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A GAME THEORETIC ANALYSIS OF THE NORDIC COALITION'S ROLE IN THE DECISION MAKING OF THE EC COUNCIL OF MINISTERS

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ABSTRACT: In this paper, we study the Scandinavian countries' influence on the decision making of the Council of Ministers of the EC. The purpose paper is twofold: first, to evaluate the Nordic countries' direct effect on outcome and second, to analyse the question of group-individual agreement, i.e. the probability that the group decision will agree with one's decision, with respect to the Nordic coalition. The analysis is based on the Shapley-Shubik and the Banzhaf power indices and on the Straffin and the Rae satisfaction indices of simple cooperative games.

KEY WORDS: European Community, Game theory, Power indices, Satisfaction indices

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1 Introduction

After the Maastricht summit in December 1991 the European Community's attitude towards taking new members from among EFTA coutries has been positive. The negotiations between the EC and new would-be members from EFTA who are wish to join the EC could start after the EC has dealt with the so-called Delors II package of future budgets for 1993-1997.

Of the EFTA countries Austria, Sweden and Finland have submitted their applications for membership. Discussion regarding EC membership has heated up also in Norway and Switzerland and it is possible that these countries will submit their applications in the near future. It has been argued that the negotiations concerning the European Economic Area (EEA) could be interpreted as a part of the membership negotiations and that is why the EC's enlargement in the latter half of the 1990's could contain all the EFTA countries in favour of membership.

The EEA aggreement does not guarantee for the EFTA countries a proper influence on decision making concerning the area. It has been argued that this unbalance between obligations and rights (Hamilton 1991) is one of the main reasons for the EFTA countries to apply for membership. Since the decision making in the EC is supranational and since the EEA aggreement will not be a permanent solution for the EFTA countries, it is essential to analyse the powers that members of the Community have and how the would-be enlargement changes the balance of power in the decision making. National aspects and the balance of national powers play an important role as long as the governments have direct influence in the decision making process, see Widgrén (1991).

When analysing the power in the EC Council of Ministers three following aspects can be distinguished:

1. Effect on outcome, i.e. the probability that one's vote will make a difference in the group decision

2. Group-individual agreement, i.e. the probability that the group decision will agree with one's decision and that it will prevent a certain action if one votes against and accomplish the action if one votes in favour
3. The concentration of power.

The first question can be analysed by the power indices, the second one by the satisfaction indices and the third one by the components of the satisfaction indices of cooperative game theory, which can be understood as a theory of coalitions rather than as a game theory since it does not model the moves of the game, i.e. coalition formation in voting games, explicitly. In the voting games it is typically assumed that there are only two kinds of coalitions: winning ones and losing ones. The power and the satisfaction indices measure power in an abstract sense, i.e. they do not concentrate to any particular question of voting.

The analysis of this paper seeks to measure the influence on the EC decision making process, in particular for the Scandinavian countries. Five different enlargements are presented: EC14, EC15, EC16, EC17 and EC19 but the analysis concentrates on the EC15, EC16 and EC17. It is asssumed that the new members will join the EC in the following order; Austria, Sweden, Finland, Norway, Switzerland, Liechtenstein and Iceland. Since this paper investigates the national role of Scandinavian countries, the analysis concentrates on the Council of Ministers. For the EC decision making institutions, see Nicoll - Salmon (1990).

Power indices have been mostly applied to institutions where voting takes place, e.g. regarding parliaments, see Holler (1982) about the U.S. Senate and presidential elections, see Shapley - Shubik (1954) and Owen (1982) or about the shareholders' meetings of large companies, see Leech (1985) and Pohjola (1987). Voting power in the EC has been analysed earlier in Johnston (1982), Brams - Affuso (1985), Brams - Doherty - Weidner (1991), Widgrén (1991) and Nurmi (1992). Satisfaction indices are not as widely applied, see however Straffin - Davis - Brams (1982), but the component of the group individual

Table 1: **The total number of votes and the number of votes needed for qualified majority in the EC Council of Ministers**

	Number of votes	Qualified majority	Blocking minority
EC12	76	54	23
EC14	84	60	25
EC15	87	62	26
EC16	90	64	27
EC17	94	67	28
EC19	97	69	29

aggreement in the sense of winning is applied to analyse the concentration of power, see Leech (1987a, 1987b) or Pohjola (1988).

In the EC most of the decision making takes place in the Council of Ministers where Germany, Italy, France and the UK have 10 votes each; Spain 8 votes; the Netherlands, Greece, Portugal and Belgium 5 votes each; Denmark and Ireland 3 votes each and Luxembourg 2 votes. The decisions are made mainly by the qualified majority for which 54 votes out 76 is needed. It has bee argued in Widgrén (1991, 4), that the relationship between the votes and population is logaritmic and from among the EFTA countries Austria, Sweden and Switzerland would get 4 votes and Finland and Norway 3 votes, Iceland 2 votes and Liechtenstein 1 vote. Coalition formation is essential in the Council of Ministers, since most of the questions are solved by the qualified majority. In Table 1 the total numbers of votes, the qualified majorities and the blocking minorities are presented after different enlargements when it is assumed that the qualified majority and the votes are determined as they are now.

It has been argued in Widgrén (1991) that, although the Nordic EFTA countries are small individually, together they would have substantial powers in the EC decision making when measured by the power indices. This paper seeks to deepen the analysis based on the power indices concerning the Nordic countries in the EC. It is shown that the

Nordic countries' power does not vary much regarding the enlargement. In this paper it is also shown that the Nordic countries form a powerful coalition with respect to preventing decisions. This property holds true even if an opposing coalition with the three or four largest members is formed. The Nordic countries form a coalition which is more powerful than any of the single member states in the EC. However, the Nordic countries cannot gain more than 10-16 percent by forming a permanent coalition (Widgrén 1991).

The rest of this paper is organized as follows. In section two the power and satisfaction indices are presented. Then in sections three and four the results are obtained and the conclusions are presented.

2 The Measures of Voting Power and Satisfaction

Since the monumental preparatory work both in the formal and informal level needed for a decision in the EC cannot be modelled in general, we instead choose a cooperative game approach. Let N be the set of n government representatives in the Council of Ministers of the EC and $w = (w_1, w_2, \ldots, w_n)$ the vector of voting weights $p_i / \sum_{i=1}^{n} p_i$, where p_i is the number of votes belonging to member state i. The decision making game in the Council of Ministers can be presented as a cooperative weighted majority game $u = [q; w_1, w_2, \ldots, w_n]$, where $q \in [0, 1]$ is the voting weight which is needed for a majority.

Let $\mu : \mathcal{P}(N) \rightarrow [0, 1]$ be a measure of voting weight in coalition $S \subset N$. If we classify the coalitions in the power set of N, denoted by $\mathcal{P}(N)$, only on the basis of winning, we can choose $v(S) = 1$ if $\mu(S) > q$ and $v(S) = 0$ otherwise. Function v can be interpreted as a game of winning or a voting game. It can be easily seen that $v(\cdot)$ presents a list of winning coalitions. Let W be a winning coalition. Then $L = N - W$ can be interpreted as a losing coalition. A coalition which has a losing complement in N is a blocking coalition denoted by B, in the sense that the complement of B is not a winning

coalition. Let $\mathcal{W}$ be the class of winning coalitions and $\mathcal{B}$ the class of blocking coalitions. An interesting subclass of $\mathcal{W}$ is a class of minimum winning coalitions $\mathcal{M}$. A minimum winning coalition M is here defined as a coalition in which there is at least one crucial, i.e. player, i.e. a player without whom the coalition would turn to a losing one. It is easy to see that $\mathcal{W} \subset \mathcal{B}$. Let U denote arbitary coalition which is blocking but not winning. We call this kind of coalitions unsolved. If the decision rule is simple, i.e. a simple majority, and there are no coalitions with precisely 50 percents of the votes so the class of unsolved coalitions $\mathcal{U}$ is empty and the classes $\mathcal{W}$ and $\mathcal{B}$ are equal. Let W_i, L_i, B_i and U_i denote winning, losing, blocking and unsolved coalitions where i is a member and $\mathcal{W}_i$, $\mathcal{L}_i$, $\mathcal{B}_i$, $\mathcal{U}_i$ denote the class of these coalitions respectively and let $\mathcal{M}_i$ denote the class of minimum winning coalitions M_i.

In the EC Council of Ministers $\mathcal{U}$ is not empty and it is interesting to analyse winning and blocking coalitions separately. In these games the *dual* v^* of the game v is interesting, since it can be interpreted as a game of blocking. The dual v^* is defined as follows: $v^*(S) = v(N) - v(N - S) \ \forall \ S \subset N$ and hence for the simple voting game defined above $v^*(S) = 1$, if $\mu(S) > 1 - q$ and $v^* = 0$ otherwise. Thus function v^* can be interpreted as a list of blocking coalitions.

When measuring the direct individual effect on an outcome in a certain voting body the most natural question to ask is , "What is the difference that one's vote will make?" (Straffin 1988). It can be measured by the difference $\Delta_i v(S) = v(S) - v(S - \{i\}), i \in S$, which is called the *marginal contribution* of player i to S. It can be easily seen that for voting games $\Delta_i v(S)$ is either 1, when i swings a coalition from losing to winning, or 0 otherwise. To answer the question of individual effect generally in all coalitions in $\mathcal{P}(N)$, we need to specify a probability model for the voting process [1].

[1]Since the power and the satisfaction indices can be interpreted as probabilities, it is appropriate to present them by using the probabilistic approach as it is done in this paper. For the axiomatic approach concerning the power indices see Shapley (1953), Dubey (1975), Dubey - Shapley (1979), Owen (1982), Young (1985), Lehrer (1988) and Chun (1989). The bargaining foundations of Shapley value are presented in Gul (1989).

Let x_i be the probability that minister i favours a given Commission proposal and x a n-vector of these probabilities called *the acceptability vector* which characterizes a vote (Straffin 1988). Let y be a n-vector of the complement probabilities of an acceptability vector. If we randomize the voting question, the acceptability vector defines the probabilities that player i belongs to an arbitary coalition $\mathcal{S}$, i.e. the probabilities that she/he will vote for a random bill and y defines its complement, i.e. the probability that she/he votes against the random bill. Supposing that each player votes 'yes' or 'no' independently of each other, we can write for any fixed $S \subset N$, the probability $P\{\mathcal{S} = S\} = \prod_{i \in S} x_i \prod_{i \notin S}(1 - x_i)$. If we take the sum of these probabilities multiplied by values of the characteristic function over all possible coalitions, we will have the mathematical expectation for the value of function v. In particular for the voting games and their duals defined above this expectation can be interpreted as a probability, because v is an indicator variable, and the summation is taken over the class $\mathcal{W}$ of winning or blocking coalitions only. Let $f(x_1, \ldots, x_n)$ denote the expectation for a voting game. It can be interpreted as a probability $P\{S \subset \mathcal{W}\}$. If we randomize the question of voting in the dual of v, the complement probabilities characterize a vote and the multilinear extension for v^* can be interpreted as a probability $P\{S \subset \mathcal{B}\}$. It can be shown that the ith partial derivative of f denoted by f_i is the expected value of the marginal contribution of player i for the coalition S, where the summation is taken over the class $\mathcal{M}_i$ (Owen 1972).

For calculation purposes we have to define the x_i probabilities explicitly. In the literature there are two following standard assumptions of the joint probability distribution for x_i:s. There is the *independence assumption* : whereby probabilities x_i are independently uniformly distributed on [0, 1] and *homogeneity assumption* : each $x_i = t$ and t is uniformly distributed on [0, 1] (Straffin 1988). The main difference between these assumptions is that under the homogeneity assumption there is a common standard by which the ministers evaluate the Commission proposal and thus the probabilities of the voters' decisions are correlated in a specific way (Straffin 1988). If we calculate

the expectation of the individual effect measured by one's marginal contribution $f_i(\cdot)$, assuming independence we have

$$E_{ind}[\Delta_i v(S)] = \int_0^1 \int_0^1 ... \int_0^1 f_i(x_1, ..., x_n) dx_1 ... dx_n = \sum_{S \in \mathcal{M}_i} (\frac{1}{2})^{n-1} = \beta_i', \qquad (1)$$

and assuming homogeneity we have

$$E_{hom}[\Delta_i v(S)] = \int_0^1 f_i(t, ..., t) dt = \sum_{S \in \mathcal{M}_i} \frac{(s-1)!(n-s)!}{n!} = \Phi_i, \qquad (2)$$

where n and s denote the cardinalities of sets N and S respectively. Equation (1) is usually referred to as the unnormalized Banzhaf index (BI), which is often nevertheless normalized although its probabilistic interpretation is then destroyed (Straffin, Davis and Brams 1981). Equation (2) is referred to as the Shapley-Shubik power index (SSI). It can be shown that Φ is the only probabilistic value for characteristic function games which has the consistency property, i.e. the sum of individual indices is always one in the voting games (Dubey, Neyman and Weber 1981). The difference between the indices is often described in terms of permutations and combinations, since assuming homogeneity means that players' permutations are equally likely, which indicates that the random variable for the number of voters who vote 'yes' has equal probabilities $\forall$ s $= 1, ..., n$ and assuming independence means that all coalitions are equally probable to form. According to Straffin (1988), however, this permutation-combination distinction is illusory, because both indices can be derived from a probability model in which the permutations of players play no role.

Satisfaction defined as above can be interpreted as the other side of the coin in the analysis of one's possibilities in a voting body. The power indices measure in some sense one's direct influence but the satisfaction indices measure one's influence as a member of a group.

In analysing the voting bodies with asymmetric majority rule it is interesting to decompose the idea behind the satisfaction, since as it was noted earlier in this paper preventing and accomplishing decisions differs considerably in bodies like the Council of Ministers of the EC. Assuming homogeneity the probability for i to accomplish a decision on condition that she/he votes 'yes' can be written as follows: $P_{hom}\{x_i = 1 \ \& \ i \in S \ \& \ S \subset \mathcal{W}\} = \int_0^1 f(t, ..., 1, ..., t)dt$ and assuming independence respectively by letting $t = 1/2$. Slightly modified versions of these probabilities can be used to analyse the concentration of power (Leech 1987a, 1987b, Pohjola 1988). It is then assumed that a coalition of the m largest players votes for the proposal and the probabilities are calculated for these alliances by letting $m = 1, ..., p$, where p is the number of the largest players needed for a majority.

To analyse one's possibilities to prevent a decision, i.e. the probability that a group decision rejects a bill one votes against, we need a multilinear extension for a dual of v defined earlier in this paper. Hence assuming homogeneity of the y_i-probabilities we have $P^*_{hom}\{y_i = 1 \ \& \ i \in S \ \& \ S \subset \mathcal{B}\} = \int_0^1 f^*(t, ..., 1, ..., t)dt$ and assuming independence $P^*_{ind}\{\cdot\}$ can be written respectively by letting $t = 1/2$.

If we would like to analyse the question of satisfaction, i.e. the question of how often will one be satisfied with the group decision, the weighted average of the terms presented must be calculated. Generally i votes 'for' and 'against' with equal probabilities, since $\int_0^1 x_i dx_i = 1/2$ and hence the satisfaction indices ρ are simply the arithmetic averages of the components. Assuming homogeneity we obtain the Straffin index, which can be written as follows:

$$\begin{aligned} \mathcal{A}_i &= (1/2) \cdot P_{hom}\{i \in S \ \& S \ \subset \mathcal{W}\} + (1/2) \cdot P^*_{hom}\{i \in S \ \& \ S \subset \mathcal{B}\} \\ &= (1/2) \int_0^1 f(t, ..., 1, ..., t)dt + (1/2) \int_0^1 f^*(t, ..., 1, ..., t)dt \end{aligned} \tag{3}$$

and under the independence assumption we will have the Rae index which can be written in the following simplified form (Straffin - Davis - Brams 1982, 243):

$$r_i = 1/2 + 1/2 \cdot \beta'_i. \tag{4}$$

Since the power and satisfaction indices can be understood as sums of independent random variables, they can be approximated by using the cenral limit theorem. The approximation of the indices is essential, since the number of coalitions, i.e. 2^n, increases fast with respect of n. For example in the EC of 19 members there are 524 288 coalitions.

Let Y be the random variable of the sum of voting weights of the players in $N - \{i\}$ who vote for the proposal. The mean and the variance of Y can be written as follows: $E(Y) = \sum_{j \neq i} w_j \cdot x_j$ and $\sigma^2(Y) = \sum_{j \neq i} w_j^2 \cdot x_j \cdot (1 - x_j)$ where x_j is the jth element of the acceptability vector defined earlier in this paper. Hence Y measures the support for player i. According to the central limit theorem it can be approximated by the normal random variable $\hat{Y}$ which can be written as follows

$$\frac{\hat{Y}_i - E(Y_i)}{D(Y_i)} \sim N(0,1). \tag{5}$$

and hence

$$\frac{Y_i - E(Y_i)}{D(Y_i)} \longrightarrow N(0,1) \tag{6}$$

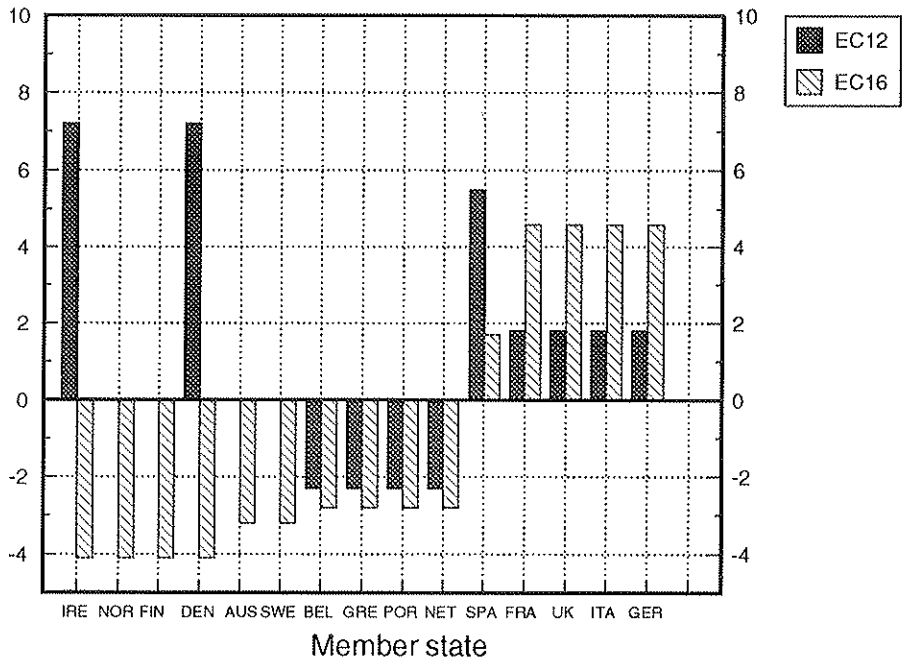
$$i.d. \tag{7}$$

The power indices can be approximated by calculating the probabilities $P\{q - w_i - 1/2 \leq \hat{Y} \leq q - 1/2\}$ where q denotes the decision rule and the $1/2$ is the standard procedure used whenever a discrete random variable is approximated by a continuous one. For the detailed presentation of the method, see Owen (1982, 203-205). For the satisfaction indices we have to define two new random variables as follows: $Q = Y + w_i$ and $Q^* = w_i + \sum_{j \neq i} y_j$ where y_j is the jth element of the complement of the acceptability vector. It can be easily seen that $E(Q) = w_i + \sum_{j \neq i} w_j \cdot x_j$, $E(Q^*) = w_i + \sum_{j \neq i} w_j \cdot y_j$, $\sigma^2(Q) = \sigma^2(Y)$ and $\sigma^2(Q^*) = \sum_{j \neq i} w_j^2 \cdot y_j \cdot (1 - y_j)$. Let $\hat{Q}$ and $\hat{Q}^*$ be the normal approximations of Q and Q^* respectively. The satisfaction indices can be now approximated as follows: $\hat{\rho} = (1/2) \cdot P\{\hat{Q} \geq q\} + (1/2) \cdot P^*\{\hat{Q}^* \geq 1 - q\}$.

3 Results

The decision making process in the EC favours the small countries like the Nordic countries by giving them larger voting weight than their share of the community's population. This does not, however, necessarily mean that their power would be relatively as high as their share of votes. It has been argued in many studies concerning the voting bodies that the power measured by the power indices tends to be smaller than the voting weight for minor voters while for the larger ones the opposite seems to be true (e.g. Pohjola 1987). The relationship between the power and the voting weight can be measured by the power coefficient (PC) defined for the SSI as follows: $PC_i^{SS} = \frac{\Phi_i}{w_i}$, i.e. as a ratio of power and voting weight. The PC can be interpreted either as a relative power of i or as a certain kind of efficiency.

Figure 1: Power coefficient: The difference from the EC average, percentage points



In Figure 1 the PC's difference from the EC average in the EC12 and EC16 cases is presented. In the EC16 it is assumed that Austria, Sweden, Finland and Norway join the EC. It can be seen that there is no clear relationship between the PC and the voting weight in the EC12 but the relationship become stricly increasing in the EC16. This property also holds true for the other enlargements containing the small EFTA countries. This is mainly due to the structure of the enlargement. Since all the four new members are small countries, the enlargement favours the largest members in the sense of relative power. It is also worth noting that it seems that the enlargement equalizes the values of the PC-curve and there are no outliers in the EC16 like Denmark, Ireland and Spain in the EC of 12 members. In the EC16 these countries will be the ones who lose most in the sense of relative power (Widgrén 1991).

When estimated, the relationship between the PC and the voting weight in the EC of 16 members can be presented with the following regression equation $PC^{SS} = 1.26 \cdot w + 0.91$, where the standard error of the β-coefficient is 0.09 and R^2 is 0.93. It can be seen that the slope of the curve is rather small and it decreases to 1.1 in the EC of 19 members (Widgrén 1991). Although the largest members are relatively more powerful than the small ones, the strong position of the small members, like the Nordic countries, with respect to their population is maintained. The relationship between the power and population seems to be multiplicative rather than linear. The population elasticity of power is 0.40 in the EC of 16 members and it decreases to 0.31 in the EC of 19 members whereas it is 0.47 in the EC of 12 members. The share of the Nordic countries' population within that of the EC19's is only 5 percent but their share of the power is 15 percent or as much as 17.4 percent assuming that the Nordic countries vote as a block.

The Shapley-Shubik and the normalized Banzhaf indices for the EC of 15, 16 and 17 members and the unnormalized Banzhaf indices for the EC of 16 members are shown in Table 2. The results are much the same regardless of the index and the enlarged Community used in analysis. The power is more equally distributed when assuming independence which can be seen by the normalized the Banzhaf indices but there are no

Table 2: **The Shapley-Shubik and Banzhaf indices in the EC Council of Ministers after three different enlargements**

Country	Φ_i	β_i	Φ_i	β_i'	β_i	Φ_i	β_i
	EC15		**EC16**			**EC17**	
10 vote countries	0.119	0.116	0.116	0.121	0.109	0.110	0.103
8 vote countries	0.093	0.092	0.090	0.099	0.090	0.086	0.085
5 vote countries	0.056	0.059	0.054	0.063	0.057	0.052	0.054
4 vote countries	0.044	0.047	0.043	0.048	0.043	0.041	0.045
3 vote countries	0.033	0.036	0.032	0.039	0.035	0.030	0.033
2 vote countries	0.021	0.024	0.020	0.025	0.023	0.019	0.022
EC TOTAL	1.000	1.000	1.000	1.108	1.000	1.000	1.000

Table 3: **Additional power which can be reached by the Nordic cooperation measured by the SSI**

the Nordic countries	**Additional power**	$\sum \Phi_i$	$\Phi_{Nordics}$
DEN, SWE in the EC14	0.005	0.079	0.084
DEN, SWE, FIN in the EC15	0.012	0.108	0.120
DEN, SWE, FIN, NOR in the EC16	0.017	0.139	0.156
DEN, SWE, FIN, NOR in the EC17	0.018	0.131	0.149
DEN, SWE, FIN, NOR, ICE in the EC19	0.024	0.150	0.174

other clear differences (see Widgrén 1991). It has been argued in Straffin (1988) that the Shapley-Shubik index is more appropriate measure for the voting bodies like the EC Council of Ministers in which there is considerable communication among representatives of member states.

The Scandinavian countries form a so-called sub-system, i.e. a group of countries which have formal cooperation together outside the EC. (see Schoutheete 1990, Stålvant 1990). In the EC of 12 members two or three sub-systems can be identified: the Benelux countries, the Franco-German axis, and even the Mediterranean block, i.e. Spain, Portugal and Greece is often considered as one. The influence of these sub-systems are analysed

in Widgrén (1991) for the EC12 and EC16.

Table 3 summarizes the results obtained by applying the assumption of the Scandinavian countries playing as a block. It is assumed that no counter-blocks are formed. The distribution of power within the Nordics in not analysed here, since the Scandinavian countries are almost symmetric in the sense that Sweden has 4 votes and the rest 3 votes each and the additional power can be then distributed approximately with respect of the voting weights (Widgrén 1991). The gain for the Scandinavian countries is small in absolute terms but relatively they can increase their power by 11 percent in the EC16. The power coefficients for the Scandinavian countries increase from $96-97$ to $107-108$ in the EC of 16 members and to $110-112$ in the EC of 19 members. The Nordic countries form a coalition which is more powerful than the largest members in the EC.

The Nordic countries need at least two countries to agree with them to form a blocking minority coalition. To form a qualified majority the Nordic countries need at least six other countries to agree with them. Tables 4 and 5 present the probabilities that the Scandinavian countries vote 'yes' and there is enough support for them to form a qualified majority, the probabilities that the Nordic countries vote 'no' and the blocking minority is reached and the averages of these two probabilities, i.e. the satisfaction indices. It can be seen that the satisfaction measured by the Straffin index is monotonically increasing but the Swiss membership decreases the Rae index.

There are two interesting results. First, it seems that it is much easier for Nordic countries [2] to form a blocking minority than a qualified majority, which can be easily understood intuitively. This in a common property for both satisfaction indices. Second, it seems that it is easier for the Nordic countries to form a winning coalition under the homogeneity assumption than under the independence assumption, while for the probability that the Nordic countries form a blocking minority the reverse seems to be true.

[2]Naturally this also holds true for other sub-systems.

Table 4: **The probabilities that the Scandinavian coalition accomplishes or prevents a decision under the homogeneity assumption and the Straffin index of satisfaction**

	Probability to accomplish decision	Probability to prevent decision	Straffin index
Den in the EC12	0.324	0.722	0.523
Den, Swe in the EC14	0.344	0.736	0.540
Den, Swe, Fin in the EC15	0.352	0.764	0.558
Den, Swe, Fin, Nor in the EC16	0.358	0.796	0.577
Den, Swe, Fin, Nor in the EC17	0.352	0.809	0.581
Den, Swe, Fin, Nor, Ice in the EC19	0.360	0.823	0.592

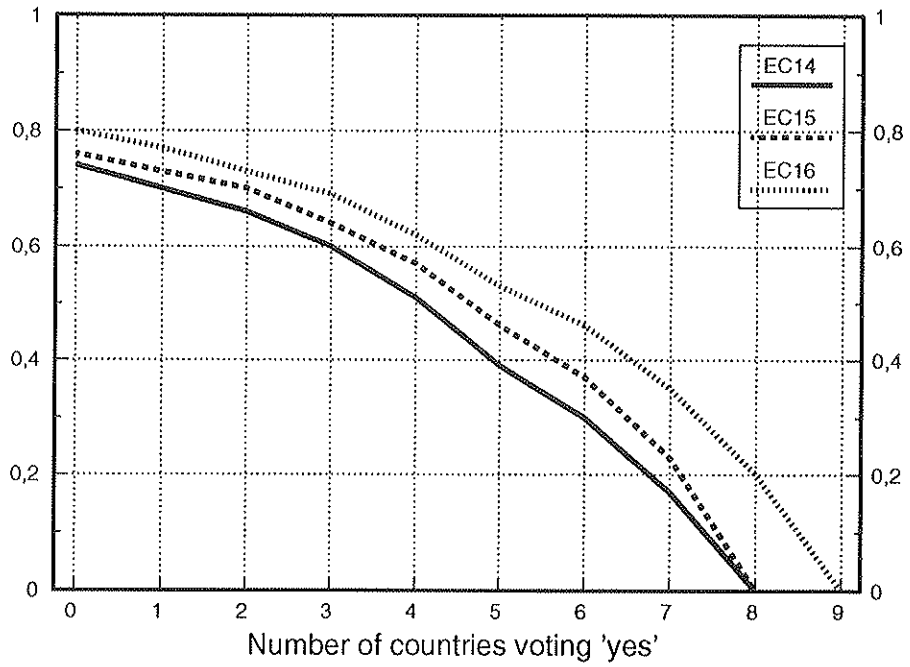
Table 5: **The probabilities that the Scandinavian coalition accomplishes or prevents a decision under the independence assumption and the Rae index of satisfaction**

	Probability to accomplish decision	Probability to prevent decision	Rae index
Den in the EC12	0.122	0.925	0.522
Den, Swe in the EC14	0.125	0.958	0.541
Den, Swe, Fin in the EC15	0.143	0.971	0.557
Den, Swe, Fin, Nor in the EC16	0.162	0.980	0.571
Den, Swe, Fin, Nor in the EC17	0.146	0.982	0.564
Den, Swe, Fin, Nor, Ice in the EC19	0.156	0.987	0.571

The Scandinavian block is rather powerful with respect to preventing decisions. This property seems to hold true even if the ideological structure of the EC's Council of Ministers changes so that the two or three largest members disagree with the Nordic countries. This does not hold true for accomplishing decisions, since the three largest members form a blocking minority. Figures 2 and 3 summarize these results.

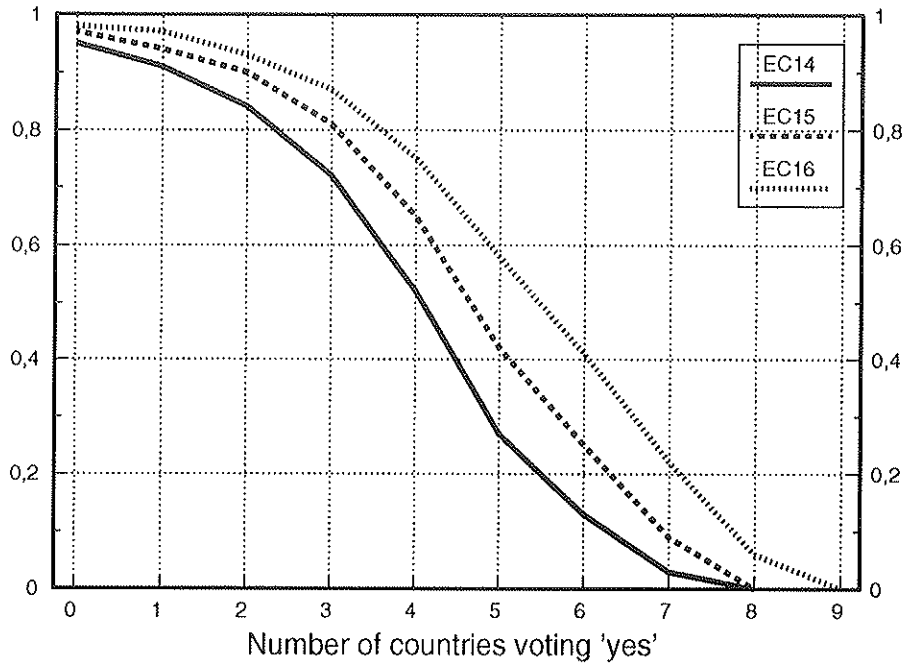
It can be seen that the shapes of these figures are very different. Under the homogeneity assumption the probability for the Nordic countries to form a blocking minority decreases slowly from 0.7-0.8 to zero, when the size of the opposing coalition reaches the 7-9 largest members. Under the independence assumption the starting level, i.e. the level where there is no ideological division, is higher but the decrease is faster between the opposing coalitions from the size of the 3 to 5 largest members.

Figure 2: The probability that the Nordic countries form a blocking minority when n largest members vote 'yes' assuming homogeneity



The difference is mainly due to the probability model behind the indices. Under the in-

Figure 3: The probability that the Nordic countries form a blocking minority when n largest members vote 'yes' assuming independence



dependence assumption the size of the supporting coalition for the Scandinavian countries varies less than under the homogeneity assumption. Hence assuming independence implies that the support for the Nordic coalition exceeds the limit needed for a blocking minority more readily than under the homogeneity assumption but it is also more likely to fall below the limit needed for a qualified majority. This implies that under the independence assumption an arbitary coalition $\mathcal{S}$ in a voting body with asymmetric voting rule is more often in the class of unsolved coalitions than under the homogeneity assumption.

In Table 6 the Scandinavian countries' contribution to Finland's possibilities to form a blocking minority are presented. It can be seen that the difference between the probability that Finland forms a blocking minority and the probability that the Nordic countries form one increases slowly under the homogeneity assumption, when the size of the op-

Table 6: **The probability that Finland or the Nordics form a blocking minority when n largest members vote 'yes'in the EC16**

n	Homogeneity assumption		Independency assumption	
	Finland	the Nordics	Finland	the Nordics
0	0.71	0.80	0.94	0.98
1	0.68	0.77	0.90	0.97
2	0.63	0.73	0.83	0.93
3	0.58	0.69	0.71	0.87
4	0.50	0.62	0.50	0.75
5	0.40	0.53	0.26	0.58
6	0.32	0.46	0.13	0.41
7	0.22	0.35	0.05	0.22
8	0.07	0.20	0.01	0.06
9	0.00	0.00	0.00	0.00

posing coalition increases and the maximum difference is 14 percentage points. When assuming independence the maximum difference is 32 percentage points and it increases fast when the size of the counter-block increases from 3 to 5 and then decreases.

4 Conclusions

In this paper the role of the Scandinavian countries in the EC decision making was analysed. It was assumed that the EFTA countries join the EC in the following order: Austria, Sweden, Finland, Norway, Switzerland, Liechtenstein and Iceland. The analysis was concentrated on the enlargements containing the four first countries in the list and it was based on the power and satisfaction indices of cooperative game theory.

The power indices showed that the small Scandinavian countries would have remarkable voting power with respect to their population in the decision making of the Council of Ministers. The determination of the voting weights favours the small countries and

this property is maintained, although the relative power would be higher for the largest members.

The satisfaction indices showed that the Nordic countries form a powerful coalition with respect to preventing decisions but are not very powerful in the sense of winning. The probability that there will be enough support for the Scandinavian countries to form a blocking minority seemed to remain high even if the three largest members disagree with the Nordics. Since this property hold true in general for small coalitions of two or three members, it can be said that the power is not concentrated in the EC. Also this result supports the hypothesis that it is not easy even for the largest members of the Community to assemble a qualified majority behind a proposal.

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