the ML method.

As far as cross-section estimates are concerned, it can be seen that sector by sector the tendency for productivity convergence is greatest in industry. With reference to spatial autocorrelation it is also confirmed that this possibly exists in agriculture and services, when taking into account the LM tests. Following the procedures of Florax et al. (2003) the equation is estimated with the spatial error component for agriculture and the spatial lag component for services, and it can be seen that the consideration of these spatial effects does not significantly alter the results obtained previously with the OLS estimation.

The level of schooling as proxy for human capital conditioning productivity convergence, improves the value and statistical significance of convergence coefficients. On the other hand, above all the variable which represents higher education shows indications which directly favour the growth of productivity, since the coefficient associated to it presents in all economic sectors the greatest marginal positive effect.

6. REFERENCES

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¹ Available at <http://geodacenter.asu.edu/>