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A SPATIAL MODEL OF THE KEYNESIAN THEORY FOR PORTUGAL

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ABSTRACT:

With this work we try to present a spatial model for Portugal based on the Keynesian theory. We built the model analysing, through cross-section estimation methods, the influence of spatial effects in productivity in the NUTs III economic sectors of mainland Portugal from 1995 to 1999 and from 2000 to 2005, considering the Verdoorn relationship. Bearing in mind the results of estimations, it can been that the effects of spatial spillovers, spatial lags and spatial error, influence the Verdoorn relationship when it is applied to the economic sectors of Portuguese regions.

Keywords: Spatial Econometric; Verdoorn Law; Portuguese Regions.

1. INTRODUCTION

The influence of neighbouring locations (parishes, councils, districts, regions, etc) in the development of a particular area, through the effects of spatial spillovers, is increasingly considered in more recent empirical studies, a fact which has been highlighted by Anselin (2002a). Anselin (1988 and 2001) and Anselin and Bera (1998), who refer to the inclusion of spatial effects as being important from an econometric point of view. If the underlying data arises from processes which include a spatial dimension, and this is omitted, the estimators are either biased and inconsistent or inefficient depending on whether the error or the lag model is the underlying data generating process.

Following on from these studies, the development of productivity of a particular region, for example, can be influenced by the development of productivity in neighbouring regions, through external spatial factors. The existence or non-existence of these effects can be determined through a number of techniques which have been developed for spatial econometrics, where Anselin, among others, in a number of studies has made a large contribution. Paelinck (2000) has brought a number of theoretical contributions to the aggregation of models in spatial econometrics, specifically concerning the structure of parameters. Anselin (2002b) considered a group of specification tests based on the method of Maximum Likelihood to test the alternative proposed by Kelejian and Robinson (1995), related to perfecting the spatial error component. Anselin (2002c) has presented a classification of specification for models of spatial econometrics which incorporates external spatial factors. Anselin (2002d) has reconsidered a number of conceptual matters related to implementing an explicit spatial perspective in applied econometrics. Baltagi et al. (2003) has sought to present improvements in specification tests (testing whether the more correct specification of models is with the spatial lag component or the spatial error component) LM (Lagrange Multiplier), so as to make it more adaptable to spatial econometrics. Anselin et al. (1996) has proposed a simple, robust diagnostic test, based on the OLS method, for the spatial autocorrelation of errors in the presence of spatially lagged dependent variables and vice-versa, applying the modified LM test developed by Bera and Yoon (1993). This test was, also, after proposed by Florax et al. (2003).

This study seeks to test Verdoorn's Law (using product per worker as a proxy for productivity) for each of the economic sectors of regions (NUTs III) of mainland Portugal from 1995 to 1999 and from 2000 to 2005, through techniques of cross-section spatial econometrics.

2. VERDOORN'S MODEL WITH SPATIAL EFFECTS

Bearing in mind the theoretical considerations, what is presented next is the model used to analyse Verdoorn's law with spatial effects, at a regional and sector level in mainland Portugal.

As a result, to analyse Verdoorn's Law in the economic sectors in Portuguese regions the following model was used:

$$p_{it} = \rho W_{ij} p_{it} + \gamma q_{it} + \varepsilon_{it}, \text{ Verdoorn's equation with spatial effects} \qquad (1)$$

where p are the rates of growth of sector productivity across various regions, W is the matrix of distances across 28 Portuguese regions, q is the rate of growth of output, , γ is Verdoorn's coefficient which measures economies to scale (which it is hoped of values between 0 and1), 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 being studied, the neighbouring regions and the period of time respectively.

The sample for each of the economic sectors (agriculture, industry, services and the total of sectors) is referring to 28 regions (NUTs III) of mainland Portugal for the period from 1995 to 1999 and from 2000 to 2005.

3. SPATIAL MODEL

In the first period we do not found spatial effects for industry and for the total of sectors. The spatial model for agriculture is the spatial error model and for the services is the spatial lag model.

In the second period we do not found spatial effects for agriculture. The spatial model for the industry and services is the spatial lag model and for the all sectors is the spatial error model.

4. CONCLUSIONS

This study has sought to test Verdoorn's Law 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 1999 and from 2000 to 2005, with spillover, spatial lag and spatial error effects. To do so, cross-section estimates (with average temporal values) have been carried out with different estimation methods, or, in other words, OLS (least squares method) and non-linear ML (maximum likelihood method). The consideration of these two estimation methods has the objective of following the specification procedures indicated by Florax et al. (2003) who suggest that models are first tested with the OLS method, to test which is the better specification (spatial lag or spatial error) and then the spatial lag or spatial error is estimated with the GMM or ML method.

Only some sectors have spatial effects.

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