

CAUSALITY AS A CONCEPTUAL FRAME FOR FOREST POLICY ANALYSIS

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1. INTRODUCTION: THE NEED FOR PUBLIC POLICY ANALYSIS

Recent decades have been characterized by the increasing efforts of the public sector to regulate and steer the commodity, money and employment markets. The increasing effects of these social and economic policy measures on the behaviour of firms, households and individuals have led to new theoretical and practical problems in economics and the social sciences.

The need for the planning and analysis of public policy has increased in various branches of economic and social policy, along with the expansion of the public sector, i.e. as the number of aims of the policy has increased and the objects of it have become more versatile, the objects of allocation have likewise been multiplied. Moreover, the multiplication of the allocation objects has been followed by an increasing scarcity of resources needed for the implementation of policy means. Thus, policy makers are in need of ever more reliable knowledge on the impacts of their decisions.

In addition, the significance of planning a public forest policy has been emphasized by many economic and social changes in forestry and the timber economy. Structural changes in the world economy have been followed by the increasing importance of the renewable natural resources in both producing raw materials and other tangible goods, as well as a source of energy. In the event of economic growth, even at decreasing growth rates, there has been a tendency to impose increasing

goals for the expansion of forest resources together with the increased intensity of their utilization. On the other hand, the significance of forests as an environmental factor, linked to various multiple use functions, has been emphasized, especially in industrialized societies.

The production goals for forestry, established from the perspective of the economy, together with political pressures attached to the distribution of the other social utilities of the forest resources, are reflected in the formulation of forest policy goals and the changes in them. Attainment of the many goals of forest policy – especially concerning investment goals coupled with timber growing and, to an increasing extent, concerning the quantitative goals of timber supply – has met with difficulties in countries where forestry is based on small privately owned woodlands. The accomplishment of the goals has been attempted by means of public forest policy, but the means have not always had the expected effects. The policy means may have been ineffective due to the inadequate planning information or to the economic and social changes in the object of forest policy, i.e. in the private forestry.

The need therefore exists for improving the public forest policy planning system, which arises from the goals and focuses on their achievement. This planning system, the premises and basic properties of which the author has dealt with in his previous paper

(cf. TIKKANEN, 1976), is characterized by the central significance of policy analyses in the design, and especially the decision making, concerning the selection of alternative policy means.

From the perspective of both practical forest policy making, as well as policy planning, we may crystallize the analysis problem of forest policy by quoting TINBERGEN (1975, p. 53):

"The central question of economic policy is the question of the effectiveness of its various instruments."

The main stages in public forest policy making can be summarized in a schematic form, figure 1, where the position of policy analysis is also graphically expressed. The scheme is adapted from BAKER et al., 1975, p. 49.

The purpose of the present paper is to outline a general frame of reference for empirical policy analysis, upon which the effectiveness analysis of forest policy is also

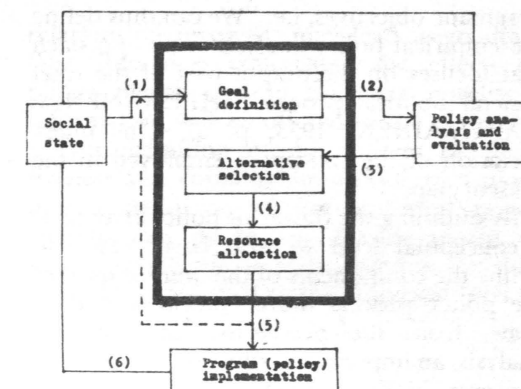


Figure 1. Basic steps in the public policy process.

based. The approach serves as a methodological frame for the empirical analysis, presented in the following paper, in which econometric methods are applied to the examination of the effects of public forest policy.

2. A FRAME FOR EMPIRICAL POLICY ANALYSIS

2.1. Policy analysis and effectiveness

BOULDING (1958, p. 1), in defining economic policy, has stated: "Any study of policy should... concern itself with three things – what we want (the ends), how we get it (the means), and who are 'we', that is, what is the nature of the organization or group concerned." GLÜCK (1976, p. 50–59), also refers to the use of this kind of goal-means scheme derived from the theory of economic policy, which he considers can be applied paradigmatically to the theoretical study of forest policy, too.

These basic constituents of the policy making process are essential also to modern policy research.

The concept 'policy analysis' here refers to all the research work, the subject matter of which is the process of public policy making as a whole or some components of it. The content of policy analysis may be illustrated from the perspective of the utilization of the study results: the pragmatic aim for policy analysis can be said to be the production and

processing information in order to improve the quality of planning and subsequent decision making in the sector of the policy in question. Along with this pragmatic aim, the research area can be considered to have theory building objectives, too (cf. QUADE, 1975, p. 4–5; COOK & SCIOLI, Jr., 1975, p. 3–8).

The development of policy sciences during recent years has emphasized empirical, rather than normative policy analysis and its results. The contribution of policy analysis to the planning and decision making has been improved by the fact that there has been a transition of the emphasis in research activity from the input part of the policy making process (i.e. policy demands, the forming of policy alternatives and the decision making process coupled with it, etc.) to the empirical analysis of the outputs of policy decisions and especially the effects (impacts) of them.

Thus, the concept of empirical policy analysis is sometimes restricted to just those components of policy process which are relevant from the point of view of its

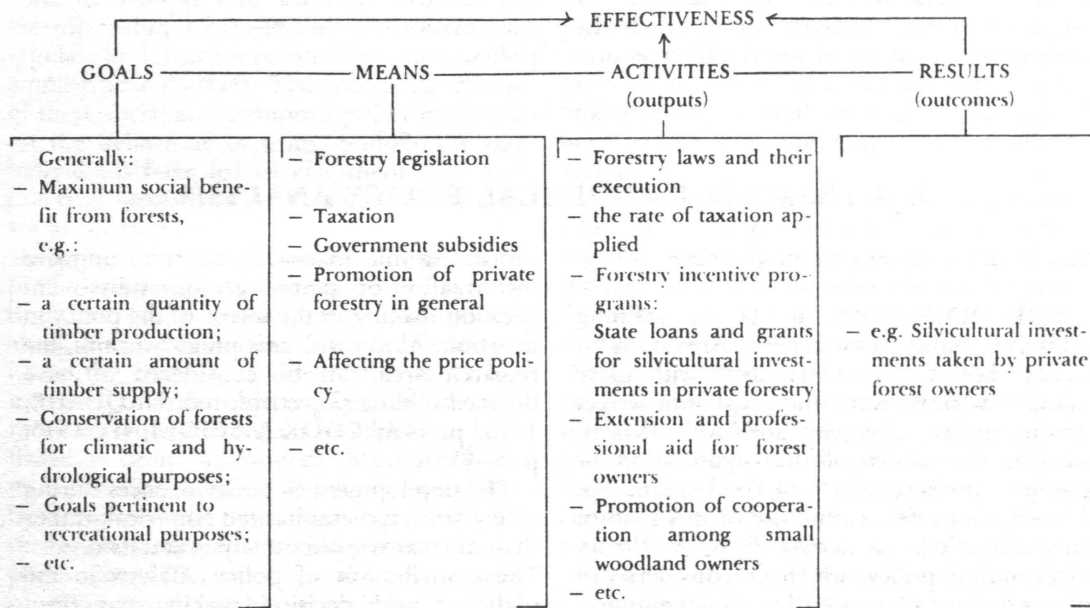
pragmatic objectives, i.e. "We can thus define the empirical policy analysis as an approach that focuses on the output part of the total societal political process" (HEISKANEN & MARTIKAINEN, 1973, p. 3). This interpretation of the concept is employed in the present paper.

By outlining the frame for policy analysis at a conceptual level we also have reason to define the components of the 'output part' of the policy process more accurately and to draw, from the perspective of empirical analysis, an important distinction between the concepts 'policy output' and 'policy outcome'. (See COOK & SCIOLI, Jr., 1975, p. 3-7; JOHNSON & PIERCE, 1975, p. 144-145; HEISKANEN & MARTIKAINEN, 1973, p. 4-7):

- policy output: the concrete decisions and acts by the decision (policy-) makers; the realization of policy measures (activities)
- policy outcome: the effects or impacts produced (caused) by the policy measures (outputs)

By means of these general concepts we are now able to outline a simplified frame, based on the goal-means-effect scheme, for the empirical analysis of the effects (effectiveness) of public forest policy. We may also describe the conceptual content of the effectiveness. (See TIKKANEN, 1976, p. 378-382 and 1977, p. 38-74):

A Frame for Policy Analysis as Applied to Public Forest Policy (an example of goals and means)



We can compound the frame e.g. by constructing goal-means-hierarchies (cf. the relevance tree-method). It is therefore necessary to identify policy goals and means, for the empirical effectiveness analysis. In the frame above there are, by way of illustration, some goal-means-combinations of public forest policy which are aimed primarily at timber growing. The most central of these are state subsidies, the aim of which is to

stimulate silvicultural investments in private forestry. Forestry legislation and taxation play a similar role.

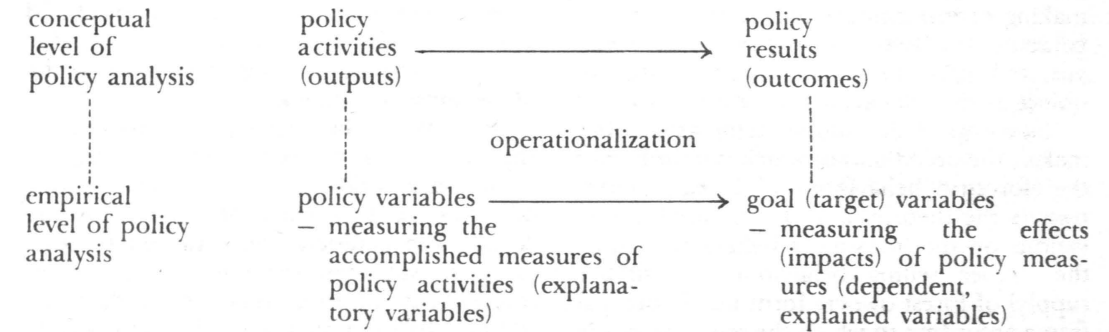
Before we shift our exploration from the conceptual level of the frame to the empirical and methodological questions of forest policy analysis we need to clarify the very nature of the concept 'effectiveness'.

'Effectiveness' is commonly defined as a relation between the goals and the outcomes

of the policy being studied. It has to be pointed out that too little stress has been laid upon the fact that the concept of effectiveness presupposes an analytic link with the accomplished policy measures (see the frame). If we are not able to give evidence of the dependence between the policy outputs and the effects due to it, we have no reason to state that we are examining the effectiveness of a policy issue. Thus, the comparison of some states, being the object of the policy, to the goals set, without the verification of the causal

relationship involved, may lead us to draw false inferences concerning the effects of policy means and in this way unreliable information will be offered to the planners.

This definition of the concept of effectiveness also contains the making of a more precise definition of the empirical policy analysis and its setting. By the means of following scheme we can illustrate the shift from the conceptual to the empirical level in policy research:



In the effectiveness analysis, a prerequisite for evaluating the relation between the policy goals and its effects is that in the empirical analysis we measure both the outcomes and the goals on the same operational variable.

One may in fact often be compelled to use good secondary measures rather than primary measures both as policy variables and the goal variables. The identification of policy effects and the restricting of the extent of the effects are always based on an agreement, depending on the needs of the user of the information and the planning situation. Thus, the goals, means and the definition of the level of effectiveness analysis may be different when evaluating the forest policy in modern industrialized countries compared to developing countries, for example.

On the basis of this scheme we can now state the following empirical objective for policy analysis: to construct a policy model, aimed at effectiveness analysis, in which there is a (dependent) target variable measuring the impacts of a given policy and as an explanatory variables there are policy variables, which measure

the accomplished activities (outputs) of the policy.

By means of a policy model, an attempt is made to quantify effectiveness as a ratio between the change in the target variable and the change in the policy variable - other factors remaining constant (see TINBERGEN, 1975, p. 53-54):

$$\frac{\partial Y_k}{\partial Z_i}, \text{ where } Y_k = \text{policy goal (target variable)} \\ Z_i = \text{policy means (policy variable)}$$

This relationship between the policy and target variable can be characterized by the concept of "productive causality", presented by BLALOCK (1972, p. 9). An essential feature of this dependence is that by means of the policy measures an attempt is made to "produce" an expected change in the target variable representing policy goals. In addition, the behavioural relationship concerned is probabilistic rather than deterministic in nature.

The ultimate theoretical and methodological question is, if we are capable of specifying the model denoting to the causality between target variable and policy variable, do we obtain from the estimation phase

reliable and stable parameter estimates which verify this causal relation? In a validly specified policy model we may interpret the parameter estimate of the policy variable as an effectiveness parameter of the policy means concerned.

2.2. On the properties of forest policy models

The specification of the policy model contributing to the planning and decision making of forest policy is determined by the contents of both the policy goals being analyzed and the policy means being an object of the effectiveness analysis.

If we regard the public sector as a policy maker, the policy aim of which is to influence the forestry behaviour of private forest owners the theories and the research observations on the investment behaviour and/or the timber selling behaviour (i.e. timber supply) of forest owners form the theoretical frame according to which the selection of the variables and the causal structure of the policy model are based.

Consequently, the theoretical premises of the model specification are determined according to which behavioural phenomenon will be affected by means of the policy measures.

The identification of the target variable of the forest policy model depends on which forestry activity is meant to be regarded as a goal of forest policy and in particular on what level of forestry or the economy the evaluation of effectiveness is performed. The problem of the level of evaluation is coupled with the distinction between micro vs. macro analysis, as much as the question of the level of aggregation.

If the aim is to cause a change in the investment behaviour of private forest owners, the target variable has to be specified with respect to the results of the investment activity, depending on whether the policy analyst or planner is interested in either the extent of certain silvicultural measures or the quantity of gross investments in forestry in general.

When concerning policy analysis, it is

necessary to make a distinction between the reforms in policy measures, qualitative and quantitative policy means (see TINBERGEN, 1966 and 1975; also TIKKANEN, 1976 and 1977). This subdivision, based on the properties of policy means, has a bearing upon the methodology to be applied in the effectiveness analysis, and hence the specification of policy model. Thus the approach to policy analysis research, as well as the operationalization of the policy variables vary according to whether the objects of the analysis are, e.g., forestry taxation measures, state incentive programs or extension and training activities of the forest owners, the aim in each case being to influence the silvicultural investments.

Obviously, the aggregate analysis is applicable to, and may be even the prerequisite for, the exploration of the effects of state subsidies, as quantitative means, where the dependence between policy variables measuring the subsidies and the investments are analyzed by utilizing time series data. In addition to the policy variable, theoretically relevant determinants of the investment behaviour should be included in the specification of this kind of macro model.

On the other hand, we may assume that in the study of the impacts of some qualitative means of forest policy, like the extension and training of forest owners to promote silvicultural activities, the analysis on the woodlot level would be justified. In specifying the variables of the planning model at the micro level, and the causal structure between them, we may use the research findings concerning the forestry behaviour of forest owners. At the woodlot level, a subdivision of the explaining factors of the silvicultural investments can be made into the structural economic and social factors, the productive resources of the woodlot, the socio-economic status of the forest owner together with the inner factors of the forest owners, such as goals pertinent to the forest property and the attitudes toward forestry and forestry promotion. (See the referencies to the research activity in this field TIKKANEN, 1976, p. 380-385, also the figure representing the planning model of forest policy, p. 382).

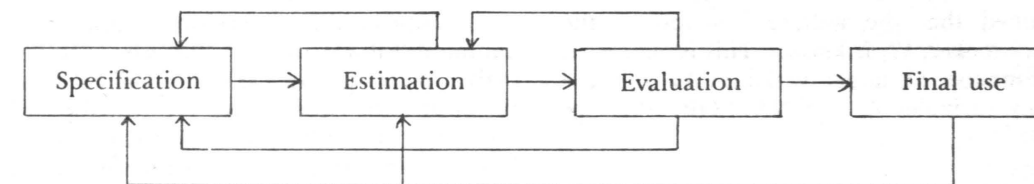
3. ECONOMETRIC APPROACH TO EMPIRICAL POLICY ANALYSIS

Due to the extensive sphere of application of policy sciences, the empirical analysis of public policy making consists of an array of alternative and complementary research methods. The selection of the methodology to be applied is naturally coupled with the purpose and the substance of policy analysis. In addition, the characteristic features and the contents of the policy concerned and its object somewhat limit the feasible methods. (Cf. COOK & SCIOLI, Jr., 1975).

If the object of empirical policy analysis is the public forest policy making, the aim of which is to influence the phenomena of the economic and social behaviour in the private forestry, and the explicit purpose of the study is to quantify the causal relation between the policy means and their impacts, then econometric methods would appear to be serviceable.

Econometrics, according KOUTSOYAN-NIS (1977, p. 3), combines economic theory, mathematical economics and statistics, and deals with the measurement of economic relationships. INTRILIGATOR (1978, p. 2) considers that the question is about the empirical estimation of economic relationships. Nevertheless, the econometric approach can be considered to extend beyond the realm of economics, and include the fields of social and behavioural sciences.

The main stages of econometric model building, in which the theory and the empirical facts are combined by utilizing statistical techniques, can be summarized in the following scheme (see NEVALA, 1976, p. 446 and INTRILIGATOR, 1978, p. 3-4):



The decisive role of theory in any economic research, as well as in empirical policy analysis, is accentuated by the specification phase of the model building process. Regarding the estimation methods, used for quantifying the relationships in the econometric model and the evaluation criteria of the goodness of the model, reference is now made to appropriate textbooks and the following empirical paper by the present author.

The estimated model, being generated as a result of econometric analysis, can be used for three main purposes (see INTRILIGATOR, 1978, p. 5; KOUTSOYANNIS, 1977, p. 8-9):

- structural analysis
- forecasting and
- policy evaluation.

These three objectives are closely connected with each other. Accordingly, structural

analysis is a prerequisite for forecasting and policy evaluation. The structural analysis can be regarded to be aimed primarily at the objective of scientific explanation and theory building, a final outcome of which is that the economic relationships are expressly quantified by means of estimated structural parameters. The objective of building the explanatory model, to obtain reliable parameter estimates, presupposes valid specification of the underlying causal structure. Estimates are interpreted as elasticities or multipliers, which express the effect of the explanatory variable (e.g. the policy variable) on the goal variable.

As already stated above, the aim of policy evaluation is to produce information on the impacts of alternative policy means regarding a set goal. Three alternative approaches to policy analysis can be applied for this purpose (see INTRILIGATOR, 1978, p. 542-553; NEVALA, 1976, p. 444):

- 1) instrument-targets approach
- 2) social-welfare function approach
- 3) simulation approach

Each of these approaches presupposes of use of an estimated econometric model based on structural analysis.

In the first approach, which is also known as the 'TINBERGEN approach', the central assumption is that the endogenous variables of the model are expressed as fixed targets of the policy. By using the given values of exogenous and perhaps lagged endogenous variables together with the expected values of the targets the optimal values of the policy instruments are solved as a function of the variables mentioned. Some of the difficulties of this approach are particularly concerned with the assumption of the fixed targets of the policy.

The policy evaluation method based on the maximizing of the social welfare function is developed by THEIL. In this approach, it is assumed that the welfare function of the policy maker, W , is known. This is expressed as function of target variables Y_t and the policy variables Z_t (see NAYLOR, 1970, p. 263):

$$W_t = W_t(Y_t, Z_t).$$

The difficulty of applying this approach to policy problems is as much related to the

specification problem of the welfare function as its operationalization. These theoretical and empirical problems have not been solved in a satisfactory way.

In the policy simulation approach we need not be dealing with the problems of the welfare function, or targets assumed to be explicitly known and fixed. Simulation is a method in which alternative time paths of endogenous variables are numerically generated on the basis of an estimated econometric, usually multiequation model. In the simulation program, the given values of the exogenous variables are fed, new values of lagged endogenous variables generated on basis of the observations of previous periods and alternative values, according to the preferences of policy makers, on the policy variables are set upon. The simulation process provides information on the impacts, in the form of changes on the level of target variable, produced by the alternative policy means. (cf. NAYLOR, 1970).

The approach can therefore be used as a communication media between policy analyst, policy planner and the policy maker, by means of which we are capable of evaluating the effects of alternative policy decisions. In forest economics the simulation approach has been applied to outlining the long range alternatives for the forestry and timber economy (see NFES Forest Policy Analysis Group, 1978; SEPPÄLÄ et al., 1980).

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