INTRODUCTION

Investigaciones Regionales

Contributions to spatial econometrics: non-linearity, causality and empirical applications

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ABSTRACT: This introduction summarizes the main contributions of the papers selected to be published in this special issue. These papers were presented (among others) in the Fourth Seminar Jean Paelinck hold in Oviedo (Spain) in 2010 and their quality justified the edition of this Special Issue. As members of the organizing committee, we are pleased with the results of this Seminar which it is considered as a reference in the spatial econometric field.

This special issue consists of two types of contributions. On the one hand, papers focus on the development of new methodologies linked to the concept of causality in spatial econometrics and, on the other hand, applied contributions where different economic problems are analyzed from a spatial or spatio-temporal perspective.

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Contribuciones a la econometría espacial: no linealidad, causalidad y aplicaciones empíricas

RESUMEN: Esta introducción trata de resumir las principales contribuciones de los artículos que finalmente han sido incluidos en este número especial. Estos trabajos formaron parte (junto con otros) del Fourth Seminar Jean Paelinck celebrado en Oviedo (España) en 2010 y la calidad de los mismos justifica la edición de este número especial de *Investigaciones Regionales.* Nos congratula, como responsables de la organización en Oviedo y como participantes en las ediciones precedentes, que este Seminario se haya convertido en un referente nacional e internacional en el ámbito de la econometría espacial.

Este número especial consta de dos grandes conjuntos de trabajos. Por un lado, trabajos que recogen nuevas propuestas metodológicas vinculadas a la idea de causalidad en econometría espacial y, por otro, trabajos aplicados en los que se analizan diferentes problemas económicos desde una óptica espacial o espacio-temporal.

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In social sciences it is a given that economic agents operate in space and time.The concreteness of economic phenomena binds what happens at a given time to what has happened in the past and, in turn, allows the former to influence the future. Also, what happens in a given location is partly the result of influences from other locations, and generates externalities in them.

That simple fact needs to be included in prospective theoretical and empirical models. Therefore, econometric techniques must also respond to this reality, and achieve in their analyses a necessary, albeit difficult, balance between simplification and fidelity to the facts, that is to say,complex spatial relationships have to be included in the models.

Over the last 30 years, the increase in theoretical and applied research that explicit the spatial phenomenon has led to substantial continuous development in the field of spatial econometrics.

The papers presented at the *Jean Paelinck* seminars have contributed to the said development. The last edition of the seminar, with «Nonlinearity and Causality in Spatial Econometrics» as theme, was held at the University of Oviedo in 2010 (October 22-23). There were presented new methodological approaches and applications to different areas of regional economics.

In this special issue, two groups of contributions may be clearly distinguished: papers which collect new methodological approaches related to causality in spatial econometrics, and applied research papers in which diverse economic issues are studied from a spatial or time-spatial perspective.

The following papers propose new methodologies to overcome the limitations of commonly used techniques in certain contexts (causality, non-linearity, heteroskedasticity, etc.).

The first paper in this special issue, by Professor Jean Paelinck himself, tackles the topic of non-linearity and its measurement by means of a new statistic, the peakiness index. The paper, whose starting point is the «complexity index», presents results related to the former index, and shows the relation between both indices using data from France.

Pinske and Slade (2010) have brought up some of the issues spatial economics may address in the next years, among them the development of non-parameteric and semiparametric alternatives for identifying spatial dependence patterns. Along this line, F. A. López, A. Artal and M. Luz Maté analyze the size and revise the characteristics of three non-parametric tests: Brett and Pinkse (1997), Ku (2009) and SG (2010). Their behavior is compared to that of traditional tests with data having

nonlinear spatial structure (Moran), and the authors conclude that the behavior of the former is better than that of the latter.

Angulo and Mur analyze the performance of the common factor likelihood ratio test —a parametric alternative— in the presence of non-ideal conditions.Montecarlo simulations show that the size of the test is quite adequate with the exception of bidirectional causality. In what concerns the power of the test, the results are good when causality is considered. All in all, the test may be deemed useful in the specification of spatial econometric models.

The definition of the spatial weight matrix has been widely discussed in the literature. Fernández's paper follows this line and proposes not to impose the elements of the spatial matrix but estimate them by cross-entropy (CE) econometrics. The results show that maximum entropy estimates outperform classical estimates, especially when the specification of the weights matrix is dissimilar to the actual.

Timo Mitze analyzes the role of globally cointegrated variable relationships using German regional data (NUTS 1 level) for GDP, trade, and FDI activity during the period 1976-2005. A Spatial Panel Error Correction Model (SpECM) for regional output growth is applied to analyze the short and long-run impacts of internationalization activities. The results point out the importance of both direct as well indirect links between variables in the long-run.

Several authors have recently revised the models selection strategies used in spatial econometrics. Along this line, P. Burridge asserts in his paper that the prevailing specific-to-general strategies may be inefficient under certain conditions. Furthermore, the existence of heteroskedasticity in spatial data is usually overlooked, which in turn may cause inefficiency problems. The author proposes a nested spatial regression model which incorporates heteroskedastic shocks, and discusses the hypothesis testing both nested and non-nested cases in a quasi-likelihood framework.

Diverse economic issues are tackled in this special issue using the most up to date spatial econometric techniques. The papers aim to show the usefulness of spatial econometric models beyond the academia, so that they may well be taken into account in the design of economic policies.

P. Suárez, M. Mayor and B. Cueto use local spatial autocorrelation measures so as to analyze whether the accessibility to public employment offices is equitable in Spain according to the distribution of three different types of municipalities: large urban, small urban and non-urban. An empirical model is estimated including spatial regimes apply for the different type of municipalities and allowing simultaneously spatial heterogeneity and spatial autocorrelation. The results suggest a negative relation between accessibility and unemployment rates in non-urban areas.

The relation between accessibility and local development in the Spain-Portugal cross-border area is analyzed by A. Ribeiro and J. Silva. The novelty of their approach lies in the inclusion of spatial effects between neighboring regions belonging to different countries.

The impact of noise on housing prices in Madrid is analyzed by J. M. Montero, R. Mínguez, and G. Fernández. In their paper, they use GIS infrastructure to define acoustic areas, and then estimate the impact of noise on housing prices by means of a traditional hedonic model which takes into account the existence of spatial dependence. The authors have resorted in this case to the spatial Durbin model (SDM), and computed the direct, indirect and total effects following LeSage and Pace (2009). As the authors themselves assert, the hedonic theory is not borne out by the approach, which suggests a design problem in the acoustic areas.

Aliaga *et al.,* consider the possibility of using solely spatial data to detect causal relationships between physical and social factors, and deforestation. They have based their strategy on a sequence of Lagrange multipliers, and the results obtained suggest that the structure of property rights has the greatest causal impact on deforestation.

The dynamic domestic effects of public infrastructures in Spain are estimated using the spatial vector autoregressive (SpVAR) methodology by M. A. Márquez, J. Ramajo and G. J. D. Hewings. The estimated SpVAR is used to calculate impulse responses that provide insights about the effects of shocks to relative regional productive capacity on differentregions.

Angulo *et al.,* revisit the utility of gravity models for analyzing the main determinants of exports. Specifically, the effect of the omitted variables and the dynamics of trade flows are analyzed by means of spatial econometrics techniques in a panel data framework.

References

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