Scandinavian Political Studies, Vol. 7 — New Series — No. 3 1984
ISSN 0080-6757

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Introduction

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Such an institutional structure gives subordinates some leeway for own judgement, and some autonomy of action. A repertoire of mechanisms is available to secure loyal and effective implementation of the organization's official aims. Assuming that the subordinates are rational, the presumption is that the perceived structure will determine the outcome in terms of loyal or disloyal action.

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The purpose of this article is to present a two-person game, and introduce the pay-off structure as the subordinate's and the superior's preferences. Next, I intend to 'play the game' in different institutional contexts, showing how these may influence the outcome.

The Control Game

Gordon Tullock's 'The Politics of Bureaucracy' (1965) presents a rather negative view on hierarchical organizations. Such structures are most likely to be populated by unscrupulous and immoral men, more interested in their personal well-being than the official objectives of the organization. The immoral and disloyal bureaucrat will have an advantage over the unambitious and ethically motivated man in the competition for higher positions in the hierarchy. According to Tullock 'the system tends to select against honest and truthful men'.

It seems obvious that Tullock exaggerates his point. Even so, most instrumental organizations have to find mechanisms to cope with disloyal behaviour. The public choice literature on hierarchical organizations suggests a number of ways in which the subordinate may manipulate in order to serve his own interests. My concern is primarily with resource allocation, efficiency and budgeting in public administration. William Niskanen (1971) suggests that the bureaus maximize their budgets, while Oliver Williamson (1964) argues that management has a preference for staff and 'discretionary profit'. And there is of course the problem of low work-effort or 'shrinking' (Alcian & Demsetz 1972).

From the political leader's point of view or the organization owner's point of view, the implications seem obvious. Never trust the subordinates! The counter-move is to monitor the activity in the organization, to punish disloyal behaviour. Breton & Wintrobe (1975) argue, for instance, that the sponsor (the superior) in Niskanen's model will buy control measures until the marginal gain equals the marginal cost of control.[1]

The public choice conception of control seems to build on two main mechanisms, privatization of the bureaucratic supply and imposing competition on the public economy. There are other organizational means of securing goal fulfillment. Of course, some degree of control exists in all organizations. By control we think of all kinds of extra measures above uncontroversial minimum. The measures may be direct monitoring by inspection routines etc., or indirect methods such as efficiency studies, cost-benefit analyses and programme budgeting. All control is designed to gather information on the performance of lower-level units.

This concept of governing organizations is related to the scientific-management tradition. This school emphasizes the measuring of output,

		SUPERIOR: Control	SUPERIOR: No control
SUBORDINATE:	Loyal effort	A	B
	Disloyal manipulation	C	D

Fig. 1. Decision outcomes between superior and subordinate actors in a hierarchical organization

monitoring work-effort, controlling work-conditions and paying according to work-effort. It is of course possible to question this strategy in terms of the human-relations approach in organizational theory.[2] The major hypothesis in this theory is that a mutual feeling of trust within the organization will increase productivity and commitment to official goals. The strategy implies that subordinates have some autonomy of action, and some freedom to find own solutions to problems. They are neither monitored nor intensely controlled, but simply trusted. This autonomy may not only create 'a happy ship', but also opportunities for hidden, disloyal action.

We assume that the *leadership* (or superior) has two strategy options.[3] One strategy rests on control, and monitoring subordinate agencies. The other is non-control, and trust — in the belief that a non-controlling regime will create commitment to organizational goals.

The *bureau* (or subordinate) may choose to act loyally, to adapt to the objectives of the hierarchical organization, or to maximize personal or bureaucratic interests. Fig. 1 indicates the decision outcomes.

The 2×2 matrix in Fig. 1 is already a rather brutal simplification of real-world hierarchical relations. Anyhow, each actor may have 24 possible preference orderings of the four outcomes. The matrix represents 576 different pairs of preference orderings (Rapoport & Guyer 1966). Some of these are equivalent from an abstract game-theoretical point of view. Taking this into consideration reduces the number of games to 78. All the same, there is a large number of possible rankings to consider. (And even so it is assumed that the pay-offs are defined on an ordinal scale only.)

Before proceeding to the discussion of the game structures, a few concepts must be defined. We assume that the actors are rational in the usual game-theoretical sense. Each player makes his choice in anticipation of how other actors will respond, assuming that everybody involved knows that all players act rationally.

The conventional solution concept is the *Nash-equilibrium*. It is assumed that each participant acts independently, without communication with other actors. Within this non-cooperative setting, the Nash-equilibrium is defined as a pair of strategies — one for each participant — which maximizes the

		SUPERIOR: Control	SUPERIOR: No control
SUBORDINATE:	Loyalty	3 3	4 4
	Disloyalty	2 2	1 1

Fig. 2. The No-Conflict Game

pay-offs of each actor when the strategy of the opponent is held constant. The strategies belonging to the Nash-equilibrium are optimal against each other, meaning that neither player can shift his strategy without impairing his pay-off, assuming that the other player does not shift.

An actor may have a *dominant strategy*. This is a strategy which has the property of having the higher pay-off no matter which strategy the other player or players may choose. If a game has dominant strategies, these will be equilibrium strategies in the Nash-sense.

Unfortunately, some of the ordinal two-person games do not have a unique Nash-equilibrium. Quite a few have two equilibria, while others have no equilibrium at all. We shall present one such no-equilibrium game, the Control Game. In order to discuss possible outcomes of this game, we shall introduce other solution concepts. These will be defined later on.

In order to make the analysis simple, we shall restrict our analysis to the 2×2 game indicated in Fig. 1. Most hierarchical decision situations are not restricted by binary choice options, and are usually n-person games. An extension of this discussion may therefore lead to qualitatively new results and insights. We think, however, that the complexity of the 2×2 game justifies this simplification.

Having this argument in mind, we shall proceed to a discussion of actor preferences. Let us first consider one possible pay-off structure which gives the model a fairly obvious solution (Fig. 2).

For each outcome in the game matrix an ordered pair of numbers represents the pay-off for each actor. The number in the lower-left corners indicates the subordinate pay-off, and the number in the higher-right corner belongs to the superior. The numbers denote the following rankings: 4 = best; 3 = next best; 2 = next worst; 1 = worst. The more preferred outcomes have higher numbers.

The superior's outcome ranking seems quite realistic: Superior (leadership, owner, political etc.) prefers B as the best outcome. The result is cheap in terms of control-costs, and the subordinate actor behaves loyally and effectively. D is probably the least-preferred outcome. The disloyal behaviour has a small probability of being detected, and the organizational objectives are not met.

		SUPERIOR: Control	SUPERIOR: No control
SUBORDINATE:	Loyalty	3 2	4 4
	Disloyalty	2 1	1 3

Fig. 3. The Easy Control Game

The choice between A and C is obvious. Ceteris paribus, loyal behaviour is preferred.

Our initial model assumes that the subordinate agency has identical preferences. If so, the game is a non-conflict game. It is difficult to see why any other outcome than B should result. The game offers no real theoretical interest.

The subordinate preferences seem strange. Why should a bureau prefer to be controlled when acting disloyally? If we, however, assume that the 'thief does not prefer to be caught', the initial conclusion is upheld. Substituting the subordinate rankings on C and D implies no difference. Loyalty is still the dominant strategy. Knowing this, the superior will choose the no-control option and B is the result.

We shall consider another change in preference assumptions. Is it reasonable for an agency to rank the A outcome higher than D? A state of affairs where you are subject to control — and therefore acting loyally — may be an acceptable state of affairs. But of course it may be even better to act disloyally when the superior chooses the non-controlling strategy. In the figure below, this tougher assumption is built into the model. The model is labelled 'the *easy* control game' (Fig. 3).

It is understandable why the game is 'easy' from the ruler's point of view; loyalty is still a dominant strategy even if the subordinate preference is far less altruistic than in the first game. The most probable outcome is a non-controlling organization with loyal subordinate bureaus, the B-outcome.

A final modification on subordinate preferences will change the game quite fundamentally. The crucial question is: Will an agency prefer to act loyally when faced with a non-controlling organization? Does a bureau perceive the reward from loyal decision-making as higher than rewards from covert, disloyal actions? If the answer is no, the decision situation is far more complicated. I suggest *'The Control Game'* as a proper name for the pay-off structure below. Within the taxonomy of Rapoport & Guyer (1966, 213), it is game number 72.

The Control Game is built on tougher assumptions regarding subordinate's preferences. The subordinate will probably try to convince his superior that

		SUPERIOR: Control	SUPERIOR: No control
SUBORDINATE: Loyalty effort		3 2	4 3
SUBORDINATE: Disloyalty manipulation		2 1	1 4

Fig. 4. The Control Game

he prefers to be loyal. Or rather that he *is* the 'always obedient servant'. This may or may not be true. As the outcome of the Control Game (Fig. 4) may be different from the preceding games, the superior's judgement of subordinate preferences will play a crucial role in determining the outcome. On the other hand, the subordinate faces the uncertainty of which information the superior actor believes in. Therefore, uncertainty regarding preferences is likely to play a role in superior-subordinate interaction.

In the next section we shall explore the implications of the Control Game under different assumptions of institutional and informational character.

Some Implications of the Control Game

In order to structure my argument, I shall distinguish between games which are repeated a large number of times and one-shot games. I also intend to discuss decision situations where the players make their draws simultaneously and games where the moves are made in sequence. I have illustrated the four categories of situations below (Fig. 5).

The Game is played as a	*Moves are made*: Successively	Simultaneously
One-Shot Game	(1)	(4)
Repeated Game	(2)	(3)

Fig. 5. Institutional assumptions

One-Shot Game with Successive Moves

When the game is played with *successive* moves, there are two possible ways of representing the game. In the first case, superior makes the first draw — in the second subordinate makes the first draw. Fig. 6 illustrates the two situations.

What happens if the superior makes the first choice? Choosing control, the subordinate prefers loyalty. Choosing trust, the subordinate prefers disloyal

				Gain to players Subordinate	Superior	
(1)	SUPERIOR	Control	Loyal	2	3	(A)
			Disloyal	1	2	(C)
		No-control	Loyal	3	4	(B)
			Disloyal	4	1	(D)
(2)	SUBORDINATE:	Loyal	Control	2	3	(A)
			No-control	3	4	(B)
		Disloyal	Control	1	2	(C)
			No-control	4	1	(D)

Fig. 6. The Control Game in extensive form

action. The superior, however, prefers A before D, and A is therefore the outcome in the first situation.

In the second case, when the strategy of the subordinate is 'loyalty', the superior's choice is trust, and the outcome is B. Choosing disloyalty, the superior's response is control, and the outcome is C. But B is better than C for the subordinate, and in this second case the outcome is B.

If both players compare the outcomes of the cases (1) and (2), it is obvious that the second choice sequence is preferable to both parties. In contrast to the well-known Chicken Game, here both players have a common preference over sequences of actions. *Both prefer the subordinate to choose first.*

This implies that in the one-shot game where it is possible for the actors to choose successively, the equilibrium solution is B: the loyal subordinate and the trustful superior.

Miller & Moe (1983) discuss choice sequences assuming that the superior agent can choose whether he will make the first draw. The leadership has this strategic advantage because of hierarchical authority.

One option is to use demand-*revealing* oversight. Political priorities or demands are signalled to the agencies, which in turn are supposed to adjust their policies accordingly. In making decisions, the bureau head can take advantage of his or her knowledge of legislative demand. This is the well-known Niskanen-approach, and the outcome is a too large budget.

The superior oversight may also be demand *concealing*. Now the agency has to transmit a supply function, relating budgets (or possible prices) to specific quantities. The superior is a monopsonist. The agency reports its true supply or cost curve, and the political body can calculate the optimal supply. Miller & Moe conclude that (305):

> 'Social welfare varies directly with the mode of legislative oversight. Society is better off when the committee hides its demand and requires the bureaucrat to go first in supplying cost information. To the extent that the committee reveals its demand for services beforehand, the bureaucracy will take advantage of the situation, and impose less favorable outcomes.'

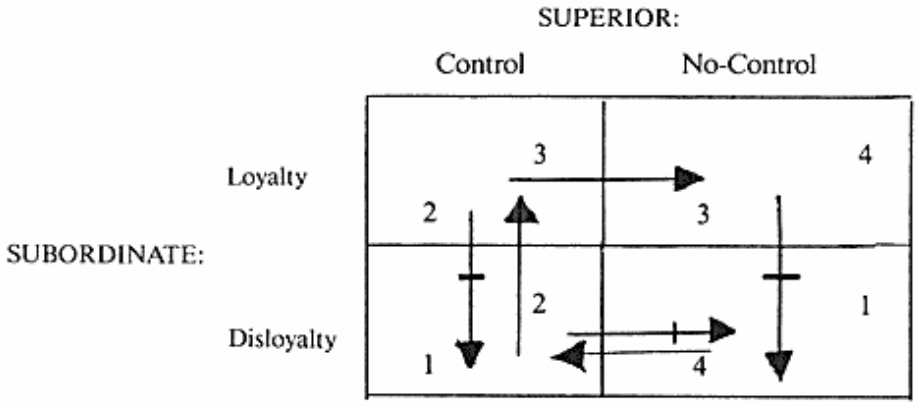


Fig. 7. The Control Game modelled with an absorbing outcome

The conclusion by Miller and Moe is in accordance with our result as far as leadership is concerned. Our result is, however, that even the subordinate may prefer 'to go first', and use a loyal strategy in order to make the superior use the non-controlling option.

The models are not directly comparable. The game presented here assumes a demand-revealing superior, and interprets loyalty as superior's adaption to political goals. Miller and Moe assume that revealing or concealing represent different strategies.

Repeated Game with Successive Moves

Most organizations do not play a 'Control Game' one and for all. Rather, it seems more realistic to assume that players adapt to each other through some kind of trial and error process. Brams & Hessel (1982) suggest a particularly interesting analysis of such decision processes. More precisely, the game is played according to the following rules:

> '1. Both players simultaneously choose strategies, thereby defining an *initial outcome* of the game.
> 2. Once at an initial outcome, either player can unilaterally switch his strategy and change that outcome to a subsequent outcome in the row or column in which the initial outcome lies.
> 3. The other player can respond by unilaterally switching his strategy, thereby moving the game to a new outcome.
> 4. These strictly alternating moves continue until the player with the next move chooses not to switch his strategy. When this happens, the game terminates, and the outcome reached is the *final outcome.*'

The authors define an *absorbing outcome* by making assumptions on which movements the players will make from worst, next worst and next best outcomes. As a first weak criterion, Brams and Hessel suggest:

'I. If departures from worst and next-worst outcomes indicate convergence either to a single outcome or two outcomes, the converged-upon outcome(s) is (are) *absorbing*'.

In Fig. 7 we have indicated the possible moves which the actors will undertake according to this criterion. An outcome is converged-upon if it has no outgoing arrow, or equivalently, if the arrows are all incoming.

We realize that avoiding the worst and next-worst outcomes does not lead to a stable result. Brams and Hessel introduce a second criterion:

'II. If departures from worst and next-worst outcomes do not indicate convergence, but there is a *deletable arrow* whose deletion results in a converged-upon outcome, this outcome is *absorbing*.'

When a pair of outcomes is connected by two arrows, one is considered deletable if the movement leads to a worse outcome for a player. As the superior will get a worse outcome by moving from C to D, this arrow is deletable. The subordinate arrrow from A to C is also deletable. These arrows are marked by a short crossing line.

Now, even this restriction does not lead to an absorbing outcome in our game. Brams and Hessel then introduce a process of successive deletability of moves. You delete the arrow leading from the next-best outcome for a player if the other player has reached his best outcome, and successively delete one of each set of double arrows in order to have a (3,4) or (4,3) outcome.

'III. Given that conditions I and II are not satisfied, a converged-upon outcome found by the rules of *successive deletability* is absorbing."

Luckily, the Control Game has an observing outcome according to this third criterion. Now, we may delete the arrow from B to D, leaving the B-outcome as the absorbing one.

The argument rests, however, on the plausibility of avoiding worst and next-worst outcomes and the deletability of arrows leading to worst outcomes, provided we have a double arrow. The third condition represents the crux of the argument. Will an actor — here the subordinate — accept the next-best solution as satisfactory?

Given the prospects of recycling the game, rational foresighted considerations give the B-outcome a high degree of plausibility. But other arguments tend to weaken the core of the model: the assumption of sequential moves.

Repeated Games with Simultaneous Moves

So far, we have discussed decision situations which are very favourable to the manager of the organization. The reason is that *very little is hidden.* When moves are made successively, and the superior can *register* potential disloyal

actions, not much autonomy is left to the bureaus. The only exception is when the superior makes the first move in a one-shot situation.

I feel that more uncertainty and less information should be included in the game. Most literature on these types of phenomena underline the importance of informational constraints (Spence 1975).

A first type of uncertainty is of course what the opponent will choose. Do in fact *any* of the actors know how the opponent will act? So far our assumption has been that *one* of the actors knows the opponent's choice. It seems rather unrealistic to argue that the superior simply registers loyalty or disloyalty and *reacts* accordingly. Indeed, it is conceptually meaningless. Disloyalty is detected by means of control, not otherwise. The extensive form assuming that the subordinate makes first draw must therefore be rejected.

Next, does the subordinate know which control option the leadership will choose before making its own decisions? If so, our analysis indicates the A-solution, a controlled loyalty. But perhaps it is a more realistic point of departure to assume that the leadership holds off its choice until the bureau has selected its choice. The *subordinate does not know whether he will be controlled or not.*

Thus, the argument converges towards a decision-representation with *simultaneous moves,* and known opponent preferences. What is the probable outcome under these conditions?

The difficult aspect of this decision situation is that the players *do not know the decisions to be taken by others.* It would be irrational to take the opponent's decision as given. Somehow the actors must take into account that *all* actors influence the outcome. Knowing that all actors are rational, each can only analyze the situation on the basis of choice options, preferences and mutual maximizing strategies. It is difficult to see a more appropriate solution concept than the Nash-solution. Unfortunately, the Control Game is particularly difficult.

The Control Game (in Fig. 4) neither contains any dominans, nor does it have any Nash-equilibrium. In other words, *it is impossible to find an outcome in which the strategies are optimal against each other.* If one actor asks: 'Suppose I choose X? Then the rational response from my opponent is Y. But, then X is not the rational strategy in the first place ...' So the argument continues in an endless, circular regress. We are in the fundamental dilemma of not having any rational choice at all![4]

One feature is quite remarkable. The superior always prefers loyal effort, while the subordinate prefers 'trust' as superior choice. This is noteworthy because in the classical Prisoner's Dilemma, each actor has a stronger preference knitted to opponent's strategy choice than to his own choice. This situation is related; each actor will probably renounce his own strategy control in order to control the opponent's choice.

Rapoport & Guyer (1966, 205) suggest one natural solution to such games, i.e. situations without a dominating strategy and no Pareto-equilibrium. Each player will choose the strategy which contains his *maximin* outcome. If so, the suboptimal A is the outcome because no-control and disloyalty contain the worst outcome for both players.

In contrast to the Prisoner's Dilemma, the Control Game has no dominant strategies. You may characterize the Prisoner's Dilemma as a powerless situation because its only equilibrium is Pareto-suboptimal. The Control Game represents a related dilemma because it inhibits no equilibria — and more specifically, *the Pareto-optimal solution is unstable* because one player (subordinate) can improve his situation by changing strategy. Mueller (1981) postulates that, in certain decision situations, the actor having an informational advantage will be in a superior power position. 'Uncertainty creates the potential to exercise power, information provides the capacity to do so' (Mueller 1981, 294). This may be so in some cases. But asymmetric distribution of information may also explain why actors end up in a worse state than necessary for *all* parties. Uncertainty may generate suboptimal outcomes in addition to power advantages.

It has been argued that the probability of realizing the Pareto-optimal solution in a Prisoner's Dilemma rises with the number of repetitions (Nurmi 1977). What is the impact of repetitions on the solution in the Control Game? Will the strategies somehow converge when the game is played over and over again?

Howard's (1971) concept of meta-games seems useful in the analysis of sequences of games. Howard focuses on games in which the strategies are made contingent upon the choices of the opponent. Each player formulates a rule which assigns a strategy to each possible strategy of the opponent, assuming that the strategy of the opponent is known.

As pointed out earlier, the Control Game resembles the Prisoner's Dilemma in one respect. The players prefer the opponent to choose one particular strategy, the strategies 'non-control' and 'loyalty'. One may label these the cooperative strategies. A reasonable meta-strategy is: I intend to act co-operatively in the first place. But, if my opponent chooses non-cooperatively, then I intend to punish him by acting non-cooperatively in a large number of the following repetitions.

If both actors implement this meta-strategy, the Pareto-optimal solution B will be a stable outcome. On the other hand, if one player (notably the subordinate in the B-situation) is tempted to break the rule — then the punishment will result in a suboptimal outcome at least for some time. Anyhow, the justification for the suggested meta-strategy is tentative. There is no convincing reason why the optimal B-solution should be the obvious, stable outcome.

The One-Shot Game with Simultaneous Moves

Lastly, I shall introduce an additional type of uncertainty. The type of uncertainty stemming from the difficulties of interpreting 'what happened'. The use of meta-strategies presuppose that the result of the last game is *known.*

From the superior's point of view, the non-controlling option gives outcomes which are difficult to evaluate. Is the result B or D? Without controlling, it is hard to detect disloyal behaviour. The superior may not know the real outcomes of the game because he does not know if he has been manipulated.

The subordinate may have to confront a similar dilemma. In many cases, it is impossible to know whether control measures are used effectively. Then the only way to test the system is to *use* disloyalty. If the agency acts loyally, perhaps it is hard to know if the result is A or B.

The difficulties of registering the opponent's last choice does not exclude the possibility of the actor perceiving the game as formulated. One way of incorporating this type of uncertainty is by assuming a one-shot game with simultaneous moves. Here it is impossible to use information from the preceding plays when deciding on strategy in the next play. Though the earlier argument seems to indicate B as a kind of 'focal point' (Schelling 1958), the lack of a Nash-equilibrium yields an indeterminate decision situation. The Control Game played in a one-shot setting with simultaneous moves has no obvious outcome at all!

The one-shot formulation probably exaggerates the uncertainty. Firstly, when the subordinate chooses disloyalty and the superior uses control, the actors can interpret the last outcome. Secondly, the subordinate ranks B higher than A. Why should he, if he cannot feel any impact of control measures at all? The one-shot argument seems to imply indifference between A and B. Thirdly, the superior ranks B far higher than D. The one-shot model with simultaneous moves assumes that a non-controlling superior is unable to register any difference at all. Of course, this may be the case. But it is also conceivable that the leadership may register the long-run effects of disloyalty.

Anyhow, the attractiveness of a non-controlling strategy depends crucially on the ability to respond to disloyal actions. It is not clear how this asymmetrical mix of successive moves and unregistrability of outcomes (one-shot nature) should be modelled in a satisfactory scheme.

Propositions and Empirical Modelling

Three types of informational constraints have been analysed in this paper.

1. *Uncertainty regarding preferences.* Especially the subordinate preferences

seem important. The Easy Control Game (Fig. 3) gives B as the outcome. The 'Pure' Control Game has no determinate or stable solution when simultaneous moves are assumed, and the outcome may also depend on the other assumptions being made. The subordinates will communicate the first type of outcome ranking, the preferences presented in Fig. 2 or Fig. 3. The superiors cannot just accept the message, and the probability superiors attached to Control-Game preferences versus the other rankings presented will be of paramount importance in determining an outcome.

2. *Uncertainty regarding choice.* If we accept the Control-Game structure as a likely description, we may assume that moves are made successively or simultaneously. In the first case, one actor knows opponent's choice before making own draw. In the second case, which may be more realistic, neither player knows what the opponent may do when making own choice.
3. *Uncertainty regarding 'what happened'.* The actors may not be able to take the results of the last play into consideration when making next choice. It is difficult to understand what the opponent really did. The one-shot game with simultaneous moves is one possible way of modelling such decision-situations. It is perhaps restricted to the superior when using the non-controlling option.

Uncertainty regarding subordinate preferences, choice and 'what happened' will influence decision-making and outcomes. Generally speaking, *the less uncertainty — the more probable is a non-controlled, loyal state.*

My tentative hypothesis is that subordinates will react to a non-controlling superior-strategy by being loyal. This hypothesis is one of *zero* correlation between loyalty and perceived control-measures. Most units are in the B-box.

The alternative proposition, in which we have less confidence, suggests that the agencies will take advantage of non-controlling superior. The bureau will only act loyally when opposed to a monitoring regime. This argument implies a *positive* correlation between control and loyalty, i.e. within the boxes A and D.

The remaining question is of empirical nature. Will subordinate actors take advantage of a trustful, non-controlling superior — or will the lower agencies within a hierarchical organization respond by loyal adaptation to political priorities? What is the relationship between possibilities for strategic manipulation and loyal decision-making and budgetary actions?

It is of course very difficult to test such a hypothesis. Manipulation is per definition intended to be covert, and it is very hard for any social scientist to demonstrate the existence of disloyal behaviour as well as to prove the opposite.

One possible point of attack is to participate in decision processes in order to find evidence of manipulation — or to falsify the proposition.

Such a research strategy would presumably give insight into diverse kinds of strategic interaction, and may produce examples of disloyal behaviour.

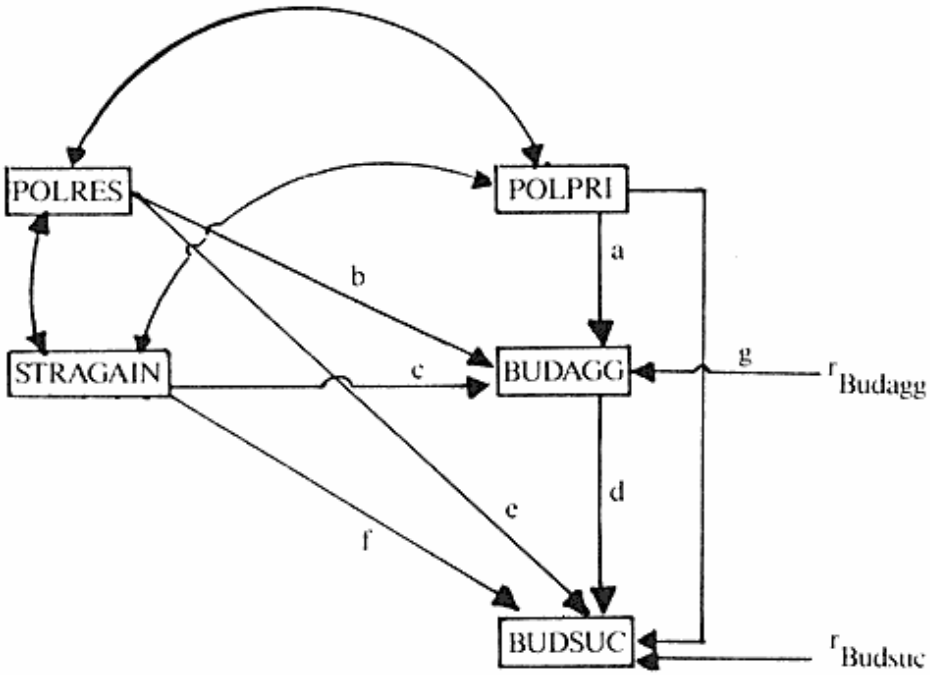


Fig. 8. Budgetary success as a Control Game

My approach relies on a combination of data from a budget process, both data on agency perceptions and the resulting agency behavior, and budget outcome. The data stem from a research project budgeting within the municipality of Oslo (Cowart & Brofoss 1979). The data are from 1973/1974.

It seems quite clear that agency-budgetary success depends on a large number of factors. A proposition that one particular agency took advantage of a non-controlled state would be most discussable. On the other hand, if I am capable of demonstrating a linkage between strategic opportunities and budgetary success as a *general trend,* the empirical support is more convincing.

I find five variables of interest here. The perceived *gains* from strategic action within the organization (STRAGAIN), next the perceived *possibilities* and *resources* political bodies have to influence decisions and actions on lower levels. The variable is called political resources (POLRES).

Political priority is of course very important in order to judge whether the agencies are loyal. We shall have to include the perceived political priority in our model (POLPRI).

The ultimate success of an agency is measured by its ability to increase its appropriations from the city council. Budgetary success is the increase from last year's budget to this year's budget (BUDSUC). The model assumes that agencies and bureaucrats obtain utility from budget maximation (Niskanen 1971).

Lastly, I suspect that the aggressiveness within the process may be an

Loyal behaviour	Disloyal behaviour
$a > 0$	$a < 0$
$b = 0$	$b > 0$
$c = 0$	$c > 0$
$d > 0$	$d > 0$
$e = 0$	$e > 0$
$f = 0$	$f > 0$
$g > 0$	$g < 0$

Fig. 9. Hypothesis in causal model

important determinant of success. The budgetary aggressiveness is the size of this year's budget request from agency compared to last year's appropriations. The variable budgetary aggressiveness measures the suggested increase in appropriations (BUDAGG).

The suggested causal model is presented in Fig. 8. The model contains two equations, one having BUDAGG as the dependent variable — the other having BUDSUC as dependent variable.

If political priority is the only decision premise when the budget proposal is decided, and the aggresiveness increases with political priority — then the behaviour is loyal. On the other hand, if the effect of priority is negative or zero and the agency is increasingly aggressive due to expected gains (STRAGAIN) and few political resources (POLRES), behavior is disloyal.

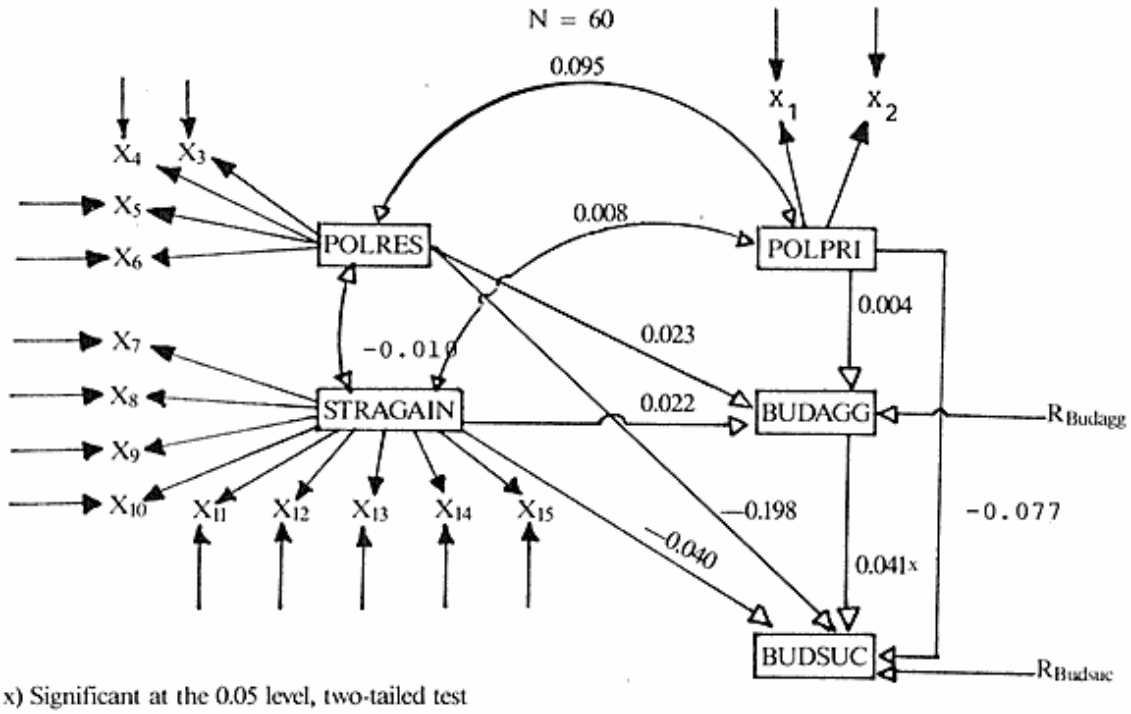
Manipulation may take other forms than budgetary aggressiveness. In general, if the (POLRES) or (STRAGAIN) increases the budgetary success, one may say that disloyal budgetary action has taken place.

I present my hypothesis in Fig. 9.

The measuring of BUDAGG and BUDSUC is straight forward. POLPRI is measured as a latent variable by two indicators, one measuring the proportion of last year's budget proposal which was appropriated (X_1) and the other indicator is agency perceived political priority level (X_2) measured on ordinal scale. POLRES is also a latent variable. Four indicators are used, each measuring the agency perception of resources within city council (X_3), the city cabinet (X_4), the council finance committee (X_5) and the political committees (X_6). The STRAGAIN variable is a 'Machiavelli-measure'. Nine indicators are used, each a measure of potential gains from different types of disloyal, opportunistic and manipulating actions (X_7-X_{15})[5]

In order to estimate the model, I have formulated a LISREL-model which is well suited to handle unmeasured variables. The results are presented in the path diagram below[6] (Fig. 10).

Budgetary aggressiveness (BUDAGG) does not depend much upon the proposed variables. None of the latent exogenous variables have significant



x) Significant at the 0.05 level, two-tailed test

Fig. 10. The LISREL-estimates of model (8).

impact on BUDAGG. Neither is the perceived political priority an important decision premise, nor are the two 'strategic variables' much related to BUDAGG. This may indicate that information on political priority is not precise enough to be responded to. In addition, the resources and possible gains (POLRES and STRAGAIN) may not play a role because the non-controlled loyal solution is a stable game solution.

The budgetary success (BUDSUC) does not co-vary significantly with any of the three exogenous variables. The proposed budget growth (BUDAGG) is highly correlated with appropriate growth. This result indicates that the agencies play an important role in shaping public decision, but this potential power is not exploited in the sense discussed earlier. Superior resources (POLRES) and perceived gains from manipulation (STRAGAIN) are negatively correlated as latent variables — but are not influencing subordinate decision-making or the budgetary success of the bureaus.

Conclusion

The aim of this discussion has been to discuss various two-person games which may represent the relationship between a superior agent and a subordinate

agency. The 'Control Game' has been suggested as one interesting game structure.

The article attempts to model various types of uncertainty, notably informational constraints regarding preferences, choice and 'what happened'. An especially difficult and interesting decision situation seems to arise when a one-shot situation and simultaneous moves are assumed. In this case, any outcome may result.

A rather suggestive empirical testing has been performed. Using data from the budgetary process in the city of Oslo, the 'manipulation hypothesis' finds little empirical support.

Further theoretical work should explore the potential for modelling uncertainty within the game-theoretical framework. Perhaps some combination of simultaneous and successive moves may give better insight. And, it may be that the concept of mixed strategies is useful in analysing hierarchical control situations.

The theoretical work should also consider whether subordinate preferences are dependent on which control strategies are used. If subordinates are more aggressive and manipulatory oriented the more control and monitoring are used, the decision situation ought to be represented by two strategy contingent game structures.

NOTES

1. It has been argued that it is impossible to compute the marginal gains from information. To allocate your resources optimally on the information-market, it is necessary to know what you are buying. The assumption is rarely met. You do not know the value of a piece of information. The ex ante demand for information is indeterminate. It may be difficult to establish a neo-classic equilibrium on a market without perfect knowledge (Hernes 1978, 206; Stiglitz 1977).
2. Landau & Stout (1979, 148-156) argue that the concept of management does not include control. They maintain that the phrase 'to manage is to control' mixes different concepts in an unfortunate way. To manage is to govern in an uncertain environment, to make decisions without sufficient information.

   The authors suggest that using extensive control in an uncertain situation leads to 'premature programming', while too little control causes the opposite mistake. By statistical analogy, the last mistake is a Type I error — rejecting a true null-hypothesis. The first is a Type II error — accepting a null-hypothesis which is false.
3. Gary Miller (1977) proposes a related model based on the contributions of William Niskanen (1971) and Migue & Belanger (1974). Miller concludes that the game between sponsor (superior) and bureau (subordinate) consists of at least one equilibrium point, most likely more. The equilibrium strategies do, however, result in a Pareto sub-optimal outcome. Therefore Miller suggests that the decision situation is a Prisoner's Dilemma.

   Miller's model does not incorporate any explicit assumptions on what kind of uncertainty the actors face. I think that any model of this kind ought to make the informational constraint explicit, and discuss how to build them into the model.

4. If we assume that preferences are measured on a cardinal scale, it is possible to compute an equilibrium in mixed strategies. In this case, the actors will choose strategies at random. Each actor will use a probability of 0.5 when selecting his strategy. The mixed, strategy outcome will obviously not be Pareto-optimal.
5. The STRAGAIN-variable is based on nine questions. The respondents, the agency heads, were asked to indicate whether they agreed to nine propositions and argument was measured on a scale from one to seven:
   1. It is best to tell people what they want to hear.
   2. When you ask somebody to do something for you, it is better to tell them the real reason for asking rather than giving more convincing reasons.
   3. Honesty is always the best way of acting.
   4. Do not ever tell others the real reason for doing things unless it is to your own advantage.
   5. You should only act when you are sure it is morally acceptable.
   6. It is wise to flatter important persons.
   7. It is possible to be good and nice in all relations.
   8. There is no excuse for lying.
   9. It brings its own punishment to trust another person, no matter who it is.
6. The LISREL-model (Jöreskog & Sörbom 1978) is specially designed for formulating and testing systems of structural equations containing latent variables. Our model has three latent variables, POLPRI, POLRES and STRAGAIN. These are modelled in the measurement model. The three exogenous, latent variables are in turn related to the two endogenous variables, BUDAGG and BUDSUC. As all possible arrows are drawn from the exogenous to the endogenous variables, and only one arrow is connecting the endogenous variables, we have a complete recursive model. These path-coefficients are of primary interest for our purpose. The standardized coefficients are presented in Fig. 10.

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