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THE ENVIRONMENTAL MOVEMENT AND RURAL DEVELOPMENT

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Introduction

During the decade of the 1960's, we in the United States have witnessed an unprecedented mobilization of rhetoric, activity, expenditure, and organization around movements or concerns of race, poverty, and environment. At various times these movements have been viewed independently, and at other times as an inter-related set of concerns. Their treatment as exclusive problems may have been optimal for such time as focus was limited to description and the measurement of symptoms. However, such an approach appears to be woefully inadequate when the range of focus is extended to specifying and estimating the critical technical and behavioral relationships suitable to be used as a basis for policy formulation.

Many existing and potential problems in rural development and the environment are not usefully identified or analyzed within the perspective of particular consequence groups, because they are often generated by symptomatic treatment in response to one consequence group which results in adverse impacts or new problems for others. For example, poverty and racial problems which emerged in Detroit in the early 1960's were probably not unrelated to rural poverty and relatively meager human environment (education, nutrition) in the Mississippi Delta. Narrowly conceived poverty measures have created unusual family and human environments which probably accentuate racial problems in many of our large cities. Similarly, in the future -- if not the present -- problems prominently associated with rural area development will be found at the confluence of poverty and natural and human environmental concerns.

The major objective of this paper is to present an analytical framework for assessing some potential challenge(s) to rural development which can be expected to arise with the emergence of an active and powerful environmental movement. This objective is approached in the following manner:

1. The environmental movement is briefly examined, primarily with respect to its strength, mode(s) of operation, and expected focus.

2. The process of economic development is examined. Special attention is focused on the identification of elements in the process which may be subjected to actions proposed by representatives of rural developmental and environmentalist groups.

3. An economic policy model is modified to provide a framework suitable for analyzing selected potential challenges (tradeoffs) between the objectives of competing interests such as those exhibited by rural development groups and the environmental movement.

Environmental Movement[1/]

Any effort to describe and assess the environmental movement is fraught with serious difficulty for several obvious reasons. It is new; it is volatile; it is an amalgam of numerous, vaguely articulated frustrations and desires; it has a multiplicity of self-appointed leaders and spokesmen. Obviously, such a movement could have significant impact on regional development. The extent to which it does will depend on its relative strength, its mode of operation, and its objectives, insofar as they may be related to the means and ends of rural development.

Evidences of Strength

Strength of a movement could obviously be measured in many ways. Membership, both in terms of quantity and position; resources, in terms of brainpower and money; public attitude; and the existence of sympathetic and institutionalized organizations within the society are suggested as important determinants. No realistic membership or participation figures are available because the environmental movement represents an amalgam of formal, informal, and completely unstructured interest groups. However, Morrison, et al. [15] suggest that

membership and budgets of formal conservationist groups such as the Sierra Club, the National Audubon Society, and the Wilderness Society have experienced rapid expansion. This would seem to indicate a growing if not large membership and increasing identification with the movement. Studies by Hendee [5] present evidence that a significant portion of the active supporters of the environmental movement are drawn from the ranks of scientists, teachers, and intellectuals; and that these people have higher than average incomes. The growth rate of the movement, plus its apparent acceptance by the general public, suggest favorable public attitudes.

Finally, it is interesting to note that rather extended list of institutionalized organizations which have major responsibility in the environmental area. Typical examples at the Federal level include the Soil Conservation Service and Forest Service of USDA, and the Federal Water Quality Administration of EPA. Numerous organizations of this type provide a complement of supporting agencies and should contribute to the "strength" of the environmental movement.

Mode of Operation

The mode of operation is important insofar as it suggests whether the impact of actions generated by the environmental movement will be assumed voluntarily or by coercive means. Further, it also provides an indicator of the ability of a movement or group to articulate its objectives and to mobilize its membership for their achievement. Morrison, et al. [15] observe that current modes of the environmental movement are basically participatory in nature. However, they predict a rapid shift toward power and coercion strategies when the objectives of the movement are better known to their membership and to the public. Additionally, the time lapse between initial emergence of the movement and generation of significant ability to influence decisions is entirely unprecedented in U.S. experience and suggests that potential impacts of the environmental movement actions could be imposed on other conflicting interest groups.

Expected Focus

A considerable historical precedent was available to the environmental movement in terms of policy focus; however, this appears to have been completely subsumed within the much broader focus of the environmental movement. Even the most cursory review of the environmentalist literature yields an incredible diversity of objectives and policy prescriptions for the movement. Conservationist predecessors to the current movement were primarily concerned with consideration of resource "supply", i.e., their efforts were directed toward the encouragement of frugal or efficient use of stock or slowly renewable resources [14]. The environmental movement extends consideration to the "demand" side and to the suspected impacts which an exponentially increasing population and increasing levels of material affluence may have in expanding resource demands. Recognition of closed loop systems and the explicit inclusion of man within the eco-system are unique with the current movement.

Four key points or objectives appear frequently [1, 2, 6, 7, 8]. The first is concerned with the desirability of establishing "long-run ecological balance". Obviously, such an objective does not lend itself to easy definition or translation into policy except in very ad hoc fashion. A second concerns the desirability of promoting environmental awareness. A third objective concerns population stabilization or reduction. A fourth is concerned with the desirability of stabilizing economic development, and, in its extreme form, of actually reversing the course of economic growth. Other objectives tend to parallel those of traditional conservationist groups. Basically, they condense into objectives for restoration and preservation of "quality" in air, water, and land.

Environmental Objectives and Rural Conditions

It is interesting to note that the conditions which commonly prevail in rural areas tend to differ from average urban conditions in precisely the directions which are espoused as desirable by many spokesmen for the environmental movement [2, 7]. Population and gross economic activity in many rural areas are stabilized or declining, population density is low relative to urban standards, and income and daily work activity are closely tied to biological and physical systems. It is equally interesting to note that at the same time there is much evidence to support an hypothesis that the objectives held by rural people for the future of rural areas differ considerably from those held by the typical environmentalist. As as example, it is very difficult to rationalize the higher than average rate

of negative net migration for a large portion of these areas where such "desirable" conditions prevail. Indeed, it merely emphasizes the importance of developing an improved capability for weighing potential tradeoffs in advance of program or policy initiation.

Rural Development Process

Much effort has been allocated to the task of defining the development process. Obviously an effort of this sort is fraught with difficulty because of the diversity of variables which must be considered and the problems which one encounters in conducting empirical investigation of pertinent technical and behavioral relationships. In an effort to simplify the problem, numerous economic, geographic, and social stratifications, including "rural", have been introduced. These have the beneficial effect of reducing the number of variables and relationships to be considered at any one time. However, they also introduce dichotomous and/or hierarchical perspectives and result in a multiplication of the dimensions which can and probably should be considered.

Despite these obvious difficulties and some remaining differences in language, essential elements involved in the development process have been identified and their causal ordering is reasonably well understood. Schumpeter [16] indicated that development could be attributed to five types of new combinations of productive resources.

Included among these were the introduction of a new good, the introduction of a new production method, the opening of a new market, the development of "new" raw materials supply, and the modification of industry organization. Maki [10] and MacMillan, et al. [13], have captured the sense of Schumpeter's "sources" when they defined economic development to be a process involving those activities which lead to greater resource productivity, a wider range of real choice for consumers and producers, and broader clientele participation in policy formulation. Essential elements included in this definition of economic development, and their causal ordering are depicted in Figure 1.

Human welfare is viewed as the ultimate product or output of the developmental process. However, elements contributing to it (affluence, range of choice, clientele participation) are singularly dependent upon resource productivity. Feedback loops in the process 4 and 3 show productivity to be influenced by the resource base, production technique, and product demand, and these in turn by the level of clientele participation.

The development process, as shown in Figure 1, appears to be entirely appropriate for any regional stratification. However, knowledge of the abstract process is of very limited value in assessing potential conflicts between interest groups unless the postulated relationships can be specified and estimated in a more disaggregated form.

For the purpose of this discussion, these would include variables subject to influence by rural development and environmentalist groups which could be directly related to a disaggregated counterpart of the human welfare element. This is precisely what Tinbergen [17] and Fox, et al. [4], have done for national economies by relating alternative fiscal policies (instrument variables) to a set of status indicators (target variables). It is assumed that the latter set of variables provides a reasonable indication of the state of human welfare so far as economic target variables are concerned. To expand the set of instrument variables to include environmental instruments and the set of targets to include environmental indices would not appear to be an insurmountable task. However, the analytical problem involved in relating economic instrument variables to environmental target variables and vice versa is only beginning.

A Framework for Analysis of Rural Development and Environmental Policy

A General Statement About Econometric Models

It was suggested above that many existing and potential problems in rural development and the environment are not usefully identified or analyzed within the perspective of a particular consequence group. Problems of this sort are generated by symptomatic treatment in response to one consequence group which often results in adverse impacts or new symptoms for others.

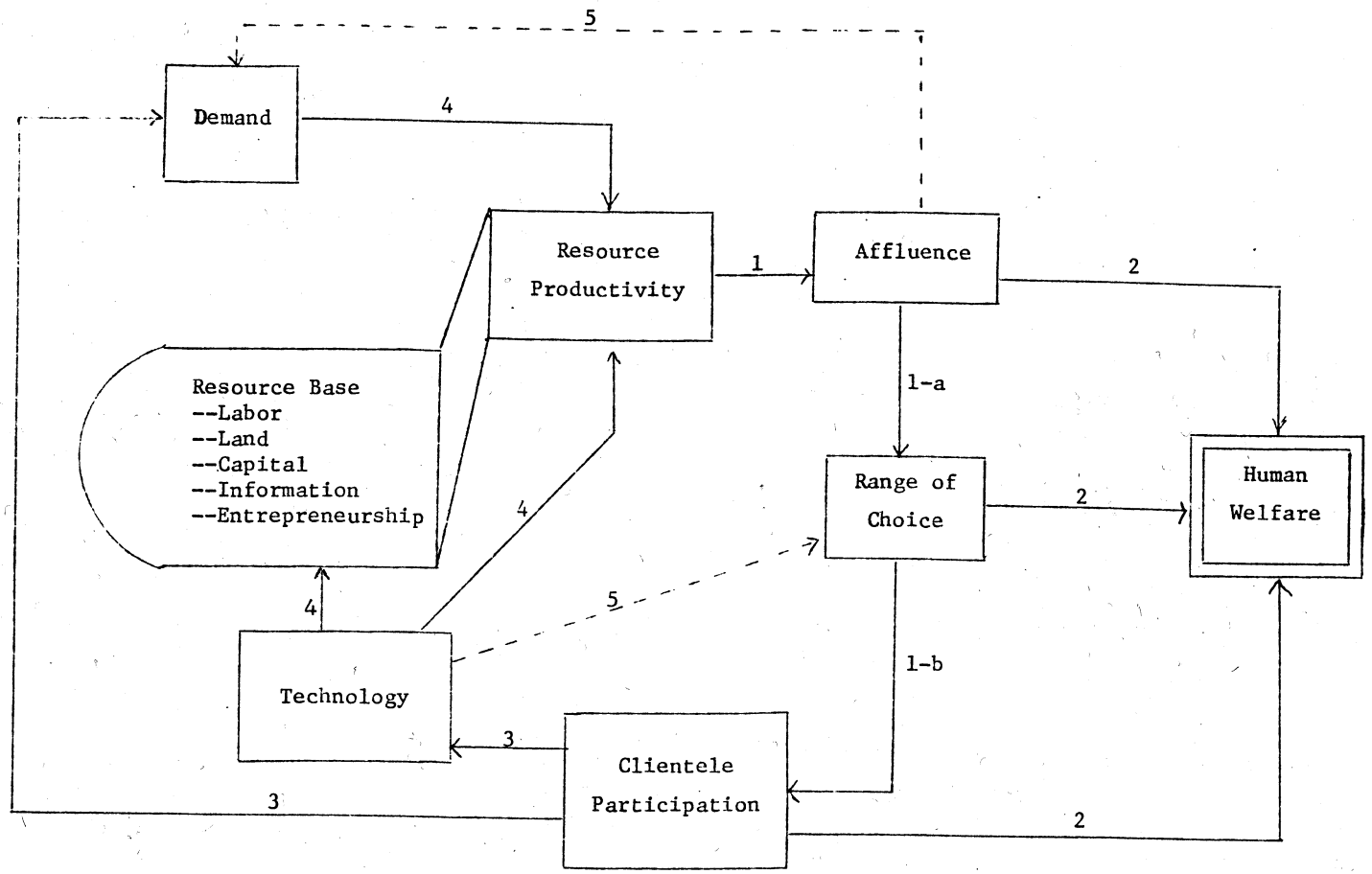


Figure 1. Elements and their implied causal ordering in the economic development process.

Discussion in this section will outline the possibility of treating selected problems of this type within the context of a modified economic policy model which takes the form of a multi-equation econometric model.

The better known econometric models, including those developed by the Social Science Research Council (SSRC), Office of Business Economics, and the University of Michigan, represent entire national economies, but other models have been developed for states, multiple county regions,[2] cities, and industries. Econometric models can be utilized to analyze the structure of an economy, to test hypotheses concerning particular relationships in the system, to forecast economic conditions, and to simulate impacts of change in specific exogenous variables, including those which are the focus of various pressure groups in an economy.

The development of an econometric model typically involves four phases, some of which may be iterative. These include specification, estimation, testing, and application. Model specification consists of combining relevant variables into functional forms, usually based on economic theory or a priori knowledge of important relationships. Parameters for the equations are usually estimated using ordinary, two- or three-stage least squares regression technique.

Testing can be conducted at several levels, but usually involves examination of the equational statistics, including R^2 and F tests. Additionally, it may be useful to "simulate" an historical period and compare predicted values for the variables of the systems with data from the real system. Applications are various, but include analysis of the structure of an economy, hypothesis testing, simulation, and prediction of impacts under alternative assumptions concerning levels (rates) of exogenous or predetermined variables.

Theory of Economic Policy

In his book, The Theory of Economic Policy, Tinbergen [17] outlines a framework for analyzing the basic inter-relationships in the economic system, with particular reference to the way in which certain objectives might be attained. In Figure 2 this system is depicted graphically. Essentially, Tinbergen's policy model, which would probably take the form of a multi-equation econometric model, combines a set of policy instruments, data (or non-controllable factors), and goals or target variables, in a way such that alternative levels of the policy variables can be related to levels of the target variables, and the latter then evaluated in terms of an objective or welfare function for society. The basic problem is one of selecting those values for the policy variables (which are constrained to lie within some predefined feasible set) that will maximize the social welfare function, given the levels of the non-controllable factors.

Examples of the type of variables in each category would include the following:

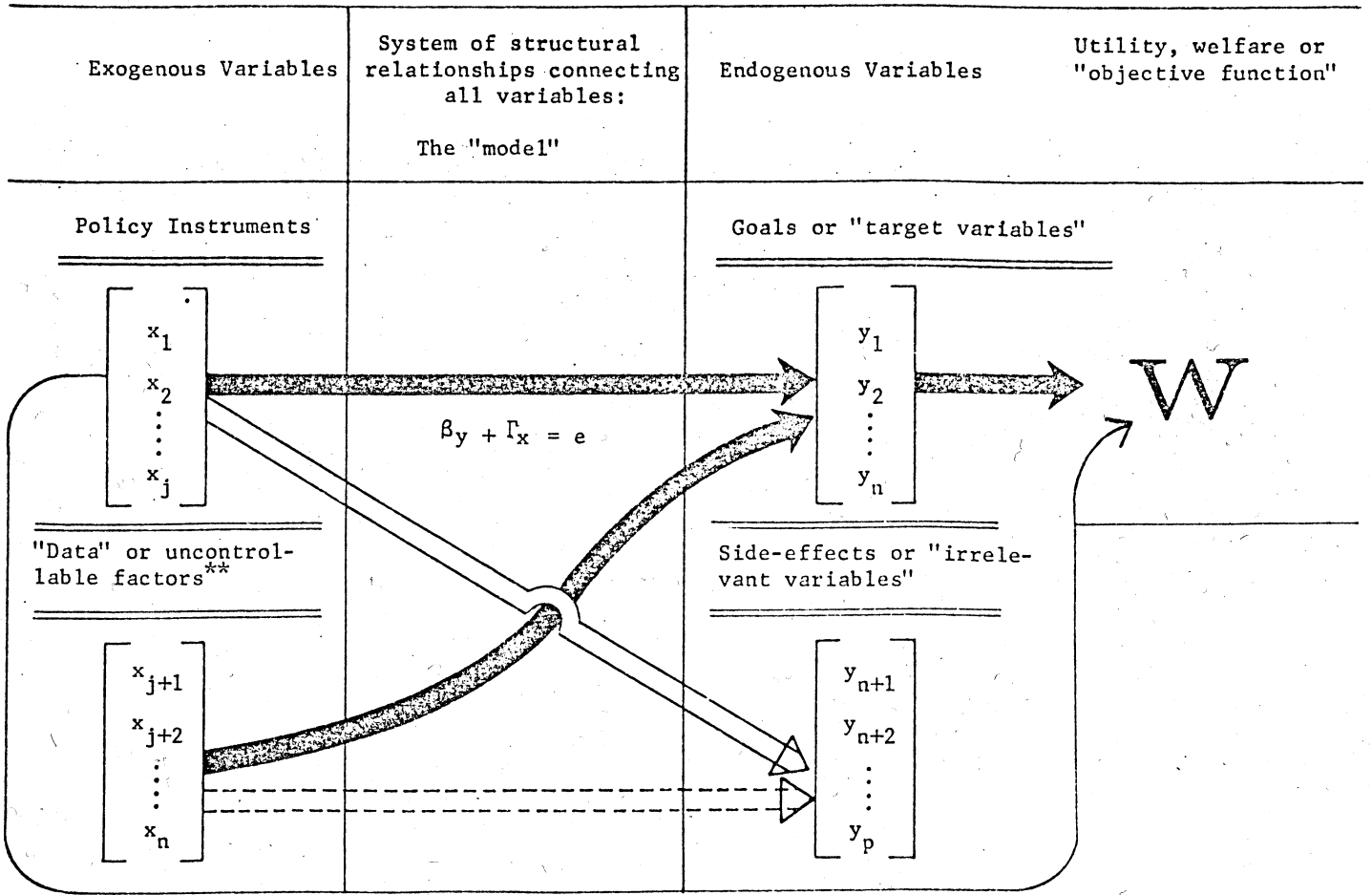
Policy Instruments	Non-Controllable Factors	Target Variables
Tax rates	Weather	Income
Interest rates	Private investment	Output
Government spending	Consumer tastes	Employment
Money supply		Price level

The side effect variables shown in Figure 2 include those things that are influenced by the level of economic activity but are considered to be irrelevant or more amenable to control through means other than those associated with economic policy. For example, there tends to be a positive correlation between the unemployment rate and the frequency of certain types of crime, e.g., burglary, shoplifting, etc. While crime is hardly irrelevant, it is probably best controlled by other than economic policy tools. Ten or fifteen years ago the effect of changes in economic activity on the environment might have been considered as irrelevant. Today, it is unlikely that any comprehensive model would exclude environmental impacts, even if these were included only peripherally.

The Tinbergen framework is perhaps most easily made operational in a multi-equation representation of the economic system. The econometric models developed for the United States can all be broken down into the components suggested in the Tinbergen framework. All are especially useful in estimating the differential impact of alternative public policies, which is measured by entering differential values for specific policy variables and then simulating the economic system over a number of time periods. The least operational

THE THEORY OF ECONOMIC POLICY *

Figure 2



*Classification of variables based on J. Tinbergen, The Theory of Economic Policy (17)

**Not subject to control by the policy-maker or level of government that sets the goals and uses the policy instruments in question.

element of this policy system is the social welfare function, which, by its very nature, defies specification, much less quantitative estimation. For "real world" application of the "Theory of Economic Policy" the economist must depend on the collective judgment of political leaders in both the executive and legislative branches to provide him with the approximate weight to be given each target variable. Thus, the problem of estimating the social welfare function, at present, is more a political than an economic problem.

Development-Environment Econometric Model

In this section a rather simple multi-equation econometric model will be set up for a hypothetical place called "quasi-region" to demonstrate probable impacts on variables which describe important developmental and environmental characteristics of a region. Developmental characteristics will be measured in terms of rural and urban income, while environmental characteristics will be measured by population and water quality. The system could be typical of a large county or functional economic area which contains an urban center within its boundaries. Coefficients for the equation system describing this region could be estimated using either time series or cross-sectional data. The latter alternative will be demonstrated in the example.

The model consists of six simultaneous equations, five behavioral relations, and one identity in six joint dependent and three predetermined variables. These variable sets are defined in the following listing:

Jointly dependent variables

Y_r = change in rural area income, 1960-1970

Y_u = change in urban area income, 1960-1970

P_r = change in rural area population, 1960-1970

P_u = change in urban area population, 1960-1970

P = change in total area population, 1960-1970

Q_u = change in index of water quality in the urban center, 1960-1970

Predetermined variables

Q_r = change in index of water quality in the rural portion, 1960-1970

D = quantity of dilution storage, 1960-1970

EM = change in the average non-agricultural wage rate in the three nearest urban centers outside the area between 1960-1970

The classification of these predetermined variables would depend upon the ultimate purpose of the model. The non-agricultural wage rate outside the area might ordinarily be considered an unlikely policy instrument. However, it is entirely conceivable that it could be utilized as a policy instrument to change population and income within the area by encouraging outmigration. In this Development-Environment model it will be treated as a non-controlled variable and change in the water quality index (Q_r) and quantity of dilution water storage (D) will be utilized as policy instruments.

An initial specification of the equation system is given below. It should be noted that in actual model construction these equations would be subject to modification depending on the results of statistical analyses and conformity with postulated relationships among the variables.

It will be noted that equations (1) and (2) explain income change in rural and urban portions of the area. Equations (3) and (4) explain population change, and equation (6) explains change in the water quality index for the urban portion of the area. Equation (5) is an identity stating that change in total area population is equal to the sum of the population change in the rural and urban portions of the area for the same period.

Numerous hypotheses may be tested with a statistical analysis of these postulated equational forms. It was hypothesized in equation (1) that change in rural income was functionally related to urban income changes, changes in population in the region, and change in the quality index of rural water supply. The expected sign on β_{12} would be

positive for at least two reasons. Rural and urban residents share the same labor market. If income in the urban portion of the area goes up or down, rural income could be expected to follow. Additionally, increases in urban income and total population should have a positive influence on the quantity of products purchased from rural residents and on rural income. Hence β_{15} is expected to be positive. The relationship between Q_r and rural income is expected to be positive, since it is assumed in this pseudo region that the rivers are being used rather extensively for waste disposal and are amply fed with inorganic nutrients.

Urban income change is assumed to be positively related to rural income change because rural residents purchase manufactured goods and services from the urban center and should contribute significantly to income in a small FEA type region. Additionally, it is expected to be positively related to total population change. Population in the rural area is assumed to be negatively related to local and external urban income change. Urban population is expected to be positively related to income increase in the local urban center, and negatively to those which surround it. It was also hypothesized that urban population would be positively influenced by positive changes in water quality index because of the more desirable environmental conditions and lower cost water input for municipal and industrial uses. Finally, the index of water quality in the urban center is assumed to be negatively related to rural income, positively related to the index of rural water quality, and positively related to changes in dilution capacity.

The equations of the model are:

$$(1)\quad Y_r = \gamma_{10} + \beta_{12}Y_u + \beta_{15}P + \gamma_{11}Q_r^* + e_1$$

$$(2)\quad Y_u = \gamma_{20} + \beta_{21}Y_r + \beta_{25}P + e_2$$

$$(3)\quad P_r = \gamma_{30} + \beta_{32}Y_u + \gamma_{33}EM + e_3$$

$$(4)\quad P_u = \gamma_{40} + \beta_{42}Y_u + \beta_{46}Q_u + \gamma_{43}EM + e_4$$

$$(5)\quad P = P_u + P_r$$

$$(6)\quad Q_u = \gamma_{60} + \beta_{61}Y_r + \gamma_{61}Q_r^* + \gamma_{62}D^* + e_6$$

The e_i represent random errors or disturbance terms. The subscripts (i, j) refer to equation (i) in variable (j) of a given class. For example, β_{25} would be the coefficient for the fifth of six jointly dependent variables for the second equation. γ_{43} would be the coefficient for the third predetermined variable in the fourth equation.

It should prove useful to examine the structure of this system in matrix form as described above. Consider the following matrices:

$$\beta = \begin{bmatrix} 1 & -b_{12} & 0 & 0 & -b_{15} & 0 \\ -b_{21} & 1 & 0 & 0 & -b_{25} & 0 \\ 0 & -b_{32} & 1 & 0 & 0 & 0 \\ 0 & -b_{42} & 0 & 1 & 0 & -b_{46} \\ 0 & 0 & -1 & -1 & 1 & 0 \\ -b_{61} & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \qquad Y = \begin{bmatrix} Y_r \\ Y_u \\ P_r \\ P_u \\ P \\ Q_u \end{bmatrix}$$

$$\Gamma = \begin{bmatrix} \gamma_{10} & \gamma_{11} & 0 & 0 \\ \gamma_{20} & 0 & 0 & 0 \\ \gamma_{30} & 0 & 0 & \gamma_{33} \\ \gamma_{40} & 0 & 0 & \gamma_{43} \\ 0 & 0 & 0 & 0 \\ \gamma_{60} & \gamma_{61} & \gamma_{62} & 0 \end{bmatrix} \qquad X = \begin{bmatrix} 1 \\ Q_r \\ D \\ EM \end{bmatrix} \qquad e = \begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ 0 \\ e_6 \end{bmatrix}$$

Note that the equation system described by equation (1) through (6) can be written as:

$$(7) \quad \beta Y = \Gamma X + e$$

and the reduced form becomes:

$$(8) \quad Y = \beta^{-1}\Gamma X + \beta^{-1}e$$

At this point it should be possible to identify (with reference to equations (1) through (6), target and instrument variables with which rural development and environmentalist groups will be concerned. Also, one could speculate about the desired direction of any changes. It would be the task of a properly specified and tested model to "weigh" the range of possible tradeoffs between target variables of interest to the two groups.

Jointly determined or target variables of concern to rural developmentalist groups would obviously be rural income (Y_r) and probably rural (P_r) and total population (P) changes. The environmentalists would most likely be concerned with water quality (Q_u) and with urban population changes (P_u).

Rural groups would probably favor maintaining Q_u only if it could be accomplished by increasing D, since a change in Q_r would have an adverse effect on Y_r. Environmental and urban groups would probably wish to improve Q_u by restricting Q_r at high levels since it could be effected without local bonding. Obviously, conflicts of interest would arise under these circumstances. However, it should be possible to "map out" a consistent set of alternatives for the region which are feasible within predesignated ranges for the instrument variables. Also, the reduced forms, as discussed above, should be especially useful to the policy maker for determining the impact on any target variable, both direct and indirect, of incremental changes in the instrument variables.

FOOTNOTES

1/ An excellent statement which summarizes current status of the environmental movement is contained in [15].

2/ These could be rural development regions, hydrologic basins, public and private service sheds, or functional economic areas as suggested by Fox [3].

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THE ENVIRONMENTAL MOVEMENT AND RURAL DEVELOPMENT: DISCUSSION

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Herbert Fullerton and Cris Lewis have chosen a timely topic for their presentation, "The Environmental Movement and Rural Development". Increasingly, there is a polarization of individuals into two separate and distinct camps, namely those concerned with economic development and those concerned with the effects of current uses upon our resources -- the environmentalists. And, under the current state of arts, conflict seems inevitable.

The gradual economic deterioration of large areas of rural America has resulted in a cry for "development". The magic word "development" to most rural residents simply means attracting industry. However, some environmentalists object to accepting this panacea to social and economic ills of rural areas without also considering the costs to our natural environment.

I assume that it was with this in mind that Fullerton and Lewis set forth in their paper the ambitious objective of developing an analytical and methodological framework for assessing the effects of the environmental movement upon rural development. Or more specifically, to develop an analytical model with sufficient precision to predict the "trade-offs," or costs, associated with predetermined rural development goals.

Along with this, the authors have assumed that "human welfare" is the ultimate product of development. However, they state while reviewing Tinbergen's framework that "the least operational element of this policy system is the social welfare function, which, by its very nature defies specification, much less quantitative estimation".

I am sure that it was with this background that Fullerton and Lewis chose their "proxy" variables to represent developmental characteristics and environmental characteristics in their modified national income model. For developmental characteristic variables they chose rural and urban income and for the environmental characteristic variables, population and water quality.

While it is possible to obtain relatively low-cost reliable data for these variables, I suspect that other more important variables have been omitted, such as those variables representing the institutional, sociological, and political factors involved in rural development. These omissions will severely restrict the predictive capacity of the model.

The model in this presentation could have been reduced to a simpler form if only the specified variables were to be used when it became operational. However, if a wider and more complex set of variables are to be utilized, then the model in its present form may indeed be too limited.

Fullerton's and Lewis' model is valuable in that it forces us to be specific in defining relevant functional relationships. The question still remains as to whether this model can be expanded to the extent it can be used to predict the "trade-offs" required in the development of an economic-ecologic system, at least to the point where it is a useful tool in policy making and planning for economic development.

Further, in evaluating their analytical framework and the effectiveness of their model, it would be helpful to know for whom the model is designed and the level of expertise and resources available to generate data and operate the model. This information may substantially temper the level of sophistication which may be achieved in the model and the degree of abstraction that can be used in interpretation and reporting of research results.

However, all of this being as it is, one of the most important features of this paper may lie in one of the authors' early observations. In fact, herein may lie the entire solution to the juxtapositions of the developmental groups; perhaps even a solution to the rural development problem!! They observed that rural areas in their present state have most of the characteristics currently desired by environmentalists, namely, that economic activity is stabilized or declining, population density is relatively low, and income and daily work activity is closely tied to biological and physical systems. On the other side,

much of what the developmentalists are seeking already exists in the urban areas.

Now why not as a solution, subsidize the environmentalists to move to the rural areas and the developmentalists to move to the urban areas? As each group wearies of its position in society, public funds will be available for mass transfers. The system would operate much as the platoon system in football where an offensive and defensive team is used to play a very effective and often exciting game. And after all, isn't a great deal of the excitement in the American scene gained as a result of change?