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Budget-Making for Social Purposes

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A theory of the budgetary process within public resource allocation has to recognize two basic properties of budgetary behavior and budgetary interaction: variation over time and program variation. Our results indicate that the hypothesis of program variation is worthy of effort, as we find different decision mechanisms operating in the six programs studied, which belong to different categories of public resource allocation. Variation over time is particularly difficult to accommodate within the framework of incrementalist notions: incremental decision rules imply structural stability over time slices. We find the opposite to be true in two of the program types analyzed, the transfer programs and the service programs. Bureaucratic programs may look incremental; however, that may only be an appearance, as a closer analysis of the data indicates that the decision mechanism involves the occurrence of shift-points or non-incremental changes. A theory of the public expenditure process has to take into account both incremental decision strategies and non-incremental ones, which requires an econometric methodology based on the possibility of structural variability. Such a methodology includes the use of both test statistics and estimation techniques suitable to the occurrence of structural variability.

Introduction

It used to be believed that public resource allocation is a linear growth process, which is governed by a set of decision principles constituting a mechanism of choice that renders budget-making incremental (Wildavsky 1964; Crecine 1969; Wildavsky 1975). As a matter of fact, qualitative studies of budgetary processes (Wildavsky 1964; Heclo & Wildavsky 1975; Caiden & Wildavsky 1974; Anton 1966) have been considered as providing confirmatory evidence of the general incremental decision theory focussing upon bounded rationality (March & Simon 1958; Cyert & March 1963) or as corroborating the principles of disjointed incrementalism (Lindblom 1959; Lindblom 1965; Braybrooke & Lindblom 1963). On the basis of incrementalist decision theory the budgetary process has been described quantitatively in terms of a set of linear and stochastic equations, one type of equations modelling request behavior and the other type modelling appropriations behavior. At first it was believed that the ordinary least squares estimation of these incremental models resulted in an

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Introduction

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appropriate goodness of fit (Davis, Dempster & Wildavsky 1966; Davis, Dempster & Wildavsky 1974), though there were warnings of a methodological nature (Wanat 1974). Then, however, it became obvious that these budgetary models had a limited explanatory *range* in so far as it was discovered that not all program developments at different levels of goverment could be accounted for by incrementalist notions (Gist 1974); moreover, it was argued that the basic concept of an incremental change was vague and could be accommodated differently in order to account for various types of program development (Bailey & O'Connor 1975). Also the *scope* of the models has been questioned, as the decision rules expressed in the set of equations was considered too simplistic to capture the decision-mechanism behind the two parts of the budgetary process, the request behavior and the appropriations behavior. Dempster and Wildavsky, though dismissing the criticism of the incremental budgetary models, recognized the occurrence of non-incremental budget behavior, arguing for the need for a development of the models to account for so-called *structural changes* in program developments (Dempster & Wildavsky 1979: 371). In effect they reopened the problem of modelling budgetary behavior in an appropriate fashion:

> 'If shift points identify epochs of change, then it may have been worthwhile puzzling over how to talk about them. If incremental means stable and non-incremental means unstable, then instability is a key to change. Our ability to make good predictions depends on stating the conditions under which shift-points — that is non-incremental behavior, otherwise called (basic, fundamental, radical) *change* — will occur' (389).

Steps are now taken towards an understanding of the public expenditure process which recognizes the complexities of budget behavior and its relationships to other aspects of the public sector (Rose & Peters 1978; Rose 1982); models of the budgetary process have been suggested that formalize these complexities in order to increase the goodness of fit when estimating models of the budgetary process (Dempster & Wildavsky 1980). However, we argue that this recent improvement in budget theory implies that the existence of *structural variability* in budget making must be recognized and its theoretical and operational implications be spelled out.

This paper is about the occurrence of structural change or shift-points in one important type of public expenditure programs. Our first step is to devise a test statistic which offers guidelines as to whether the development of a program is characterized by structural stability or structural variability. Our second step is to employ an econometric estimation technique that is suitable to either the occurrence of structural stability or variability, as the case may be. Finally, we use our econometric tools applying them to some programs in order to analyze budget behavior in a new way. Our empirical cases refer to budgeting for social purposes in the Swedish welfare state. Now, budgeting for social purposes

is a vital part of public resource allocation in most western democracies (Wildavsky 1975); all welfare state nations have programs of that kind and they consume a considerable share of the revenues. Our empirical questions then become: how do various kinds of programs entering into social budgeting develop and how can program development be modelled?

The Data

The program structure of the national government effort within the social sector of the Swedish welfare state comprises a large number of appropriations, or roughly 90 programs. The Department of Health and Welfare, which has the authority at governmental level over social budgeting, is the most expensive department in the national budget. Its program structure may be divided into *transfer, service,* and *bureaucratic* programs. Our analysis covers two programs within each of these program types:

Transfer programs	pensions family allowances
Service programs	the Caroline Hospital the Academic Hospital of Uppsala
Bureaucratic programs	the National Board of Health and Welfare (NBHW) the National Social Insurance Board (NSIB)

We have computed the yearly request and appropriations for these programs for the period 1946 to 1980 on the basis of the following considerations:

(a) All measures are expressed in the 1980 price level; thus, the budget figures have been adjusted with regard to the effects of inflation.
(b) Transfer programs lack the request side in the proper sense of that word.
(c) The appropriations for the transfer programs have been adjusted with regard to changes in the population structure. We have recomputed the measures for these programs by means of indices which take into account those changes in the number of the aged and of children over which the budget makers have no control.

Table 1. Structure of the data

Programs	Time period	Variables
Pensions	1947-1980	appropriations
Family allowances	1948-1980	appropriations
NBHW	1950-1980	appropriations requests
NSIB	1954-1980	appropriations requests
The Caroline Hospital	1950-1980	appropriations requests
The Academic Hospital	1953-1980	appropriations requests

(d) Due to certain difficulties of arriving at reliable data for some years after the Second World War, our data contain the following cases (Table 1):

(e) The data have been compiled from two sources: the national budget proposal for the request data, the yearly budgetary accounts for the appropriations data; moreover, we have taken into account the supplementary budget proposals as well as the organizational changes taking place during the time period investigated. Appropriations and requests have been aggregated in order to arrive at comparability by cancelling out purely organizational changes. The accounting technique has been the same for the entire period.

The Method of Analysis

The framework for the analysis of the behavior processes resulting in budget-making for social purposes is constituted by the following linear models:

$$A_t = \beta_{1t} A_{t-1} + \varepsilon_{1t} \quad (1)$$

$$R_t = \beta_{2t} R_{t-1} + \varepsilon_{2t} \quad (2)$$

$$R_t = \beta_{3t} A_{t-1} + \varepsilon_{3t} \quad (3)$$

$$A_t = \beta_{4t} R_t + \varepsilon_{4t} \quad (4)$$

$$R_t = \beta_{5t} A_{t-1} + \beta_{6t}(R_{t-1} - A_{t-1}) + \varepsilon_{5t} \quad (5)$$

and

$$A_t = \beta_{7t} R_t + \beta_{8t} (R_{t-1} - A_{t-1}) + \varepsilon_{6t}\,, \quad (6)$$

where A_t and R_t denote appropriations and requests at time t, respectively, β_{it} ($i = 1,2,..,8$) denotes structural parameters, and finally, ε_{jt} ($j = 1,2,...,6$) denotes structural residuals.

The public expenditure process is generally modelled in terms of these equations (1) - (6), which is of course also true of incrementalist decision theory about budget-making (Wildavsky 1975); it is then, however, assumed that $\beta_{it} = \beta_i$, for $i = 1,2,...,8$, and for all t, i.e. the structural parameters are assumed to be stable over time, which is a basic idea behind the notion of incremental change (Lane, Westlund & Stenlund, 1981). The equations (1) and (2) model autoregressive processes, while (3) - (6) model simple and multiple regression relations. The rationale of equations (5) and (6) is given in Dempster & Wildavsky (1980).

Although our present analysis allows for structural variability, it by no means excludes the possibility of the occurrence of stable parameters. The information contained in the empirical data is the basis for a choice between these two alternative hypotheses. Formally, statistical testing of *structural stability versus variability* is applied.

The test technique, that is applied to indicate structural variability or stability, is generally called the *CUSUMQ test,* as it is based on cumulated sums of

squared residuals. In order to describe the testing procedure, let us represent (1) - (6) in general by

$$y_t = z_t \beta_t + \varepsilon_t , \tag{7}$$

where y_t denotes the regressand, z_t is a (lxk) vector of regressors, β_t the parameter vector, and ε_t a stochastic residual. The following discussion is based on the assumption that $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. If the structural parameters in β_t are stable over time, i.e. $\beta_t = \beta$ for all t, the ordinary least-squares estimate of β_t based on t observations (where $k \leqslant t \leqslant T$) is given by

$$\hat{\beta}_t = (Z_t' Z_t)^{-1} Z_t' Y_t , \tag{8}$$

where $Z_t' = (z_1', \ldots, z_t')$ of order (kxt), and $Y_t' = (y_1, \ldots, y_t)$ of order (lxt). The variance-covariance matrix of $\hat{\beta}_t$ is given by $\sigma_\varepsilon^2 (Z_t' Z_t)^{-1}$.

Let us now define recursive residuals as

$$\nu_t = \frac{y_t - z_t \hat{\beta}_{t-1}}{\{1 + z_t (Z_{t-1}' Z_{t-1})^{-1} z_t'\}^{1/2}} \quad ; k+1 \leqslant t \leqslant T. \tag{9}$$

If $\beta_t = \beta$ for all t, and as the residual ε_t is assumed to be normally distributed, we find that

$\nu_t \sim N(0, \sigma_\varepsilon^2)$,

and that ν_t is serially independent.

By determining

$$V_t = \left(\sum_{s=k+1}^{t} \nu_s^2 \right) / \left(\sum_{s=k+1}^{T} \nu_s^2 \right) ; k+1 \leq t \leq T, \tag{10}$$

we have the basis for the CUSUMQ test procedure. Obviously, V_t is monotonically increasing, with $\max V_t = V_T = 1$. As it is possible to show that $1 - V_t$ is beta distributed with parameters $\alpha_1 = -1 + (T-k)/2$, and $\alpha_2 = -1 + (t-k)/2$, we conclude that the mean value of V_t is $E(V_t) = (t-k)/(T-k)$.

Thus, the CUSUMQ testing procedure implies rejection of the structural stability hypothesis, if

$$| V_t - (t-k)/(T-k) | > \delta ; k+1 \leqslant t \leqslant T, \tag{11}$$

where δ is determined approximately by the significance level to be used (δ is given by Durbin, 1969).

If the testing procedure results in a rejection of the stability hypothesis, the model (7) should be estimated according to a principle which takes structural variability into account. One simple approach for the estimation of time-varying structural parameters is the so-called *Kalman filtering* technique, which is applied in this paper. In order to use Kalman filtering, (7) must be supplemented by an autoregressive model describing the parameter variability:

$$\beta_{t+1} = \Omega_t \beta_t + \chi_t , \tag{12}$$

where Ω_t denotes a transition matrix, and χ_t a residual vector with expected values $E\chi_t = 0$ (a zero vector), and with variance-covariance matrix Γ.

This parameter model may be derived from a more general description of the parameter variability, and is thus not as restrictive as it might seem. The model (12) represents a system of k relations, where each parameter $\beta_{i,t+1}$ is supposed to vary stochastically (χ_t) and through some systematic change, dependent on an earlier parameter vector ($\Omega_t\beta_t$). The transition matrix Ω_t is here generally assumed to be time-invariant, and even identical to or approximately equal to the identity matrix. The variance-covariance matrix Γ is generally assumed to be diagonal, and ε_t and each element in χ_t is also supposed to be independent.

Being able to a priori specify σ_t^2, Γ, Ω_t and $\beta_{0|0}$, we may determine the so-called Kalman filters as estimates of β_t, based on sets of observations s (denoted $\beta_{t|s}$). Thus, we obtain

$$\beta_{t+1|t+1} = \beta_{t+1|t} + S_{t+1}(y_{t+1} - z_{t+1}\beta_{t+1|t}), \tag{13}$$

where

$$\beta_{t+1|t} = \Omega_t \beta_{t|t}. \tag{14}$$

The up-dating equation (13) gives the estimate of β_{t+1} based on information to and including time $t+1$, as a weighted sum of the prediction of β_{t+1} based on t observations, and the prediction error $(y_t - z_{t+1}\beta_{t+1|t})$. The weights are given by the so-called gain matrix S_{t+1}, which is determined by

$$S_{t+1} = V_{t+1|t} z'_{t+1} (z_{t+1} V_{t+1|t} z'_{t+1} + \sigma_t^2)^{-1}, \tag{15}$$

where $V_{t+1|t}$ denotes the estimated variance-covariance matrix of $\beta_{t+1|t}$.

It is also possible to derive up-dating and prediction relations for V_t (in parallel to (13) and (14)). Thus, we have

$$V_{t+1|t+1} = V_{t+1|t} - S_{t+1} z_{t+1} V_{t+1|t} \quad , \tag{16}$$

and

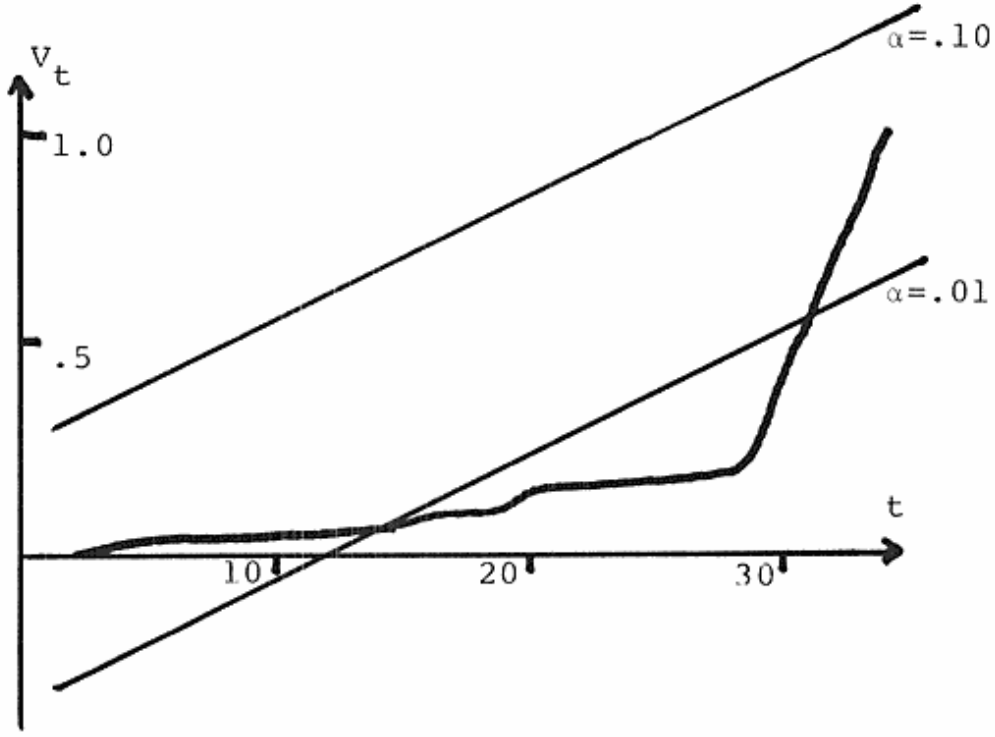
$$V_{t+1|t} = \Omega_{t+1} V_{t+1|t} \Omega_{t+1} + \Gamma \tag{17}$$

The Kalman filter approach, constituted by (13) - (17), has a recursive structure, which renders it attractive for empirical applications. Insofar as the a priori characteristics mentioned above are not too severely mis-specified, the Kalman estimation is, moreover, characterized by good theoretical properties. There is in addition a manifest robustness vis-à-vis the a priori specification of σ_t^2 and Γ, but unfortunately also a significant sensitivity to incorrect specification of the transition and the initial structural parameter matrices.

Transfer Programs

When modelling the development of our two transfer programs we first commit ourselves to a decision between the hypothesis of structural stability versus structural variability. If the test statistic indicates the occurrences of structural changes or shift-points we argue that the analysis of these programs has to be based on a model assumption of structural variability on the one hand and on an estimation technique that adequately portrays these structural changes on the other hand. Diagram 1 has the answer to the problem of deciding between

Diagram 1. Testing for structural stability in the development of pensions program: appropriations as a function of last year's appropriations.

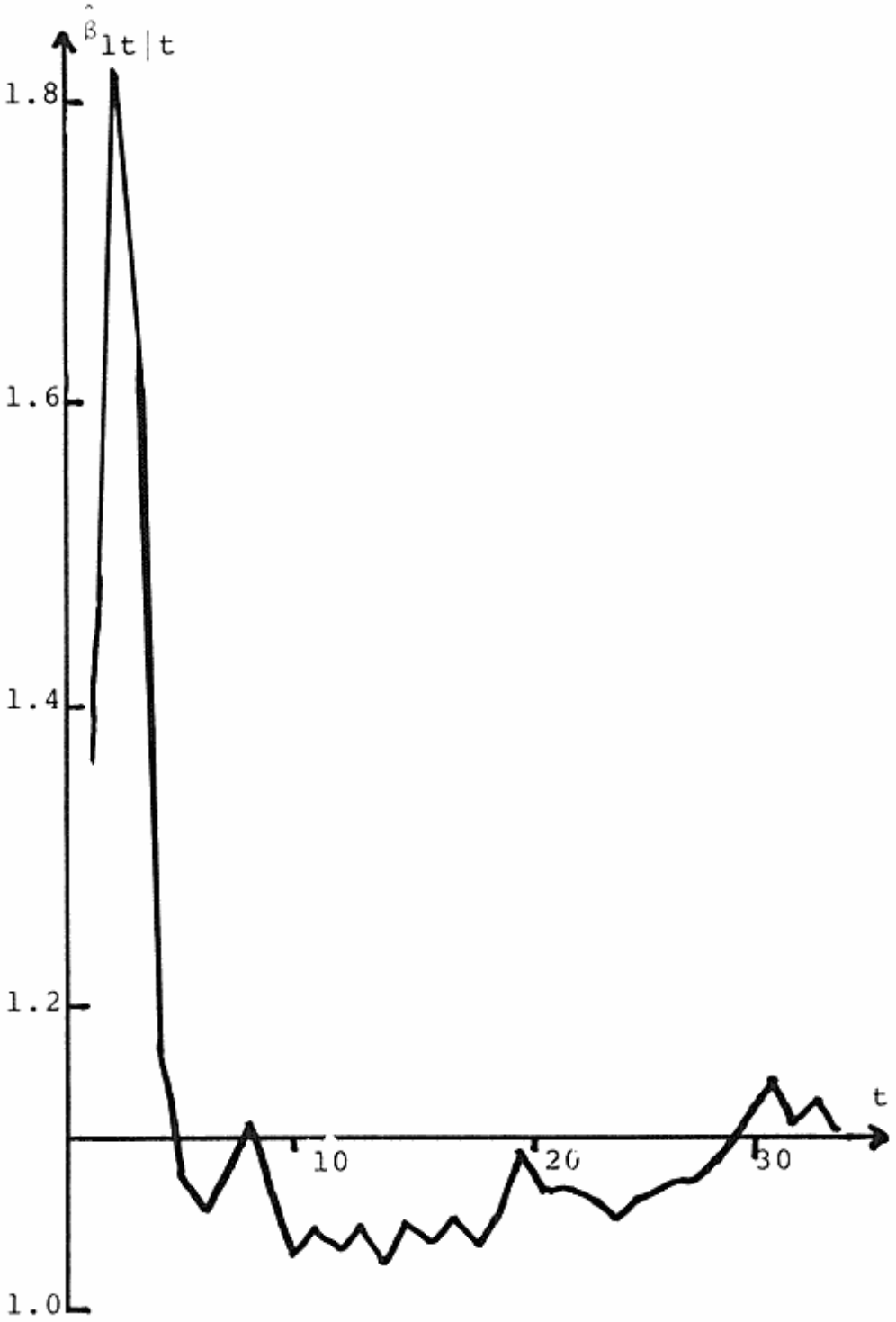


a model assumption of structural stability and a model assumption of structural variability.

The CUSUMQ test implies that a model assumption of structural variability is relevant for the understanding of the growth of the pensions program; the test results imply that the Kalman filter estimation technique is one adequate econometric method if the shift-points typical of the development of this program are to be captured. Diagram 2 contains the Kalman curve for the pensions program modelled in terms of equation (1).

When the development of the pensions program is interpreted on the basis of a model estimation allowing for structural variability it appears that the program is characterized by considerable shifts in growth rates, and that the program development over a period of time can be neatly divided into quite different stages of expansion. Firstly, immediately after the War, decisions were taken that expanded the pensions program very rapidly; of course, these drastic yearly changes reflect a political preference function in which a policy reorientation is expressed: a new emphasis is placed on this item of public resource allocation. The reorientation period lasting for about 5 years implies a rapid introduction of a new commitment or a commitment to an old program but on an entirely different level. Secondly, we identify a period of steady state lasting for roughly 10 years, during which the new commitment is solidified;

Diagram 2. Parameters in the equation (1) estimated for the pensions program 1947-1980.



marginal changes are made in order to improve on an already defined technique for supporting the aged, and these marginal improvements are all posi-

tive increments. Thirdly, it seems possible to identify a process different from the two already described. After 1965 there seems to occur a stable positive yearly change in the increments indicating a new emphasis on this type of social program. This new commitment towards accomplishing greater equality between generations is not readily apparent in the data if one only looks at the change from one year to the next, but it comes out nicely when the increment for 1964 (3%) is compared with that of 1977 (14%).

Apparently the growth process starting after the Second World War has not been stable: structural variability is a feature of the growth of the pensions program. Moreover, the occurrence of shift-points is reflected in the changing relative share for this program of the total national budget. In 1946 the relative share of the national budget for the pensions program was 7%, in 1950 it amounted to 15.8%, in 1964 the relative share was 16.7% and in 1977 it had risen to 18.9%. The change in real economic terms between 1964 and 1977 is the huge sum of roughly 3 billion Swedish kronor, which actually exceeds the entire cost for operating the universities and the advanced professional schools in 1977.

When we turn to the analysis of the second transfer program, the family allowances, we find again that structural instability is the typical feature of its development in the budgetary process, as indicated by the CUSUMQ test results. Estimating the auto-regressive appropriations model for the family allowance program, the Kalman curve pinpoints decision-making shifts, revealing policy changes. Immediately after the Second World War the policy ambition was raised considerably as the amount of real economic resources allocated to this program was increased with a staggering 90% between 1948 and 1949. During the 1950's the size of the appropriation of the program actually declined somewhat; since the number of children kept growing during that decade it seems as if the program dit not receive full compensation for inflation. In the early sixties a new emphasis was placed on this program, which continuously expanded the program over a period of roughly five years to its prevailing size. Look at the following yearly growth rates:

(a) 1958-59: 16%
(b) 1960-61: 11%
(c) 1963-64: 20%
(d) 1965-66: 22%.

During the time period 1965-1980 the size of the program has *hovered* significantly. It seems as if the program has difficulties in receiving full compensation for the inflation during some years, whereas the opposite is true for other years. In any case the size of the program in 1980 is much the same as that of the year 1966 when the price level is adjusted for the inflation and the number of children is held constant. The family allowance program just as the pensions is characterized by structural variability, revealing changes in the political preference function governing the development of these transfer programs.

Service Programs

Perhaps the occurrence of structural variability in the expansion of the pensions program as well as in the growth of the family allowance program can be explained by referring to the special nature of these programs: they lack the request part of the budgetary process in the proper sense. A transfer program is simply the allocation of money in accordance with criteria and does not involve public consumption, or investment; there is no *authority* producing goods or services that puts forward yearly requests for resources to the government. Actually the political parties themselves operate as the requesting bodies for that kind of item in the public expenditure process. Service programs enter into the public sector defined as public consumption and investment; they are carried out by authorities that perform as requesting actors in the budgetary process interacting with the government, appropriating funds to them on a yearly basis. In order to look into the typical features of request behavior we model the development of the requests of two authorities in charge of the provision of health care services, the Caroline Hospital and the Academic Hospital. Maybe the budgetary process is more characterized by structural stability when budget-making involves a request side?

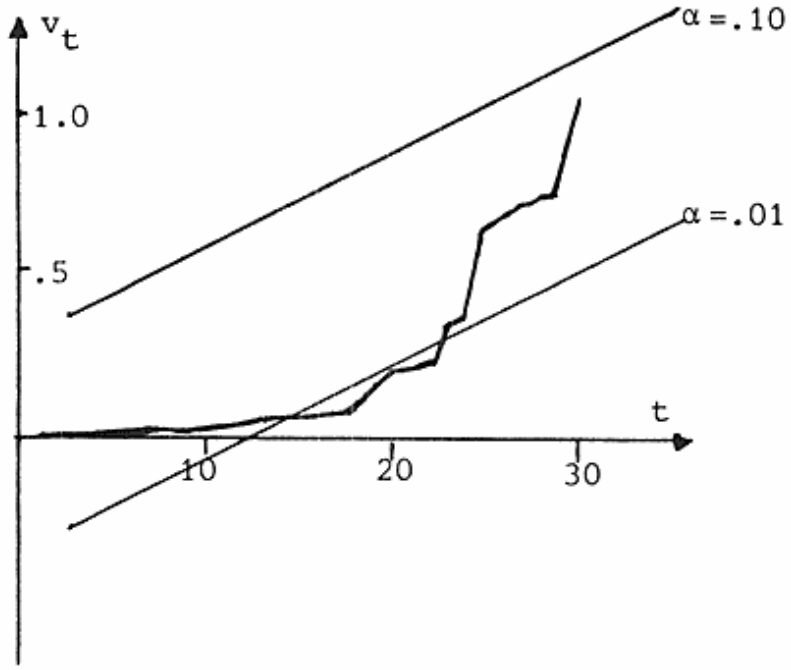
Typical of the budgetary process involving non-transfer programs is *budget interaction* between request actors and the appropriating government; the understanding of the development of the public expenditures has to be based on a modelling of the relationship between request behavior and appropriating behavior. More complicated models have to be employed with regard to service programs than in relation to transfer programs in order to capture that interaction. At the same time as the developments of the request side and the appropriation side of a program have to be kept separate, it must be remembered that the outcome of the interaction between these processes determines the pattern of the overall program development. Understanding the public expenditure process means to be alert to the possibility that request behavior and appropriation behavior may employ different decision rules, the interaction of which determines the pattern of development. Actually, this difference in decision strategy is the key to the explanation of the growth of appropriation to the Caroline Hospital.

The Caroline Hospital

The government employs a standard mechanical decision rule when it handles the request of the Caroline Hospital; between the years 1948-1980 there is hardly any variation in the way the government appropriates resources to the Hospital on the basis of the request made by that Hospital. There are no shift-points, as the government appropriates roughly 95% of what the hospital asks for. What is the reaction of the requesting authority to such an appropriation

behavior on the part of the government? The equation (3) — request as a function of last year's appropriation — models the relevant data in an elementary fashion. However, the data concerning the request behavior of the Caroline Hospital display a variation which makes an explicit statistical model choice relevant. The test statistic indicating whether the request behavior of the Hospital is characterized by structural stability or variability is reproduced in Diagram 3.

Diagram 3. Testing for structural stability in the development of the Caroline Hospital program: request as a function of last year's appropriation.

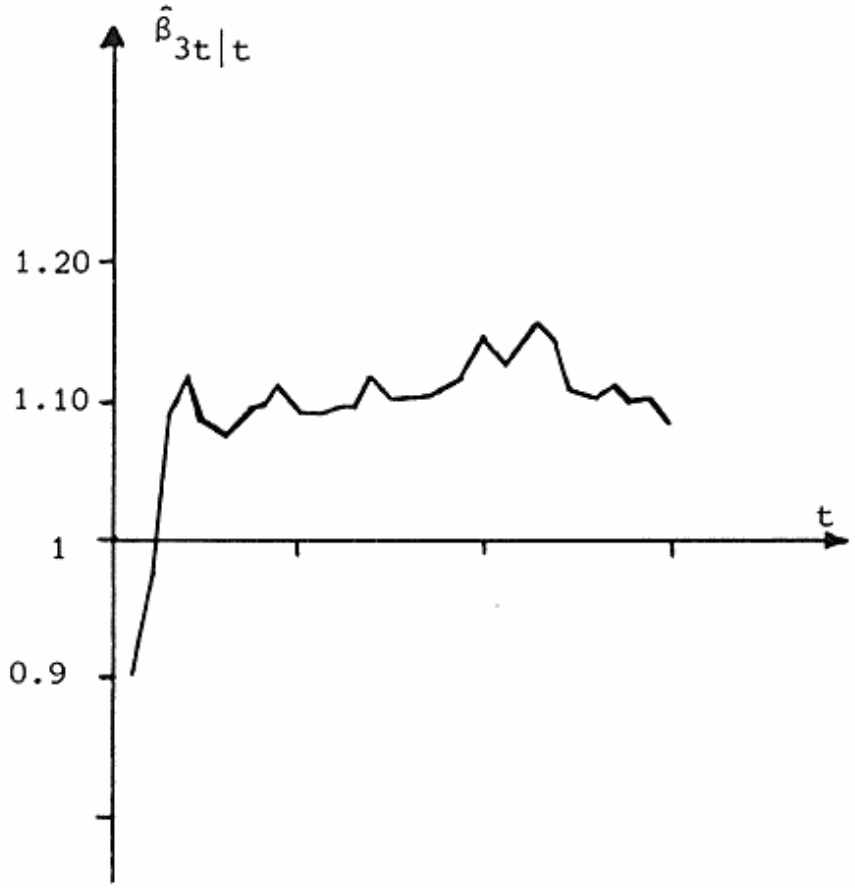


It appears from the test statistic that a model assumption of structural variability is relevant to the request behavior of the Caroline Hospital. Thus, we estimate the equation (3) by means of the Kalman filter technique (Diagram 4).

Modelling the request side of the budget process for the Caroline Hospital it appears that the occurrence of two shift-points is the typical feature of the development of the funding of this program. As the hospital gets nearly all it asks for each year from the government, it expanded its requests in the early fifties to capture some real non-incremental changes:

(a) 1951-52: 30%
(b) 1962-63: 21%
(c) 1969-70: 29%
(d) 1971-72: 25%

Diagram 4. Parameters in equation (3) estimated for the Caroline Hospital program 1948-1980.



Not until the seventies was there hesitance on the part of the hospital about how much to ask for. The Kalman filter estimation captures an important shift-point in the seventies, braking the high level request behavior characterizing the fifties and the sixties. The decision interpretation of the occurrence of structural variability in the request behavior on the part of the hospital is straight forward: the Caroline Hospital used a decision strategy that is different from the one employed by the government transforming the request into appropriations; the hospital raised its requests at the same time as the government appropriated roughly the same percentage of the yearly requests. This kind of budgetary interaction is, of course, very much conducive to public sector growth; the overall expansion of the Caroline Hospital resulting from the combination of a strictly mechanical governmental decision rule appropriating to the hospital nearly all what it asked for and an expansionary request tactic on the part of the hospital appears nicely in the following simple growth rates:

(a) 1950-60: 142%
(b) 1961-70: 165%
(c) 1971-80: 76%

The national budget-making that funds the Caroline Hospital is the outcome of the interaction of two *different* budget processes, the incremental appropriating behavior of the government and the non-incremental request behavior of the hospital.

In order to shed more light on the occurrence of shift-points in the request behavior, we model that behavior in terms of a more complex equation (5), which takes into account two relevant request decision rules. Request decisions may be made with regard to last year's appropriation on the one hand, and on the basis of the difference between last year's appropriation and request on the other hand. The equation (5) models the request decision as the combination of two decisions, one dealing with how large an increment to ask for in relation to last year's appropriation (*the increment decision*), the other how to adapt the demand for an increment based on dealing with the treatment by the government of last year's request (*the difference decision*). A decision rule governing the difference decision may make requests automatically dependent upon the behavior of the appropriating body: the more the government cuts the requests for one year the larger a change the authority demands next year, and vice-versa. It has been suggested that the inclusion of a second regressor in the equation (3) — request as a function of last year's appropriation — makes the budgetary process more stable over time:

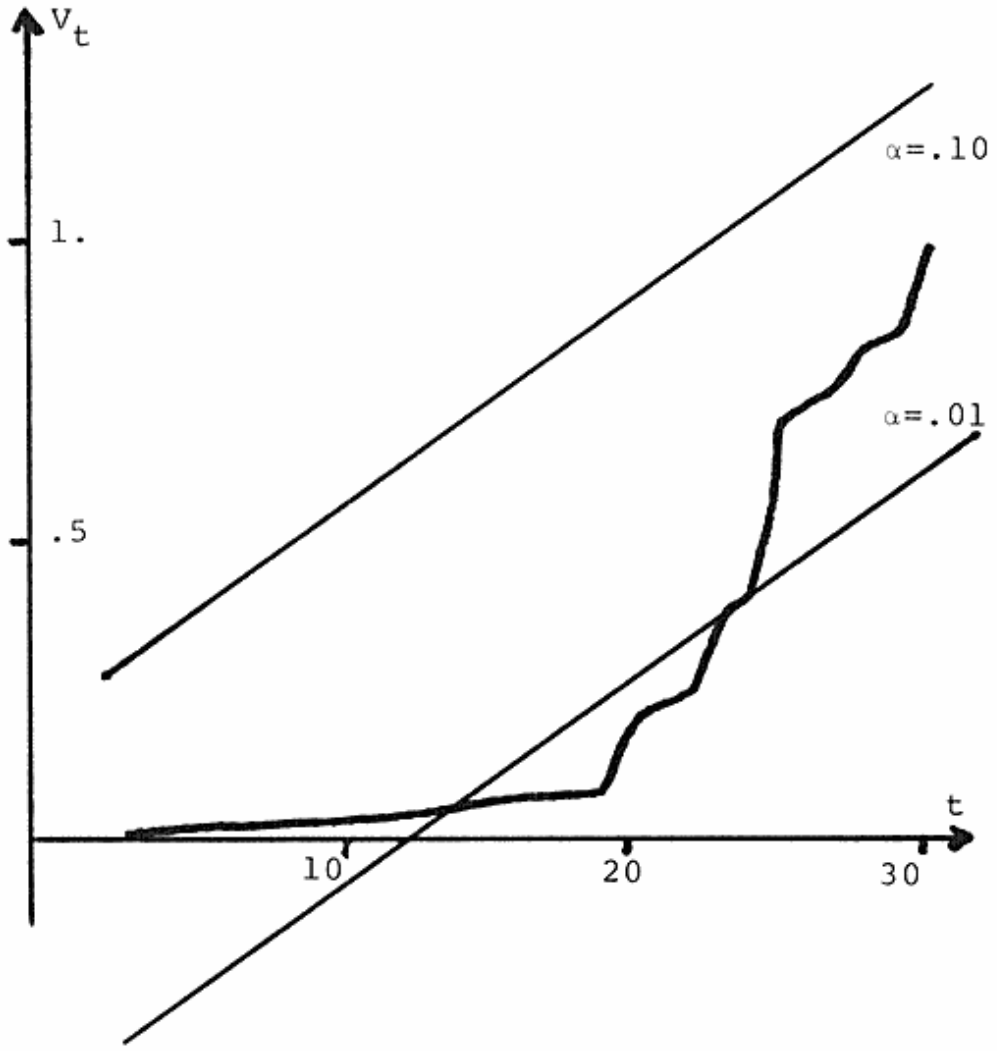
> '... while this agency makes a request which is roughly a fixed percentage of the previous year's appropriation, it wants also to smooth out its stream of appropriations by taking into account the difference between its request and appropriation for the previous year. If there was an unusually large cut in the previous year's request, the agency submits a 'padded' estimate to make up for the loss in expected funds; an unusual increase is followed by a reduced estimate to avoid unspent appropriations' (Wildavsky 1975, 34).

However, the CUSUMQ test of the enlarged equation modelling the request behavior of the Caroline Hospital indicates that a model assumption of structural variability is appropriate for the understanding of *both* types of request decisions.

Estimating the complex request model by means of the Kalman filter technique makes it possible to identify the instability in the budget process by locating shift-points in the decision rules governing both the increment decision and the difference decision.

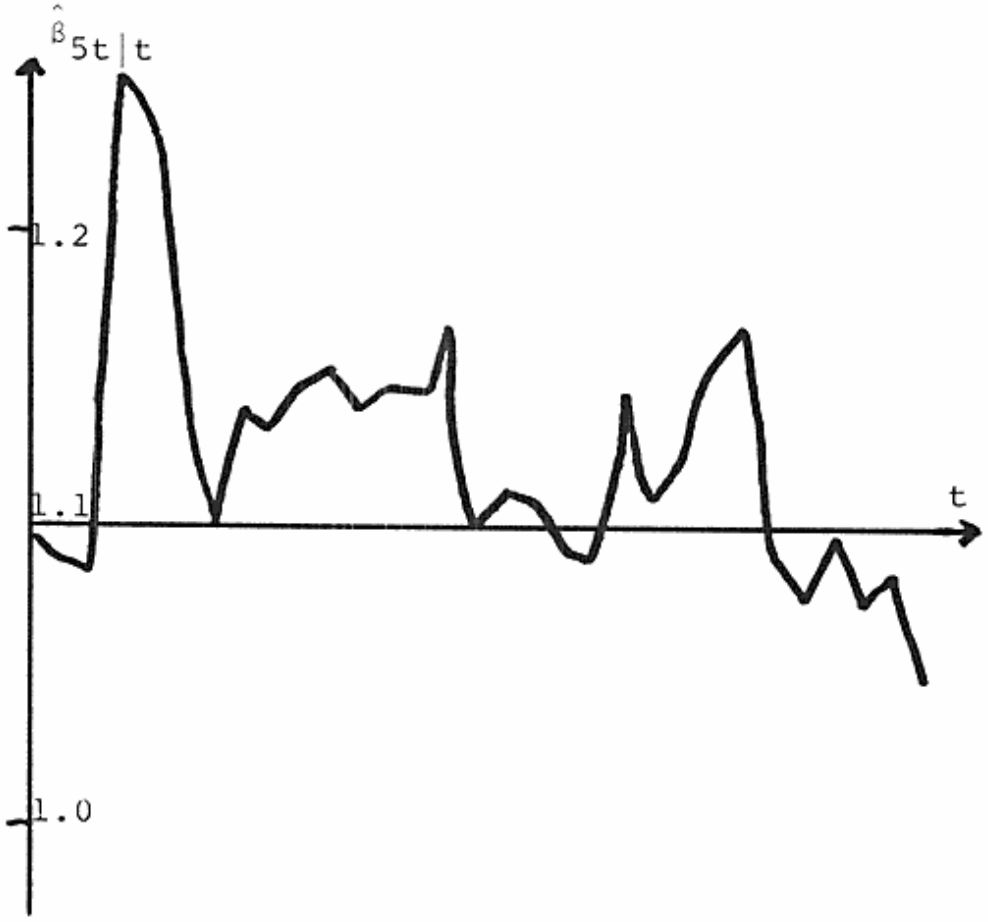
The expansion of the program funding the Caroline Hospital during the fifties and the sixties involves a decision strategy on the part of the requesting actor to ask at various times for substantial increments in relation to last year's appropriation and in addition to demand substantial increases as a reaction to governmental cuts in last year's requests. It is in the beginning of the fifties that the hospital embarks on this expansionary decision strategy employing both its increment decision rule and its difference decision rule. In the same

Diagram 5. Testing for structural stability in the development of the Caroline Hospital program: request as a function of last year's appropriation and last year's difference between request and appropriation.



way the transition to a less expansionary request behavior in the early seventies is the outcome of two shift-points, the first referring to a change in the increment decision rule asking for less in relation to last year's appropriation, whereas the second refers to the difference decision rule changing to an acceptance of the governmental cuts. The Caroline Hospital when deciding upon its requests employs different decision rules at different periods of time. Budget-making may be characterized by the application of standard decision procedures as was typical of the government appropriating behavior in relation to the requests of the Caroline Hospital; but budgetary processes may also dis-

Diagram 6. Parameters in equation (5) estimated for the Caroline Hospital program 1948-1980.



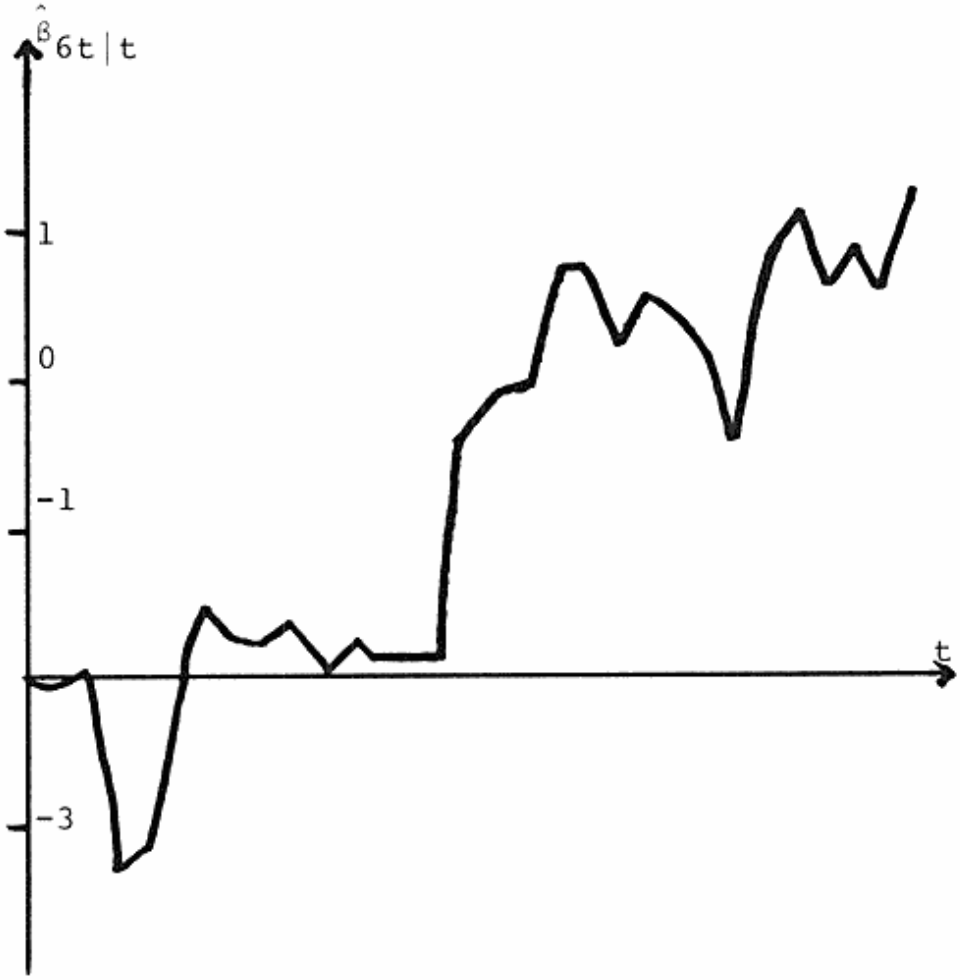
play features of changes in decision rules as reflected in the structural variability of the request behavior of the hospital. We now turn to an empirical case where the appropriating as well as the request behavior display shift-points in the decision rules, the budget-making with regard to the Academic Hospital.

The Academic Hospital

The overall program development for the Academic Hospital may be stated in the following somewhat schematic way. Firstly, there is a period of actual cutting back. Between the years 1953-1956 the hospital suffered a loss in real resources of 3%, which is surprising when considering an overall expansion of the state budget of 18.1% for these years. Secondly, we may identify a period of accelerating growth taking the appropriation to a resource level that in 1970 was 552% higher than the 1957 figure. Thirdly, there follows a period of yearly fluctuations sometimes increasing the appropriation, sometimes decreasing the appropriation.

How is this development to be accounted for in models over the budgetary process? Looking first at the behavior of the appropriating party to the bud-

Diagram 7. Parameters in equation (5) estimated for the Caroline Hospital program 1948-1980.



getary relation, the government, we detect a change in preferences reflecting the shift from a 75% decision rule to a 92% decision rule in the handling of the yearly requests from the hospital. However, this preference change cannot alone account for the staggering expansion from 1957 to 1970. Thus, we must look at the behavior of the other party to the budget interaction, the hospital. The expansion during the late fifties and the sixties is the outcome of two simultaneous shift-points in the budget-making with regard to the hospital; besides the change in decision rules by the government handling the requests of the hospital, there occurred a structural change in the behavior of the requesting actor. In the early fifties the hospital employed a highly restrictive request decision rule only demanding compensations for the inflationary implications, but towards the end of the fifties the hospital changed to an expansionary decision rule, demanding non-incremental changes some years. The outcome of the simultaneous occurrence of these two shift points is, of course, a fast growth in the public expenditures funding the Academic Hospital.

Bureaucratic Programs

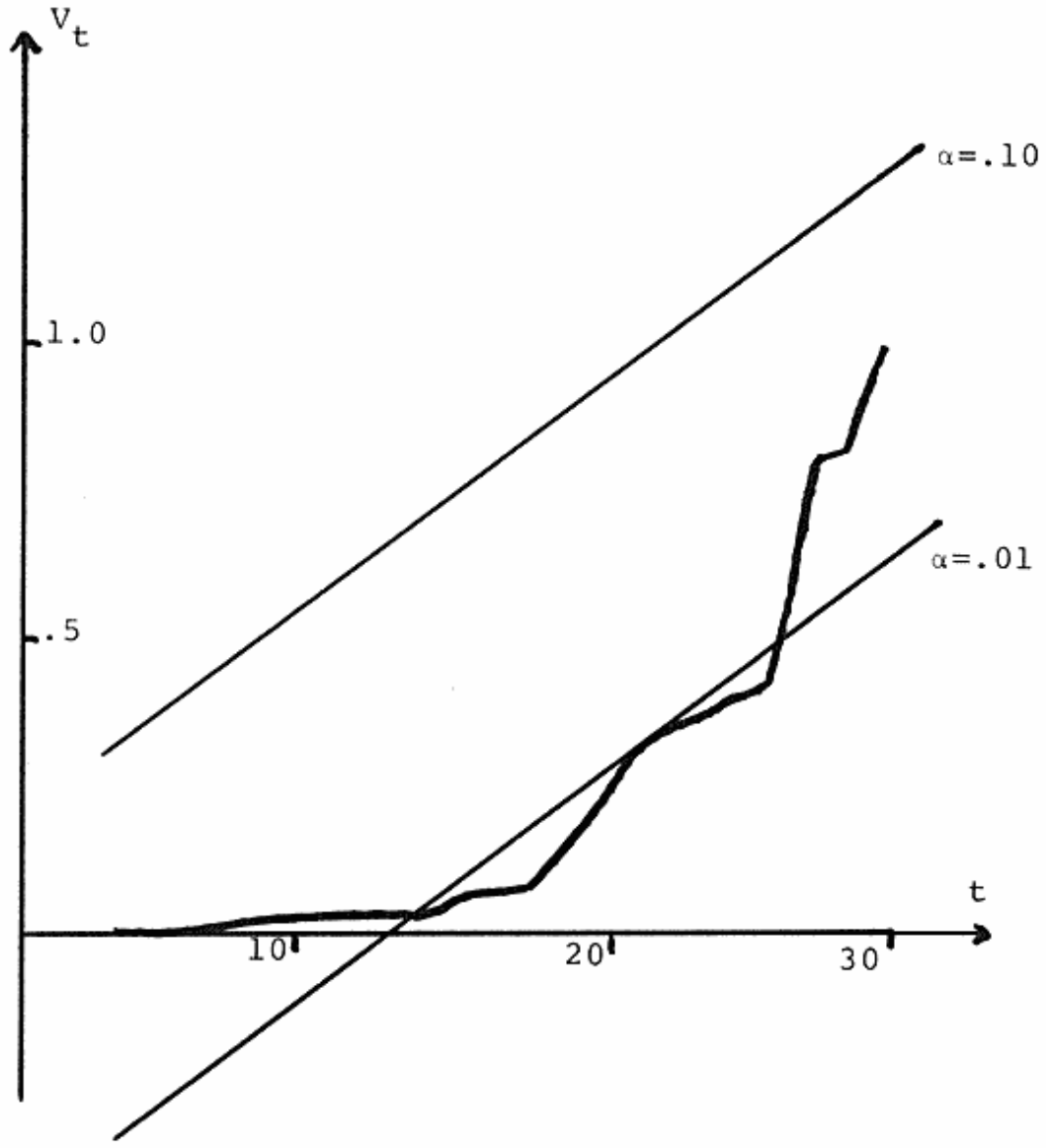
Public resource allocation depends upon the existence of coordinating and implementing agencies or bureaucracies. Responsible for much of the national effort within the social sector of the Swedish welfare state is the National Board for Health and Welfare (NBHW) and the National Insurance Board (NSIB), the former being predominantly oriented towards the provision of social services, whereas the latter is predominantly occupied with the allocation of transfer payments. What are the typical features of the budgetary processes through which these agencies themselves are funded?

Looking at the manifest outcome of the budgetary interaction between the government and the National Board for Health and Welfare in terms of model (1) — the yearly appropriations as a function of last year's appropriation — it appears that budget-making with regard to bureaucracies may be incremental. Actually, the yearly changes in growth rate for the period 1954-1980 indicate an incremental pattern: —1.4%, 1.7%, .5%, 2.9%, —1.2%, 0%, 1.0%, —1.2%, —.2%, .1%, .8%, .5%, 3.0%, 2.0%, 6.8%, —.4%, —3.3%, 1.9%, —1.8%, —1.5%, .1%, 2.0%, —2.8%, 2.1%, —2.8%. However, the *pattern of interaction* between the appropriating body and the requesting agency does not have to be incremental in order for the *outcome* of that interaction to be incremental. Understanding the development of NBHW requires that we model the interaction between the government and the NBHW from two aspects of the budgetary process, from the appropriation side as well as from the request side. Again, we commit ourselves to a model choice and on the basis of that decision to an appropriate estimation technique.

Appropriating bodies may not employ only one decision rule like increasing last year's appropriations or cutting this year's requests. Appropriations are often made by both considering the merits of the requests on their own terms and using a uniform reduction principle across all programs, the so-called proportional cut decision rule (Wildavsky 1975, 35; Dempster & Wildavsky 1980, 18-25). Modelling the government appropriating behavior in relation to NBHW in terms of equation (6) we can see how a proportional cut model may arrange the data. Testing the assumption of structural stability in the behavior of the government it appears that we may expect the occurrence of shift-points in the decision rules applied by the government. The CUSUMQ test indicates structural variability (Diagram 8).

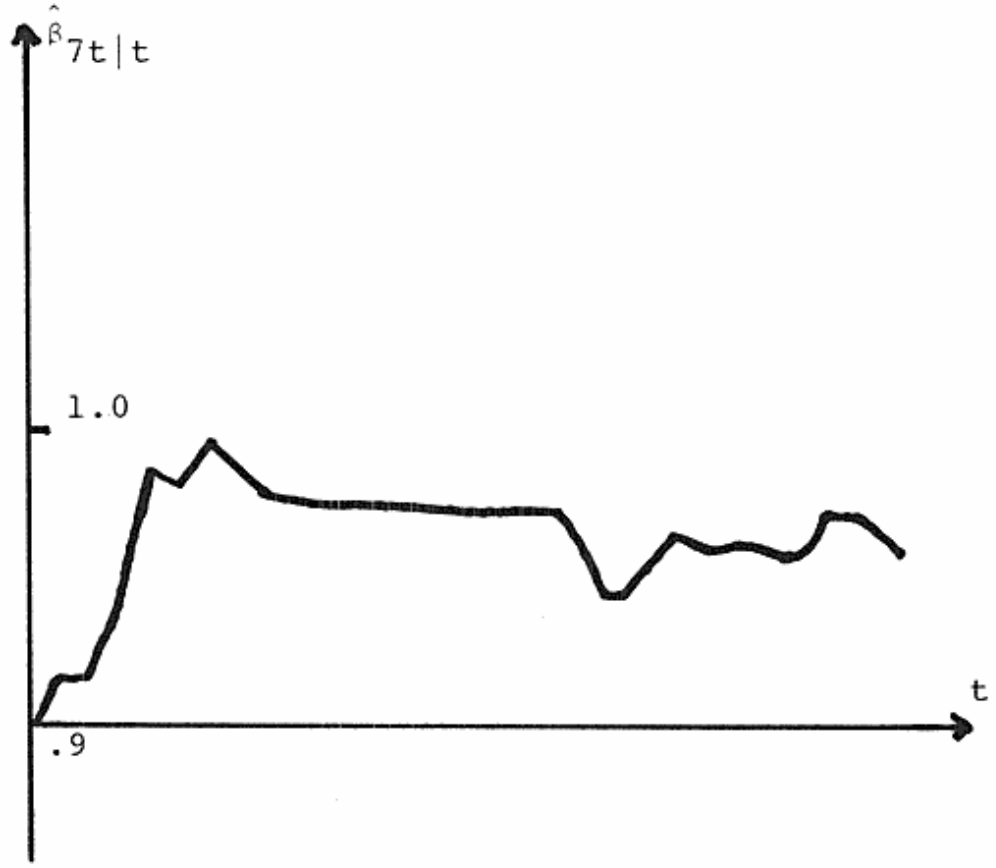
Estimating the proportional cut model with a technique that captures the structural changes, the Kalman filter curve for this program contains interesting information about appropriation behavior. Firstly, it appears that the government during the fifties changes to a decision rule that accepts roughly 95% of the NBHW request from a decision rule cutting about 10% of the request when the government considers the requests on its own merits. Secondly,

Diagram 8. Testing for structural stability in the development of the NBHW program: appropriation as a function of requests and last year's difference between request and appropriation.



the proportional cut decision has substantial effects on the size of the final appropriation. Though this decision rule is characterized by the occurrence of shift-points, the government reduces the request by means of the proportional cut decision with the exception of two shorter periods of time. The outcome of the combined application of the government decision rules is that the board receives almost about 80% of its requests from year to year. The variation is a

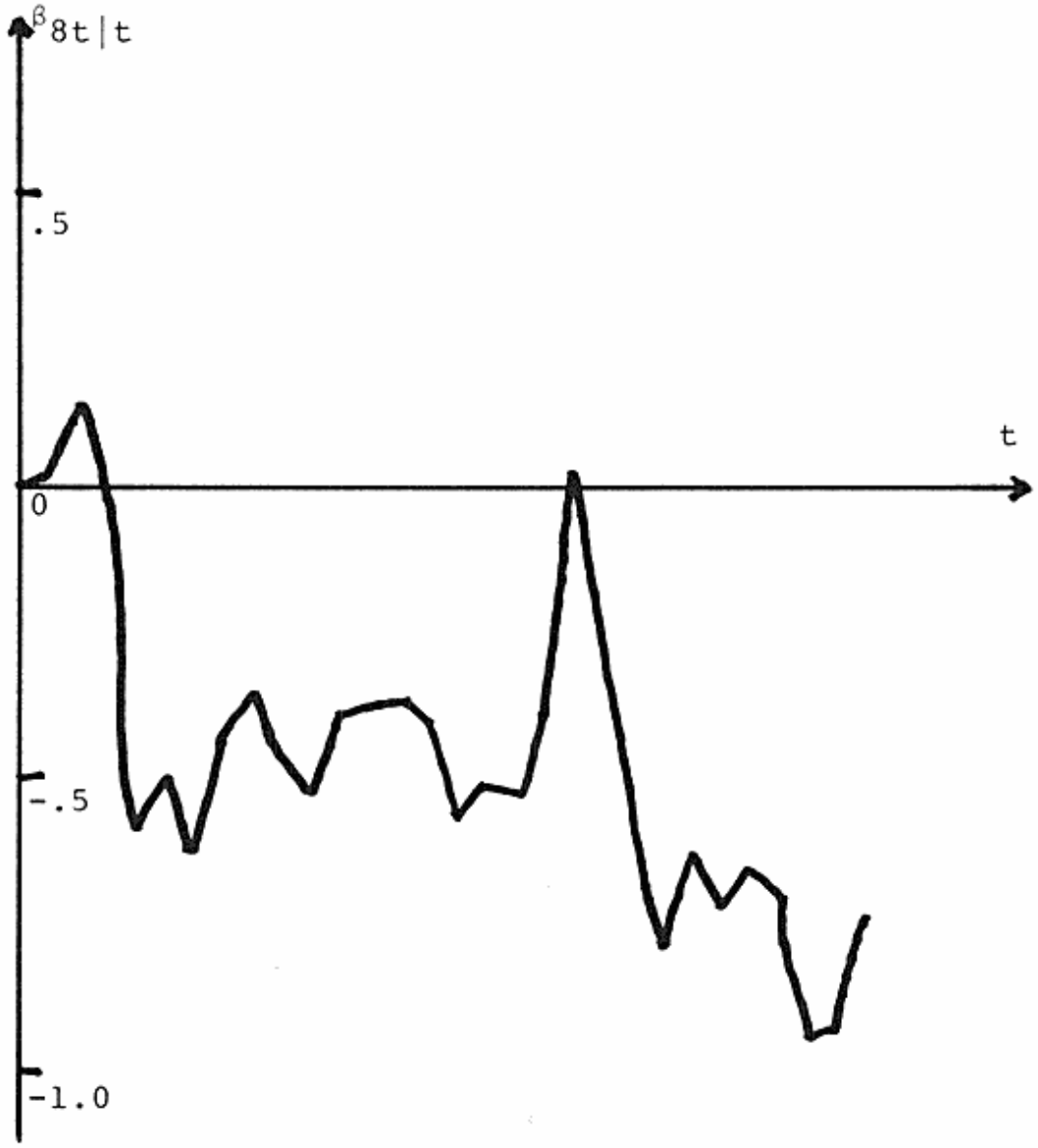
Diagram 9. Parameters in equation (6) estimated for the NBHW program 1955-1980.



function of how the government combines a decision rule treating the agency request on its own terms and a decision rule cutting back on the appropriation in relation to the difference between last year's appropriation and the request of that year. However, even if the data support the Wildavsky hypothesis about the relevance of a proportional cut budget model, there is no indication that the decision rules are uniform with regard to this program. It seems to be the case that the government may change its idea about how large a proportional cut should be.

Understanding the growth of the program funding the NBHW, it seems as if the appropriation is a function of the request. The question then becomes: what explains the request behavior of the NBHW? Modelling the request behavior of the board we employ equation (2) — this year's request as a function of last year's request. The test statistic for the application of this model on the behavior of the NBHW indicates the occurrence of a shift point. The Kalman filter curve estimating the request model for the board contains the following information: two decision rules explain the variation in the request behavior of the NBHW.

Diagram 10. Parameters in equation (6) estimated for the NBHW program 1955-1980.



The bureaucracy first attempts to adapt to the behavior of the government. As a reaction to the cuts by the government when accepting only about 80% of this year's request, the bureaucracy holds back on its request next year. It defines a roughly 95% acceptance of its request last year as acceptable for the protection of the base of its program in real economic terms. The outcome of such a budgetary interaction involves a substantial risk of a decrease, if the government does not change its decision rule. Checking for the outcome of this interaction for the fifties we find that it is equally probable that the appropriation for the board will decrease as that it will increase from year to year.

The reaction of the bureaucracy to such a pattern of budgetary interaction appears in a drastic shift to a new pattern of interaction in which the bureaucracy instead tries to exploit the decision strategy of the government. By moving within one year to a different level of requests, asking for roughly 10% more than they asked for last year while at the same time the government keeps applying the 80% rule, the bureaucracy manages to accomplish a safe growth rate including a considerable one-time jump. Checking for the actual outcome of this new interaction pattern we find that the NBHW increases its appropriations with a 167% between the years 1965-1980 in real economic terms.

The response of the government to the new decision strategy of the NBHW appears from Diagram 10, which shows that the appropriating body in the face of a sharp rise in yearly requests begins to apply the difference decision rule more severely in order to cut back on the appropriation in relation to the extent to which the requesting agency inflates its requests. Thus, we conclude that though budget-making for a bureaucratic program may appear incremental at the surface, it may be the case that the underlying budgetary interaction between the appropriating body and the requesting agency displays changes in decision strategy resulting in the occurrence of shift-points.

If we look at another bureaucratic program — the National Insurance Board — it appears from the analysis of the estimation results of the various budgetary models that it is the bureaucracy that has the initiative over the government when decisions concerning appropriations are made. The government applies a mechanical decision rule to the requests of the NSIB, always providing that bureaucracy with roughly 85% of its requests. The Board on the other hand employs two decision strategies; at first it seems as if the bureaucracy remains content with a *low size policy* asking almost only for a prolongation of its program measured in real economic resources. Between the years 1955-1972 the board based its requests on a 5-8% increase in last year's appropriation. However, during the seventies the bureaucracy shifts to a *large size policy,* which is most successful due to the mechanical decision procedure adhered to by the government. The yearly demanded increments in relation to the appropriations of the preceding year are:

(a) 1974: 12%
(b) 1975: 16%
(c) 1976: 14%
(d) 1977: 13%
(e) 1978: 16%
(f) 1979: 19%
(g) 1980: 13%.

The outcome of this budgetary interaction between the NSIB and the government was that the appropriation developed rather slowly up to the early seventies, when the appropriation almost exploded. During a five-year period the

board managed to increase its appropriation with a considerable 57%. The period of sharp rise in appropriation was followed by a five-year period of fluctuations during which the board both suffered declines and experienced increases which together add up to zero. Apparently, there is a similarity in the development of the two bureaucratic programs studied; both expanded very much during a short period in the early seventies as a result of a change in budgetary tactics which became successful because the government adhered to a strictly mechanical decision rule.

Conclusions

A theory of the budgetary process within public resource allocation has to recognize two basic properties of budgetary behavior and budgetary interaction: variation over time and program variation. It is certainly a difficult task to arrive at a satisfactory classification of the activities comprising public resource allocation (Danziger 1978, Musgrave-Musgrave 1980, Hedtkamp 1977), but it is a promising hypothesis to assume that budget behavior and interaction need not be the same for all kinds of programs. Our results indicate that the hypothesis of program variation is well worthy of effort, as we find different decision mechanisms operating in the six programs studied, which belong to different categories of public resource allocation activities according to traditional classification criteria.

Variation over time is particularly difficult to accommodate within the framework of incrementalist notions; incremental decision rules imply structural stability over time slices. We find the opposite to be true of two of the program types analyzed here, the transfer programs and the service programs. Evidently, non-incremental decision rules are operating in the budget behavior and budgetary interaction resulting in the development of the funding of these programs. Bureaucratic programs may look incremental; however, this may only be an appearance, as a closer analysis of the data for one such program indicates that the decision mechanisms involved exhibit the occurrence of non-incremental shift-points. Incrementalist theory implies that the expansion of the public sector has some kind of stability and necessity inherent in it; it seems as if that Juggernaut is a methodological artifact, resulting from the use of an estimation technique in relation to budget modelling that a priori takes structural stability as given (Westlund & Lane 1983).

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