

Strategy Choices of Foreign Policy Decision Makers

THE NETHERLANDS, 1914

I. N. GALLHOFER

W. E. SARIS

Social Science Department

of Methods and Techniques

Vrije University

Amsterdam, The Netherlands

The assessment of the selection of strategy is studied using documents of a specific case of Dutch foreign policy from the beginning of World War I. First, a content analysis procedure was developed in order to search for the relevant concepts in the documents and to represent the argumentations in decision trees. Thereafter, the applicability of several decision criteria to the data is discussed. In order to describe the data, an alternative decision rule had to be developed, one which can be considered an adaptation of Simon's satisficing principle.

Immediately following the outbreak of World War I, the Dutch government proclaimed its neutrality (Smit, 1972: 1). The proclamations were commensurate with its small power and its independence policy, aimed at maintaining the territorial and economic status quo of the homeland and colonies (see Vandenbosch, 1959: 4; Smit, 1950: 270). The British and the Germans, when giving their assurances to respect Dutch neutrality, made some conditions. The Germans specified that they expected a "benevolent" attitude toward them (Smit, 1972: 3), while the English stated their respect "provided that it is not one-sided and that Great Britain is given the same or equivalent advantage as

AUTHORS' NOTE: All correspondence should be sent to Subfakulteit der Sociaal-Kulturele Wetenschappen, Afdeling Methoden en Technieken, Vrije Universiteit, De Boelelaan 1115, Amsterdam 1007 MC.

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Germany may at any time be given or have taken" (Smit, 1972: 9). These conditions can be better understood if one considers the peculiar geographic situation of the Netherlands functioning as a buffer state between the great powers. The western borders—the North Sea shore with the estuaries of the great rivers, the Scheldt, the Meuse and the Rhine—could be of vital importance in a conflict between England and Germany. Besides the strategic military importance, the Dutch rivers and harbors constituted an important waterway for Germany. When neutral Belgium was invaded by Germany on August 3, 1914, the British, as guarantors of Belgium's neutrality, respected Dutch neutrality and did not request access to the Scheldt in order to help Belgium and protect the important harbor of Antwerp by sea, which could have been strategically advantageous to them.

The Germans, meanwhile, were trying to defeat the French after the military failure on the Marne, which destroyed Germany's plan to finish the war in a short expedition and establish its hegemony in Central Europe (see Zechlin, 1964: 437; Fischer, 1961: 113). On September 28 Germany began an offensive against Antwerp in order to get access to the sea. As the Netherlands controlled the estuary of the Western Scheldt and thus the access to Antwerp, this military operation put the Dutch government in a very precarious situation. Although the Germans had assured them at the beginning of the siege of Antwerp that they would respect Dutch neutrality (Smit, 1972: 14), it was questionable whether the British would act similarly and whether a German Antwerp might not have unfavorable consequences for Dutch trade and politics. On October 1 and 3, the Dutch Council of Ministers therefore convened secretly in order to discuss which measures should be taken.

How did the Dutch ministers reach their decision? That is the research question we intend to investigate in this article. Several decision models can help us in this task. Section I describes in greater detail the models mentioned in the literature.

I. DECISION MODELS

As we are interested in terminal decisions in the field of foreign policy, theories which focus on the predecisional phase or on aspects of information processing and learning (Axelrod, 1976: 18) were excluded from our investigation. The choice of models was therefore limited to decision theory. Since the models of game theory are based on the

assumption of infallible rationality¹, they seemed inappropriate for the description of real-life decision situations. However, in the last decade a wider range of models has been developed with decreasingly rigorous assumptions. Some laboratory experiments (Coombs et al., 1967; Tversky, 1967; Wallsten, 1971) have shown positive evidence for the applicability of the Subjective Expected Utility Model (SEU), while Saris and Gallhofer (1975) have successfully applied the model to a historical bargaining situation.

The SEU model assumes that a decision maker is capable of evaluating all the outcomes of the behavior alternatives he perceives and that he can also indicate the probability of these events. The probabilities and utilities are considered subjective, since they are specific to the individual decision maker. The expected utility of a strategy (Fishburn, 1964: 21) is defined as a composite function of the utilities of the outcomes and their probabilities:

$$p_{i0_{ij}} = (1 - p_{io_{ij}}) \quad [1]$$

where $p_{io_{ij}}$ indicates the probability of the occurrence of outcome j under strategy i , and

$p_{i0_{ij}}$ indicates the probability of the occurrence of the logical alternative of outcome j (o_j) under strategy i .

The decision rule consists of selecting the strategy which maximizes the expected utility (see Coombs et al., 1970: 117-129). It allows for alternative decision principles (such as the maximax, minimax regret rule) which by-pass probability consideration. The evidence of empirical research also indicates that several new principles should be developed (e.g., the lexicographic rule). The choice criteria in these models are based on the utilities (see Coombs et al., 1970: 141-144; Vlek and Wagenaar, 1976: 464).

Another model developed by Simon (1957), which relies on the limited computational abilities of human beings, only uses dichotomous utilities, classified as "satisfactory" and "unsatisfactory." The decision criterion of the satisficing principle consists of choosing the first strategy one detects which leads to satisfactory outcomes only (see Simon, 1957: 248-254).

1. Game theory assumes that decision makers are aware of all available strategies both to themselves and their opponent(s) and that they possess full information about the objective probabilities and utilities (see Rapoport, 1966: 200).

	interval measurement level of utilities	nominal measurement level of utilities
interval measurement level of probabilities	SEU model I	II
nominal measurement level of probabilities	minimax regret-, maximax-, lexicographic rule etc. III	satisficing principle IV

Figure 1: Classification of the Decision Models with Respect to the Measurement of Utilities and Probabilities

This brief discussion of the models indicates that they differ with respect to the kind of information that is needed for the choice of a strategy. Figure 1 gives a classification of the models in this respect.

The scheme indicates that numeric information concerning utilities and probabilities is necessary for the SEU model. Less information is required for the other models. The class III models, for example, need numeric information for the utilities, but not for the probabilities. The satisficing model does not need numeric information at all. However, both utilities and probabilities must be of nominal measurement level—that is, satisfactory or unsatisfactory and certain or uncertain.

It is remarkable that we did not find any examples of the class II model which require numeric information with respect to probabilities and nominal information for utilities. As will be shown, such a model fits the data of this study, whereas the others failed.

TEST OF THE DATA REQUIREMENTS OF THE DIFFERENT MODELS

Concerning the plausibility of the different models for empirical data, the following data requirements were stated:

- (1) If the SEU model has been implicitly used by the decision makers, then they have to describe the probabilities and utilities at least on an ordinal level. In fact, higher

order information is necessary, but one can assume that ordinal statements are translations of numeric information in ordinary language.

- (2) If the class III models have been used implicitly by the decision makers, then they have to specify the utilities at least on an ordinal level, while the probabilities can be indicated as possible or not.
- (3) If the satisficing model is used, utility and probability statements should be on a nominal level.
- (4) The class II model requires ordinal statements of probability and nominal statements of utilities.

II. TEST OF THE MAXIMIZING MODEL

Before testing the applicability of the models, the choice of the test case and the analysis of the documents for obtaining the necessary information will be discussed.

A. CHOICE OF THE DOCUMENTARY ANALYSIS

For our case study we chose a debate by the Dutch Council of Ministers at the beginning of World War I about the impending occupation of Antwerp by the Germans (RGP IV, n.d.: 149). Our choice was based on the following considerations:

- The minutes of this debate contained a verbatim account of the formulation of choice of a large number of ministers.
- The decision had to be made secretly in a short period of time so that a check for additional material could be undertaken easily. It was negative in fact.
- The material was easily accessible.

B. OPERATIONALIZATION OF CONCEPTS

In order to test the models, the minutes had to be screened for the presence or absence of the decision-making concepts as mentioned above: possible actions, outcomes, utilities, and probabilities. This set of concepts was extended by the variable “possible new developments” which seemed useful for cases in which the actor was not specified. The definition of the various concepts is as follows:

Possible Actions

(a) *Actions of one's own party.* After considering the actual state, decision makers may examine the means which are available to them to

obtain the desired results. They may then review a series of possible alternative actions in such a case.

(b) *Actions of the other party(ies)*. When choosing from among the available actions, decision makers must take into account the actions of the other party: the other party, in pursuing its own objectives, may take measures which counteract those of the decision makers. In order to attempt to exclude undesirable effects, decision makers are therefore likely to review the available actions of the other party before selecting their own actions.

Possible New Developments

Events may occur which change the entire political situation. They are neither caused explicitly by actions of the decision makers themselves nor by actions of the opponent(s). Before deciding on policies, decision makers should also take into account the likely occurrence of new developments.

Possible Outcomes for One's Own Party

The choice of action(s) is based on the results that it may produce. Since not all consequences of an action are desirable, decision makers should examine the entire set of possible outcomes before selecting.

Utilities of the Possible Outcomes

Some outcomes are more desirable than others; the choice of action(s) is based on the degree of desirability of the different outcomes. Decision makers will therefore explicitly assign subjective values or utilities to the different outcomes.

Probabilities of "Actions of the Other Party," of "Outcomes," and of "New Developments"

Whether "actions of the other party," "new developments," and "outcomes" occur is uncertain. "Which actions will most probably produce the desirable results?" To answer this question, it is necessary to estimate subjectively the probabilities of occurrence of "actions of the other party," "new developments," and "outcomes."

C. CONTENT ANALYSIS

Since there were no automatic procedures available for searching for the relevant concepts in the documents, the content analysis had to be performed by human coders. Their task was actually split into two major steps:

- (1) Coders extracted the relevant concepts from the document. This procedure consisted of two tasks:
 - (a) the decomposition of sentences into relevant semantic units, and
 - (b) the classification of those units using one of the selected concepts.
- (2) Based on the concepts found, coders had to represent the reasoning of each minister in a decision diagram; that is, a chronological sequence of the minister's available actions, the actions of the other party(ies), the possible new developments, and outcomes. This task was again split up into two steps:
 - (a) the construction of diagrams for parts of the argumentation, and
 - (b) the combination of interrelated argumentations into an overview decision tree for each minister.

The whole coding procedure was replicated after two months and then the inter- and intracoder reliabilities of individual and group coding were computed for the different coding steps. For the decomposition of sentences into semantic units and the construction of decision diagrams, graph measures developed for this purpose were used and the reliability of classification of semantic units was computed by Scott's π . In general, the agreement of coders for these various steps was very high—greater than .8 (for details see Gallhofer, 1978 and Gallhofer and Saris, 1979). The agreement with respect to the construction of overview diagrams of the reasoning of each minister, however satisfactory, was less high, ranging from .6 to .8. The instructions will therefore have to be improved.

Since the results of the reliability tests were satisfactory, we resolved the remaining differences among coders with respect to concepts and diagrams by discussion. The data subjected to analysis are thus based on a consensual agreement of the coders.

D. RESULTS

The following observations are in order with respect to the quality of the utility statements. First, utility statements frequently overlapped with outcomes, consisting of emotive words like "loss," "oppression,"

“vassal state,” and others. Second, when stated in separate clauses, they were denoted mainly by expressions like “it is against our interests,” “it is an advantage,” “where our interests lie,” “it is satisfactory,” and so on. Going through these utility statements, we found that the ministers did not rank order their preferences. Only the Minister of War indicated once that a specific outcome would be “most fatal.” The other ministers only indicated whether utilities were *positive* or *negative*. As far as probabilities are concerned, we observed the following: that (a) ministers frequently indicated overall probabilities for a combination of branches in the tree structure; (b) overall probabilities were also indicated by specifying the chance of occurrence of events by branch (as the overall probability cannot be higher than the lowest individual probability, the latter has been used as an indicator of the former); and (c) sometimes the probability is only indicated for one outcome, while the chance of occurrence of the alternative event is not mentioned.

From the previous section it is obvious that the SEU model and the class III models cannot have been used by the decision makers, since the utilities do not fulfill the minimal requirement of ordinal measurement. This result was quite surprising, as it was in contrast with our previous study (Saris and Gallhofer, 1975). Given this fact, only the satisficing and the class II models seem plausible. The applicability of the satisficing model is not entirely satisfactory because of the frequent occurrence of ordinal probability statements. An objection to the class II model would be that probabilities are not indicated for all outcomes.

Given the quality of the data in this test case, we therefore rejected the SEU model and the class III models and checked more carefully whether Simon’s model or the class II model could describe the choice of the ministers.

III. CHOICE BETWEEN SATISFICING MODEL AND CLASS II MODEL

In order to test the applicability of the Simon model or the class II model for the choice of strategy of the ministers in the meetings of October 1 and 3, 1914, we must first present the general framework of the debate in schematic form as well as describe how each minister perceived the situation.

A. GENERAL FRAMEWORK OF DEBATE

Figure 2 presents the general framework of the debates. Besides the strategy of neutrality, each minister considered at least one alternative strategy. In total, they envisaged three available strategies: continue the strict neutrality (S_1); change to a conditional neutrality—for instance, by asking the Germans about their purposes with Antwerp (S_2), and inform the Germans that the Scheldt would be opened to the British if they should ask for access, since they were the guarantors of Belgium's neutrality (S_3). Each strategy was examined separately to ascertain whether or not it could lead to war and, consequently, the ministers also frequently indicated whether the political and economic status of the Netherlands might be affected during the peace treaty. Since ministers may differ in their perceptions of possible outcomes, the probabilities assigned to the outcomes, and/or the utilities, they may then choose different strategies. In the following we shall give an example illustrating possible differences among decision makers.

Figures 3A & 3B present the views of the Ministers of Agriculture and Foreign Affairs concerning the questioning of the Germans about their purposes with Antwerp (S_2).² The figures show that both ministers considered the possibility of getting a "satisfactory answer" (O_1). But while the Minister of Agriculture considered it as "highly probable," his colleague qualified it as "unthinkable," which implies that his alternative—"the evasive answer" (O_2)—has a good chance of occurring. The Minister of Foreign Affairs thereafter considered the possible consequences evolving from "the evasive answer" and examined in particular the consequences for the peace treaty should the Netherlands become involved in the war. His colleague, on the other hand, considering the chance of war (O_2) "not very high," examined the consequences for the Netherlands at the peace treaty in the case that a satisfactory answer was obtained. The results at the branch ends of the trees differ, therefore, both with respect to the formulation of the outcomes and the utilities.

With this example we have indicated the major differences in the argumentation of ministers. As it would be too tedious to present the diagrams for all the ministers, we shall summarize the outcomes they perceived for each strategy in Table 1. As can be seen in Table 1 the Ministers only considered a few outcomes per strategy. These outcomes

2. The outcome, value, and probability statements were translated from the original Dutch text and slightly paraphrased in order to make them manageable for presentation in diagrams.

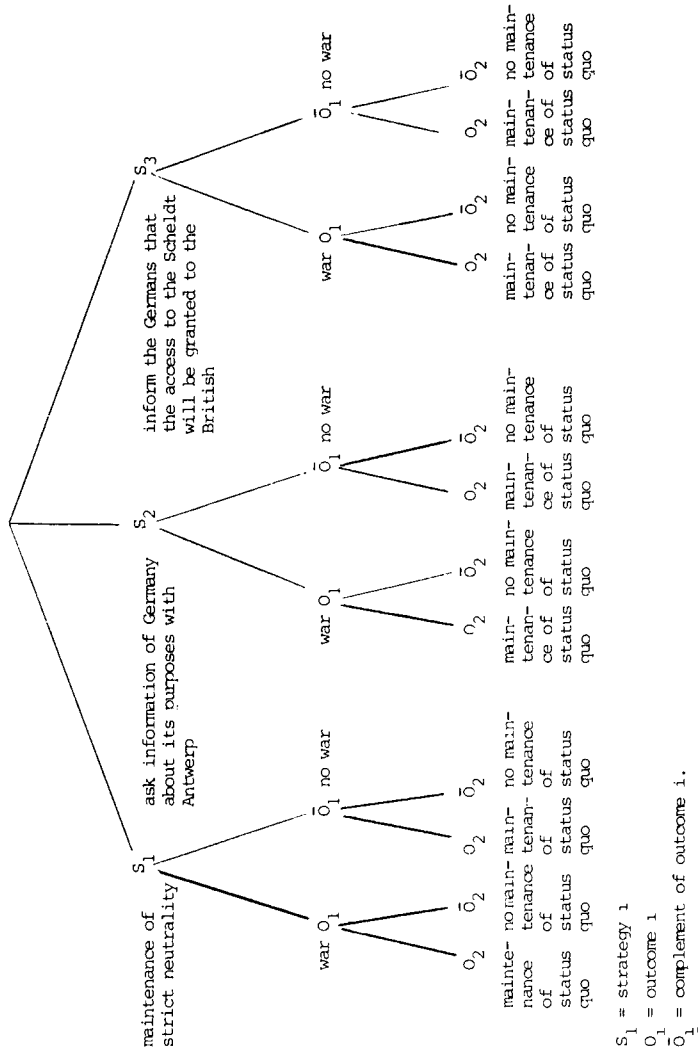
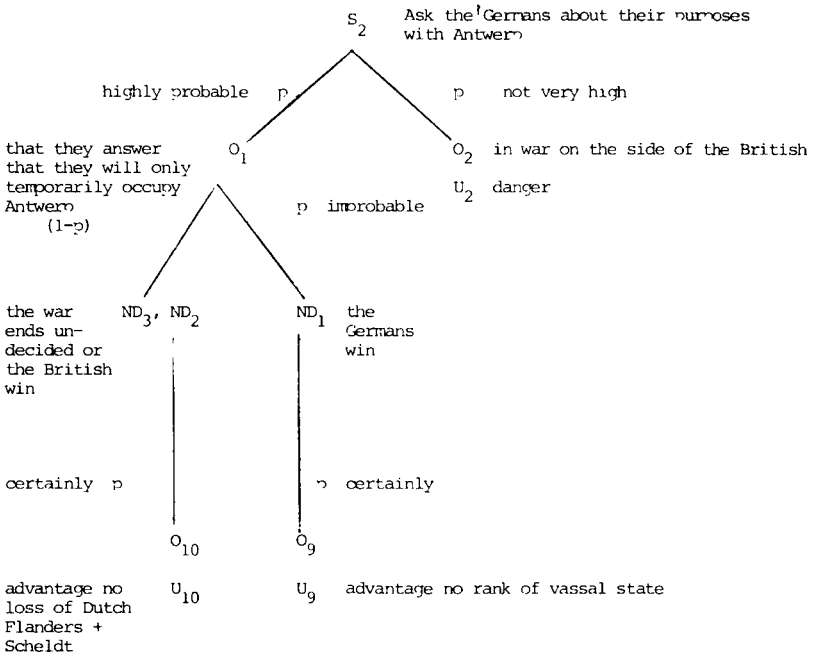


Figure 2: Tree Structure of the General Decision Model



- S_i = strategy i
- O_i = outcome i
- U_i = utility i
- ND_i = new development i

Figure 3B: Diagram 3b—The Minister of Agriculture

ranged from the loss of political and economic independence to the maintenance of the status quo. Occurrences such as incorporation into the German Empire and degradation to the rank of a German vassal state were considered possibilities should the Germans win the war. That could happen either if Holland participated in the war on the British side or if it remained neutral. German war goals in this period confirm to some extent these Dutch fears (Fischer, 1961: 118). Concerning Dutch Flanders and the Scheldt—a sort of “Dardanelles of Western

TABLE 1
Outcomes Perceived per Strategy per Minister

Strategies	S ₂										S ₃
	S ₁	O ₂₁	O ₂₂	O ₂₃	O ₂₄	O ₂₅	O ₃₁	O ₃₂	O ₃₃		
Outcomes	O ₁₁	O ₁₂	O ₂₁	O ₂₂	O ₂₃	O ₂₄	O ₂₅	O ₃₁	O ₃₂	O ₃₃	
Navy	no war, oppression of interests	no war, economic ruin of Belgium + incorporation in the loser	no war, with the Germans, where our interests lie	in war with the British + the loser	no war, highly consolidated	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
War	in war with the British + the loser	no war, economic ruin of Belgium + incorporation in the loser	in war with the Germans, where our interests lie	in war with the British + the loser	no war, highly consolidated	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Agriculture	no war, rank of German vassal state	no war, loss of Dutch leaders + the Scheldt	in war with the Germans	no war, no loss of territory	no war, no rank, no territorial state	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Charman	no war, economic and political autonomy	in war with the British	in war + loss of existence as a nation	no war, no loss of territory	no war, no rank, no territorial state	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Foreign Affairs	in war with the British	no war, rank of vassal state	in war + we have to pay the piper	in war + partially destroyed country + shaken confidence	in war + exchange for Dutch hands + the Scheldt territory	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Justice	in war with one of the belligerent parties	no war, no troubles at the peace settlement	now in war with the Germans	in war + troubles with the Germans	in war + exchange for Dutch hands + the Scheldt territory	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Finance	in war with one of the belligerent parties	no war, no troubles at the peace settlement	now in war with the Germans	in war + troubles with the Germans	in war + exchange for Dutch hands + the Scheldt territory	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	
Colonies	no war, loss of colonies	no war, no troubles at the peace settlement	now in war with the Germans	in war + troubles with the Germans	in war + exchange for Dutch hands + the Scheldt territory	no war, no rank, no territorial state	no war, only temporary occupation of Antwerp	in war with Germany, the side of our interests lie	in war with the British on the side of the loser	Germany renounces the occupation of Antwerp	

Europe"³—the ministers who considered the possibility of losing these areas must have been influenced by the memory of earlier Belgian annexation plans favored by certain military circles in London and Paris (Smit, 1950: 337). This outcome was perceived as possible if the war ended without decisive victory by one party or if the British won. The loss of colonies (especially the East Indies) was considered in terms of a possible joint action of the British and their ally, the Japanese, if unofficial guarantees to respect the status quo in this area were disregarded (Smit, 1972: 9).

B. STRATEGY PREFERENCES OF INDIVIDUAL MINISTERS

Table 2 summarizes the utility and probability statements explicitly assigned by the ministers to the different outcomes. The outcomes of Table 1 are summarized either in the main categories "war," "no war," or in the subcategories "war and maintenance of status quo," "war and change of status quo," "no war and maintenance of status quo," and "no war and change of status quo," depending on whether the ministers indicated the consequences of the peace treaty.

On the basis of the tree structures represented in Figures 3A & 3B, we can illustrate how Table 2 was set up. Figure 3a shows that the Minister of Foreign Affairs perceived three possible outcomes if there was a war—a "partially destroyed country + shaken confidence" (O_8), a "compensation for the loss of Dutch Flanders + the Scheldt" (O_7), or that "they had to pay the piper (O_6). These outcomes are summarized in the subcategory "war and change of status quo" (O_{212}) with a negative utility (U_{212}), since the modifiers of these phrases had a negative connotation. As the minister did not indicate probabilities for all branches or an overall probability, this result (O_{212}) is considered only as possible.

The outcomes "shaken confidence" (O_3) and "shaken confidence and troubles" (O_4) are summarized in the category "no war + change of status quo" (O_{222}) with a negative utility (U_{222-}). O_{222} is also only considered as possible.

Finally, the "satisfactory answer" (O_1) is classified into the category "no war + maintenance of status quo" (O_{221}) with a positive utility (U_{221+}) and the probability (p_{221} "unthinkable"). As the minister did not

3. The Dutch ambassador in England used this expression when reporting to his minister concerning the general feeling of the British on October 5, 1914 (RGP IV, n.d.: 179, 165).

TABLE 2
Utilities and Probabilities of the Different Outcomes per Strategy

Strategies Outcomes	S ₁		S ₂		S ₃		Proposed strategy
	O ₁₁ War	O ₁₂ No war	O ₂₁ War	O ₂₂ No war	O ₃₁ War	O ₃₂ No war	
Ministers	O ₁₁₁ change of status quo	O ₁₂₁ change of status quo	O ₂₁₁ change of status quo	O ₂₂₁ change of status quo	O ₃₁₁ change of status quo	O ₃₂₁ change of status quo	O ₃₂₂ change of status quo
Navy	U ₁₁₂ - P ₁₂₂ certainly	U ₁₂₂ - P ₁₂₂ certainly	U ₂₁₁ + U ₂₁₂ -	U ₂₂₁ + P ₂₂₁ by no means excluded	U ₃₁₁ + U ₃₁₂ - P ₃₁₂ is avoided	U ₃₂₁ + U ₃₂₂ -	S ₂
War	U ₁₁₂ -	U ₁₂₂ -	U ₂₁₁ + U ₂₁₂ -	U ₂₂₁ + P ₂₂₁ highly probable	U ₃₁₁ + U ₃₁₂ - P ₃₁₂ is avoided	U ₃₂₁ + U ₃₂₂ -	S ₃
Agriculture	U ₁₁₂ - P ₁₂₂ far from improbable	U ₁₂₂ - P ₁₂₂ far from improbable	U ₂₁₁ - P ₂₁₁ not very high	U ₂₂₁ + P ₂₂₁ highly probable	U ₃₁₁ + U ₃₁₂ - P ₃₁₂ is avoided	U ₃₂₁ + U ₃₂₂ -	S ₂
Chairman	U ₁₁₁ - P ₁₁₁ very low	U ₁₂₂ - P ₁₁₂ speculative	U ₂₁₁ - P ₂₁₁ most probable	U ₂₂₁ - P ₂₂₁ most probable	U ₃₁₁ - P ₂₁₁ most probable	U ₃₂₁ - P ₂₂₁ most probable	S ₁
Foreign Affairs	U ₁₁₁ - P ₁₁₁ unexpected	U ₁₂₂ - P ₁₂₂ unlikely	U ₂₁₁ - P ₂₁₁ high probability	U ₂₂₁ + P ₂₂₁ unthinkable	U ₃₁₁ - P ₂₁₁ high probability	U ₃₂₁ - P ₂₂₁ high probability	S ₁
Justice	U ₁₁₁ - P ₁₁₁ highly probable	U ₁₂₁ + P ₁₂₁ highly probable	U ₂₁₁ - P ₂₁₁ high probability	U ₂₂₁ - P ₂₂₁ highly probable	U ₃₁₁ - P ₂₁₁ high probability	U ₃₂₁ - P ₂₂₁ high probability	S ₁
Finance	U ₁₁₁ - P ₁₁₁ unexpected	U ₁₂₂ - P ₁₂₂ must not be over- estimated	U ₂₁₁ - P ₂₁₁ + P ₂₂₂ = without any doubt	U ₂₂₁ - P ₂₂₁ highly probable	U ₃₁₁ - P ₂₁₁ + P ₂₂₂ = without any doubt	U ₃₂₁ - P ₂₂₁ highly probable	S ₁
Colonies	U ₁₁₂ - P ₁₂₂ must not be over- estimated	U ₁₂₂ - P ₁₂₂ must not be over- estimated	U ₂₁₁ - P ₂₁₁ certainly	U ₂₂₁ - P ₂₂₁ highly probable	U ₃₁₁ - P ₂₁₁ certainly	U ₃₂₁ - P ₂₂₁ highly probable	S ₁

explicitly consider the outcome “war and maintenance of status quo” (O_{211}) and there was no indication by a probability statement that this complementary outcome of “war and change of status quo” could occur (in which case it would have been indicated by a dotted branch in the tree structure), the cell O_{211} is omitted from consideration. Thus, blank cells in Table 2 indicate implicit alternatives derived from the probability statement of the explicitly mentioned outcome. Concerning the argumentation of the Minister of Agriculture (Figure 3b), the outcome “in war on the side of the British” (O_4) is classified under O_{21} with a negative utility (U_{21-}) and probability “not very high” (p_{21}). “Advantage no loss of Dutch Flanders and the Scheldt” (O_5) and “advantage no rank of vassal state” (O_6) are summarized under “no war + maintenance of status quo” (O_{221}) with a positive utility (U_{221+}). The probability that a positive result would occur (O_{221}) was indicated at the beginning of the tree structure as “highly probable” (p_{221}).

The available information was summarized in Table 2 for each minister. With respect to probabilities, it turned out that ministers, apart from the Minister of War, specified at least one probability explicitly, either for the positive or the negative outcome. Table 2 further indicates the strategy which each minister preferred. In the next sections we shall try to explain these choices based on the data of Table 2.

C. TEST OF THE SATISFICING MODEL

Given the data in Table 2, the satisficing principle can be tested. The decision rule consists of choosing the strategy which contains only satisfactory results. An inspection of the data reveals that only the choice of the Minister of War can be described by this rule. He preferred the third strategy, indicating that only positive outcomes could occur. The other ministers always kept open the possibility of negative outcomes either by explicitly specifying these possible negative outcomes or by specifying that the positive outcome was not certain. Since the satisficing principle only fits the selection of strategy of one minister, it is desirable to derive another heuristic rule which describes the choice of the ministers in a better way.

D. TEST OF THE CLASS II MODEL

The data generally show that the ministers explicitly formulated one outcome with its probability while leaving it to the listener to fill in the

logical alternative (that is, that the specific outcome will not occur) with its probability. The reader can estimate the probability of the alternative if he uses the following rule:

$$EU(S_i) = \sum_{j=1}^r p_{ij} U_j$$

where $EU(S_i)$ indicates the expected utility under strategy i

and p_{ij} the probability of the occurrence of outcome j under strategy i

and U_j the utility of outcome j .

Given this probability rule, the following decision rules describe the selection of strategy of each minister:

- (1) Select the strategy with the lowest probability of a negative outcome. This is a formulation based on the negative outcomes, though the rule can also be formulated similarly on the positive outcomes.
- (2) Select the strategy with the highest probability of a positive outcome.

More formally, these rules can be expressed:

$$\begin{aligned} \text{if } p_{i-} < p_{j-} &\Rightarrow S_i \text{ is chosen} & [2] \\ \text{or, equivalently,} & \\ \text{if } p_{i+} > p_{j+} &\Rightarrow S_i \text{ is chosen} \end{aligned}$$

where p_{i-} and p_{j-} indicate the probability of a negative outcome under the i^{th} respectively the j^{th} strategy

and p_{i+} and p_{j+} indicate the probability of a positive outcome under the i^{th} respectively the j^{th} strategy.

We shall now demonstrate that the two rules lead to the same choice. Suppose

$$\begin{aligned} p_{i-} < p_{j-} \\ \text{or } -p_{i-} > -p_{j-} \\ \text{and } 1 - p_{i-} > 1 - p_{j-}. \end{aligned}$$

Using the probability rule it follows that $p_{i+} > p_{j+}$. Thus, if $p_{i-} < p_{j-}$ then $p_{i+} > p_{j+}$, then the same strategy (S_i) has to be chosen.

Suppose

$$p_{i+} > p_{j+}$$

or $-p_{i+} < -p_{j+}$

and $1 - p_{i+} < 1 - p_{j+}$.

Using the probability rule it follows that $p_{i-} < p_{j-}$. Thus, if $p_{i+} < p_{j+}$ then $p_{i-} < p_{j-}$, then the same strategy (S_i) has to be chosen.

From the above it is clear that both rules lead to the same conclusions. We have therefore called them equivalent with respect to the decision. The goodness of fit of this model to the data can be demonstrated by inspecting the decisions of the ministers. Table 2 shows that the Minister of The Navy proposed the adoption of strategy 2. For strategy 1 he perceived an outcome with a negative value as "certain" ($p_{1-} = 1$), implying that the probability of the occurrence of the complementary outcome was zero ($p_{1+} = 0$). However, for strategy 2 there was a chance to achieve a positive outcome ($p_{2+} =$ "by no means excluded"). Since $p_{2+} > p_{1+}$,⁴ strategy 2 had to be chosen.

The Minister of War perceived that for strategy 1 two negative outcomes were possible ($p_{1-} \neq 0$), which implies that positive results could also occur ($p_{1+} \neq 0$). For strategy 2 a positive outcome and its negative complement were mentioned as possible ($p_{2+} \neq 0$, $p_{2-} \neq 0$). For strategy 3 he indicated two positive results and one negative. Since the probability of the negative event was excluded ($p_{3-} =$ "avoided") $p_{3+} = 1$. As $p_{3+} > p_{2+}$ and $p_{3+} > p_{1+}$, strategy 3 ought to be selected and was, in fact, also chosen.

The Minister of Agriculture mentioned for strategy 1 a "far from improbable" negative result ($p_{1-} =$ "far from improbable"), which implies that its positive complement was less likely to occur ($p_{1+} = 1 -$ "far from improbable"). For strategy 2 he indicated a positive result as "very probable" ($p_{2+} =$ "very probable"). As $p_{2+} > p_{1+}$,⁵ strategy 2 had to be chosen and was indeed selected by the minister. The chairman perceived for strategy 1 two negative outcomes with probabilities "very low," respectively "speculative" ($p_{1-} =$ "very low" + "speculative"). For the second and third strategies he indicated a negative outcome as "most probable" ($p_{2-} =$ "most probable," $p_{3-} =$ "most probable"). Since $p_{1-} <$

4. Although the ordinal probability statements probably could be transformed into numeric values, we did not undertake this effort, since the ordinal statements already were clear enough for the necessary conclusions.

5. It will be obvious to the reader that "very probable" is greater than "1 - far from improbable."

p_{2-} and $p_{1-} < p_{3-}$,⁶ strategy 1 ought to be selected and actually was chosen.

The Minister of Foreign Affairs indicated for strategy 1 two negative results with probabilities "unexpected" respectively "unlikely" ($p_{1-} = \text{unexpected} + \text{unlikely}$). For the second strategy he indicated two negative outcomes and one positive. Since $p_{2+} = \text{"unthinkable"}$ $p_{2-} = 1$. As $p_{1-} < p_{2-}$ he ought to prefer strategy 1 above strategy 2, which was actually done.

The Minister of Justice mentioned for strategy 1 a positive outcome, as "highly probable" ($p_{1+} = \text{"highly probable"}$). For strategy 2, he indicated a negative result with "high probability" ($p_{2-} = \text{"highly probable"}$) implying that $p_{2+} = 1 - \text{"highly probable."}$ Since $p_{1+} > p_{2+}$ he ought to choose strategy 1, which was indeed his preference.

The Minister of Finance mentioned for strategy 1 a negative outcome, which he perceived as "unexpected" ($p_{1-} = \text{unexpected}$). For strategy 2 he indicated two negative outcomes with probability "without any doubt" ($p_{2-} = 1$). Since $p_{1-} < p_{2-}$, he ought to choose strategy 1, which he did.

The Minister of Colonies perceived for strategy 1 a negative result which "must not be overestimated" ($p_{1-} = \text{"must not be overestimated"}$). For strategy 2 he indicated a negative result as "certain" ($p_{2-} = \text{"certain"}$). Since $p_{1-} < p_{2-}$, he chose strategy 1.

Our previous discussion has thus shown that the rules given above lead to the choice of the strategy proposed by each of the ministers.

CONCLUSION

When analyzing the data of this decision situation, it turned out that neither the SEU model nor the less restrictive decision rules were applicable for the assessment of the selection of strategy. We therefore developed an alternative decision rule, making use of the probabilities and the dichotomous utility statements indicated by the decision makers. In Figure 1 above this rule could be placed in the empty cell with the entries "interval measurement level of probabilities" and "nominal measurement level of utilities."

6. We assume that "very low + speculative" (p_{1-}) is lower than "most probable" (p_{2-} , p_{3-}).

As in Simon's model, the utilities of the alternative rule are only characterized as satisfactory or not satisfactory. However, the rule differs from Simon's model with respect to its applicability in case no strategy leads with certainty to a satisfactory outcome. One could say that, according to our model, the decision maker chooses the strategy which most likely leads to a satisfactory outcome, and in this way it is the closest approximation of the satisficing rule under the condition of uncertainty.

Another remarkable aspect which this model has in common with the Simon model is that the values of the utilities are ignored. This means that extremely negative results would be treated the same way as less negative outcomes. Only the probability of the outcome determines the choice of the strategy. Although this behavior does not seem to be rational, it is not unusual in practice. In nuclear energy debates similar behavior is observed (see, for example, Lukkenauer, 1978). We also have some evidence that the formulated decision rule is applicable to other data (see Gallhofer and Saris, forthcoming). However, in an earlier study (Saris and Gallhofer, 1975) the SEU model described the data very well. To this date, it is therefore unclear under which conditions the different models could be used by the decision makers. Further research is required to specify these conditions.

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