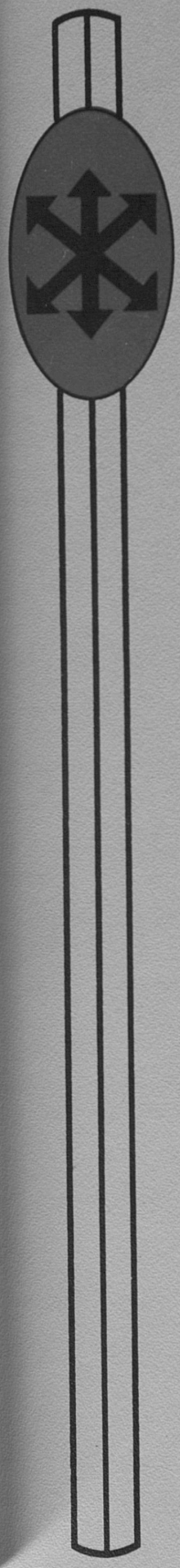

PERFECTING METHODS FOR PREDICTING THE COURSE OF RURAL AREA DEVELOPMENT

PART I

Toward a Definition of Economic Development
and
A Framework for Evaluating Model Efficacy

By

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PREFACE

This is the first of two reports relating results of research conducted under Kentucky Hatch Project 89, "Development of Procedures for Quantifying and Assessing the Economic Well-Being of Rural Areas in Kentucky." The research reported in this and its companion publication is based in large part on the Ph.D. research effort of Thomas H. Klindt. This thesis research represented the initial phase of research contributing to Hatch 89.

The principal thrust of Hatch 89 is to perfect methods for predicting the course of rural area economic development. Specifically, five objectives are involved—(1) definition of economic development, (2) delineation of criteria and procedures for evaluating model efficacy, (3) construction of alternative models for predicting important components of economic development, (4) comparative tests of alternative models in accordance with criteria established in objective two, and (5) use of "best" models based on results obtained in carrying out objective four to predict the course of economic development for selected rural areas of Kentucky.

The purpose of this publication is to present an overview of the objectives, methodology, and philosophy of the total research effort. In addition, preliminary results related to two of the five general objectives are reported herein. That is, a definition of economic development is tendered, and a framework for considering model efficacy is offered. The results in this regard should not be construed as a final statement but rather as a reporting of our thinking at this early stage of research.

Work related to objectives three, four, and five of the total research effort will be reported in another research report—*Perfecting Methods for Predicting the Course of Rural Area Development: Park 2—Using Simple Forecast Models to Predict Income in Selected Rural Areas of Kentucky*.

The authors gratefully acknowledge the assistance and cooperation of Dr. Harold K. Charlesworth and staff of the Office of Development Services and Business Research at the University of Kentucky, Mr. William G. Herzel and staff of the Program and Research Staff, Kentucky Department of Revenue, and the Kentucky Department of Economic Security for providing much of the data for this study. Also, the criticisms and comments of our colleagues in the Department of Agricultural Economics, especially those of Harry H. Hall, are gratefully appreciated.

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Part I

TOWARD A DEFINITION OF ECONOMIC DEVELOPMENT AND A FRAMEWORK FOR EVALUATING MODEL EFFICACY

by

Bruce R. Beattie, Thomas H. Klindt, and Garnett L. Bradford*

INTRODUCTION

Area development programs are not new, but in the past few years there has been a renewed surge of interest in rural area development. In the Report of the President's National Advisory Commission on Rural Poverty [22] it was recommended that multicounty development districts be established throughout the country. Fifteen such districts have been delineated in Kentucky. The purpose of these districts presumably is to provide a mechanism for promoting area development. In addition to these districts, area and regional development associations are being formed by various interest groups. If these groups are to be effective in accomplishing their "development objectives," then decision makers at various levels will need reliable information concerning economic consequences of alternative courses of action.

Thus, there is need to structure an effective analytical framework which can be used to quantify and assess the effectiveness of rural area development programs. The need for such research can be supported from two levels: (1) in terms of the ultimate need of the decision maker for useful, reliable economic information and (2) in terms of the immediate needs of economists for a relevant framework from which to view rural area development. The first, a need for applied research, gives rise to the second, a need for more fundamental research focusing on the identification of relevant economic issues and the development of operational techniques for their quantification.

There is, we believe, considerable confusion concerning the nature of rural economic development.[1] This "confusion" seems due in part to the fact that the articulation of this concept is based largely on the intuitive feelings of many individuals, representing diverse interests and disciplines, about what "ought to be" important in a developmental context. There is need for a

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[1]We shall attempt to justify this assertion in a later section by briefly reviewing literature on this subject.

more solid conceptual foundation for rural area development, thereby providing a relevant set of criteria and/or framework for judging what "will be" given the inception or absence of certain programs. It is to this end that the research reported herein is directed.

Before looking at objectives and procedures, let us take a brief diversion to make explicit the research philosophy underlying this study. Hopefully, this will enable the reader to gain greater appreciation of why the particular objectives and procedures were selected.

Research Philosophy

The philosophy underlying this research effort is relatively straightforward. We believe that the applied researcher can be most effective if he orders his thinking and effort something like the following. He must first conceptualize the problem in terms of an appropriate theoretical framework. This permits a set of relevant variables, researchable issues, and/or hypotheses to be deduced and isoloate[d] and, most importantly, establishes a framework so that individual issues or variables may be related to and kept in proper perspective in terms of the problem. Such a framework is needed so that the forest (the problem) is not lost sight of while examining individual trees (issues, variables, or hypotheses).

If the researcher is then to effectively research issues, predict levels of the relevant variables, and/or test hypotheses, he must establish criteria for evaluating model performance or efficacy. Presumably, one of the criteria will be that the models developed be amenable for predicting future events. Of course, where is no *ex ante* way that this can be done with certainty. However, the researcher can lend some credence to the predictive capability of his model(s) if he can demonstrate that the model has accurately predicted in the past. A rigorous test of a model's capability in this regard is more complex than one might suspect at first glance. Notice that the statement reads, ". . .demonstrate that the model has accurately predicted in the past", *not* that it accurately predicts past events. There is a not so subtle difference between the two statements. It is one thing to construct, using all information available today, a model that does an adequate job of *explaining* past events. There is no prediction involved. It is quite another to demonstrate that a model based on experience and information of the distant past is capable of *predicting* less distant past events. This is the real essence of establishing the predictive capabilities of a model. Such is the thrust of objectives three and four of this research (see next section).

The underlying philosophy of the empirical portions of this effort, then, is that if one can demonstrate that a particular model has predicted well "in the past," then the model is preferred for predicting future events to one for which this has unsuccessfully been established. This notion seems so obvious as to be elementary; however, we believe that economists (including agricultural varieties) have been derelict in this regard.

Let us turn now to the objectives and procedures of this research effort.

Objectives and Procedures

Hatch 89 has five objectives:

(1) to define economic development,
(2) to delineate operational criteria and procedures for evaluating model efficacy,
(3) to construct alternative models for predicting important components of economic development,
(4) to comparatively test alternative models in accordance with criteria established in objective two, and
(5) to use "best" models based on results obtained in carrying out objective four

to predict the course of economic development for selected rural areas of Kentucky.

Some amplification of these objectives is in order; we consider each in turn and include a cursory look at the procedures utilized (or proposed)[2] to accomplish each.

Definition of Development

Research and planning pertaining to areas or districts (rural or urban) commonly have the goal of enhancing the development of those areas or districts. In these cases, development is normally defined in terms of a single criterion such as increasing employment or increasing total or per capita income.[3] The first objective of this effort was to articulate a more comprehensive definition of development—that is, establish a comprehensive theoretical framework. The general procedure used to meet this objective was to derive a set of criteria, each component of which might affect aggregate social welfare. This was achieved by beginning with a welfare economics framework and deducing, by identifying the assumptions that permit optimization, a set of critical economic variables relevant in identifying and quantifying the economic dimensions of area development. Although no objective method for combining or comparing (trading-off) each of the dimensions (variables) is available, each may affect aggregate welfare and should, therefore, be considered by decision makers or planners when contemplating programs to develop an area. Once relevant variables have been identified, the researcher can then develop analytical models to predict future levels of each, given alternative development strategies.

Model Efficacy

If predictive models are to be useful in a decision-making context, then criteria are necessary for determining the "best" model under given circumstances (objective 2). Certainly, the determination of a "best" model depends upon what is required of it. We propose to elaborate and give operational content to economic and statistical criteria in terms of logical validity and Friedman's concepts of simplicity and fruitfulness [11].

Model Construction

The third objective involves the construction of alternative models (in accordance with criteria established in accomplishing objective two) with a view toward predicting future levels of variables (identified in accomplishing objective one) given alternative development strategies. Alternative econometric models were constructed with the aim of predicting the future state of affairs given alternative development programs including the "no program" alternative. During the first phase of study, emphasis has been placed on constructing single-equation multiple regression models. In later phases consideration will be given to "more sophisticated" models.

Model Testing

After models are developed, it is necessary to devise testing procedures to determine which are superior in terms of criteria for model efficacy. To test the predictive accuracy of models, each must be

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[2] Our progress in accomplishing objectives one and two is reported in subsequent sections of this report. Preliminary results related to objectives three, four, and five are reported in Part 2 (forthcoming). A brief discussion of the last three objectives is included here so that the reader may view objectives one and two in proper perspective.

[3] The oversimplified nature of such criteria has been pointed out by Levin [16, p. 24] and Smith, Brannon, and Anschel [24].

used to predict the dependent variable into a time period in which actual values of that variable are known. This allows measurement of deviations of the predicted values from the actual values. Based on this information, accuracy of the predictions can be determined by tests of unbiasedness and precision. From such tests the "most accurate" models can be selected for predicting future levels of important area development variables.

Predicting

Objective five is self-explanatory. It merely involves using the "best" model(s) for predicting future states. Thus far, our main concern has been to predict future levels of total and per capita regional incomes with the most accurate models. The procedures involved are the same as those utilized in making text predictions except that data used are more current.

Having completed this discussion of the overall research effort and philosophy underlying Hatch 89, we now turn to the main theme of this publication—a reporting of our research results regarding the definition of area economic development and the specification of a framework for evaluating model efficacy.

TOWARD A DEFINITION OF ECONOMIC DEVELOPMENT

Let us consider the planned implementation of a project or program which would somehow affect the economy of an area and assume that the question was raised concerning whether the project would enhance economic development of that area. Such a question cannot be answered until criteria are established for judging economic development.

For all that has been written about the subject, no comprehensive definition of area economic development (and hence, criteria) has come to the fore. There is widespread agreement that more research is needed for identifying and measuring the impact of alternative rural development programs on those economic variables deemed important. But, it seems clear from the literature on economic development that economists do not have a firm grip on what is deemed important, i.e., what is meant or implied by the term area economic development. For example, Berry [3] and CSRS [7] indicate that the creation and maintenance of an employment base is the major objective of economic development. Spiegelman, Baum, and Talbert [25] suggest that "the essential goal of planning for economic development is to increase per capita income." Viner [27], in an article concerning developed versus underdeveloped countries, suggests that per capita living levels and population density are both important dimensions of development with per capita living levels being the most important. Clearly these objectives (definitions) are not equivalent or, for that matter, necessarily compatible.

Welfare and Development

Most economists agree that the theoretical basis underlying all policy related issues in economics, including those of area development, is welfare economics. As Mishan has noted:

> The practical importance of an understanding of welfare economics can be questioned today only by those unfamiliar with its subject matter. . . . whether to invest in a road or a railway, or whether to conserve natural beauty and how much, are all political questions which, in so far as they are influenced by economic considerations, must ultimately be

referred to the propositions of welfare economics [21, p. vii].

Since economic development is concerned with the health, happiness and prosperity of people, it would seem only appropriate that development be defined in terms of people [20]. Social welfare depends on the satisfaction levels of all consumers, or of all members of a particular society, however, delimited [13]. Obviously, "... the concept of social welfare transcends the more restricted notion of economic welfare" [13, p. 20]. The concept that we wish to pursue is that of economic development. Hence, the goal of concern is economic welfare.[4]

If increases in economic welfare of people is the goal, then it is reasonable that economic development be equated with that increase. Thus, an increase in aggregate economic welfare becomes the definition of economic development. That is, if as a consequence of a developmental program aggregate economic welfare is increased, then economic development has occurred. Obviously, this definition shifts the burden from defining economic development to defining increases in aggregate economic welfare. However, this seems justified in order to make clear (as should be obvious upon completing this section) that to equate area economic development with increases in real personal income, for example, is at worst fallacious and at best misleading.

One may begin the process of defining social welfare by postulating that it depends upon the quantity of all goods and services available for consumption[5] and to the extent that there is scarcity, the distribution of those goods and services among the individual members of society. Frequently, these two considerations are labeled by economists as efficiency and equity effects. That is, the impact of a developmental project or program on economic welfare may be considered in terms of (1) the production of the largest possible "social pie" (in terms of the output of goods and services) from available resources—economic efficiency—and (2) equitable division of the "social pie" among individuals of society—economic equity. In functional form, the relationship may be stated as

$$W = w_1(A,E) \tag{1}$$

where

W—denotes aggregate social welfare
A—denotes efficiency effects
E—denotes equity (distributive) effects.

If efficiency effects are divided into market effects and extra-market effects, the relationship may be rewritten as

$$W = w_2(A_1, A_2, E) \tag{2}$$

where

A_1—denotes market effects
A_2—denotes extra-market effects.

In general, market effects represent that collection of goods and services for which the market is relied upon as the principal allocative mechansim. On the other hand, extra-market effects represent that collection of goods and services for which market prices (or reasonable proxies thereof) are not generated and used as measures of economic value.[6] Some examples of extra-market goods

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[4] Henceforth in this report, the term "welfare" refers to the concept of economic welfare.

[5] The phrase "goods and services" is used in a very general context. It refers to both market and extra-market goods and includes discommodities as well as commodities. A commodity is a good of which consumers prefer more to less, whereas discommodities are those for which they prefer less to more.

[6] See discussion of "intangibles" by Ciriacy-Wantrup [5, pp. 9-21].

are national defense, publicly provided recreational facilities, and polluted air. (Recall, that discommodities as well as commodities are included in the categories of market and extra-market effects as per footnote 5.)

The problem in defining total welfare as presented in equation (2) is that in this form the concept is not operational. Most economists agree that problems of interpersonal utility comparisons and interdependency of individual utility functions preclude the use of a social welfare function as an operational criterion for judging the social desirability of alternative economic states. However, if such information were available, i.e., if we had the wisdom, techniques, and data needed to overcome these two problems, then the status quo could be compared with the aggregate welfare value which would result from the expected economic changes of a planned developmental program or project. If the welfare change were positive, then it could be claimed that welfare and, hence, development had been enhanced.

Since the concept of a social welfare function is not operational even on a conceptual basis, much less on an empirical basis, then alternatives must be introduced if operational criteria for judging the social desirability of alternative economic states and, hence, economic development are to be forthcoming. McKean addressed this point when he wrote:

> Since it is impossible to measure achievements in these terms (ultimate goals), it is necessary to adopt indirect but workable criteria that appear to be consistent with ultimate aims [18,p. 29].

An Examination of the Components

Recall, that the original problem was one of determining whether a particular program or project would enhance development of a region. Thus, one need not be concerned directly with every component of economic welfare (i.e., every aspect of A_1, A_2, and E), but instead, only with those aspects which would be changed by a developmental project. What is needed then is a system for determining the effects of a proposed project on component parts of the total welfare relationship (equation 2). In effect, a separate "with" and "without" comparison is required for each of the component parts of the welfare function. Let us take a closer look at each of the components to identify how each might be affected by a proposed developmental program.

Market Effects, A_1

Market effects represent that element or argument of economic welfare with which economists have historically concerned themselves. The value of market goods may be measured in dollars because of the ability of consumers to express themselves in the marketplace through the medium of a general good, viz., money. Recall, the market effects component was said to represent that collection of goods and services for which market prices (or reasonable proxies thereof) are used as a measure of economic value.[7]

Market effects include both direct and indirect net, present, real market value of the relevant collection of goods and services. Net, present, real market value of the relevant collection of goods and services is a deceptive notion. A number of important concepts are involved. First, indirect as well as direct (immediate) effects are important and must be accounted for in assessing the net market value of incremental output attributable to a

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[7] Considerable discussion in economics literature has been devoted to the question of the usefulness of observed prices as indicators of economic value. An excellent discussion of the deficiencies and advantages of observed market prices is given by McKean [19, pp. 33-65].

developmental project or program. To complicate matters, not only indirect benefits but also indirect costs must be taken into account. Indirect benefits (costs) are benefits (costs) resulting from the economic activity generated (curtailed) in the process of realizing direct benefits. Indirect benefits (costs) are realized (borne) by those individuals who service direct beneficiaries as well as by individuals in other interdependent sectors of the economy.[8]

Another important concept involved in assessing the net, present, real market value of incremental output attributable to a developmental program is that in identifying the relevant set of goods and services, non-pecuinary (technological) externalities must be considered.[9] We will elaborate on the notion of externalities by using producer-producer and consumer-producer technological interdependencies as examples. We use producer-consumer and consumer-consumer types as examples in the next section (extra-market effects) not because we believe that these varieties are uniquely associated with the category of extra-market effects, but rather because producer to consumer and consumer to consumer interdependencies are more frequently associated with extra-market effects.[10]

Producer-producer externalities (if any) must be accounted for in determining the total market effect component. Attention is drawn specifically to this type of market effect because these externalities do affect the quantity and value of goods and services but are frequently overlooked in evaluating the impact of proposed developmental projects or programs. The externalities of interest are technological as opposed to pecuniary.[11] Producer-producer technological externalities occur when the production of one firm affects the production process of another firm. An example of this phenomenon is the case in which an upstream producer so pollutes the water that a downstream producer must expend resources to clean the water before use. These externalities, both external economies and diseconomies, are only important (that is, they must be accounted for in determining total market effect) when they are of an uncompensated variety. For example, if a downstream producer were compensated for the external diseconomy imposed by the upstream producer, then the effect would show up as an increase in costs of production for the upstream firm and would be accounted for in terms of net value of the incremental output.

Consumer-producer externalities are comparable to producer-producer externalities. Again, only the uncompensated technological varieties need to be considered. A consumer-producer technological externality exists if consumption of a good or service (on the part of consumers) affects the production process of a producer(s). If, in the example given above, the polluter(s) had been

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[8] The concepts of direct and indirect benefits and costs are well developed in the literature. A detailed treatment of these concepts is found in Beattie, et al., [2]. The concept of net, present, real market value of incremental output is developed in McKean [18].

[9] For a discussion of external effects, see Castle [4, pp. 542-556].

[10] We do not wish, given the scope and purpose of this report, to engage in the debate concerning whether or not certain extra-market effects, including those due to technological interdependencies, can be included in the market effects category. There have been numerous attempts to derive market price proxies in order to ascribe economic value to extra-market goods. Our choice is primarily one of convenience and should in no way be interpreted as a point of view that we strongly adhere to, even through we remain skeptical of procedures commonly used to derive such market price proxies.

[11] The reason for exclusion of pecuniary externalities in considering the market effects component is that reshuffling of resources and resultant losses (gains) due to changes in product and factor prices are merely the distributive effects of an economy striving to more adequately meet the soverign consumer's demand. Pecuniary externalities are, of course, an important consideration when describing distributive or equity implications of developmental programs. For a more detailed examination of this reasoning, see McKean [18, pp. 134-144].

a consumer(s) (e.g., sewage), then the external diseconomy would be of the consumer-producer variety.

If a proposed developmental program has associated with it uncompensated technological externalities, then those effects (direct and indirect) should be accounted for in addition to the impact on value of immediate goods and services. Since the impact of producer-producer and consumer-producer externalities can be measured in commensurate terms (changes in costs of production) with immediate markets effects, these effects (direct plus indirect impact) must be added (or subtracted) to assess the total market effect.

If a developmental project or program increases the market value of market goods (positive market effect), then real income is claimed to have been increased. All that is needed to argue that increases in real income imply increased welfare *ceteris paribus* (extra-market and equity effects unchanged) is a positive marginal utility for income on the part of each individual, an assumption which is readily made by most economists. Although this point of view is adopted herein for pragmatic reasons, a caveat should be noted. That is, value is placed upon goods because sovereign consumers demand that good; however, the distribution of purchasing power enables some persons to command more resource use than others. If the distribution of purchasing power were altered, the value of a given output could change appreciably. Hence, any statement concerning the value of market goods is subject to the distribution of purchasing power which was apparent at the time the values were set [1, pp. 363-365]. However, because we are unable to combine the array of market effects in any other manner, market value given the existing distribution of purchasing power is generally used and is adopted for purposes of this report.

Extra-Market Effects, A_2

Because market prices (or reasonable proxies thereof) are not or cannot be determined for all goods and services and because utility is obviously derived from consumption of extra-market goods, these effects must be considered as a separate issue. Description of extra-market effects "with" and "without" the program is imperative if welfare judgments are to be made concerning a developmental program or project.

The analysis of extra-market effects is similar to that of market effects; that is, there may be changes in extra-market goods resulting directly from a developmental project or program and/or resulting from producer-consumer or consumer-consumer externalities. If a wildlife refuge were constructed for public use without fee (or with a fee that bears no relation to prices that would be generated by free markets), then direct extra-market goods are provided. However, this is not the only method whereby a developmental program might affect extra-market goods. If a project induced production such that the production itself caused extra-market goods to be affected, then producer-consumer externalities are said to exist. For example, if a project induced a producer to start (expand) production and that production caused pollution of the air, then to the extent that polluted air is viewed as a discommodity the supply of extra-market goods would have been altered.

Shifts in extra-market effects may also stem from consumer-consumer externalities. That is, consumers, by the act of consumption, may affect the supply of extra-market goods for others. For example, motor boating by one consumer on a lake might affect another consumer's ability to view the lake's serene beauty. In this case viewing a serene lake (an extra-market good)

has been disrupted by consumption on the part of another consumer.

Extra-market effects are segregated from market effects because extra-market goods do not lend themselves to objective measure. However, as was implied in equation (2) extra-market goods affect the change in welfare; hence, they need to be accounted for in some manner when examining a project for its effects on welfare or development. Since extra-market effects may only be described, the discussion here is useful only in categorizing possible ways in which extra-market goods may be altered. It is, of course, obvious that since no objective measure is available, the various extra-market goods may not be added or traded-off. Indeed, in some cases normative judgments might be required to decide whether a specific change is positive or negative. It should be further noted that there is no way of comparing market goods and extra-market goods using equivalent units. If an extra-market good can be compared in commensurate terms with market goods, then it belongs in the market good category.

Equity Effects, E

In equation (1) it was hypothesized that welfare is a function not only of all goods, but also in the distribution of those goods. If a proposed developmental project or program somehow alters the quantity of goods, then there must also be distributive aspects. Obviously, this pertains to the distribution of both market and extra-market goods. By separating market and extra-market equity effects, equation (2) may be rewritten:

$$W = w_3(A_1, A_2, E_1, E_2) \qquad (3)$$

In this case, E_1 and E_2 represent the distributive effects of market goods and extra-market goods, respectively. These effects are discussed in turn.

Concerning the distributive effects of market goods, E_1, Baumol has pointed out that the optimum allocation of two goods, x and y, between two consumers, A and B, requires that the marginal rate of substitution of x for y must be the same for both A and B. Presumably, this state could be brought about by trade. However, Baumol goes on to say: "This proposition thus tells us something about how commodities should be distributed among individuals *without saying anything about how income should be distributed among them!*" [1, p. 359]. That is, for each of the infinite distributions of income, there is an optimal allocation of goods. If a developmental project or program alters the distribution of income, effects on welfare are inevitable.

For purposes of this study, two sources of income distributive effects, are considered, effects on individual utility functions and utility interdependency effects.

The change in individual utility reflects the possible difference in welfare due to providing additional (less) income to individual A rather than B. If a proposed project increases income, then to increase welfare the most the income should go to the individual with the highest marginal utility for income. The fact remains, however, that there is no way of determining which individual possesses the highest marginal utility for income. This inability to measure and compare causes particular difficulty when a proposed project decreases income to individual A while increasing income to individual B. Even though there may be a net increase in aggregate income, the economist is unable to assess the effect on welfare.

It might be claimed that if a project increased incomes of both A and B, or increased the income to A while leaving B's income unchanged, then welfare must have increased. However, the possibility of utility interdependencies precludes definite statements concerning welfare even in this case. If interdependencies exist in utility functions, then for an individual the level of welfare forthcoming from a given level of consumption depends in part on the level of

consumption of another individual(s). Examples of envy and benevolence are commonly given to illustrate this phenomenon. It is conceivable that a project could increase the income of both A and B, but the income effect on B's total utility could be outweighed by his envy of A's increased income. These interdependencies are, of course, nonquantifiable. Therefore, given a project that affects the distribution of income, as any project that increases (decreases) total income must, no definitive statement is possible concerning the effect on welfare. The economist's role must be limited then to describing or predicting how income distribution would be changed by a proposed project.

Distributive aspects of extra-market goods, E_2, affect welfare just as E_1. The primary difference is that there is no standard for measuring different extra-market effects in commensurate terms. Further, because of the nature of many extra-market goods, trade may be impossible and, therefore, equating marginal rates of substitution between individuals may be impossible. These problems combined with the problems discussed under E_1 require, again, that the economist be limited to merely describing the distribution of extra-market effects.

The preceding discussion indicates that no definitive conclusions may be reached concerning distributional effects of either market or extra-market goods upon welfare. Although we are disposed to leaving social welfare judgments to public decision makers, some may wish to make certain restrictive assumptions in order that qualified judgments concerning distributive effects on welfare might be reached. The most restrictive assumption one could make is that distribution of gains (losses) does not affect welfare; in which case, distributive effects, E_1 and E_2, need not be considered. Surely this assumption would be rejected out of hand by "rural development type" economists as, in our opinion, it should be.

Somewhat less restrictive assumptions might be made to make certain qualified assessments of distributive effects. If one were willing to assume that utility function interdependencies do not exist or that they are always of a positive variety and that extra-market effects are irrelevant (or remain unchanged), then as long as one individual gains income while no other individual loses income, welfare will have increased.

An alternative set of assumptions which would allow ordinal judgments is available. One might assume that utility functions are such that if income accrues to one group—say the poor—while a less than or equal amount of income is forfeited by another group—say, the rich—then total welfare would be enhanced. If a project distributed gains and losses in the prescribed manner, then the net welfare effects could be deemed positive.

It should be pointed out that even with the assumptions above, only normative judgments concerning welfare changes may be made, for there is no method for comparing, quantitatively, distributive effects with market good and extra-market good effects.

A Definition of Economic Development

Given the present state of the arts, there is no value-free method of comparing or trading-off increases and decreases in the various components of equation (3). That is, for example, if a project engenders an increase in A_1 and a decrease in A_2, there is no method of determining the net effect on W. In fact, as was pointed out earlier, it may not even be possible to attach a commensurate weighting scale for alternative effects *within* the A_2 and E_2 categories. Thus, we are left with a situation that makes it impossible to render categorical statements concerning the effect of a proposed developmental program on economic welfare and, hence, on economic development.

Considerable discussion may be found in welfare economics literature bearing on this

issue. A number of alternative criteria have been advanced for resolving the problem of weighting and combining components of social welfare so that a single-dimensional function or decision criterion might result. (Most of this discussion has centered around the problem of trading-off efficiency and equity effects.) The only criterion that would, in fact, accomplish this task is the so-called Bergson criterion. Bergson suggested that a grand social welfare function should be developed, complete with a set of explicit value judgments (a weighting scheme), which would permit the analyst to resolve the problem of incommensurability of the various components (dimensions) of social welfare.[12] Concerning the Bergson criterion, Baumol points out:

> Essentially, the Bergson criterion must be judged right, if not very helpful. . . . [it] unfortunately does not come equipped with a kit and set of instructions for collecting the welfare judgments which it requires [1, p. 300].

Few economists have felt themselves to be in close enough contact with divine guidance to make the value judgments required to operationalize the concept of a grand welfare function. The position that the business of making trade-offs must be left to the social decision-making process (political process) seems much more defensible.

If one accepts the notion that individual components cannot be put in commensurate terms (at least by economists), thereby eliminating the possibility of a single-dimensional welfare function and thus a single-dimensional criterion or definition of economic development, what can be said regarding criteria for judging a developmental program? The answer is of necessity neither simple nor foolproof:

> Definition: *Economic welfare and hence economic development may be said to have increased if at least one component of equation (3) is increased as a consequence of a project or program while no other has decreased.*[13]

That is to say, for example, if income (market effects, A_1) is increased and extra-market effects, A_2, and equity effects (both E_1 and E_2) are judged not to have diminished, then the program (or lack thereof) may be said to enhance economic development. However, a caveat must be offered. Such simplified judgments may, in most situations, be impossible. Suppose there is an increase in A_1 while A_2 and E_2 remain unchanged. The very existence of an increase in income implies an absolute change in the distributive effects, E_1. Suppose that the distribution of gains and losses in income was such that every individual had a net gain; then the utility or welfare of each individual and, hence, society as a whole has increased *if individual utility functions are independent*. If individual utility functions are interdependent (in the envy sense), then an increase in welfare cannot be established even for this simplified situation. While we should be cognizant of this theoretical possibility, we are not inclined to view it as a particularly devasting or compelling restriction. A more important practical limitation, in our view, is that for most situations the net effect on welfare of a developmental program cannot be established. Even assuming A_2 and E_2 unchanged, surely

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[12] For a concise treatment of alternative welfare criteria proposed to resolve the incommensurability problem associated with multi-dimensional social welfare functions, see Baumol [1, pp. 375-80].

[13] If in the eye of the decision maker, the resulting distribution is preferable to that in a previous state, distribution effects are said to have increased. Similarly, if extra-market effects are preferable in the eye of the decision maker, then those effects are said to have increased.

the number of developmental programs involving no losers (i.e., no negative E, effects) must be negligible.

It should go without saying that inability to establish an increase in welfare does not necessarily imply a decrease in welfare. Further, it does not mean that a project should not be undertaken because an increase in welfare cannot be established. It simply means that for many situations the total welfare effect cannot be assessed until assumptions are made concerning the relative importance of components of equation (3) or until objective measures are placed on each of the components to make them directly comparable, a possibility that was rejected earlier.

What then is the upshot of this effort? Since a definition of economic development has been put forth that by the authors' own admission is extremely limited in an operational context, of what possible use is the "definition?" All that is claimed for the definition is that it sets economic development in perspective in that components that ultimately must be taken into account one way or another by decision makers are explicitly identified. Its main usefulness may be that it clearly suggests what economic development is *not*, and it points out the futility of attempts to define economic development solely in terms of a single criterion, e.g., per capita personal income.

If one accepts the argument that the economist cannot, for many situations, categorically establish a positive or negative developmental effect, what then does the economist have to offer decision makers concerned with rural area development? An answer to this question is presented following a brief discussion regarding the social decision-making process.

A Framework for Social Decision-Making

Many of the decisions regarding rural area development strategies are made at one or more levels (be it federal, state, or local) of the political process. If this decision-making process is to function, obviously some criteria, implicit or explicit, for judging developmental impact will be adopted in order that decisions may be reached. That is, decision makers, collectively or individually, will adopt means for weighting or comparing the components suggested in equation (3).

Fox [10] has suggested criteria for judging, and methods for improving, this process. Regarding the decision-making process, Fox has noted:

> Studies lead to the conclusion that there are no universally acceptable value criteria which can be applied to determine whether a given program produces an optimum social product. This leads to a recognition that a program must be judged by the *process* through which it is decided upon rather than by some measure of the consequences of the program itself [10, p. 30].

Fox's political science criteria are not as alien to economics as they might first appear. Among others, he enumerates two important aspects of an effective social decision-making process: "(1) the relevant alternative courses of action are identified and evaluated and (2) those affected have a practical opportunity to be represented in the final decision" [9, p. 31].

The Role of the Economist

Effort to provide for perfection concerning Fox's point (2) belongs in the realm of political science. The role of the economist is identified in point (1), the identification and evaluation of relevant courses of action; that is, to provide decision makers with information concerning the effects of selected programs so that they may, if even in an implicit manner, account for the effects upon welfare and come to a decision.

Such a role for economists conforms with the role envisioned by Hadar:

> But to the extent that economists do study problems of economic welfare, they do so not because of a belief in the superiority of their own value judgments, but because they believe that once society has defined certain economic goals as desirable—and it is of no concern to economists *how* such goals are chosen—the economist is best equipped to propose a course of action that will lead toward the fulfillment of those objectives [12, p. 279].

In essence, the economist's burden is to furnish information concerning those elements which will be affected in a total social welfare function (A_1, A_2, E_1, and E_2). The burden of weighing those elements and making final decisions falls upon those who are responsible to the people affected by the implementation or nonimplementation of a program.

In the companion piece to this report (Part 2), aspects of A_1 and E_1 are considered. Specifically, personal income, both total and per capita, in rural areas of Kentucky is predicted to some future time period under the assumption of no substantiative change in public policy. Such predictions serve two purposes. First, the total income predictions provide a benchmark to which alternative projects which change the structure of the economy can be compared on an efficiency basis. Second, while per capita figures do not indicate the distribution of income within an area, when many areas are examined, the distribution of income among them is at least partially indicated.

In the next section we turn our attention to the development of a framework and procedures suitable for evaluating the performance of models developed to predict levels of important components of social welfare identified in this section.

A FRAMEWORK FOR EVALUATING MODEL EFFICACY

The purpose of this section is to present a framework for evaluating the performance of models designed to assess the economic impact of alternative development strategies. Presumably, the framework has sufficient generality that it should be useful in other contexts as well. Seemingly the justification for such an effort is obvious, but perhaps something should be said in this connection.

This effort is primarily one of applying economic analysis to decisions involving the appropriate level of sophistication in models developed for the purpose of providing relevant decision-making information. We are motivated in this direction by a commonly expressed assertion among professional economists that our level of sophistication in model building is far beyond the optimum in terms of the problems the models are purportedly designed to provide insights into. That is, it is frequently asserted that less sophisticated models would better serve the needs of decision makers confronting "real world" problems. How often one hears the comment that we have achieved a level of model building sophistication and complexity that far surpasses our ability to apply such models in the solution of "relevant" problems.[14]

While we are probably less disheartened than most about this "problem," there may be an element of truth to such assertions. Research is needed in the area of model

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[14] In fact, this assertion was recently intimated by Wassily Leontief in his presidential address delivered at the annual meeting of the American Economic Association [15].

evaluation or efficacy. It is our belief that procedures can be developed to come to grips with such assertions by trying to develop criteria and procedures that will yield some evidence to go along with the ample quantity of speculation surrounding this issue. This section is devoted to this end. The proposed framework is incomplete and we have thus far developed objective measures for only one facet of model efficacy. Even so, we believe the framework represents a useful point of departure for such research.

Criteria for Comparing Models

A set of criteria for judging model performance must be established if effectiveness of a model is to be assessed. Forrester provided insight here:

> The validity (or significance) [efficacy] of a model should be judged by its suitability for a particular purpose. A model is sound and defendable if it accomplishes what is expected of it. This means that validity [efficacy], as an abstract concept divorced from purpose, has no useful meaning. What may be an excellent model for one purpose may be misleading and therefore worse than useless for another purpose [8, p. 115].[15]

Model efficacy deals with assessing how effective a model is in doing what it is intended to do. Model efficacy becomes a relevant consideration, then, only assuming the alternative models are capable of yielding information concerning appropriate design or decision variables and parameters. If it is not potentially possible to glean from a model predictions (information) concerning issues of interest, then of course, the issue of model effectiveness is a moot one. Thus, in the schematic of model efficacy components (see Fig. 1), model capability in terms of yielding pertinent information (pertinence) is connected to model efficacy by a horizontal dashed line. While pertinence is not an element of model efficacy per se, it is assumed *a priori* that models incapable of yielding pertinent information given the purpose at hand will not be considered.

Before turning to a discussion of the components of model efficacy, we should point out that the notion of model pertinence, unlike model efficacy, is an absolute concept. That is, a model either has the potential of yielding information relevant for the purpose at hand or it does not, whereas the issue of model effectiveness is a relative one.

What is expected of a model is of essence in establishing criteria by which it is judged. Friedman suggested general criteria concerning what should be expected of a model when he wrote:

> . . .There is general agreement that relevant considerations are suggested by the criteria 'simplicity' and 'fruitfulness', themselves notations that defy complete objective specifications. A theory is 'simpler' the less initial knowledge needed to make a prediction within a given field of phenomena; it is more 'fruitful' the more precise the resulting prediction, the wider the area within which the theory yields predictions and the more additional lines for further research it suggests [11, p. 10].

Friedman amplified one of the components of fruitfulness when he stated: "The only relevant test of the validity of a hypothesis [model] is comparison of its predictions with experience[16] [11, p. 8-9].

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[15] The term efficacy (in brackets) was inserted by the authors. Forrester's use of the term validity is synonymous with our term efficacy. General use of the term validity for our purposes is reserved for logical validity.

[16] The term, model (in brackets), was inserted by the authors.

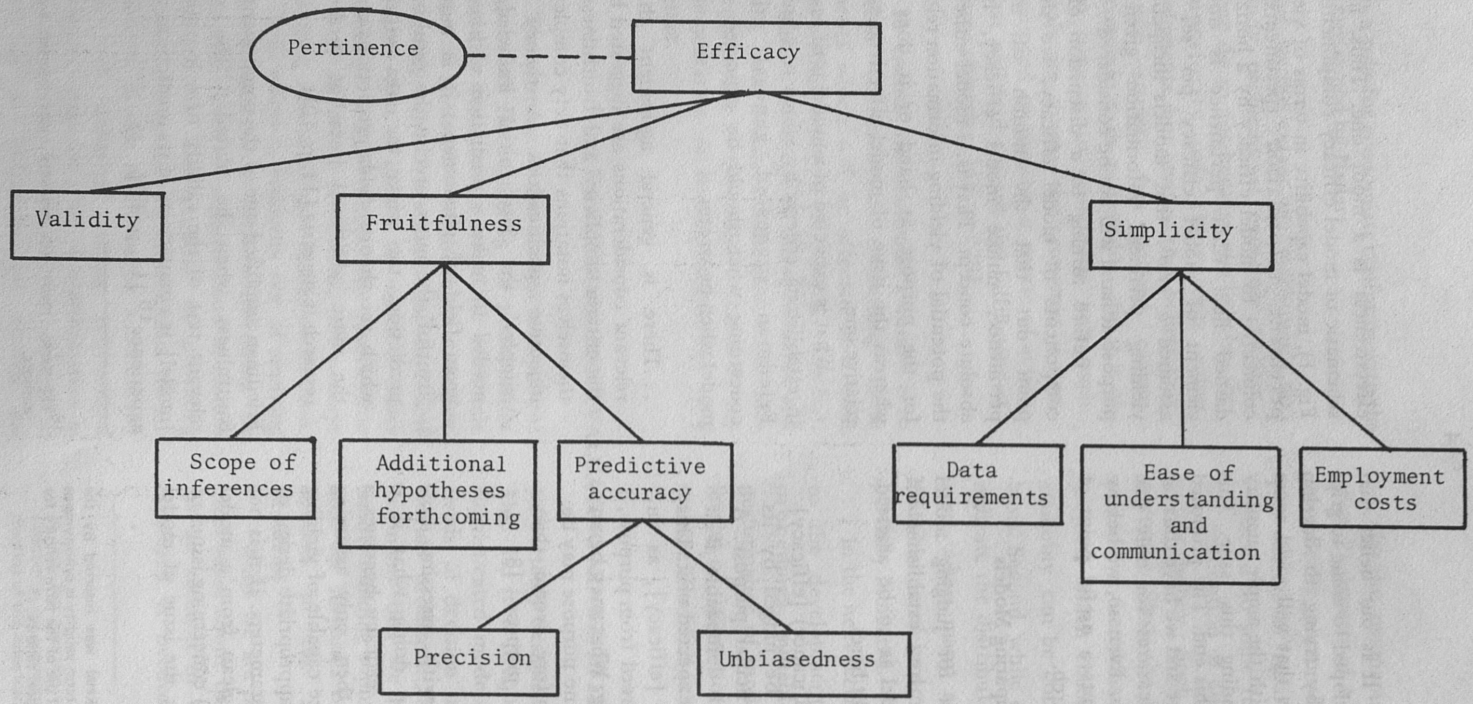

Figure 1. Components of model efficacy.

Besides simplicity and fruitfulness, logical validity is important. This criterion requires simply that conclusions follow from premises.

These three general criteria—logical validity, simplicity and fruitfulness—are components of model efficacy or total effectiveness. Figure 1 is an hierarchical schematic of efficacy components. It is under these general criteria that we propose to evaluate the effectiveness of alternative development models. Each criterion is discussed below.

Logical Validity

When a conclusion logically follows from a set of premises, the argument is said to be valid. Validity, then, requires only a logical consequence—the conclusions of a model must follow from its premises.

Simplicity

The simplicity criterion, for purposes of this study, contains a number of components. A model is simpler if fewer data are required for its use, if the model is easier to understand, or if it is less costly to employ. The models reported on, in the companion piece of this report compared to the entire specturm of possible predictive models—including simulation, input-output, and simultaneous equations models—appear relatively simple since they are single equation models with a limited number of variables all of which utilize secondary data.

Fruitfulness

According to Friedman, a model is more fruitful the more accurate the resulting predictions, the broader the scope of inferences, and the more hypotheses forthcoming from its use (additional research suggested) [11]. However, the importance of this criterion must be viewed in terms of model purpose. Recall, model efficacy must be judged in accordance with its intended purpose. If the purpose of a model is more limited than that of another, then comparisons in this regard may not be particularly helpful in the evaluation process.

The scope of inference of a model is a multidimensional concept having to do with the "size" of the population to which inferences may reasonably be made. Spatial, temporal, demographic, and other dimensions that serve to delimit the population are important in identifying the scope of inference.

The final component of fruitfulness is predictive accuracy. Because predictive accuracy is viewed as necessary for model effectiveness,[17] it was the primary criterion upon which the models of this study were judged. The remainder of this section is devoted to a discussion of methods used in comparing the predictive accuracy of the models developed in the companion piece to this report (Part 2).

Model Testing Procedure

The goal of the testing procedure was to select the model or models which most accurately predicted the dependent variable of interest. (Thus far, our effort has been concerned with accuracy in predicting area total personal and per capita personal income.) Richmond suggested that two factors are important in accuracy; precision and unbiasedness [22]. Precision may be measured by the standard error of a statistic; unbiasedness exists if the expected value of a statistic is equal to the population parameter being estimated. An accurate prediction is one that is both unbiased and precise.

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[17] See second quotation from Friedman, this section.

For purposes of this study, both concepts—unbiasedness[18] and precision—were utilized in addition to a composite accuracy criterion, namely, minimum mean-square-error (MSE). There is a problem in attempting to incorporate the concepts of bias and precision into a test of comparative accuracy in that both are relative; there are varying degrees of biasedness and precision. How does one compare a model that yields predictions which are very precise but biased, against another model which yields predictions which are unbiased (less biased) but relatively less precise? One way to *circumvent* this problem is to use the minimum MSE criterion which does not distinguish between bias and precision aspects of accuracy. We used the MSE criterion as our critical (most revealing) measure of bias and precision combined.[19] However, statistical measures for all three criteria were calculated because in our view only the decision maker, given the uniqueness of his particular problem, is in a position to decide the optimal weights to assign to bias and precision as individual components or whether a composite measure such as MSE is appropriate for his purpose.

Testing for Bias

To test for bias, a "t" test of the paired differences was used. Our objective was to test the null hypothesis that $\bar{Y} - \tilde{\bar{Y}} = 0$. That is, we wished to discover whether the mean difference between the actual and predicted dependent variable value was significantly different from zero.

Even though our study areas represent a cross-sectional population it is legitimate to use a "t" test based on sample information. In this case, time-series observations represent samples from the population of all possible time-series observations. Thus, the mean of predicted income levels has a probability distribution function, which permits the application of the "t" test. The "t" value used to compare with the appropriate critical "t" value was calculated as follows:

$$t = \frac{\bar{d} - \mu_{\bar{d}}}{s_{\bar{d}}}$$

where

$\mu_{\bar{d}}$—denotes the expected value of the difference

$\bar{d}$—denotes the difference between the means of actual and predicted dependent variable (income) levels and is given by

$$\bar{d} = \bar{Y} - \tilde{\bar{Y}}$$

$\bar{Y}$—denotes the mean of actual dependent variable levels for the study areas

$\tilde{\bar{Y}}$—denotes the mean of predicted dependent variable levels for the study areas

$s_{\bar{d}}$—denotes the standard error of the difference and is given by

$$s_{\bar{d}} = \sqrt{\sum_{i=1}^{n} \frac{(d_1 - \bar{d})^2}{n(n-1)}} \quad \text{for } i = 1, 2, 3, \ldots, n$$

d_i—denotes the difference between the i^{th} actual and predicted dependent variable level

n—denotes the number of paired differences.

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[18] The term "unbiasedness" as used in this report may not conform to the strict definition used by statisticians. The point at issue is whether $\bar{Y}$ and $\tilde{\bar{Y}}$ (see next section) are actually expected values as required for strict statistical interpretations. For purposes of this research "unbiasedness" simply refers to the situation wherein the mean of the predicted values is not significantly different from the mean of observed values.

[19] The authors are grateful to our colleague, Harry H. Hall, for pointing out the usefulness of the MSE criterion.

Testing for Precision

Models were also compared in terms of precision. The measure of precision used was standard error, $s_{\bar{d}}$, as computed for the "t" test. Determining the most precise model involves selecting the predictive model which has the smallest standard error of the differences (paired) between actual and predicted levels of the dependent variable.

The Mean-Square-Error Criterion

Mean-square-error statistics were also computed for the alternative models. Estimates of MSE were calculated as follows:

$$\hat{MSE} = \sum_{i=1}^{n} d_i^2 \Big/ n$$

where d_i and n are as previously defined.

The MSE criterion (select model with minimum $\hat{MSE}$) is a composite criterion in that it yields a unidimensional measure of accuracy; i.e., bias and precision components are lumped together. Probably in most model testing situations the MSE criterion represents a sufficient test of model accuracy. However, if in a particular situation bias in and of itself is a critical consideration, then, of course, the MSE criterion would be inadequate For this reason in Part 2 we elected to present all three accuracy statistics ($\bar{d}$, $s_{\bar{d}}$, and $\hat{MSE}$) for the alternative models.

It should be emphasized that selection of a "best" or "most effective" model involves other criteria in addition to predictive accuracy (see Fig. 1). Our effort thus far to quantify other dimensions of fruitfulness and simplicity has been limited. Although we believe predictive accuracy to be an important aspect, we recognize that the decision criteria regarding model efficacy are multidimensional.

SUMMARY AND CONCLUSIONS

The purpose of this report was to present some preliminary research results on the development of methods and procedures for assessing the economic well-being of rural areas. Results obtained thus far in achieving the first two major objectives (definition of economic development and delineation of criteria and procedures for evaluating model efficacy) were presented in addition to a brief look at the research procedures and philosophy of the entire effort. Research results related to the other three objectives are reported in the companion piece to this report (forthcoming). Following a brief summary, we conclude with a statement of implications for further research and for the role of economists in rural area development, decision-making processes.

Definition of Economic Development

The first objective addressed in this report was that of defining economic development. We began with the proposition that there ought to be a correspondence between the concepts of economic welfare and economic development. Specifically, we postulated that economic development could be claimed as a consequence of a developmental project or program (or as a consequence of no developmental project or program) if and only if an increase in economic welfare could be claimed. Obviously, this postulate shifted the focus from defining economic development per se to identifying those elements critical in assessing changes in economic welfare of

society, however delimited. We believe that this shift of focus was justified in order to make clear the deceptive and misleading nature of certain simplified definitions of economic development such as increasing total or per capita income.

Given the foregoing proposition, we then proceeded to identify certain critical elements (assumptions) that must be reckoned with if a freely operating market system is to achieve equilibrium positions consistent with optimum social welfare. The assumption implicit in this process was that the identification of these critical assumptions would provide a listing of critical variables in the welfare, and hence development, matrix.

It was through this process that we concluded, as exemplified in equation (3), that critical components in assessing economic development were market effects, extra-market effects, and the equity or distributive effects of each. That is, in assessing the developmental implications of a proposed program, one must consider effects on the "size of the social pie" insofar as they can be and are expressed in monetary terms (market effects) and in other terms insofar as there are other relevant effects that cannot be or that are not expressed in monetary terms (extra-market effects) and on the "distribution of the social pie" in terms of identifying the incidence of benefits and costs of the program. In other words, important dimensions of economic development include total impact on area income (assuming all direct, indirect, and external effects have been properly accounted for), nonmonetary effects (e.g., environmental quality), effects on distribution of income, and incidence of favorable and unfavorable nonmonetary effects.

An agrument was then developed to the effect that it is impossible to reduce the concept of welfare and hence development to some unidimensional combination of the above. It is our belief that to reduce economic development to fewer dimensions than these four requires value judgments which we find unacceptable or at least beyond the scope of economics.[20] Thus, we are left with a definition of economic development that, while perhaps unacceptable to those who insist on reducing all economic phenomenon to a single objective function, is relatively comprehensive and consistent with tenets of welfare economics and democratic decision-making processes. That definition states that economic development has occurred if, in the eye(s) of the decision maker(s), at least one dimension of welfare (market effects, extra-market effects, market equity effects, or extra-market equity effects) is said to have increased (is preferred to the status quo) as a consequence of a project or program while no other has decreased (is less preferable than the status quo). For example, if income (market effects) is increased and extra-market effects and equity effects are judged not to have diminished, then the program may be said to contribute to economic development.

The section concerned with the definition of economic development concluded with a cursory look at how the political process operates (or might operate) concerning matters such as economic development and how economists might best serve this process in improving decisions regarding rural economic development. After summarizing important results of the section dealing with model evaluation, we return to this issue and conclude with some remarks

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[20] In our view, the problem of weighting various irreducible dimensions is the function of the political, or social decision making, process. To assert otherwise is tanamount to suggesting that a few "enlightened" economists could eliminate the need for public decision-making—a proposition that, while probably appealing to certain overzealous social planning types, is viewed with considerable schepticism by those who question whether the rigors and techniques of economic science are that advanced and reliable. (See Baumol [1, p. 380] and Stigler's presidential address to the American Economics Association, 1965 [26].)

concerning implications for further research anf for the role of economists in the process of rural area development.

Model Efficacy

The other major objective of the overall research effort addressed in this report was delineation of criteria and procedures for evaluating model efficacy. In this regard, a framework for evaluating the relative effectiveness of alternative models in predicting the consequences of alternative development strategies (in terms of critical variables identified above) was proposed. Also, procedures were suggested for evaluating one aspect of model efficacy, namely, predictive accuracy.

In developing the model efficacy framework, it was suggested that a model must be evaluated in terms of the purpose or purposes it is intended to serve. Therefore, an *a priori* condition necessary for model usefulness is that a model be potentially capable (irrespective of its relative effectiveness in so doing) of yielding information concerning issues of interest. For example, if one were interested in the marginal productivity of a particular factor in some production process, one would not consider a production function specification that was incapable of yielding such information even if an excellent fit of the model was certain.

Given the foregoing, it was proposed that the relative effectiveness of models be evaluated in terms of the general criteria of logical validity, simplicity, and fruitfulness. The criterion or category of simplicity was subdivided into data requirements, ease of understanding and communication, and costs of employing the model in serving its intended purpose. Fruitfulness was subcategorized in terms of scope of inferences, additional research or hypotheses suggested, and predictive accuracy, which was further subdivided into precision and bias components.

Ideally these subcategories should be stated in terms such that they are ammenable to measurement (if not objectively, at least, subjectively) and so that they are mutually exclusive and exhaustive. At this point we do not claim to have fully fulfilled any of these three principles in establishing these criteria for evaluating model efficacy. However, we do claim that the proposed framework serves as an appropriate beginning or point of departure and would argue that in terms of the subcategory of model accuracy we have made some progress in this regard.

Implications

We conclude with a brief statement of some of the implications of this research for further research and for the role of the economist in the area development process. Let us consider first implications of the model efficacy results and then follow with those related to the definitional results.

Certainly further research is needed to improve our conceptual framework for evaluating model efficacy. In this connection particular attention should be given to the classification principles of mutual exclusiveness and exhaustiveness [6]. Furthermore, this conceptual work must be undertaken with a view toward ultimately developing a system of criteria that is amenable to quantification. We believe that this research effort also has implications for the role of the economist. It is our opinion that more effort ought to be expended by "applied" economists in pretesting the efficacy of their proposed, policy useful, models. We recognize that the ultimate test of model usefulness is its performance when applied in actual (as opposed to synthesized) decision-making processes. However, we believe that if economists truly desire to have an impact on social decision-making

processes, more effort in the model evaluation arena will have a high payoff.

The role of the economist and applied research needs suggested by our research on definition of development are obvious. There is need for economists to provide relevant decision-making information concerning important economic dimensions of development including, in addition to efficiency or market effects, equity effects and, insofar as economics is appropriate, description of important extra-market (nonmonetary) effects of alternative development strategies and/or programs. In addition there is need for further research directed toward articulating a more comprehensive and quantifiable definitional framework.

In fact, there are so many research opportunities of both an applied and fundamental nature implied as to defy an exhaustive listing. However, in order to set the stage for Part 2 of this report (forthcoming) and to suggest the direction that our further research effort will likely take, let us suggest a few specific research opportunities:

(1) Construction and evaluation of alternative models for predicting income in rural areas given alternative development programs including the no change option.

(2) Construction and evaluation of alternative models (techniques) for describing and predicting income redistributive implications of alternative area development programs.

(3) Construction and evaluation of alternative models (techniques) for describing and predicting extra-market effects of alternative area development programs.

(4) Development and evaluation of procedures for obtaining reliable (theoretically as well as empirically) price proxies for certain extra-market effects.

(5) Construction and evaluation of alternative models and procedures for assessing the incidence of extra-market effects.

We expect our future effort in rural area development research to focus primarily on the first two issues. In any event, there is, indeed, plenty for economists to do that is both challenging and relevant.

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