Analytical tools of regional science: A symposium from the 1997 meetings of the Mid-Continent Regional Science Association

JRAP (1997) 27, 2: 79-81

The Journal of Regional Analysis & Policy

Analytical tools of regional science

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This is the second year the Mid-Continent Regional Science Association has invited experts in regional science to present their work at a symposium at the association's meetings and to have their papers published in the *Journal of Regional Analysis and Policy*. This year's topic was "Analytical Tools of Regional Science." My motivation in selecting this topic rests on the premier role a discipline's analytical methodology plays in building its body of knowledge. Economics, in my view, has achieved a role of preeminence among the social sciences because it has recognized the power that the scientific method offers in advancing knowledge and understanding. Part of that ability to exploit the power of the scientific method has involved the continuous development and refinement of its tools of mathematical and statistical analysis. To some degree, regional science has adopted many of the analytical tools used in economics to address issues relevant to the regional economy. Yet the regional setting differs significantly from the setting under which many of the mathematical and analytical tools of economics were developed. The smallness of the regional economy, its openness with respect to trade, its commuting patterns of workers and consumers, its data limitations, and its policy concerns all result in analytical needs much different from those encountered in a broader, more aggregate setting. The two papers presented below provide excellent examples of the necessity to recognize regional dimensions when designing analytical tools of analysis.

The paper by Professor LeSage points out that cross-sectional and time series regressions using regional data will have spatially correlated errors. Spatial autocorrelation happens because of the social and economic linkages between regions in close proximity. Political subdivisions such as counties, metropolitan areas, or states are artificial constructs that are ignored in the everyday activities of consumption and production. The presence of these interactions and the resulting spatial autocorrelation they create make parameter estimates biased and inconsistent and, as Professor LeSage demonstrates through an example, potentially far from their true values. Correction for spatial autocorrelation appears also to increase the efficiency of the regression equation leading to higher R^2 values and more accurate forecasts. Professor LeSage notes that the problem is comparable to the problem of simultaneous equation bias.

As regional economists, the presence of spatial autocorrelation should not surprise us. Regional economies that have significant spatial interactions would be expected to generate feedbacks among endogenous variables similar to those found in

any simultaneous equation system. What is surprising, however, is the seeming lack of attention paid to this problem. Except for specialized texts, standard econometric textbooks ignore spatial autocorrelation. Moreover, popular econometric packages such as SPSS and EVIEWS provide no easy, direct ways to correct for spatial autocorrelation. More unfortunately, many regional science researchers seem to be unaware of the problem. A perusal of the regional science literature reveals numerous examples of cross-sectional and time series regressions that ignore this problem. As regional scientists, this should shock us because the nature of the interactions leading to spatial autocorrelation is the essence of what distinguishes regional analysis from more traditional macroeconomics and microeconomics. Professor LeSage's paper is a wake-up call to those of us doing econometric regional modeling. He illustrates that this problem is a violation of the error assumption on par with any of the many other problems that we so studiously test for and attempt to correct such as simultaneous equation bias, serial correlation, and heteroscedasticity. Professor LeSage's paper contains several straightforward approaches to correct for spatial autocorrelation under a variety of different settings.

The consequences of spatial interactions are not only of consequence to sound econometric modeling, but they play an important role in non-econometric model building as well. The paper by Professor Maki offers constructive criticisms and potential solutions to some of the problems involved in adapting national input-output (I-O) models to a regional setting. The regional setting introduces a variety of place specific elements into the I-O framework, considerations that do not arise at the national level. Production technologies may differ considerably from one area to another depending on the sizes of the areas, whether they are rural or metropolitan, the nature of their labor forces, and perhaps such other factors as technological know-how and supplier access. Complications also arise from the spatial separation of labor and capital that typically exemplifies the regional setting. Workers often reside in one county and work in another, for example. Trade flows play a more significant role in the small, open regional economy than they do at the national level. Many regional industries export all of their production and often import most of their intermediate input needs.

Professor Maki's paper demonstrates how the absence of these regional specific elements in standard regional I-O models leads to misspecifications that systematically overestimate or underestimate key impact multipliers. Through a case study that compares and contrasts the characteristics of the millwork industry in a metropolitan versus rural location, he finds strong similarities in the extent to which most of the output, regardless of whether it is produced in a metropolitan or rural area, is exported outside of the county of production. In contrast, a rural versus metropolitan location leads to significant differences in production technologies, balances of payments between primary inputs such as labor and capital, and propensities to import intermediate goods. Professor Maki notes that these place specific problems often afflict standard regional I-O models and proposes a number of insightful solutions. His proposals contain words of wisdom for both I-0 users and model designers alike.

Finally, as organizer of last year's symposium I would like to thank all of the presenters—Richard Greene, James LeSage, Wilbur Maki, and Dean Schreiner—for a

stimulating and exciting discussion of an important topic. I also would like to express my appreciation to Andrew Krmenec who served as a discussant. Andy's comments made the proceedings all the more lively and interesting.