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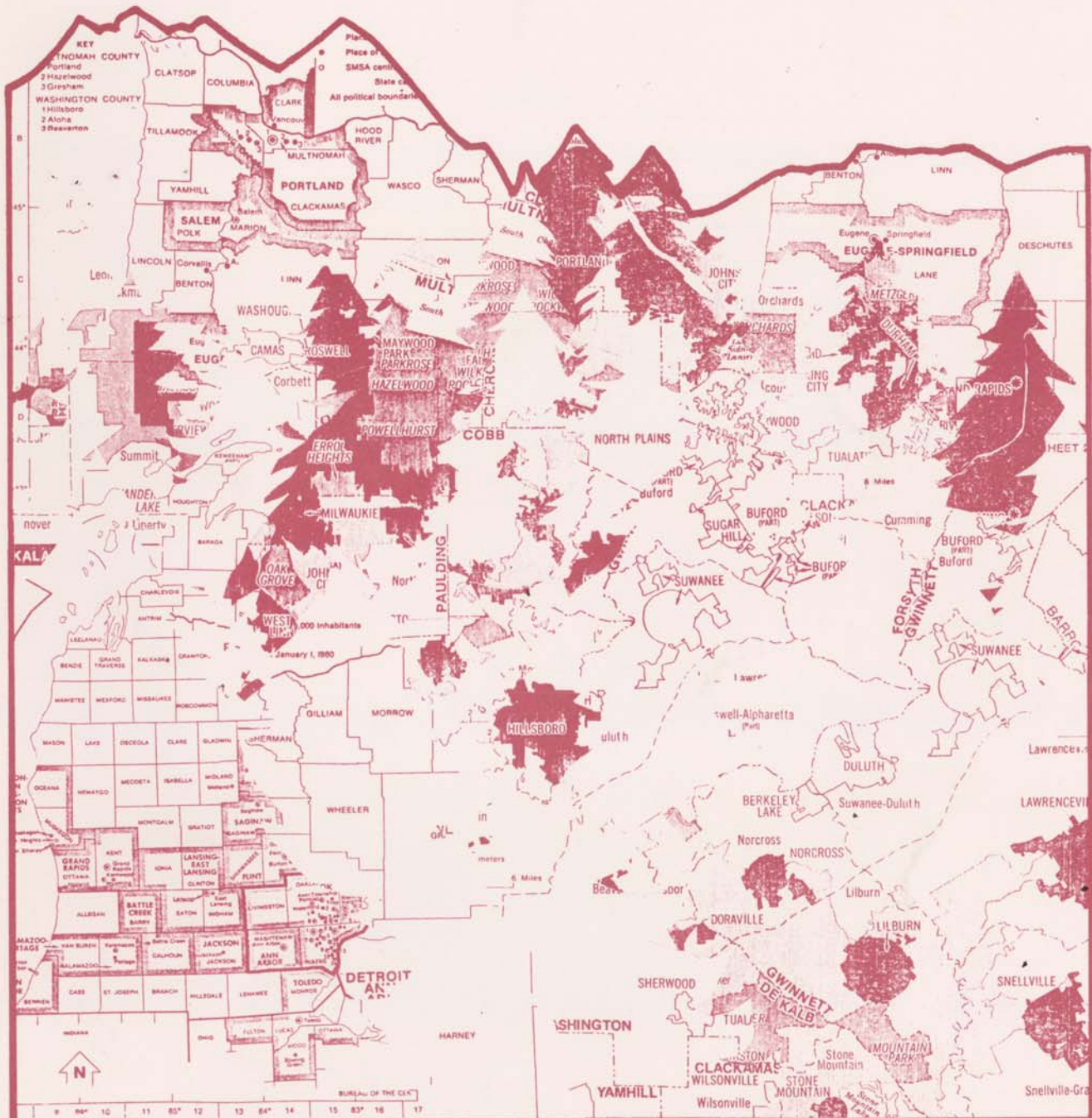
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Spatial and Regional Analysis Methods in Forestry Economics: An Annotated Bibliography



Compilers

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Spatial and Regional Analysis Methods in Forestry Economics: An Annotated Bibliography

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Abstract

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Spatial and regional analysis methods in
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This bibliography provides extensive coverage of a relatively new field of study. Entries relate to models, techniques, and information regarding spatial and regional analysis printed before 1981.

Introduction

Forest economics has always included spatial and regional analysis. Nevertheless, the central analytical core of forestry economics has been almost exclusively based on neoclassical microeconomics, which assumes that the spatial dimension of resource management decisions is relatively unimportant. In recent years, however, a great deal of research has been completed that applies regional economic concepts and methods to the analysis of natural resources, including forest resources. This annotated bibliography attempts to provide extensive coverage of publications in this relatively new field of study.

The main criterion for selecting publications for inclusion in this bibliography was that they should relate to models, techniques, and information of spatial and regional analysis that have been or could be applied to some economic factor, aspect, or problem involving forest resources.

Entries are listed alphabetically by author(s). Major sources consulted in developing this annotated bibliography were library collections and published bibliographies. Most citations are accompanied by an annotation. Materials from which annotations were adapted are from periodicals, articles, books, and other annotated bibliographies.

Although this bibliography is not an exhaustive treatment of the subject matter, we include what we believe are important citations for information printed before 1981. We believe these citations will provide a good source of information to individuals wishing to conduct in-depth study of important forestry economics research.

Bibliography

1. Adams, Darius M. Forest products prices and National Forest timber supply in the Douglas-fir region. *Forest Science*. 20(3): 243-259; 1974.

This paper presents a quarterly econometric model of forest products markets of the Douglas-fir region. Through simulations, regional price and output behavior were examined under alternative National Forest timber supply policies.

2. Adams, Darius M. Private investment in forest management and the long term supply of timber. *American Journal of Agricultural Economics*. 64(2): 232-241; 1982.

Timber supply from private forest owners is a major uncertainty in long-term forest product market projections. A model of private supply is developed that explains harvest management investment decisions.

3. Adams, Darius M.; Haynes, Richard; Darr, David. A welfare analysis of long-term forest products price stabilization. *American Journal of Agricultural Economics*. 59(4): 662-673; 1977.

The prospective welfare and market impacts of Federal efforts to stabilize prices of wood products are examined for two alternative strategies involving manipulating Forest Service harvest levels. Generally, these stabilization strategies yield substantial net benefits. Consumers consistently gain, whereas losses by stumpage producers and by end product suppliers in the South are largely offset by gains in the West.

4. Adams, Gerard F. An econometric model of the United States forest products industry. *Forest Science*. 19(2): 82-96; 1973.

A model of the U.S. wood products industry is estimated and simulated. The equations link the principal structural elements of markets for lumber, plywood, saw logs, veneer logs, and stumpage. The model simulates results throughout the sample period and was used to make forecasts to 1975.

5. Anderson, F.J. Demand conditions and supply constraints in regional economic growth. *Journal of Regional Science*. 16(2): 213-224; 1976.

This paper provides a synthesis of supply and demand models of regional economic growth. Demand conditions (stressed in export base and accelera-

tor models) act as necessary conditions for regional growth by creating tight labor markets, whereas labor supply constraints act as sufficient conditions that respond through migration processes to levels of regional factor prices.

6. Andrews, Richard B. Mechanics of the urban economic base: historical development of the base concepts. *Land Economics*. 29(2): 161-167; 1953.

Examines base theory with the objective of finding gaps and inadequacies. Reviews a historical evolution of the concept. Highlights a series of articles that aim at a comprehensive description, analysis, and criticism of the mechanics of the urban economic base then conceived.

7. Armstrong, Harvey; Taylor, J.M. Regional economic policy and its analysis. Oxford, England: Phillip Allan; 1978. 355 p.

Author describes how "to provide a link between the theory and practice of regional economics." The origins of economic policy are also discussed.

8. Austin, J.W. Timber flows and utilization patterns in the Douglas-fir region. Res. Pap. PNW-89. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1969. 89 p.

A detailed study of the pattern of timber movement from each land ownership class to each type of mill.

9. Austin, John W.; Darr, David R. The Jones Act and the Douglas-fir region softwood lumber industry in perspective. *Journal of Forestry*. 73(10): 644-648; 1975.

Impact of the Jones Act on Pacific Northwest softwood lumber producers.

10. Baird, C.O. Gauging the potential investment efficiency of the forest resource in a depressed area—a study in methodology with application to the Cumberland Plateau section of Appalachia. Bull. 17. Durham, NC: Duke University, School of Forestry; 1965. 133 p.

Develops a model for classifying regions of forest land according to variables affecting the cost of growing stumpage. The region's depressed state is partially accounted for by depletion of its forests.

11. Balaehandran, M. Regional statistics: a guide to information services. Econ. Inf. Guide Ser. Detroit: Gale Research; 1980; 3: 257.

A guide to sources of State, local, and regional socioeconomic data.

12. Bare, B. Bruce; Stone, Robert N. A computer program for displaying forest survey type information. Res. Note NC-45. U.S. Department of Agriculture, Forest Service; 1968. 4 p.

Presents a computerized procedure for displaying information on forest types from inventory plots. Although the development of general forest-type maps is emphasized, the program can be used to display any locational data having rectangular coordinates.

13. Barkley, Paul; Allison, T.H., Jr. Economic base studies in resource administration. Land Economics. 44(4): 470-479. 1968.

The purpose of this paper is to show that, in the area of natural resource development, the economic base theory has been called on to perform a function to which it is not well suited. The paper has four main sections dealing with interest of the agencies' in base studies, the technical problems of the economic base study, a review of some federally sponsored base studies, and a discussion of misuse and potential use.

14. Barnard, J.R. A social accounting system for regional development planning. Journal of Regional Science. 9(1): 109-115; 1969.

This paper considers the types of information that would be useful in a system of social accounts for analyzing economic change with reference to regional development planning; it also presents an overview of a system of accounts that was developed for generating information about regional economic structures.

15. Bartels, Cornelius P.A.; Ketellapper, Ronald H., eds. Exploratory and explanatory statistical analysis of spatial data. Boston: Martinus Nijhoff; 1979. 268 p.

Papers in this volume include: a survey of statistical methods for analyzing spatial data; the statistical description; interregional input-output tables; estimation methods; stochastic control of regional economies.

16. Battison, E J.; Jansma, J.D. A framework for community economic planning based on the integration of an input-output model and a linear programming model. Bull. 757. University Park, PA: Pennsylvania State University, Agricultural Experiment Station; 1969. 36 p.

The objective of this report is to present a framework for community economic planning. The focus is on the presentation of the basic input-output technique with emphasis on the development of a money-flows model. It also deals with an integration of the extended input-output model and a linear programming model.

17. Bell, Enoch F. Estimating effect of timber harvesting levels on employment in the Western United States. Res. Note INT-237. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1977. 11 p.

Tells how to estimate employment resulting from changes in the level of timber harvesting.

18. Beltz, R.C. Average hauling distance for mid-south pulpwood unchanged since 1970. Tappi. 54(4): 579-580; 1971.

Computer processing of procurement data from all mills using wood from the mid-South indicates that in 1968 the average regional pulpwood bolt was pulped at least 62 miles from its stump, and that the average hauling distance changed little after 1960.

19. Beuter, J.H.; Johnson, K.N.; Shuerman, H. Lynn. Factors influencing future timber harvests in Oregon. Res. Bull. 19. Corvallis, OR: Oregon State University, Forest Research Laboratory; 1976. 111 p.

Provides projections of likely changes in future timber harvests and in their contributions to the economy of Oregon communities for major economic areas within the State—under varying assumptions about land-use changes, growth rates, harvest regulation policies, and efficient utilization.

20. Beuter, J.H.; Olson, Douglas C. Lakeview Federal sustained yield unit—Fremont National Forest, a review 1974-1979. Corvallis, OR: Oregon State University, School of Forestry, Department of Forest Management; 1980. 94 p.

Uses shift-share technique to compare employment changes in Lake County, Oregon, with those of contiguous areas in eastern Oregon, and northern California.

21. Beuter, J.H.; Schallau, Con H. Forests in transition: relationship to economic and social stability. 8th World Forestry Congress; 1978 October 16-28; Jakarta. (Special paper).

The purpose of this paper is to discuss forest management and its relationship to community stability; uses Douglas County, Oregon, as a case study to demonstrate role of public and private forest policies in achieving community stability.

22. Bos, H.C. Spatial dispersion of economic activity. Rotterdam, Netherlands: Rotterdam University Press; 1965. 99 p.

The study contributes to the understanding of a problem of spatial economics and spatial dispersion of economic activity.

23. Boughton, W.C. Planning the construction of forest roads by linear programming. Australian Forestry. 31(2): 111-120; 1967.

An application of linear programming to the planning of forest road construction is illustrated. Movement of earth for cuts and fills is formulated as an allocation problem, and an optimal solution is obtained by linear programming.

24. Boyce, Stephen G. Management of forests for optimal benefits (DYNAST-OB). Res. Pap. SE-204. Asheville, NC; U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1980. 92 p.

New processes can help forest management provide selected optimal forest benefits in perpetuity. A system dynamics technique, DYNAST-OB, is a mechanical method for quantifying and interrelating different kinds of forest benefits. This model has the capacity to integrate management strategy and tactics for a complex area divided into types or categories.

25. Boyd, Kenneth G. Water transport of wood: B.C. coast. Pulp and Paper Canada. 80(11): 28-34; 1979.

Mills on the British Columbia coast depend on water to transport their wood supply. Larger carriers are more efficient, but the high capital costs for such equipment deter investments.

26. Bradley, Dennis. Improve forest inventory with access data—measure transport distance and cost to market. Res. Pap. NC-82. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1972. 21 p.

This paper describes a fairly simple model relating transport distance to: (1) length of the road network per unit of land area, (2) the distribution of the road network, (3) the terrain, and (4) the location of specific delivery points.

27. Bradley, Dennis P. Solving wood chip transport problems with computer simulation. Res. Pap. NC-138. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1978. 8 p.

Efficient chip transport operations are difficult to achieve because of frequent and often unpredictable changes in distance to market, chipping rate, time spent at the mill, and equipment costs. This paper describes a computer simulation model that allows a logger to design an efficient transport system in response to these changing factors.

28. Bray, L.G. A model of local sector growth in the South. Knoxville, TN: University of Tennessee; 1980. 144 p. Ph. D. dissertation.

Study examines effectiveness of economic base theory in explaining longrun impacts. Size of region and other growth factors—that is, interindustry linkages, labor market, capital cost and availability, national trends, and spatial factors—were found to influence employment forecasts. Author concludes that an effective growth model should include growth indicators other than simple measures of basic activity.

29. Brazzel, John M.; Hicks, W. Whitney. Exports and regional economic growth: an evaluation of the economic base and staple models. Land Economics. 44: 503-509; 1968.

This paper contends that the two models—economic base and staple—represent similar explanations of regional growth and that differences between the models are complementary.

30. Brodie, D.; McManon, R.; Gavelis, W. Oregon's forest resources: their contribution in the State's economy. Resour. Bull. 23. Corvallis, OR: Oregon State University, School of Forestry; 1978. 78 p.

Authors review forest products industry employment in Oregon (SIC codes 24, 25, 26), shifts within the industry, value of products, relation of the industry to all manufacturing, and various other items related to the importance of the industry in Oregon.

31. Bromley, Daniel W. An alternative to input-output models: a methodological hypothesis. Land Economics. 48(2): 125-133; 1972.

A considerable amount of information about the economic structure of rural economies can be discerned without the implementation of a complete input-output study. Two indexes that form the basis for understanding an economy are defined, the index of internal purchases and the index of internal sales.

32. Bromley, Daniel W.; Blanch, G.E.; Stoevener, H.H. Effects of selected changes in Federal land use on a rural economy. Bull. 604. Corvallis, OR: Oregon State University, Agricultural Experiment Station; 1968. 27 p.

Authors used a primary data base input-output model to examine the relative importance of grazing on Federal range land and lumber production to the Grant County, Oregon, economy. They compared a 20-percent reduction in use of Federal ranges with a 10-percent increase in the output of the lumber sector. The decrease in use would reduce gross business income in the county by \$623,739, whereas the increase in output would increase income by \$1,784,243.

33. Brookshire, David S. A macroeconomic analysis of regional environmental modeling and planning. Journal of Environment and Management. 5(3): 268-282; 1978.

Two models are presented: an expanded inter-regional model that incorporates regional disamenities into the multiplier structure and a regional migration model for estimating disamenities. The results suggest that failure to include corrections of disamenities in regional multipliers will lead to greater regional inequality in welfare.

34. Brown, N.; McMillan, J.A. Recreation program development impacts: a dynamic regional analysis. American Journal of Agricultural Economics. 54(4): 750-754. 1977.

The purpose of this article is to compare impacts of a recreation program relative to agricultural development programs using a dynamic regional economic model. The article is organized into three sections: (1) the inclusion of recreation in a regional model, (2) an assessment of recreation versus agricultural development programs, and (3) development policy implications.

35. Browne, L.E.; Mieszkowski, P.; Syron, R.F. Regional investment patterns. New England Economic Review. July/August: 5-23; 1980.

Simple representations for differences in regional investment between 1959 and 1976 were shown to account for only about one-third of the variation. Wage differentials and relative energy costs were important, but intangibles and historic accidents were also significant factors behind investment decisions.

36. Bryne, J.J.; Nelson, R.J.; Googins, P.H. Logging road handbook: the effect of road design on hauling costs. Agric. Handb. 183. Washington, DC: U.S. Department of Agriculture; 1960. 65 p.

Analyzes hauling costs, the use of diesel and gas-driven trucks, size of hauling unit, and type of road.

37. Buckman, Robert E.; Fight, Roger D. Multi-resource inventories...resolving conflicts. Inventory design and analysis. In: Proceedings of a workshop; SAF Inventory Working Group 1974; Ft. Collins, CO. Colorado State University; 1974: 181-185.

An analysis of the role of multiresource inventories in resolving conflicts is presented. The authors conclude that conflict in resource decisionmaking does not result primarily from a lack of inventory data. Inventory data, however, are an essential link in resource decisionmaking and can play an important role in focusing the conflict on the real issues.

38. Bureau of Governmental Research and Service. The significance of the O and C forest resource in western Oregon. Eugene, OR: University of Oregon; 1968. 169 p.

Describes historical highlights of the Oregon and California railroad land grants and the importance of O and C timber harvests in the Oregon economy. Income derived from the O and C forest resource and expenditure patterns of dependent counties are given. A case study of Josephine County, Oregon, is described to identify and measure the impacts of the O and C forest resource in a comprehensive and detailed manner.

39. Business-Economics Advisory and Research, Inc. The role of forest land in Washington economy. Seattle, WA: Washington Forest Protection Association; 1970. 55 p.

Describes the contribution of forest lands and forest-based industries to the economic well-being of the State of Washington.

40. Carpenter, Eugene M. Transportation facilities for developing wood-using industries in north-eastern Minnesota. St. Paul, MN; U.S. Department of Agriculture, Forest Service, Lake States Forest and Range Experiment Station; 1964. 34 p.

Describes the transportation facilities and services available in northeastern Minnesota and compares shipping rates to Midwest markets for several forest products. This study considers rail, truck, and seaway shipping resources in a five-county area.

41. Carpenter, Eugene M. Canadian forest products shipped into the north-central region. Res. Pap. NC-83. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Experiment Station; 1972. 22 p.

This report summarizes trends in the importation of various forest products from Canada and approximates the volumes of these products that have a first destination within the north-central region.

42. Castle, E.N.; Youman, R.C. Economics in regional water research and policy. American Journal of Agricultural Economics. 50(5): 1655-1666; 1981.

Part I of this paper pertains to water resources and regional economic growth. Part II deals with choice indicators in public decisionmaking about investment in natural resources.

43. Chaffin, J. A.; Kushner, A. Important facts of forest industries on the economy of Georgia. Rep. 26. Macon, GA: Forest Research Council; 1971: 22.

Characterizes the role of the forest industry in Georgia for 1958 and 1967. Characteristics include: employment, payrolls, and value added. Forest products manufacturing ranks third in importance relative to other Georgia industries.

44. Chang, Sun Joseph; Buongiorno, Joseph. A programming model for multiple use forestry. Journal of Environmental Management. 13: 45-58; 1981.

A methodology of resource allocation combining goal programming and input-output analysis to provide a solution to the problem of multiple use planning on public forests. The model allows managers to specify the exact goal level for each management activity, to experiment with varying degrees of management intensity, to explore the outcome of different management assignments, and to determine the tradeoff between management activities.

45. Chappelle, D.E. Linear programming for forestry planning. In: Convery, Frank; Ralston, Charles, eds. Forestry and long range planning: Durham, NC: Duke University, School of Forestry and Environmental Studies; 1977: 129-163.

This paper provides (1) a simplified and concise description of linear programming, (2) a description of how linear programming has been used in forestry planning, and (3) a discussion of the advantages and disadvantages of linear programming in forestry planning.

46. Chase Econometric Association, Inc., Economic Research Service. Rural impacts of monetary policy. Agricultural Economic Research. 33(4): 1-11; 1981.

Responses to changes in national monetary policy vary regionally. Urban areas tend to be more responsive than rural areas. Some areas appear immune to national trends and can experience growth during a national credit crunch.

47. Chatterji, M. Space, location and regional development. In: Proceedings of a symposium; 1976 university symposium on regional science; London. London and New York: Academic Press; 1976. 239 p.

Papers are by economists, geographers, and regional science experts on aspects of urban and regional planning and techniques used in regional science. Categories discussed include: growth and development patterns, spatial regularities and equilibrium models, urban transportation, welfare economics, and the environment.

48. Chinitz, B. Problems of regional economic development: discussion. American Economic Review. 68(2): 116; 1978.

The author argues that although it probably would be hard to project the flow of revenues and the impact of fiscal policy on migration and local economic activity in the Southwest, policymakers would do well to study the Alaska model and its findings.

49. Cichetti, Charles J.; Seneca, Joseph; Davidson, Paul. The demand and supply of outdoor recreation: an econometric analysis. New Brunswick, NJ: Bureau of Economic Research, Rutgers - The State University; 1969. 310 p.

The authors describe an econometric model based on the 1965 survey of outdoor recreation activities and other Census Bureau data. Implications of predictions through the year 2000 are also considered.

50. Clark, Colin W. Mathematical bioeconomics: the optimal management of renewable resources. New York: John Wiley & Sons; 1976. 352 p. (A Wiley-Interscience Series).

The theory of renewable resource management is applied to the commercial fishery and forestry industries. Among the models discussed are the phase-plane analysis of dynamical systems and the economic aspects of resource management. Also discussed are discrete time models and extension of the theory to more complex biological models involving age structure and multispecies systems.

51. Clawson, Marion. Decision making in timber production, harvest and marketing. Res. Pap. R-4. Washington, DC: Resources for the Future; 1977. 127 p.

This paper describes the decisionmaking process in producing, harvesting, and marketing timber in the United States; the biological, economic, and management considerations; and the methods of analysis. Author suggests that future management of National Forests will be based more directly on economic considerations in the future than on biological considerations.

52. Clawson, Marion, ed. Research in forest economics and forest policy. In: Proceedings of a symposium on research in forest economics and forest policy; 1977 January 13-14; Washington, DC. Res. Pap. R-3. Washington, DC: Resources for the Future. 1977. 555 p.

53. Connaughton, Kent P.; McKillop, William. Estimation of "small area" multipliers for the wood processing sector: an econometric approach. Forest Science. 25(1): 7-20; 1979.

The primary objective of the study was to develop estimates of multipliers that could be used to gauge the effect on local employment and different levels of income in California. The analysis focused on individual counties in the northern California planning areas of the USDA Forest Service. A multisector econometric approach to multiplier estimation was adopted to bridge the gap between the aggregate economic base multiplier and the multisector input-output multiplier.

54. Conopask, J.V. 1978. A data-pooling approach to estimate employment multipliers for small regional economies. Tech. Bull. 1583. Washington, DC: U.S. Department of Agriculture, Economic Research Service; 1978. 31 p.

This study demonstrates a procedure for estimating disaggregated and lagged economic base multipliers for short to intermediate term forecasting models.

55. Conroy, Michael E. Alternative strategies for regional industrial diversification. *Journal of Regional Science*. 14(1): 31-40; 1974.

This paper considers the problem of choosing an optimal diversifying increment of industries for a regional economy. Three alternative approaches or strategies for choosing such increments are explored, first theoretically and then in terms of their significance for three U.S. cities that have histories of greater than average instability for comparable cities. The industries nationally most stable will yield the optimally diversifying industrial increments only under very limited conditions.

56. Convery, F.J. Unit planning and local economic impacts of alternative forest management practices. *Teah. Pap. 1*. Durham, NC: Duke University, School of Forestry; 1973. 27 p.

Describes the development of procedures for determining the effect of alternative forest management systems on the local economy (as measured by income, employment, and tax revenue) and their application to a case study based on an area in Tennessee.

57. Cumberland, John H.; Vanbeek, Fritz. Regional economic development objectives and subsidization of local industry. *Land Economics*. 43(3): 253-254; 1967.

Article discusses the pros and cons of subsidization by local governments and private interest groups. Economists have generally rejected subsidies as an unwarranted interference with the efficiency of resource allocation. The proponents of the practice argue that subsidization can be used as a means of neutralizing or reducing misallocation under certain conditions.

58. Cummings, R.G.; Schuize, W.D.; Mehr, A.R. Optimal municipal investment in boomtowns... an empirical analysis. *Journal of Environmental Economics and Management*. 5(3): 252-267; 1978.

The primary concern of this paper is the use of wage-infrastructure tradeoffs as a measure of the social benefits of municipal infrastructure in boomtowns. A regression based on pooled cross sectional and time series data for 26 towns in the Rocky Mountain region suggests that individuals will "tradeoff" a 1-percent increase in per capita stocks of municipal infrastructure for a 0.035-percent decline in wages. These results are then used to calculate "optimal" levels for an example boomtown.

59. Cunningham, J.P. An energetic model linking forest industry and ecosystems. Helsinki. *Communicationes Instituti Forestalis Fenniae*. 79.3; 1974. 51 p.

The author provides a theoretical foundation for examining interactions between human activities and the environment. The results of an empirical test of these principles involving the paper industry of Finland are described.

60. Dane, C.W. Truck, rail and water movement of western softwood plywood and lumber. *Forest Products Journal*. 15(2): 91-92; 1965.

Analyzes movements in 1961 from and to the three western and eight Rocky Mountain States, including a comparison of costs for transporting western and southern softwoods.

61. Dane, C.W. Economics of softwood plant location. *Forest Products Journal*. 20(1): 16-18; 1970.

The paper discusses economic factors influencing geographical location of softwood plywood plants: costs of labor, transportation, and timber.

62. Darr, David R.; Fight, Roger D. Douglas County, Oregon...potential economic impacts of a changing timber resource base. *Res. Pap. PMW-179*. Portland, OR; U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1974. 41 p.

An input-output technique was used to estimate the impact of the following on sales: change in demand for forest products, change in Forest Service or Bureau of Land Management timber harvest, and a decline in private harvest offset by an increase in Forest Service and Bureau of Land Management harvest.

63. Davis, Lawrence S.; Lyon, Edward F.; Burkhart, Harold. A spatial equilibrium analysis of the southern Appalachian hardwood lumber-using industry. *Forest Science*. 18(3): 247-260; 1972.

The organization and cost efficiency in wood utilization of the southern Appalachian hardwood-using industry was studied. Linear programming was used to analyze a multistage, integrated industrial structure. The least-cost organization of the industry under a variety of future economic conditions was forecast.

64. Dean, Robert D.; Leahy, William H.; McKee, David L. Spatial economic theory. New York; Free Press; London: Collier-Macmillan; 1970. 365 p.
65. Diamond, Joseph D ; Chappelle, Daniel E. Application of an input-output model based on secondary data in local planning: the case of Manistee County. Rep. 409. East Lansing, MI: Michigan State University, Agricultural Experiment Station; 1981. 15 p.

The study objective was to evaluate the usefulness of a set of growth guidelines to local public and private planners in achieving more effective use of local resources. The paper focuses on Manistee County and assesses some economic-ecologic impacts of a woodpulp plant.

66. Dicker-man, Alan; Butze, Stanley. The potential of timber management to affect regional growth and stability. Journal of Forestry. 73(5): 268-269; 1975.

A model was developed for the Pacific coast and western Montana relating personal income generated in 16 economic sectors to a matrix of expected transactions between sectors. Multipliers were computed by industry based on net exports from the region. A computer model was also developed to assess the impact of alternative harvest levels.

67. Drake, Ronald; Randall, Stanley; Skinne, Michael. Evaluation of economic impacts of Forest Service programs in northern New Mexico: development of analytical tools. Berkeley, CA: Department of Agriculture, Economic Research Service, Southwest Resource Group; 1973. 154 p. Office report.

Analytical methods for estimating economic impacts were developed and applied to seven case studies. The usefulness and limitations of the models were evaluated.

68. Duerr, W.A.; Teegarden, D.E.; Guttenberg, Sam. Decision making in forest resource management. Journal of Forestry. 66: 760-763; 1968.

Describes decision theory with emphasis on the firm, the interdependence of decisions, and the problems of forecasting with uncertainty.

69. Dutrow, George F. Shift-share analysis of southern forest industry, 1958-1967. Forest Products Journal. 22(12): 10-14; 1972.

Between 1958 and 1967, average growth rates for southern forest industries surpassed expansion rates for all manufacturing in the United States in terms of value added in production and new capital expenditures. Shift-share analysis and growth ratios reveal the amounts by which expansion of forest industries in the South exceeded growth of the same industries nationwide.

70. Dyer, Alien A.; Hof, John; Kelly, James; Crim, Sarah. Implications of goal programming in forest resource allocation. Forest Science. 25(4): 535-543; 1979.

The paper describes and evaluates the use of goal programming as a forest resource allocation model. Goal programming is compared with linear programming in terms of achieving Pareto optimal solutions.

71. Elsner, Gary H.; Oliveira, Ronald A. Predicting traffic load impact of alternative recreation developments. Res. Pap. PSW-96. U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1973. 11 p.

Describes how changes in traffic load as a result of expansion of recreation facilities may be predicted. Once the basic model has been established, development alternatives may be simulated to estimate probable traffic loads for each link of the road system. Estimates for six alternatives are illustrated for the Harney Peak area of South Dakota.

72. Enos, John L.; Griffi, Keith B. Planning development. London: Addison-Wesley Publishing Company; 1970. 262 p.

This book is concerned with the practical problems of planning policy in underdeveloped countries. The justification for planning is described, followed by an explanation of the characteristics, uses, and limitations of planning models.

73. Erickson, Rodney A. The spatial pattern of income generation in lead firm, growth area-linkage system. Economic Geography. 51(1): 16-26; 1975.

The spatial pattern of income generated by a large lead firm is examined by use of a case study of the Boeing Aerospace Company and its contribution to growth of the Puget Sound area from 1963 through 1968.

74. Faden, Arnold M. Economics of space and time: the measure-theoretic foundations of social science. Ames, IA: Iowa State University Press; 1977. 703 p.

Develops a "novel...approach to the economics of space, incorporating much of the classical economics of location in its modern framework." Examines the von Thunen optimization model which deals with minimization of overall transport costs subject to areal capacity and land use allotment constraints. Discusses interplant and inter-industry optimization problems, and the classical Weber problem dealing with choice of a plant location.

75. Ferguson, J.S. Wood chips and regional development. Australian Forestry. 36(1) 15-23; 1972.

Impact of a wood-chip project on the regional economy is examined using data from an **input-output analysis of the economy of western Australia.**

76. Field, David B. **Goal programming for forest management.** Forest Science. 19(2): 125-135; 1973.

Goal programming is a mathematical procedure for the determination of a plan of action that offers a minimum aggregate deviation from a set of quantitative goals. This paper presents the technical details of the goal programming model. Included is a review of its use and an illustration of a possible application to a forest management problem.

77. Finn, R. Forsund; Steiner, Strom. The generation of residual flows in Norway: an input-output approach. Journal of Environmental Economics and Management. 3(2): 129-141; 1976.

The generation of 35 kinds of residuals is analyzed by an input-output approach for the economy of Norway in 1977. The input-output model disclosed that exports from the pulp and paper, metals, and minerals sectors are the main contributors to the annual flow of residuals.

78. Flacco, Paul R. Projected income and employment impacts of a decline in the timber resource base of a highly timber-dependent economy. Corvallis, OR: Oregon State University; 1978. 76 p. M.S. thesis.

Analysis based on an existing primary input-output model and a household survey of Douglas County, Oregon. Direct and indirect impacts on nine income categories were measured.

79. Flick, W. A. Resource valuation and multiple use planning: an input-output approach. Syracuse, NY: State University of New York, College of Environmental Science and Forestry; 1972. Ph. D. dissertation.

Provides a quantitative input-output model for predicting the impact of changes in one activity on all other activities in the forest and a list of "decision values" for the resources of the forest, the values being implied by management decisions and stated in dollars.

80. Flick, Warren A. Resource flows and values. Tech. Note 276. Denver, CO: U.S. Department of the Interior, Bureau of Land Management; 1975. 35 p.

An input-output model of the Eugene District of the Bureau of Land Management was constructed. The "industry" sectors correspond to the five major resource programs of the district: timber, wildlife, recreation, roads, and air and water pollution.

81. Flick, Warren A.; Trench, Peter, III; Bowers, John R. Regional analysis of forest industries: input-output methods. Forest Science. 26(4): 548-560; 1980.

This paper presents a package of methods used to build an input-output model of Alabama. The model is based on a combination of primary and secondary data, and the structure of the forest industries is highlighted.

82. Forestry and Forest Products Division. Geographic comparison of the economics of pulp production. In: Proceedings, 5th session Food and Agriculture Organization of the United Nations (FAO) Advisory Committee on pulp and paper; 1964 April 27-28; Rome, Italy. Rome: Food and Agriculture Organization of United Nations; 1964. 33 p.

Study of industrial plant location, wood supply, (including tree species mix), pulp marketing, and prices. Capital and manufacturing costs and returns were estimated.

83. Fowler, Kenneth. Impacts of projected timber harvests in Humboldt County. Berkeley, CA: University of California; 1974. 116 p. Ph. D. dissertation.

Five alternative timber cutting levels are projected for a 20-year period ending in 1992. Models are developed to estimate effects of social factors, including employment, assessed valuation, gross regional product, and the productive capacity of the forest. Social tradeoffs associated with various rates of resource use are presented.

84. Friedmann, John R.P. Locational aspects of economic development. *Land Economics*. 32: 213-227; 1956.

The spatial incidence of investment, production, distribution, and consumption activities is crucial to the effective functioning of the activities in an economy.

85. Fromer, R. Some problems of regional planning in forestry. *Unasylva*. 15(2): 81-87; 1961.

Describes problems of regional forestry planning, Describes economic regions and production zones.

86. Gamble, Hays B. The regional economic role of forest products industries. *Journal of Forestry*. 66(6): 462-466; 1968.

The purpose of this paper is to define explicitly the role of forest products industries in the economic life of communities.

87. Gane, M. Priorities in planning cost and benefit methodology and simulation with special reference to forestry and economic development in Trinidad. *Inst. Pap.* 42. Oxford, England: Commonwealth Forestry Institute, University of Oxford; 1969. 101 p.

Contains technical descriptions of models and simulation techniques used in cost-benefit analysis of the wood-based sector of the Trinidad economy.

88. Giarratani, F. Application of an interindustry supply model to energy issues. *Environment and Planning A*. 8(4): 447-454; 1976.

An interindustry model relating gross output to the availability of primary inputs is used to examine supply linkages associated with national

energy production. The results of calculations for U.S. data highlight the importance of extractive energy sectors in intermediate production, and they identify supplying sectors that have the potential for restricting output. The use of this model as a means to simulate impact of alternative energy allocation programs on gross output is discussed, and the results of one simulation are presented.

89. Giarratani, Frank; Maddy, James D.; Socher, Charles F. [and others]. Regional and interregional input-output analysis: an annotated bibliography. Morgantown, WV: University of West Virginia, West Virginia Library; 1976. 126 p.

An annotated bibliography covering the theoretical, conceptual, and applied literature on regional and interregional input-output analysis.

90. Gillis, William; Butcher, W. Regional income effects of roundwood exports compared to local processing in timber dependent counties of western Washington. *Res. Cent. Circ.* 0620. Pullman, WA: Washington State University, College of Agriculture; 1979. 21 p.

Describes an econometric technique for estimating the effects on income when exports of roundwood from the timber-dependent region of western Washington are restricted.

91. Gilmore, John S. Boom towns may hinder energy resource development. *Science*. 191: 535-539; 1976.

Gilmore argues that isolated rural communities cannot handle sudden industrialization and growth without help. Major assistance--often involving institutional change--should come from States. In Gilmore's model community, economic stability is achieved when "the basic sector and the public services sector are more or less in balance."

92. Girgig, M.A. The regional income and employment multiplier effects of a pulp and paper mill. *Scottish Journal of Political Economy*. 18(1): 31-48; 1971.

Describes a multiplier model, constructed to analyze the effects of a subregion of a major industrial project on income and employment. Illustrates some of the difficulties of estimating the multiplier effects on income, and especially on employment.

93. Goldin, K.D. Roads and recreation. *Land Economics*. 48(2): 115-124; 1972.

Describes the allocation and distribution of roads and recreational services.

94. Green, George R. Community size and agglomeration of trade, service, and other locally oriented industries. Work. Pap. CWR 5. St. Louis, MO: Washington University, Institute for Urban and Regional Studies; 1966. 31 p. Office report.

This study is the first attempt to determine whether agglomeration effects might be predictable. Author describes the results of a statistical test for the assumption that residential employment rises more in proportion to the growth of total employment than in proportion to the demand for a region's industrial output.

95. Gregersen, H.M. The Latin American contribution to United States forest products imports: problems and potentials for the exporter. *Forest Products Journal*. 21(3): 16-20; 1971.

Discusses reasons for the comparatively small trade in tropical hardwoods, especially problems related to limitation of economically available quantities of acceptable species, the quality of processing, and difficulties in shipping and marketing. Possible remedies are considered.

96. Gregersen, Hans M. The role of forestry in regional economic development: an alternative view. *Journal of Forestry*. 71(2): 98-99; 1973.

The author presents eight views on the role of forestry in regional economic development in response to Kromm's (150) view.

97. Gregory, G. Robinson. Forest and economic development in Latin America: a challenge for the American forestry profession. *Journal of Forestry*. 63: 83-88; 1965.

This article shows why forests can and should play an important role in the development of Latin America; it emphasizes the need for American forestry to rise to the challenge.

98. Gregory, G. Robinson. **Forest resource economics**. New York: Ronald Press, 1972. 548 p.

Chapter 16 discusses the economics of transportation costs.

99. Gronberg, Timothy J.; Meyer, Jack. Spatial pricing and its effect on product transportability. *Journal of Business*. 55(2): 269-280; 1982.

The issue of which resources to devote toward making a product more transportable is addressed within the standard and spatial pricing model of a firm. The relationship between transportability and pricing mode is specifically examined.

100. Haalik, Henry A. The role of physical and non-physical determinants of resource access roads in National Forest transportation planning. Syracuse, NY: State University of New York, College of Forestry; 1975. 386 p. Ph. D. dissertation.

The nonphysical determinants are laws, regulations, orders, objectives, plans, studies, research, hearings, court actions, advisory committees, interest groups, the public, and economic factors. The physical determinants are geographic location, land surface, and terrain features. The author describes forest resources, road characteristics, and transportation systems as they relate to National Forests.

101. Hagenstein, P.R. The location decision for primary wood-using industries in the northern Appalachians. Dissertation Abstracts. 24(2): 457; 1963.

Author discusses factors determining plant locations. Quantitative estimates (derived from interviews) of location requirements for plants of specific sizes in the lumber, particle board, and pulp industries were used in constructing a model for selecting economically optimum plant locations.

102. Hagenstein, P.R. The location decision for wood-using industries in the northern Appalachians. Res. Pap. NE-16. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1964. 36 p.

Discusses the future location of the lumber, particle board, woodpulp, and furniture industries in relation to wood requirements, labor, and transportation.

103. Hamilton, H.R.; Goldstone, S.E.; Milliman, J.W.; [and others]. Systems simulation for regional analysis: an application to river-basin planning. Cambridge, MA: H.I.T. Press; 1969. 407 p.

The purpose of this book is to explore how systems simulation may be applied to regional analyses. Although the actual model presented was developed within the context of river-basin analysis and planning, the findings of the research and the model developed are similar to other applications and may serve as a starting point for the construction of other regional simulation models.

104. Hamilton, T.E. Dimensions of the structure and performance in the Wisconsin pulpwood market. Dissertation Abstracts. 25(10): 5603; 1965.

Discusses efficiency of production and transportation and rate of profit for pulp and paper mills and for pulpwood producers and intermediate market agents.

105. Hamilton, T.E. Log export policy: theory vs. reality. Journal of Forestry. 69(8): 494-497; 1971.

Discusses economic theory regarding exports, U.S. economic statistics for 1961-69, national objectives and export policies, and some special characteristics of the forest products industry in relation to the controversy over increasing log exports to Japan.

106. Hammon, G.A.; McDonald, J.K. Recreation information management. Trends in Parks and Recreation. 4(2): 29-32; 1967.

Describes a recreation information management system, called RIM, that provides a detailed picture of where and when recreation use occurs on National Forest lands in relation to planned capacity. The system provides a wide variety of descriptive data such as the biological, physical, and esthetic characteristics of land and water units.

107. Hansen, Niles M., ed. Public policy and regional economic development: the experience of nine western countries. Cambridge, MA: Ballinger; 1974. 354 p.

Collection of 10 papers, each dealing with the following topics: general regional tendencies, policy issues and goals, regional development

policies and tools for their implementation, evaluation of policies, and indications of likely future directions of regional policy.

108. Hartman, L.M. Simulating a regional economy. Back, W.B.; and Waldrop, John E., Jr., eds. Regional studies of income distribution. Baton Rouge, LA: Louisiana State University; 1966: 83-88.

The objective of this paper is to indicate a tentative formulation of a regional simulation model for studying the effects of government programs on distribution of income. The model attempts to show procedural steps for computer programs to reproduce certain aspects of a regional economy over time.

109. Haynes, Richard W. A dynamic spatial-equilibrium model of the softwood timber economy with demand equations specified. Raleigh, NC: North Carolina State University; 1975. 109 p. Ph. D. dissertation.

A model for estimating changes in product prices and processing-plant locations resulting from changes in the geographic pattern of the U.S. softwood timber output.

110. Herrick, Owen W. Delimiting regional sub-areas for studies of timber-resource based activity in the Northeast. Forest Science. 19(3): 180-189; 1973.

The Northeast is classified into homogeneous subareas based on a variety of physical, economic, and demographic variables postulated to reflect conditions underlying timber-based activity in the region. Factor and cluster analyses provided efficient and objective procedures for classifying this extensive and complex region.

111. Hewings, Geoffrey J.D. Regional industrial analysis and development. The field of geography series. New York; St. Martin's Press; 1977. 180 p.

Describes the economic base and trade-flow analysis, the input-output analysis, theories of regional economic growth and public policy, and the problem of implementing development guidelines.

112. Hill, Forest G. Regional aspects of economic development. *Land Economics*. 38(2): 85-93; 1962.

Describes how regional development helps to shape and is shaped by national development, how national economic policy has differential effects on regions, and why policy should be adapted to regional conditions.

113. Hirsch, W.Z. Regional information design for public decisions. *Review of Income and Wealth*. 15(4): 369-380; 1961.

Key characteristics of regional accounts and regional information systems of relevance primarily at the State or Province level are examined first. Then the nature and scope of regional decisions are reviewed. Finally, one regional information design is sketched; it classifies the environmental and program information useful in regional decisionmaking.

114. Hirsch, Wemer Z.; Sonenblum, Sidney. Selecting regional information for government planning and decision-making. *Praeger special studies in U.S. economic and social development*. New York: Praeger; 1970. 198 p. Published in cooperation with Los Angeles, CA: University of California, Institute of Government and Public Affairs.

Outlines a "subnational information design (SID) that will facilitate improved (economic policy) decisions at the state and local levels." Describes the construction, mechanics, and uses of such an information retrieval system by urban and other regional decisionmakers.

115. Holland, I.I. Foreign trade in forest products from the point of view of the importing country: the United States. *Journal of Forestry*. 60(8): 538-545; 1962

Examines U.S. import position with Canada and suggests possible future trends.

116. Holland, I.I.; Judge, G.G. Estimated interregional flows of hardwood and softwood lumber. *Journal of Forestry*. 61(7): 488-497; 1963.

This study attempts to describe separately the distribution of hardwood and softwood lumber in 1958-under optimum conditions of minimum total transportation costs.

117. Holley, L.D. Location of the softwood plywood and lumber industries: a regional programming analysis. *Land Economics*. 46(2): 127-137; 1970.

A linear programming model demonstrates that the location of lumber and plywood production in the United States is inefficient and unstable. The plywood shift to the South is a move toward equilibrium. Results of the model justify more intensive forest management in the South than in any other region.

118. Holley, Lester D. Regional aspects of long-range planning in forestry. In: Convery, Frank; Ralston, Charles, eds. *Forestry and long-range planning*. Durham, NC: Duke University, School of Forestry and Environmental Studies; 1977: 75-78.

The objective of this paper is to discuss some of the regional aspects of planning the production and consumption of timber and timber products.

119. Hopkins, F.E. Transportation cost and industrial location; an analysis of the household furniture industry. *Journal of Regional Science*. 12(2): 261-277; 1972.

This article includes a discussion of the effect of transportation cost on industrial location. A model was used to investigate the level of employment and rate of change in employment in the household furniture industry between 1964 and 1966 at the county level for the continental United States.

120. Hughes, Jay. Forestry in Itasca County's economy: an input-output analysis. Misc. Rep. 95. St. Paul, MN: University of Minnesota, Agricultural Experiment Station; 1970. 98 p.

The publication uses an input-output framework for analyzing the impacts of changes in the level of activity associated with the timber resources of Itasca County. A 39- by 39-sector model was used. Transactions tables, technical coefficients, and expenditure multipliers are presented. Discusses the multiplier effect and what it means and does not mean for the planning process.

121. Hultman, Charles W. Exports and economic growth: a survey. *Land Economics*. 43(2): 148-157; 1967.

Article discusses and compares several models that have been advanced to describe the method and extent to which external trade has facilitated economic growth of regions or nations. Among the important approaches are: (a) the foreign trade multiplier models, (b) the "growth" models, (c) the leading sector, (d) the staple model, (e) the export base, and (f) the development stages (or location theory).

122. Hwang, Henry H.; Maki, Wilbur R. User's guide to the Minnesota two-region input-output model. Staff Pap. Ser. P79-34. St. Paul, MN: University of Minnesota, Department of Agricultural and Applied Economics. 1979. 85 p.
123. Hyde, William F. Timber supply, land allocation and economic efficiency. Washington, DC: Resources for the Future; Baltimore: Johns Hopkins University Press; 1980. 224 p.

This book explains some of the economic theory that is relevant to modeling longrun timber supplies and the optimal allocation of forest land to timber production and to other uses, principally recreation. This analysis is applied to two case studies from the important Douglas-fir region (roughly the area of Oregon and Washington west of the Cascade Range) which produces one-quarter of the Nation's softwood timber.

124. Irland, Lloyd C. Wilderness economics and policy. Lexington, MA: Heath, Lexington Books; 1979. 225 p.

Author concludes that economies may be useful for studying the markets for products of wilderness areas, for clarifying the impact of decisions, for describing the costs and benefits of wilderness areas, and for aiding in setting preservation priorities.

125. Isard, Walter. Location and space-economy: a general theory relating to industrial location, market areas, land use, trade, and urban structure. Cambridge, MA: M.I.T. Press; 1956. 350 p.

This book is Isard's important initial contribution to spatial economics. Topics are general theories of location and space-economy, transport

inputs and related spatial concepts, the locational equilibrium of the firm, and an analysis of the market and supply area.

126. Isard, Walter. Methods of regional analysis: an introduction to regional science. The regional science study series. Cambridge, MA: M.I.T. Press; 1960. 784 p.

Author purports to refine the spatial and regional frameworks of the social science disciplines, especially economics, through the development of a more adequate general theory of location and space-economy.

127. Isard, Walter. General theory: social, political, economic and regional, with particular reference to decision making analysis. The regional science study series. Cambridge, MA: M.I.T. Press; 1969. 1,040 p.

Offers "a general theory on the social, political and economic structure of regions."

128. Isard, Walter. Some notes on the linkage of the ecologic and economic systems. Papers, Regional Science Association. 22: 85-96; 1969.

This paper discusses concepts relating to linkages between the economic and the ecologic systems and how these linkages could be analyzed.

129. Isard, Walter. Problems of regional economic development: discussion. *American Economic Review*. 68(2): 116-117; 1978.

The challenge centers around the development of an operational framework for deepening, in the study of an individual region, the analysis and projection of its connections with every other region in a system such as the U.S. system.

130. Isard, Walter; Van Zeie, Roger. Practical regional science analysis for environmental management. *International Regional Science Review*. 1(1): 1-25; 1975.

Presents basic techniques for environmental management. Techniques discussed help describe and predict both economic and ecological consequences of alternative plans. But for techniques to be put to use, the political process must provide the values to be reflected in environmental decisions.

131. James, G.A.; Henie, R.K. Sampling procedures for estimating mass and dispersed types of recreation use on large areas. Res. Pap. SE-31. Asheville. NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1968. 15 p.
132. Johansson, Per-olov. On regional effects of government policies in a small open economy. Scandinavian Journal of Economics. 83(4): 541-552; 1981.

A regional version of "disequilibrium" situations affects the shortrun impacts of government policies. The impacts of government are analyzed under flexible and fixed exchange rates.

133. Johnston, Warren E.; Elsnor, Gary. Outdoor recreation as a sector for economic development. 16th IUFRO World Congress (Div. 4), Oslo, 1976, (Place of publication unknown) (Publisher name unknown); p. 110-121. 1976.

Concludes that data amassed from a "systems" viewpoint is required for assessing the applicability of outdoor recreation-oriented programs in fulfilling economic development.

134. Jones, Barclay G.; Ragatz, Richard L.; Uathauikul, P. Regional analysis for economic development. Ithaca, NY: Cornell University, Division of Urban Studies, Center for Housing and Environmental Studies; 1964. 143 p.

The purpose of this study is to consider the economic development problem of Schoharie County, New York, in a broad general framework of similar kinds of problems that characterize many rural counties in this country.

135. Jones, Clifford D., Jr. Input-output analysis applied to rural resource development planning. ESCS-14. Washington, DC: U.S. Department of Agriculture, Economic Statistical and Cooperative Service; 1978. 94 p.

The use of an input-output model for estimating the economic impact of resource conservation and small watershed projects is illustrated.

136. Kaiser, H.F., Jr. Interindustry model of the U.S. forest products economy. Forest Products Journal. 18(11): 15-18; 1968.

An input-output model is developed to show the flow of goods through the forest products industry economy. Data from 1963 Census of Manufactures (227) are used to analyze each forest industry's contribution to the economy. Calculations were also made to determine direct and indirect effects of an increase in final demand for each industrial sector.

137. Kaiser, H.F., Jr. Input-output analysis of the southern forest economy, 1963. Res. Pap. SO-43. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1969. 18 p.

Analysis of data from the 1963 Census of Manufactures (227) indicates that primary processing industries produce \$5,126 million worth of output and purchase stumpage costing \$335 million. Secondary processing industries converted a portion of this output into products worth \$3,365 million. Collectively, forest related industries paid \$2,181 million in wages to southerners.

138. Kaiser, H.F., Jr. Multi-regional input-output model for forest resource analysis. Forest Science. 18(1): 46-53; 1972.

An input-output model is developed to show the flow of goods through the forest products economy. Calculations also show direct and indirect effects of an increase in final demand for each industrial sector.

139. Kallio, Edwin; Dickerhoof, Edward H. Business and economic information available for market planning. Forest Products Journal. 29(10): 61-66; 1979.

Literature on forest products and their markets is expanding rapidly. The business manager must know where and how to select appropriate sources of information. Library reference sources and computer systems can help find the latest information on current and future products, production methods, and markets.

140. Kalter, Robert J.; Lord, William B. Measurement of the impact of recreation investments on a local economy. *American Journal of Agricultural Economics*. 50(2): 243-256; 1968.

A from-to type of interindustry model is formulated and empirically implemented to quantify local economic impacts of expenditures resulting from outdoor recreation. Direct, indirect, and induced sales, income, and employment impacts are derived; and multiplier values are calculated. Relationships among the from-to model, supplemental studies, and the analysis of regional benefits from governmental investment decisions are discussed.

141. Kennedy, J.J., Jr. The economic impact of outdoor recreation activities on a rural area economy: an input-output approach. University Park, PA: Pennsylvania State University; 1966. M.S. thesis.

142. King, K.F.S. Conflicting demands for land-economic factors and their reconciliation. *Unasylva*. 19(4): 195-199, 202; 1965.

Discusses economic and noneconomic factors for land use decisionmaking, including supply and demand, labor requirements, market location, and industrial crop possibilities.

143. Kirby, Malcolm. Land use planning, transportation planning, and integer programming. In: *Systems analysis and forest resource management; Proceedings of a workshop; SAF Systems Analysis Working Group*. Society of American Foresters; 1975 August 11-13; University of Georgia, Athens, GA. Athens, GA: University of Georgia; 1976: 271-284.

Suggests the potential range of applications of mathematical programming to planning problems in land use and transportation.

144. Klaassen, L.H.; Paelinck, J.H.P.; Wagenaar, S. Spatial systems: a general introduction. Westmead, England; Teakfield, Saxon House; 1979. 165 p. Netherlands Economic Institute, Studies in Spatial Analysis Series.

Discusses the advantages of "integral approaches" to planning that recognize the interrelationships among sectors of the regional economy and develops the concept of "potential access" to employment and other economic opportunities, linking it to the construction of a spatial welfare function.

145. Klein, E.L.; Fogg, P.J. Marketing practices of Louisiana sawmills. *Wood Util. Note*. Baton Rouge, LA: Louisiana State University, School of Forestry; 20: 4; 1970.

Provides general information on sources of logs, sales locations, and marketing channels.

146. Knetsch, J.L. Forest recreation: a case of non-market resource use. *Journal of Forestry*. 65(2): 102-105; 1967.

Author points out that most forest-based recreation is provided outside traditional markets, and also describes a method of calculating recreation benefits based on travel cost data.

147. Kort, John R. The theory of economic stability differentials; analysis, reformulation, and empirical evidence. Knoxville, TN: University of Tennessee; 1979. Ph. D. dissertation.

The entropy measure of industrial diversification is used to examine variation in regional growth. A model of 106 standard metropolitan statistical areas, corrected for city-size variation, showed that diversification was one of the factors accounting for regional differences in economic instability.

148. Kort, John R. Regional economic instability and industrial diversification in the U.S. *Land Economics*. 57(4): 596-608; 1981.

The purpose of this paper is to test the relationship among the economic variables: diversification, economic instability, and city size. The model explains variations in regional economic instability.

149. Kresge, David T.; Seiver, D. Planning for a resource-rich region: the case of Alaska. *American Economic Review*. 68(2): 99-104; 1978.

Describes a model for estimating the regional economic impacts of resource development, and more specifically, for evaluating regional policies designed to deal with these impacts. The Alaska model offers an excellent laboratory for a general analysis of resource development.

150. Kromro, D.E. Limitations on the role of forestry in regional economic development. *Journal of Forestry*. 70(10): 630-633; 1972.

The author questions the role of forestry as a method of growth. The presentation is mainly qualitative rather than quantitative.

151. Kuklinski, Antoni; Kultaihti, Olli; Koskiah, Briita, eds. *Regional dynamics of socio-economic change*. Tampere, Finland: Finnpublisher; Atlantic Highlands, NJ: Humanities Press; 1979. 547 p.

Methods and approaches to rules used to control socio-economic change in regional development. Focuses on the processes, methods, and approaches to regional planning policy in different countries,

152. Laurent, F.A.; Hite, J.C. *Environmental planning: an economic analysis-application for the coastal zone*. New York: Praeger Publishers; 1972. 155 p.

The book develops the body of economic logic applicable to resource problems in the coastal zone and diagnoses the problems as legitimate matters of economic concern.

153. Le Heron, R.B. Best practice firms and productivity changes in the Pacific Northwest plywood and veneer industry, 1960-1972: some regional growth implications. *Environment and Planning A*. 8(2): 163-172; 1976.

This study summarizes the results of an empirical investigation of regional development roles of best practice firms in the Pacific Northwest plywood and veneer industry. It examines interrelations between growth impacts of high productivity performance and output and employment change, and the relative growth impacts of high productivity, best practice firms and less productive, nonbest practice firms.

154. Leuschner, William A. An econometric analysis of the Wisconsin aspen pulpwood market. *Forest Science*. 19(1): 41-46; 1973.

An econometric study of the short-term aspen pulpwood market in Wisconsin is described. The choice of variables entering the mathematical model, the method of parameter estimation, and the results of the analysis are discussed.

155. Leven, Charles L. The economic base and regional growth. In: Maki, W.R.; Berry, B.J.L., eds. *Research and education for regional and area development*. Ames, IA: Iowa State University Press; 1966: 79-94.

Discusses the base theory of regional growth. Author examines what the economic base should theoretically include. The relationship between the neoclassical stages of growth theory is related to the growth of the economic base.

156. Leven, Charles L.; Legler, John B.; Shapiro, Perry. *An analytical framework for regional development policy*. Cambridge, MA: M.I.T. Press; 1970. 192 p.

This book establishes criteria for the definition and the number of output and final demand sectors, and for the degree of industrial disaggregation in the production and resource accounts.

157. Leven, Charles L.; Legler, John B.; Shapiro, Perry. Regional analysis problems. In: Kuklinski, Antoni R., ed. *Regional information and regional planning*. Amsterdam, Netherlands: Mouton Publishers; 1974. 389 p.

This paper is about the "empirically implementable analytical system" that could make an effective contribution to the problem of how to effectively account for the regional dimension in national economic development policy.

158. Linowes, R. Robert; Allensworth, Don T. *The States and land-use control*. Praeger Special Studies in U.S. Economic, Social and Political Issues. New York, Praeger Publisher: 1975. 243 p.

Demonstrates the interrelationship of land-use controls and various public facilities and services such as highways, water, and control of air pollution. Discusses the role of State policies, particularly the influence of State institutions (legislature and courts), as well as public and private interests.

159. Lyon, Kenneth S. Mining of the forest and the time path of the price of timber. *Journal of Environmental Economics and Management*. 8(4): 330-344; 1980.

The paper analyzes the effect of transportation (site specific) costs and the effect of mining (depletion) of the forest on the time path of the price and the net price of timber in the forestry models. The models differ in that one has zero costs, the other has positive costs. For certain costs, the analyses yield the standard mining theory results. The paper concludes that the theory of the mine is useful for analyzing the time path of the price of timber.

160. Maki, Wilbur; Schallau, Con H.; Beuter, John H. Importance of timber-based employment to the economic base of the Douglas-fir region of Oregon, Washington, and northern California. Res. Note PNW-76. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1968. 6 p.

Degree of economic dependency on timber industries was estimated for 15 subareas of the Douglas-fir region of Washington, Oregon, and California. This analysis was part of a study of how the region's forest resources can better contribute to the economic growth and development of the region. Dependency, measured in terms of the percent of economic (or export) base employment accounted for by timber-dependent industries, ranged from 6.2 percent for the Seattle economic area to 99.4 percent for the Roseburg area. Timber-dependent industries accounted for approximately 45 percent of the Douglas-fir region's economic base employment.

161. Maki, Wilbur; Schweitzer, Dennis L. Importance of timber-based employment to the Douglas-fir region, 1959 to 1971. Res. Note PNW-196. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1973. 11 p.

Contrary to substantial increases in total employment in the Douglas-fir region from 1959 to 1971, employment in timber-dependent industries declined slightly. Only 3 of the 14 economic areas in the region matched national gains in employment in these industries. Although economies that were highly dependent on timber in 1959 still were in 1971, in nearly every instance a smaller proportion of economic base employment was concentrated in the timber-dependent industries.

162. Manthy, R.S. Marketing pulpwood in the north central region. Dissertation Abstracts. 25(4): 2137-2138; 1964

163. Manthy, R.S. Pulpwood procurement practices viewed by forest economist. Technical Papers of the American Pulpwood Association. Montgomery, AL; January 1966: 5-8.

Shows the interrelationships between the agents or institutions within the marketing system in the Southeastern United States, and discusses some implications for pulpwood producers.

164. Masser, A.N.; Brows, Peter, eds. Spatial representation and spatial interaction. Leiden; Boston: Martinus Nijhoff Publishing; 1978. 212 p.

This book draws together various related investigations regarding spatial interaction research and sets them in a general framework within which the problem of spatial representation is viewed as part of the general problem of aggregation.

165. Massie, M.R.C. Marketing timber products in selected areas of the north central region. Dissertation Abstracts. 26(8): 4147; 1966.

Includes information on procurement, methods of transporting raw material and distances covered, profits, and changes in marketing practices that might increase marketing efficiency.

166. Mathur, Vija. Spatial economic theory of pollution control. *Journal of Environmental Economics and Management*. 3(1): 16-28; 1975.

The spatial theory of the firm presented in this paper casts doubt on the efficacy of a pollution tax to achieve the desired goal of the administration to tax sulfur oxide emissions over and above the Federal standard for electric powerplants.

167. McConnen, Richard J. The use and development of America's forest resources. *Economic Botany*. 21(1): 2-14; 1967.

The increased importance of recreation, water, and other multiple uses will have a great influence on the development and use of forest lands.

168. McConnen, Richard J.; Navon, Daniel I.; Amidon, Elliot. Efficient development and use of forest lands: an outline of a prototype computer-oriented system for operational planning. Forestry Commission (London), Forest Record. 59: 18-32; 1966.

The prototype system consists of a computer-oriented system called MIADS—an analytical model in linear programming format—and solutions for this model; also, auxiliary computer programs to update resource inventory information.

169. McKillop, William; Mead, Walter, eds. Timber policy issues in British Columbia. Vancouver, BC: University of British Columbia; 1974. 277 p.

This book was developed from a conference on British Columbia timber policy held in Vancouver. The articles fall into three sections: (1) goals, conflicts, and opportunities; (2) perspectives in resource administration; and (3) determining management priorities.

- 170.. Meadows, John Crawford. Some approaches to considering the impact of forest based industries on the southern economy—an examination of growth using some comparative static models. Durham, NC: Duke University; 1970. 463 p. Ph. D. dissertation.

Study examines some of the possible approaches to considering the potential contribution forest-based industries make to regional growth. The region considered is the Southeastern United States, a region with distinctly low levels of economic activity and, according to most measures, relatively abundant forest resources.

171. Michigan Department of Commerce. A 44-sector input-output model of the Michigan economy. Lansing, MI: Michigan Department of Commerce, Energy Administration; 1980. 20 p. (Energy issue analysis series).

A 44-sector model of the Michigan economy is presented. By use of Hwang and Maki's (122) method, national statistics are split into Michigan and the rest of the Nation. A table was developed primarily for the consideration of energy issues.

172. Mierynk, William H. Long range forecasting with a regional input-output model. Western Economic Journal. 6(3): 165-176; 1968.

Discusses method for constructing a regional input-output table that uses location quotients for regional forecasting.

173. Moody, Harold T.; Puffer, Frank W. A gross regional product approach to regional model building. Western Economic Journal. 7(4): 391-402; 1969.

Authors attempt to evaluate the usefulness of regional income and product accounts in the analysis of regional economy. The introduction of the demographic and income sectors allows some exploration of regional interactions.

174. Moore, B.C.; Rhodes, J. Regional economic policy and the movement of manufacturing firms to development areas. Economica. 43(169): 17-31; 1976.

Provides information on one of the major mechanisms for creating employment in regions of high unemployment. Regression analysis is used to estimate the impact of different instruments of regional policy on the number of new firms moving into development areas.

175. Morey, Edward R. The demand for site-specific recreational activities: a characteristic approach. Journal of Environmental Economics and Management. 8(4): 345-371; 1981.

A model of constrained utility maximizing behavior is developed to explain how a representative individual allocates ski days among alternative sites. A multinomial logit model of skier behavior is also developed, and maximum likelihood estimates of its parameters are obtained.

176. Moroney, John R. Natural resource endowment and comparative labor costs: a hybrid model of comparative advantage. Journal of Regional Science. 15: 130-150; 1975.

The paper first presents a synthesis of two theories that have historically been treated as alternative explanations of comparative advantage; then it uses a simplified hybrid model to partially explain why the low-wage southern region of the United States produces large concentrations of certain capital intensive goods.

177. Murray, James M.; Harris, James J. A regional economic analysis of the Turtle Mountain Indian Reservation: determining potential for commercial development. Minneapolis, MM: Prepared for Federal Reserve Bank of Minneapolis; 1978. 26 p. (Ninth District Economic Information Series).

An economic base model and the threshold analysis technique are used to examine opportunities for business expansion.

178. Nashlund, B. The principle of sustained yield and forest management. *Scandinavian Journal of Economics*. 79(1): 1-7; 1977.

For several reasons, it seems reasonable to base an analysis of optimal forest management on a principle of a guaranteed longrun supply of wood. Optimal policies for forest management (fertilization, thinning, rotation) can thereby be determined with less reliance on estimates of future prices. Optimal control theory is applied, and the use of the ad joint variable for economic information is discussed.

179. Navon, Daniel I. Short-run and long-run models for planning forest transportation. In: Systems analysis and forest resource management: Proceedings of a workshop; Society of American Foresters Systems Analysis Working Group: Society of American Foresters; 1975 August 11-13; University of Georgia, Athens, Ga. Athens, GA: University of Georgia; 1976: 300-312.

Describes two models for attacking short- and long-range planning problems of an integrated forest enterprise that sells logs delivered to the mill gate.

180. Needleman, L., eds. Regional analysis: selected readings. London: Penguin Books, Ltd.; 1968. 395 p.

Selections are concerned specifically with the economic aspects of regional science and especially with the techniques of regional economic analysis.

181. Norman, George. Economies of scale, transport costs and location. *Studies in Applied Regional Science* 16. Boston: Martinus Nijhoff; 1979. 205 p.

Employs mathematical programming and activity analysis techniques to examine industrial spatial

choice decisions in a world in which production units are allowed to operate in nonconvex regions of their total cost-curves.

182. North, Douglas J. Location theory and regional economic growth. *Journal of Political Economy*. 63: 240-255; 1955.

To understand the growth of regions, according to North, one must understand the rate of growth of the export base. As the income in a region grows and transfer costs become less significant, the region will export goods and services once produced solely for local consumption. This leads to diversification of the export base and ultimately causes local economies "to lose their identity as regions" (224).

183. Oliveira, Ronald A. Systems analysis in land use planning...a conceptual development. Gen. Tech. Rep. PSW-5. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1973. 8 p.

Describes the general structures of a land use decision model approached through systems analysis, with an example of its application on a USDA Forest Service Ranger District.

184. Osteen, Craig D. An application of a linear programming model to spatial planning of forest resources in the Kalamazoo River basin of Michigan. East Lansing, MI: Michigan State University; 1976. 350 p. Ph. D. dissertation.

The objective of the study is to examine the feasibility of building an integrated land inventory and evaluation system for river basin planning studies. The location aspect of the model is emphasized.

185. Osteen, Craig D.; Chappelle, Daniel E. Forest resource management options for Kalamazoo River basin. Res. Pap. 404. East Lansing, MI: Michigan State University, Agricultural Experiment Station; 1981. 12 p.

This research report provides land management guidelines for three interdependent forest resource concerns in the Kalamazoo River basin: (1) increasing production from nonindustrial, privately owned woodlands; (2) maintaining or increasing wildlife; and (3) protecting water quality.

186. Paelinck, Jean H.P.; Klaassen, Leo H. [and others]. Spatial econometrics. Westmead, England: Teakfield, Saxon House, 1979. 211 p. (Netherlands Economic Institute, Studies in Spatial Analysis Series).

Introduces the general principles of the econometric modeling of phenomenon characterized by spatial interdependence. Treats problems of specification, identification, estimation, and hypothesis testing and provides empirical results illustrating basic concepts.

187. Palmini, Dennis J. The secondary impact of non-point pollution control: a linear programming/input-output analysis. *Journal of Environmental Economics and Management*. 9(3): 263-278; 1981.

A joint linear-programming interindustry model is used to estimate the impact on small regional economies of nonpoint pollution controls of agriculture. Results from the linear-programming submodel of the farm production sector of a region are entered as final demand changes in the "rows-only" interindustry model of the regional economy. Emphasis is placed on describing the models and the linkages between them and on evaluating the usefulness and limitations of the modeling approach. A brief review of empirical results is also given.

188. Park, Se-Hark; Mohtadi, Maiek; Kubursi, Atif. Errors in regional nonsurvey input-output models: analytical and simulation results. *Journal of Regional Science*. 21(3): 321-339; 1981.

This paper derives analytical error functions that specify mathematically the error functions associated with the use of a nonsurvey input-output table that would be unknown without a study.

189. Pillai, N.G. Regional development and economic growth, problems, analysis and policies. Selected bibliography. Ottawa, ON: Department of Regional Economic Expansion; 1969. 285 p.

Lists books, pamphlets, and journals on many topics including regional development and economic growth.

190. Fleeter, Saul, ed. Economic impact analysis: methodology and applications. *Studies in Applied Regional Science* 19. Boston: Martinus Nijhoff; 1979. 196 p.

Reviews basic regional models and foundations of the economic base model, and discusses input-output models. Also discusses application of regional models, such as econometric and regional input-output models for impact analysis and the multi-regional, multi-industry forecast model.

191. Richardson, Harry W. The state of regional economies: a survey article. *International Science Review*. 3(1): 1-48; 1978.

This paper reviews three categories of regional economics research: theory, methods, and policy. Author suggests that many of the unresolved questions in regional economics overlap disciplinary boundaries and require the interdisciplinary skills of regional science rather than those of mainstream economics.

192. Risbrudt, Christopher. Past and future technological change in the U.S. forest industries. East Lansing, MI: Michigan State University; 1979. Ph. D. dissertation.

The author examines technological change in the forest industries covered by SIC codes 2411, 242611, and 2621. Qualitative and econometric measurements are used.

193. Roberts, R.B.; Fishkind, H. The role of monetary forces in regional economic activity: an econometric simulation analysis. *Journal of Regional Science*. 19(1): 15-29; 1979.

The simulation analysis indicates that regional econometric models that exclude considerations of regional financial markets are capable of reasonable simulation behavior and can produce adequate forecasts. A more structural model, however, that explicitly allows for regional financial markets can provide greater accuracy.

194. Rose, Adam; Nakayama, Benand; Stevens, Brandt. Modern energy region development and income distribution: an input-output analysis. *Journal of Environmental Economics and Management*. 9(2): 149-164; 1982.

This paper formulates an input-output method for determining the distributional consequences of energy development projects. An analysis of geothermal energy development in Imperial County, California, is presented. Results indicate that inequality of personal incomes is likely to increase by several percentage points as measured by the Gini Coefficient. Sensitivity of the results is examined for important factors such as labor supply elasticities, preferential employment of local residents, and concentration of land holdings.

195. Ross, Peggy J.; Bluestone, Herman; Mine, Fred K. Indicators of social well-being for U.S. counties. *Rural Dev. Res. Rep.* 10. Washington, DC: U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service; 1979. 18 p.

This report describes how four composite indexes of social well-being for 3,097 U.S. counties were constructed. These indexes—socio-economic, health, family status, and alienation—are depicted by U.S. county maps and through mean index scores of counties grouped by metro-nonmetro status and rural-urban orientation.

196. Row, dark. Regional competition in softwood lumber. *Society of American Foresters proceedings* 1962. Washington, DC; 1963: 97-103.

The widespread internal change of the last decade will continue. Increased timber supplies, trends in regional production and freight costs, characteristics of lumber species in relation to demand, and the shifting geography of lumber consumption favor the western pine region. Southern States west of the Mississippi, and Canadian imports.

197. Russell, Robert M. WRIS: a resource information system for wildland management. *Res. Pap. PSW-107*. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1975. 12 p.

WRIS provides a means of collecting, processing, storing, retrieving, updating, and displaying

geographic, data and makes possible the performance of logical operations on these data.

198. Sartorius, Peter; Heni, Hans. Forestry and economic development. *Praeger special studies in international economics and development*. New York: Frederick A. Praeger; 1968. 340 p.

Discusses the role of forestry in rural economics of both developed and underdeveloped countries and considers its relationship to economic development. Provides a general discussion of world lumber markets, manpower needs, and the possibilities of establishing forestry industries in the less developed countries.

199. Schallau, Con H; Maki, Wilbur; Beuter, John. Economic impact projections for alternative levels of timber production in the Douglas-fir region. *Annals of Regional Science*. 3(1): 96-106; 1969.

The paper explores whether permanent forests, producing a sustained, even flow of timber, assure economic stability of timber-dependent communities; also, how sustained yield forestry affects employment and population in today's ever changing economy.

200. Schallau, Con H. An economic analysis of accelerated road construction on the Bureau of Land Management's Tillamook resource area. *Res. Pap. PNW-98*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1970. 29 p.

Acceleration of road construction in the Bureau of Land Management Tillamook resource area would not be economically feasible. Although doubling the current rate of construction would increase thinning yields, added stumpage revenues would not compensate for higher interest, timber sale administration, and maintenance charges. In fact, investment in such a plan would earn a minus 1.25-percent rate of return.

201. Schallau, Con H. Can regulation contribute to economic stability? *Journal of Forestry*. 72(4): 214-216; 1974.

Examines the efficacy of strict adherence to nondeclining even-flow as a means of fostering economic stability of timber-dependent communities,

202. Schallau, Con H. Stages of growth theory and money flows from commercial banks in timber dependent communities. Res. Pap. PNW-279. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1980. 16 p.

The flow of funds from commercial banks in western Oregon may indicate how a timber short fall will affect community stability. Results suggest the inappropriateness of a single public forest management policy.

203. Schuster, Ervin G. Local economic impact: a decision variable in forest resource management: a study report. Missoula, MT: University of Montana, Montana Forest and Conservation Experiment Station, School of Forestry; 1976. 104 p.

This paper considers local economic impacts that result from changes in forest management decisions (for example, timber harvesting) in the Forest Service. The direct and indirect consequences, both short and long range, of these decisions is discussed.

204. Schuster, Ervin G.; Hatch, Charles; Koss, William. Location quotients, excess employment and short-run economic base multipliers for Idaho's forest products industry. Inf. Ser. 10. Moscow, ID: University of Idaho, Wildlife and Range Experiment Station; 1975. 25 p.

This paper focuses on three measures commonly used in the evaluation of alternatives: (a) location quotient, (b) excess employment, and (c) shortrun economic base multipliers.

205. Schuster, Ervin G.; Koss, William D.; Godfrey, E. Bruce. Employment and wages in Idaho's forest products industry. Inf. Ser. 5. Moscow: University of Idaho, Wildlife and Range Experiment Station; 1974. 48 p.

This paper focuses on selected characteristics of the forest products industry. It addresses questions about wages, employment, total sales, number of firms, and value added by the industry.

206. Serck-Hanssen, Jan. Optimal patterns of location. Contributions to Economic Analysis 66. Amsterdam; London: North-Holland; 1970. 235 p.

Discusses the conditions necessary for optimal spatial distribution and attempts to analyze the type of market mechanism that will bring about an optimal solution.

207. Shane, Mathew D. The flow of funds through the commercial banking system, Minnesota-North Dakota. Stn. Bull. 506. Minneapolis, MN: University of Minnesota Agricultural Experiment Station; 1972. 30 p.

Loan-to-deposit and correspondent balances ratios were used to examine how well commercial banks performed the task of transferring funds between regions and sectors. Evidence tended to support the hypothesis that rural area savings provide part of the capital for industrial-urban development.

208. Shechter, Mordechai; Lucas, Robert C. Simulation of recreational use for park and wilderness management. Baltimore: Johns Hopkins University Press for Resources for The Future; 1978. 220 p.

A simulation model is used to predict overall use patterns of new trails, trail closures, new camp areas, and new entry points, designed to preserve the wilderness aspect of public wilderness parks by restricting the number of people who may receive the benefit, while attempting to minimize the number of people excluded and the number of activities prohibited.

209. Siebert, H. Environment and regional growth. Zeitschrift National Economie. 33(1-2): 79-85; 1973. (In English).

A two-region model is constructed with the environment as one determinant of regional growth. It is assumed that production generates a pollutant as a byproduct and that pollution increases progressively with the level of output. The model indicates that in a spatial setting, a high level of pollution may cause a lower regional growth rate because labor is sensitive to environment quality.

210. Siebert, Horst. Regional economic growth: theory and policy. Scranton, PA. International Textbook Co.; 1969. 217 p.

211. Smith, Donald Mitchell. Neoclassical growth models and regional growth in the U.S. *Journal of Regional Science*. 15(2): 165-181; 1975.

The aggregate theory of growth was tested using data for the States of the United States. Results showed that the growth experience of States since 1880 supports the aggregate theory of growth. Labor migration is in the direction hypothesized, and capital movement provides indirect support for the assumption that capital moves from State to State in search of a higher return.

212. Smith, Kerry V. Congestion, travel cost recreational demand models and benefit evaluation. *Journal of Environmental Economics and Management*. 8(1): 92-96; 1978.

The treatment of congestion in travel cost demand models for recreational sites is a subject of considerable importance for both allocation and management of public lands. The most appropriate treatment of congestion requires that travel cost models be amended to reflect the effects of congestion on: (a) the modeling of individual behavior, (b) the estimation of individual demand for service for recreational sites, and (c) the description of how services for sites are allocated for individual users.

213. Snyder, Robert. An interregional analysis of the location of the pulp and paper industry in the western U.S. Corvallis, OR: Oregon State University; 1975. Ph. D. dissertation.
214. Soderland, J.R. Procedures in planning forest transportation systems with particular reference to the Pacific Northwest. Seattle, WA: University of Washington; 1968. M.S. thesis.
215. Steensen, D.H.J. A spatial equilibrium model of the wood-supply sheds for the pulp and paper industry in Alabama. *Dissertation Abstracts*. 27A(11): 3575; 1967.

A model was developed in which locations of processing plants were assumed to be fixed in space, whereas the boundaries of the supplying area (shed) associated with each plant were determined by the model.

216. Streeby, L.L. Role of the wood products industry in Oregon's economy. Corvallis, OR: Oregon State University; 1974. Ph. D. dissertation.

Estimates the contribution of the wood products industry to income and employment of the State of Oregon. Estimates contribution of the wood products industry to the income and employment of each of the following sections of the State: Astoria, Portland, Salem, Corvallis, Eugene, Roseburg, Coos Bay, and Medford areas, and eastern Oregon.

217. Streyffert, T. World pulpwood: a study in the competitive position of pulpwood in different forest regions. Stockholm: Almquist and Wiksell; 1968. 213 p.

Primarily a study of the comparative cost of growing pulpwood and its harvesting and delivery to the mill. Part I includes regional and county studies grouped under tropical and subtropical zones, and temperate zones. Part II describes the economics of expansion in pulp and paper on a worldwide basis.

218. Stumbo, Donald A. Choosing forest products industries for community development planning. *Forest Products Journal*. 29(7): 16-22; 1979.

The study used a static linear-programming approach limited by annual growth of the forest resource for rural development planning. Three different goals were optimized: employment, income, and profit. Input-output data for each operation provided the necessary coefficients for all the functions. The data were obtained from individual studies of each operation to determine capital requirements, operating costs, return to the community, and production levels and prices.

219. Sutherland, Ronald J. A regional approach to estimating recreation benefits of improved water quality. *Journal of Environmental Economics and Management*. 9(3): 229-247; 1981.

Recreational demand and value are estimated by the travel-cost method for fishing, camping, boating, and swimming on a site-specific regional basis. The model is regional in that 179 sites are defined for the Pacific Northwest. A gravity model is used to estimate the number of trips from each destination in the region, and these data are the basic input in the travel-cost demand curves. The model is illustrated by estimating the recreation benefits that would result from meeting the national environmental goal of "fishable" and "swimmable" rivers. The main finding is that potential recreation benefits are concentrated in a few select areas that are accessible to large population centers.

220. Tarayama, T.; Judge, G.G. Equilibrium among spatially separated markets: a reformulation. *Econometrica*. 32(4): 510-524; 1964.

This paper reformulates the Samuelson model concerning competitive equilibrium among spatially separated markets. If the existence of linear regional demand and supply relations is assumed, the problem of interconnected competitive markets is converted into a quadratic programming problem, and a computational algorithm is specified that may be used to obtain directly and efficiently the optimal solution.

221. Teitz, Michael B. Technical and social basis for regional land use policy and planning. *Regional Science Association Papers*. 32:203-211; 1974.

The paper explores issues associated with land use policy and planning in the United States.

222. Thomas, Morgan C. The export base and development stages theories of regional economic growth: an appraisal. *Land Economics*. 40(4): 421-432; 1964.

This paper comments on various aspects that are pertinent to the understanding of regional economic growth. Some characteristics of the development stage and export stage, which provide insights about the process of economic growth, have been stressed. Both theories have many good attributes that could be developed and perhaps could be incorporated into a single theory of regional economic growth.

223. Thomas, Morgan C. Regional economic growth: some conceptual aspects. *Land Economics*. 45(1): 43-51; 1969.

The principal theories explaining the how and why of economic growth are the stages of development and the export base theories. Because of dissatisfaction with these theories, the author used elements from both to construct an alternative theory.

224. Tiebout, Charles M. Exports and regional economic growth. *Journal of Political Economics*. 64(2): 256-265; 1956.

Tiebout argues that export base is "merely one aspect of a general theory of short-run regional income determination." This discussion is the other half of the classic debate with Douglas North (182).

225. Tombaugh, L.W. The location of vacation homes in Michigan: a socio-economic study of environmental preferences. Ann Arbor, MI: University of Michigan; 1968. Ph. D. dissertation.

Using data from a canvas of nearly 1,200 vacation homeowners in Michigan, the author describes location patterns of vacation homes, the relation between location and selected socio-economic variables, and probable future location patterns.

226. U.S. Department of Agriculture, Economic Research Service. Regional development and plan evaluation. The use of input-output analysis. *Agric. Handb.* 530. Washington, DC: U.S. Department of Agriculture; 1978. 128 p.

Examines the use of input-output models for evaluating water and related land resource plans prepared by the Federal Government. Input-output concepts are described and applied to a hypothetical project. A nonsurvey estimation technique for developing input-output models for small areas is also described.

227. U.S. Department of Commerce, Bureau of the Census. 1963 census of manufactures. *Industry statistics*. Vol. 2, pt. 1. Washington, DC: U.S. Government Printing Office; 1966.

228. U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Analysis Division. Industry-specific gross output multipliers for BEA economic areas (RIMS). Washington, DC; 1977. 135 p.

Provides economic impact multipliers for 173 BEA (Bureau of Economic Analysis) economic areas and a description of how they can be used.

229. Ullman, Edward L.; Dacey, Michael F. The minimum requirements approach to the urban economic base. Paper and Proceedings, Regional Science Association; 1960: 6:176-194.

This paper offers an alternative method for understanding the urban employment structure. This method yields a quantitative statement that closely approximates the minimum percentage of a labor force required in various sectors of its economy to maintain viability of an urban area.

230. Valfer, Ernst S.; McWhinney, William N. Decision making in land management and the impact of socio-political problems. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station; 1970. 10 p.

Surveys the major decision fields in the Forest Service, the tasks and skills required for each, and the relationship between the decisionmaking tasks and the character of the organization.

231. Van Delft, A.; Nijkamp, P. A multi-objective decision model for regional development, environmental quality control and industrial land use. Papers, Regional Science Association. 36: 35-57; 1976.

This paper aims to present a set of recently developed methods for making adequate policy decisions on the selection of regional economic activities. A central element in the paper is the combination of traditional optimization procedures (namely, linear programming techniques) and more recently developed multicriteria procedures (namely, a concordance analysis) to determine an optimal planning strategy.

232. Vining, Rutledge. Delimitation of economic areas: statistical concepts in the study of spatial structures. Journal of American Statistical Association. 48(261): 44-64; 1953.

The paper analyzes the concept of state economic areas: areas that are designated as "functional groupings of counties," each containing a "distinctive" economy.

233. Waggener, Thomas R. Community stability as a forest management objective. Journal of Forestry. 75(11): 710-714; 1977.

Author predicted that the National Forest Management Act of 1976 would spark renewed interest in community stability.

234. Wall, Brian R. Employment implications of projected timber output in the Douglas-fir region, 1917-2000. Res. Note PNW-211. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1973. 11 p.

Employment in the timber-based industries in the Douglas-fir region is projected to drop 45 percent between 1970 and the year 2000. Employment-wood consumption relationships are a major factor influencing employment projections, although declining timber production and a high level of log exports are also important.

235. Wall, Brian; Oswald, Daniel. A technique and relationships for projections of employment in the Pacific coast forest products industries. Res. Pap. PNW-189. Portland, OR; U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1975. 49 p.

The authors develop employment-raw material consumption ratios based on historical data for specified primary wood-using industries. Trends in total employment by geographic area and industrial sector, and slow changes in labor requirements and raw material input-product output are described. Employment-wood consumption ratios were used to predict future employment in some sectors of the forest products industry, given estimates of future wood consumption.

236. Wardle, P.A. The application of linear programming to problems of timber transport scheduling the supply to a pulpmill. Geneva, Switzerland: Food and Agriculture Organization of the United Nations Study Group on Methods of Organization of Forest Work; 1966. 7 p.

Exemplified by a study of optimum cutting programs for a group of British Forestry Commission forests at different distances from the pulpmill.

237. Weintraub, Andres; Navon, Daniel. A forest management planning model integrating silvicultural and transportation activities. *Management Science*. 22(12): 1299-1308; 1976.

A mixed integer linear programming model is used to integrate the long-range planning of silviculture, road construction and maintenance, and log-hauling activities for large forest management units.

238. Werczberger, E. A goal-programming model for industrial location involving environment considerations. *Environment and Planning A*. 8(2): 173-188; 1976.

This paper presents an application of goal programming to the planning of industrial location in the context of air pollution policy. Author first discusses the theoretical basis for goal programming and then presents the mathematical formulation and numerical evaluation of a hypothetical industrial location problem. Finally, goal programming is evaluated for its implications for environmental planning.

239. Wheeler, James O. Spatial changes in manufacturing: the Michigan example, 1840-1963. *Land Economics*. 47(2): 197-198; 1971.

Author illustrates the patterns of manufacturing change in the Lower Peninsula of Michigan and summarizes these changes for four major areas of technological development.

240. Will, Robert A. Federal influences on industrial location: how extensive? *Land Economics*. 40(1): 49-57; 1964.

Influence of Federal Government on plant location decision.

241. Williamson, Robert B. Simple input-output models for area economic analysis. *Land Economics*. 46(3): 333-338; 1970.

This study, using simple input-output models, attempts to find a practical, improved substitute for the economic base analysis technique.

242. Willidmsen, Robert B. Regional growth: predictive power of the export base theory. *Growth and Change*. 6(1): 3-10; 1975.

The primary purpose of this article is to present a survey of studies that contain empirical evidence on the export base theory. Presented first as background are a brief statement on the nature of the theory and some of the major conceptual issues pertaining to its use.

243. Willman, Elizabeth. The value of time in recreation benefit studies. *Journal of Environmental Economics and Management*. 7(3): 272-286; 1979.

This paper examines the role of time costs in models describing recreation behavior and draws implications for the travel-cost approach to estimating the benefits of recreation sites. The analysis shows that both recreation and travel time are costly.

244. Wilson, D.A. Comparative economics of management of close and distant lands. *Pulp and Paper Magazine Canada*. 64(4): WR194-WR197; 1963.

Discusses the economics of management of forest lands in Canada near to and far from markets.

245. Wilson, Holton J. Impact analysis and multiplier specification. *Growth and Change*. 8(3): 42-46; 1977.

The effect that the choice of multipliers can have on economic impact studies can be substantial. This is illustrated by the impact of the University of Tulsa on the economy of the Tulsa standard metropolitan statistical area (SMSA). Although this article focuses on a university, the concepts apply equally well to other types of export activities.

246. Yoho, J.G.; Muench, J.R. Regional economic factors bearing on the future of the lumber and woodpulp industries in the South. *Journal of Forestry*. 60(5): 312-319; 1962.

The study considers factors that might influence the course of industrial forestry in the South. These are the forces of population, labor, income, land use, and some of the cost-price aspects of the lumber and woodpulp industries.

247. Youmans, Russell C.; Darr, David R.; Fight, Roger; [and others]. Douglas County, Oregon...structure of a timber county economy. *Circ. Inf.* 645. Corvallis, OR: Oregon State University, Agricultural Experiment Station; 1974. 24 p.

The input-output technique is used to show how the economic sectors in Douglas County relate to each other. Special emphasis is given to the timber processing industries, the Bureau of Land Management, and the USDA Forest Service. Timber processing industries account for 63 percent of the exports of the county.

248. Youngday, D.J.; Fight, R.D. Natural resources policy: the distributional impact on consumers of changing output prices. *Land Economics*. 55(1): 11-17; 1979.

An input-output methodology is developed to examine the impact of natural resource policy on output prices and the real distribution of (given) nominal incomes. A measure of welfare change is constructed for individual households; it yields the distributional impact of price changes. An application to forest products suggests that policies resulting in higher consumer prices are regressive.

249. Zinn, Gary W. A model for analyzing the contributions of forestry to a region. Syracuse, NY: University of New York, College of Environmental Science and Forestry; 1972. 268 p. Ph. D. dissertation.

This study develops a model for comprehensively analyzing the present contribution of forestry to a regional economy. Author describes the accepted general principles of regional development that form the background and bases for the model. Explains how the model can be combined with other techniques to aid efficient planning for regional development and discusses and illustrates the application of the model to the Appalachian region of New York State.

250. Zinn, Gary U. Regional development and forest resource management. *Journal of Forestry*. 73(5): 287, 305; 1975.

Social and economic development do not necessarily depend directly on economic growth. Recognition of this fact is producing changes in public attitudes and policies regarding the objectives and nature of economic activity. These changes, in turn, are creating a new and greatly expanded framework for decisionmaking in many contexts, including forestry. Thus, it behooves the profession to understand and adjust to the situation.

251. Zivnuska, J.A. The integration of forest development plans and national development plans: how to make the forestry case at the national level. In: 1966 Proceedings, 6th World Forestry Congress; Rome, Italy. Rome: Food and Agriculture Organization of the United Nations; 1968: 557-566.

A general model of economic growth in labor-surplus underdeveloped nations is presented. This model is used to demonstrate that forest development can often be very useful in facilitating the desired structural shifts in the economy because the forest industries sector in many of its major characteristics represents an intermediate state between the agricultural sector and the general industrial sector.

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