

AREc/FOR 599: Spatial Economics of Natural Resources

Spring Quarter 2008

Course Syllabus

Instructors: Professors Wu (AREc), Fisher (AREc), and Albers (FR)

Class meeting: Tuesday and Thursday, 14:00 – 15:20, EDUC 126

Description:

Although the temporal aspects of natural resource economics have long been recognized, the spatial aspects of resource management decisions have only recently come to the attention of economists. It is an exciting time for natural resource economists who are developing approaches to address the spatial characteristics of both benefits and costs of resource management in tandem with the natural scientists who develop spatial models of resource systems. In addition, natural resource economists are making methodological advances in order to take advantage of the increasing availability of explicitly spatial data. This course introduces the tools of spatial economics—both modeling structure and spatial econometrics—and demonstrates how those tools have been applied to various natural resources. In addition, the course will identify unexplored areas of spatial natural resource economics. Specific topics include the theory of spatial economics (3 weeks), spatial econometrics (3 weeks), and applications of spatial modeling to parks, fisheries, extractive reserves, and forests (4 weeks). The course will have a seminar format. Materials will emphasize readings and grading will be based on student discussion and presentations.

Objectives:

This course has three objectives: 1) explore theoretical approaches to modeling the spatial aspects of economic problems, 2) develop empirical methods and techniques to analyze spatial data and problems, and 3) learn how to apply theoretical and empirical approaches to the spatial aspects of natural resource problems.

Evaluation:

Students are expected to read the required papers before class. Students will be evaluated based on the following:

30%: An in-class presentation in which each student will be required to present a paper or papers on the reading list and lead the class session. We anticipate one such presentation per section of the course (i.e., 3 assignments worth 10% each).

30%: participation in class discussion throughout the course.

40%: A paper in which the student takes a non-spatial journal article from the last 5 years (not on the reading list) and describes how they would go about extended the paper to include spatial aspects of the problem. At a minimum, the paper should describe: what the unstudied spatial issues in that article are; how the article's modeling framework could be altered to address the spatial components of the issue; how the inclusion of spatial components would alter the methodology employed and data requirements; and how the results are likely to differ from those in the original article. We do not expect you to do any analysis, but the paper should lay out how the analysis would be done. The paper is due June 9 in class.

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Reading List

Section I: Theory of Spatial Economics

A. Urban Spatial Structure

Anas, A., R. Arnott, K. A. Small, "Urban Spatial Structure," *Journal of Economic Literature*, 36 (1998), 1426-64.

Wheaton, William C. "A Comparative Static Analysis of Urban Spatial Structure." *Journal of Economic Theory*, October 1974, 9(2), pp. 223-37.

Wheaton, William C. "Income and Urban Residence: An Analysis of Consumer Demand for Location." *American Economic Review*, 67(September 1977): 620-31.

B. Spatial Heterogeneity, Development Patterns, and Community Characteristics

Brueckner, J. K., T. Jacques-Francois, Y. Zenou, "Why Is Central Paris Rich and Downtown Detroit Poor? An Amenity-Based Theory," *European Economic Review*, 43 (1999), 91-107.

Wu, JunJie, and Andrew J. Plantinga. "The Influence of Public Open Space Policies on Urban Spatial Structure." *Journal of Environmental Economics and Management*. 46(September 2003): 288-309.

Wu, JunJie. "Environmental Amenities, Urban Sprawl, and Community Characteristics." *Journal of Environmental Economics and Management* 52(2006): 527-547.

Wu, JunJie, and Elena Irwin. "Optimal Land Development with Endogenous Environmental Amenities" *American Journal of Agricultural Economics* 90(February 2008): 232-248.

C. Spatial Heterogeneity and Conservation Targeting

Wu, JunJie, David Zilberman, Bruce A. Babcock. "Environmental and Distributional Effects of Conservation Targeting Strategies." *Journal of Environmental Economics and Management* 41(May 2001): 333-350.

Lewis, David, Andrew J. Plantinga, and JunJie Wu. "Targeting Incentives to Reduce Habitat Fragmentation." Working paper, 2008.

Wu, JunJie, and Katherine Skelton. "Targeting Conservation Efforts in the Presence of Threshold Effects and Ecosystem Linkages." *Ecological Economics* 42(August 2002): 313-331.

Babcock, Bruce A., P. G. Lakshminarayan, JunJie Wu, and David Zilberman. "Targeting Tools for the Purchase of Environmental Amenities." *Land Economics* 73(August 1997): 325-339.

Section II: Spatial Econometrics

A. Motivation: Spatial Data, Spatial Analysis, and Natural Resource Issues

Anselin, L., R. Florax, and S. Rey. 2004. "Econometrics for Spatial Models: Recent Advances." In L. Anselin, R. Florax, and S. Rey (Eds.) *Advances in Spatial Econometrics: Methodology, Tools, and Applications*. Heidelberg: Springer-Verlag, pp. 1-25.

Bateman, I.J., Jones, A.P., Lovett, A.A., Lake, I.R., and B.H. Day. 2002. "Applying Geographical Information Systems (GIS) to Environmental and Resource Economics." *Environmental and Resource Economics* 22: 219-269.

Bockstael, N.E. 1996. "Modeling Economics and Ecology: The Importance of a Spatial Perspective." *American Journal of Agricultural Economics* 78: 1168-1180.

Goodchild, M.F. 2006 "Geographical Information Science: Fifteen Years Later." In P.F. Fisher (Ed.) *Classics from IJGIS: Twenty years of the International Journal of Geographical Information Science and Systems*. Boca Raton: CRC Press, pp. 199-204.

B. Spatial Autocorrelation: Diagnostics, the Spatial Error Model, and the Spatial Lag Model

Anselin, L. 2006 "Spatial Econometrics." In T.C. Mills and K. Patterson (Eds.) *Palgrave Handbook of Econometrics: Volume 1, Econometric Theory*. Basingstoke: Palgrave Macmillan, pp. 901- 960. (Note: Please read Sections 26.1 and 26.2)

Anselin, L. 2002. "Under the Hood: Issues in the Specification and Interpretation of Spatial Regression Models." *Agricultural Economics* 27(3): 247-267.

Anselin, L., I. Syabri, and Y. Kho. 2006. "GeoDa: An Introduction to Spatial Data Analysis." *Geographical Analysis* 38(1): 5-22.

Brueckner, J.K. 1998. "Testing for Strategic Interaction Among Local Governments: The Case of Growth Controls." *Journal of Urban Economics* 44: 438-67.

Dubin, R.A. 1998. "Spatial Autocorrelation: A Primer." *Journal of Housing Economics* 7: 304-327.

Pisati, M. 2001. "Tools for Spatial Data Analysis." *Stata Technical Bulletin* 60: 21-37.

Plantinga, A.J., Lubowski, R.N., and R.N. Stavins. 2002. "The Effects of Potential Land Development on Agricultural Land Prices." *Journal of Urban Economics* 52(3): 561-581.

C. Spatial Probability Sampling

Carrion-Flores, C., and E.G. Irwin. 2004. "Determinants of Residential Land-Use Conversion and Sprawl at the Rural-Urban Fringe." *American Journal of Agricultural Economics* 86(4): 889-904.

Mueller, D. and D.K. Munroe. 2005. "Tradeoffs between Rural Development Policies and Forest Protection: Spatially Explicit Modeling in the Central Highlands of Vietnam." *Land Economics* 81(3): 412-425.

Mueller, D. 2005. "Stata in Space: Econometric Analysis of Spatially Explicit Raster Data." *The Stata Journal* 5(2): 224-238.

Nelson, G. and D. Hellerstein. 1997. "Do Roads Cause Deforestation? Using Satellite Images in Econometric Analysis of Land Use." *American Journal of Agricultural Economics* 79: 80-88.

D. Spatial Heterogeneity: The Expansion Method and Geographically Weighted Regression

Eldridge, J.D. and J.P. Jones. 1991. "Warped Space: A Geography of Distance Decay." *The Professional Geographer* 43(4): 500-511.

Fotheringham, A.S., M.E. Charlton, and C. Brundson. 1998. "Geographically Weighted Regression: A Natural Extension of the Expansion Method for Spatial Data Analysis." *Environment and Planning A* 30: 1905-1928.

Section III: Applications of Spatial Economics to Natural Resources

A. Fish

Sanchirico, J. N., and J. E. Wilen. "Bioeconomics of Spatial Exploitation in a Patchy Environment." *Journal of Environmental Economics and Management* 37(1999): 129-150.

Sanchirico, J. N. and J. E. Wilen, Optimal spatial management of renewable resources: matching policy scope to ecosystem scale, *Journal of Environmental Economics and Management* 50 (2005) 23-46.

Wu, JunJie, Richard M. Adams, and William G. Boggess. "Cumulative Effects and Optimal Targeting of Conservation Efforts: Steelhead Trout Habitat Enhancement in Oregon." *American Journal of Agricultural Economics*. 82 (2000): 400-413.

B. Forests

- Swallow, S.K. Talukdar, P., and D.N. Wear. "Spatial and Temporal Specialization in Forest Ecosystems Management under Sole Ownership." *American Journal of Agricultural Economics*. (1997) 79:311-326.
- Swallow, Stephen K. and David N. Wear. "Spatial Interactions in Multiple-Use Forestry and Substitution and Wealth Effects for the Single Stand." *Journal of Environmental Economics and Management* 25 (2) (1993): 103-120.
- Nalle, D.J., Montgomery, C.A., Arthur, J.L., Schumaker, N.H., and Polasky, S. 2004. Modeling joint production of wildlife and timber in forests, *Journal of Environmental Economics and Management* 48(3): 997-1017.
- Albers, H. J. "Modeling Ecological Constraints on Tropical Forest Management: Spatial Interdependence, Irreversibility, and Uncertainty." *Journal of Environmental Economics and Management* 30(1996): 73-94.
- Chomitz, Kenneth M. and David A. Gray. "Roads, Land Use, and Deforestation: A Spatial Model Applied to Belize." *World Bank Economic Review*. 10:3:487-512.
- Nelson, Gerald, and Daniel Hellerstein. 1997. "Do roads cause deforestation? Using satellite images in econometric analysis of land use." Staff paper 95-E488. *American Journal of Agricultural Economics* 79: 80-88.

C. Reserves

- Church, R. and C. Reville (1974). The maximal covering location problem. *Papers of the Regional Science Association* 32, 101–118.
- Hayri Onal and Robert A. Briers. Incorporating spatial criteria in optimum reserve network selection. *Proceedings of the Royal Society of London B*.(2002) 269:2437-2441.
- Costello, Christopher and Steve Polasky. "Dynamic reserve site selection." *Resource and Energy Economics*, 26:157–174, 2004
- Sanchirico, J. N. 2005. Additivity Properties in Metapopulation Models: Implications for the assessment of marine reserves, *J. Env. Econom. Man.* 49(1):1-25.
- Parkhurst, Gregory M. and Jason F. Shogren. "Spatial Habitat Design by Agglomeration Bonus" forthcoming, 2006.
- "Equilibrium Patterns of Land Conservation: Crowding In/Out, Spatial Attraction, and

Policy.” Heidi J. Albers, Amy W. Ando, and Michael Batz. 2006.

“A Spatial-Econometric Analysis of Spatial Attraction and Repulsion between Private and Public Conservation” Heidi J. Albers, Amy W. Ando, and Xiaoxuan Chen. 2006.

D. Extractive Reserves, Non-timber Forest Products, and Common Property Forests

Skonhofs, A., and J.T.Solstad. 1996. Wildlife Management, Illegal Hunting and Conflicts. A Bioeconomic Analysis. *Environment and Development Economics*. 1:165-181.

Robinson, E. J. Z., J. C. Williams, and H. J. Albers, The influence of markets and policy on spatial patterns of non-timber forest product extraction, *Land Economics* 78 (2002) 260-271.

Alix-Garcia, J. Seeing the Forest and the Trees: A Spatial Analysis of Common Property Deforestation. Department of Agricultural and Resource Economics, UC-Berkeley (December 31, 2004) downloaded from <http://are.berkeley.edu/~alix/papers.html>

Kohlin, G. and P. J. Parks, Spatial variability and disincentives to harvest: deforestation and fuelwood collection in South Asia, *Land Economics*, 77 (2001) 206-218.

Elizabeth J Z Robinson, Heidi J Albers, and Jeffrey C Williams. “Spatial and Temporal Modeling of Community Non-Timber Forest Extraction.” Centre for the Study of African Economies Working Paper Series 2006-03, University of Oxford.

E. Other Topics

Invasive species: discussed but no papers assigned

Fire: discussed but no papers assigned

Water:

Ray, Isha and Jeffrey Williams. “Evaluation of Price Policy in the Presence of Water Theft.” *American Journal of Agricultural Economics*, Nov 1999, Vol. 81 Issue 4.