Title
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Journal
Comparative Political Studies, 12(1)

ISSN
0010-4140

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Publication Date
1979

DOI
10.1177/001041407901200101

Peer reviewed

"EFFECTIVE" NUMBER OF PARTIES
A Measure with Application to West Europe

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Is a large number of parties bound to destabilize a political system (Duverger, 1954) or is it not (e.g., Lijphart, 1968; Nilson, 1974)? Before this question can be answered, the number of parties must be operationally defined in a way that takes into account their relative size. Such a number is also needed if one wants to detect trends toward fewer or more numerous parties over time, or the effects of a proposed change in electoral rules. This article presents ways to calculate this important political variable, calculates it for 142 post-1944 elections in 15 West European countries, and analyzes its possible effect on stability.

We often talk of two-party and multiparty systems. We further distinguish three- or four-party systems in some countries, and even talk (e.g., Blondel, 1969: 535) of a two-and-a-half-party system when there is a third party of marginal size. Mexico could be viewed as a one-and-a-half-party system because the PRI is so much larger than all other parties. Rather than take the number of *all* existing parties, including even the very smallest, one visibly has a need for a number that takes into account their relative size. We will call this number the "effective number of parties," using the word "effective" somewhat in the sense pressure group literature uses it when talking about "effective access" (Truman, 1951: 506), but even more in the operational sense physicists give it when they talk about effective current (Richards et al., 1960: 594),

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mass (Kittel, 1956: 289), charge (Curie, 1963: 112), range (Segré, 1964: 385), energy (Symon, 1953: 109), cross-section, and retardation (Landau and Lifshitz, 1958: 396, 459): The effective number of parties is the number of hypothetical *equal*-size parties that would have the same total *effect* on fractionalization of the system as have the actual parties of *unequal* size. One can go beyond the impressionistic level and define the effective number of parties in operationally unequivocal terms. Two such definitions have been used in political science.

Laakso (1977) has proposed and used

$$N_2 = \frac{1}{\sum_{i=1}^{n} p_i^2} = \left(\sum_{i=1}^{n} p_i^2\right)^{-1} \qquad [1]$$

where p_i is the fractional share (of votes or of seats, as the case may be) of the i-th party. The summation is over all n parties which obtain seats or votes. If all shares are equal, N_2 equals the actual number of parties. If one party has a huge majority, N_2 is only slightly larger than one. According to the index N_2, in 1966 the United Kingdom had 2.4 parties on the popular votes level, but only 2.0 parties on the Parliament seat level. In the former case, N_2 reflects the appreciable third party vote, while in the latter it expresses the clear predominance of the two major parties. One could also say that the Finnish national assembly has shifted from 4.8 effective parties in 1951 to 5.1 in 1962 and to 5.5 in 1972. Thus, N_2 does reflect our semiquantitative impressions rather well, but also enables us to detect small shifts (such as those in Finland) which may be missed otherwise. The Herfindahl-Hirschman concentration index (HH) and the Rae and Taylor (1970) fractionalization index (F) used in such collections as the *World Handbook of Political and Social Indicators* (Taylor and Hudson, 1972) can be readily converted to N_2, and vice versa:

$$N_2 = 1/HH = 1/(1-F), \qquad [2]$$

$$F = 1 - HH = 1 - 1/N_2. \qquad [3]$$

Since N_2 can be visualized easily as an effective number of parties, it may tell people more than do the more abstract concentration or fractionalization indices, although the information carried is exactly the same.

Another way to define an effective number of parties is

$$N_1 = \text{antilog}\left[-\sum_{i=1}^{n} p_i \log p_i\right] = \prod_{i=1}^{n} (p_i)^{-p_i} = e^H \qquad [4]$$

where π represents the product of all the terms $(p_i)^{-p_i}$, e is the basis of natural logarithms, and H is the system's entropy as given by

$$H = -\sum_{i=1}^{n} p_i \ln p_i . \qquad [5]$$

The outcome is the same for any logarithms used, provided that the same basis is used for log and antilog. Kesselman (1966) called N_1 the "index of multipartyism" and referred back to Soares and Noronha (1960). Wildgen (1971) called it "index of hyperfractionalization." It was noticed that, for equal shares, N_1 equals the number of parties, but in the general case the relationship to the number of parties was not stressed. Yet, N_1 possesses the same qualitative features as N_2. Its numerical values tend to be somewhat higher.

The concept of entropy underlying the definition of N_1 is a very basic one, both in physical and social sciences (Theil, 1967; Coleman, 1975; Taagepera and Ray, 1977). On the other hand, N_2 is tied to well-established measures of fractionalization and concentration. Which one is to be preferred? With two procedures already given are there still others which could be as strongly defended? How do these expressions correlate? We will try to answer these questions by presenting a generalized mathematical framework which includes both N_1 and N_2 as particular cases. The nonmathematically inclined reader may want to pass over the next section and go directly to application of results to West European parliamentary elections.

A GENERALIZED EXPRESSION FOR THE EFFECTIVE NUMBER OF COMPONENTS

Any rational expression $N(p_i)$ for effective number of components in terms of the shares p_i of the n unequal components should satisfy the following conditions.

1. If all components have equal shares, then the effective number must be the same as the actual number: N = n.

2. If all components except one have zero shares ($p_i = 0$ except for $p_1 = 1$), then we have a single-component system and must accordingly have N = 1.

3. We must be able to add zero-share components to the system without altering the value of N. This is important because it eliminates distortion in the index that could result from an arbitrary decision to include or exclude very small components. The effect of near-zero components will become negligible, provided that small changes in p_i do not lead to large changes in N. This leads to the next conditions:

4. Small changes in component shares must lead to small changes in effective number of components.

5. The shares of all components must be treated on equal basis; that is, they must be submitted to the same mathematical transformation $f(p_i)$, and the resulting transforms must be cumulated in an additive way.

6. The sum thus obtained must be the same for the actual system and for the equivalent system with N equal components (each with a share 1/N of the total):

$$\sum_{i=1}^{n} f(p_i) = \sum_{j=1}^{N} f(1/N). \qquad [6]$$

Condition 2 requires that $f(0) = 0$ and $f(1) = 1$. With $f(0) = 0$, Condition 3 regarding zero-size variables is also satisfied. Condition 4 regarding continuity is satisfied, if $f(p_i)$ is an analytical function when p_i ranges from 0 to 1. Furthermore, $f(p_i)$ must be monotonically increasing in that range (i.e., $df/dp_i \geqslant 0$) because an increase in p_i should always affect $f(p_i)$ in the same direction.

There are many functions which satisfy these requirements: $f(p_i) = \sin p_i$ is one example which does not lead to an easy solution for N. One family of satisfactory functions which does lead to an easy solution is $f(p_i) = p_i^a$ where the power index a can in principle be assigned any positive values. Eq. 6 then yields

$$\sum_{i=1}^{n} p_i^a = \sum_{j=1}^{N} (1/N)^a = N^{1-a} \qquad [7]$$

and hence

$$N_a = \left[\sum_{i=1}^{n} p_i^a\right]^{1/(1-a)} \qquad [8]$$

where N_a indicates that the effective number of components depends on the value of the parameter a.

For a = 2, Eq. 8 yields the Laakso effective number N_2 in Eq. 1. As a tends toward unity, Eq. 8 yields the entropy-based N_1 in Eq. 4, although at first look the outcome may seem to be an indeterminate expression 1^{∞}.[1]

As a tends toward zero, all p_i^a tend toward unity so that $N_0 = n$, including any zero-share components used. Continuity properties suggest that all small values of a will make N_a unduly dependent on tiny and zero-size components. Note that for $a > 0$, we always have $N_a < n$, unless all shares are equal.

As a tends toward infinity, the component with the largest share (P_1) becomes increasingly predominant, and N tends toward $1/p_1$. Any very large values of a make N_a depend almost solely on the largest component's share.

Figure 1 shows the variation of N_a with a for eight different constellations selected from the European parliamentary elections data that we will discuss in more detail later. The Greek 1950 votes distribution has the highest effective number of parties encountered; and even that number is an underestimate, because one of the 5% components represents the total of many small parties. Finnish 1972 votes distribution is typical of many multiparty systems. French 1962 seats offer the steepest slope encountered (for $a > 0.5$), showing the combined action of numerous small parties (which lead to a large $N_0 = n$) and a very large major party (which leads to a very low $N_{\infty} = 1/p_1$). French 1951 seats reach the contrary record of curve flatness, due to the nearly equal shares of all six parties. Greek 1952 seats yield the lowest effective number of parties encountered. The Belgian 1946 (45-34-11-8-1) and the Irish 1965 (50-33-15-1-1) seats distributions inspired our three hypothetical curves which show that N_a at low values of a is strongly affected by small components, whose shares often are lumped together in electoral statistics. When the two 1% components of the 45-34-19-1-1 distribution are lumped together (45-34-19-2) or joined to major parties (45-35-20), N_0 and even N_1 are strongly reduced, while N_2 and N_3 are affected very little. Both N_1 and N_2 seem to be preferable to, say, $N_{0,5}$ which emphasizes the smallest parties, and to N_3 which already may start to emphasize the largest party alone.

The inverse (1/N) of the effective number of components, however defined on the basis of Eq. 6, could always be visualized as concentration, and its complement (1-1/N) as fractionalization. Thus, for every N_a from Eq. 8, there is a corresponding fractionalization index

$$F_a = 1 - 1/N_a. \qquad [9]$$

This systematism may help to clarify the meaning of the hyperfractionalization and fractionalization indices debated by Wildgen (1971, 1972), Rae (1971), and Väyrynen (1972). Within the generalized framework (Eqs. 8 and 9), the Rae-Taylor fractionalization index is F_2, while the Wildgen hyperfractionalization is N_1. Thus, the Rae-Wildgen controversy focused on two distinct issues: the merits of fractionalization versus effective number of parties, and the merits of exponent value 2 versus 1.

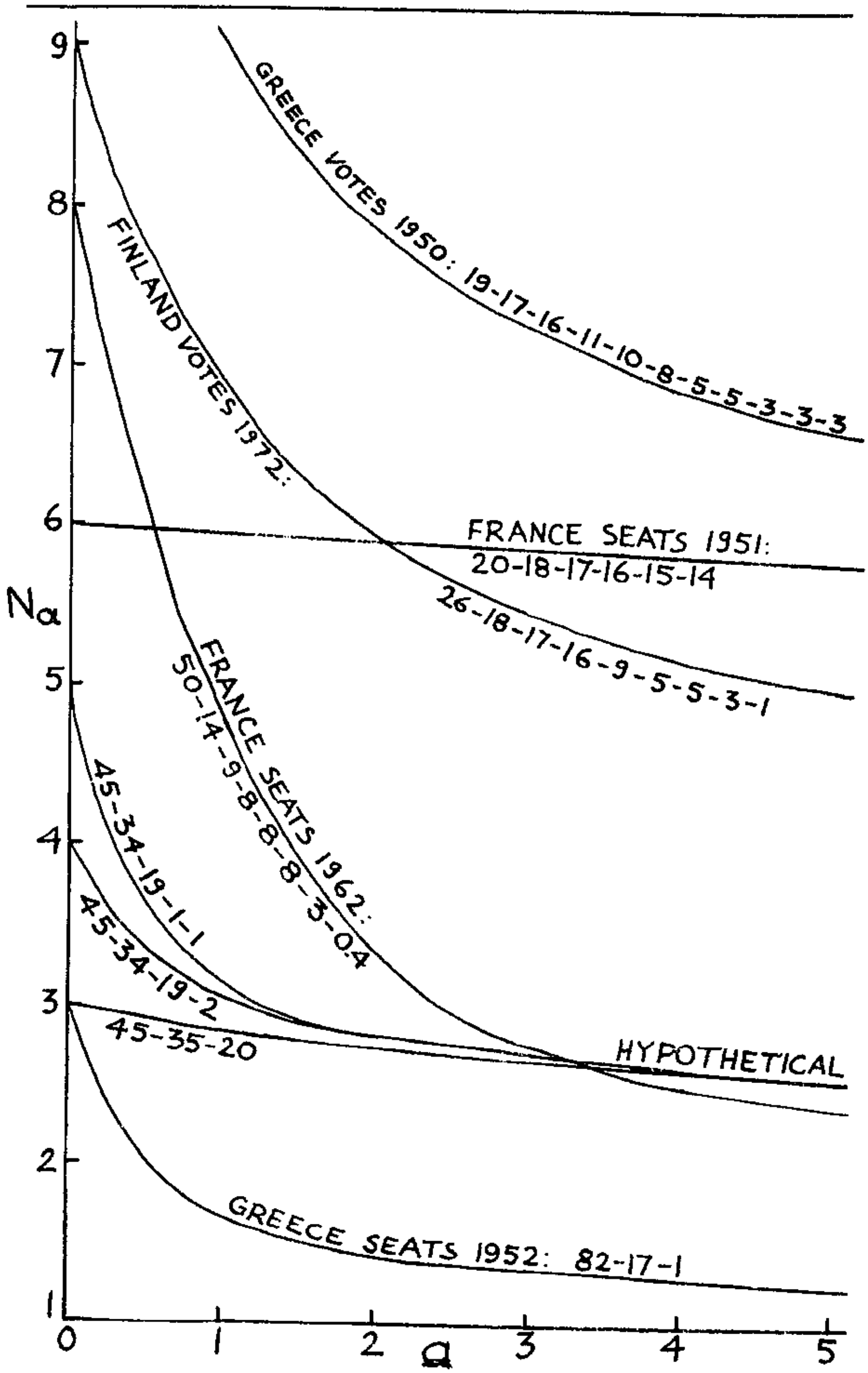
The choice between $a = 1$ and $a = 2$ is a question of degree, with $a = 1$ yielding somewhat higher values of N and F. But N_1 and N_2 cannot be exactly calculated from each other (unless all p_i are given). Hence their information content differs somewhat. The same applies to F_1 and F_2.

The choice between fractionalization and effective number of components is a matter of discontinuous choice between one scale running in principle from 0 to 1, and another running from 1 to infinity. This is the aspect that seemed most to concern Rae and Wildgen. However, F_1 and N_1 can be calculated exactly from each other, using Eq. 9. Hence their information content is strictly identical, and the same applies to F_2 and N_2. This identity is, of course, lost when comparison is made between N_1 and F_2. Rather than analyzing the relative merits of these indices on a theoretical level, we calculated all four indices for a number of actual cases to see what the different indices tell or fail to tell us.

WEST EUROPEAN PARLIAMENTARY ELECTIONS 1945-1976: CHOOSING AN INDEX

The effective number of parties as well as fractionalization were calculated for all post-1944 elections in 15 West European countries, both on popular votes and on assembly seats level, and using both $a = 1$ and $a = 2$.[2] Shares of coalition-formation power within the assembly, as expressed by Shapley-Shubik (1954) numbers, were not considered here. In the case of Finland, the effective number of parties tends to decrease from seats to power share level (Laakso and Taagepera, 1979). Even with seats and votes, we had eight indices for each election. The first objective was to decide which one tells us most. For reasons given below, we chose N_2 as preferable to N_1, F_1, or F_2.

Table 1 shows the N_2 values for all elections, both at seats level (designated as N_{S2} or simply N_S) and votes level (N_{V2} or N_V). The corre-



NOTE: Shares for parties rounded off to full percent, from Rokkan and Meyriat (1969).

Figure 1: Dependence of the Effective Number of Components (N_a) on Exponent a for Various Share Constellations

TABLE 1
Effective Number of Parties in 124 West European Postwar Parliamentary Elections, on Votes and Seats Levels

	Austria		Belgium		Denmark		Finland		France		W. Germany		Greece		Iceland	
Year	N_v	N_s	N_v	N_s	N_v	N_s	N_v	N_s	N_v	N_s	N_v	N_s	N_v	N_s	N_v	N_s
1945	2.2	2.1			4.6	4.5	5.1	4.8	4.6	4.2						
6			3.3	2.9					4.6	4.2			2.7	2.5	3.6	3.6
7					3.8	3.6			4.5[a]	4.3[a]						
8							4.9	4.5								
9	2.8	2.5	3.2	2.8							4.7	4.0			3.6	3.5
50			2.8	2.5	4.0	4.0							7.8	5.7		
1							5.0	4.8	5.5	5.9			4.2	3.0		
2													2.7	1.4		
3	2.8	2.5			3.9	3.8					3.3	2.8			4.2	3.4
4			3.0	2.6	3.8[a]	3.6[a]	5.0	4.7								
5																
6	2.5	2.2							6.3	5.7			2.2	2.0	3.6	3.5
7					3.9	3.8					2.8	2.4				
8			2.8	2.4			5.2	4.9	5.9	3.4			3.5	2.4		
9	2.5	2.2													3.4	3.2
60					3.8	3.6									3.7[a]	3.4[a]
1			3.1	2.7							2.8	2.5	2.5	2.2		
2	2.5	2.2					5.7	5.1	5.3	3.3						
3													2.8	2.4	3.4	3.3
4					3.8	3.5							2.4	2.2		
5			4.0	3.6							2.6	2.4				
6	2.4	2.1			4.2	4.0	5.2	5.0								
7									3.8	3.0					3.8	3.5
8			4.2	4.1	4.6	4.2			3.7	1.8						
9											3.0	2.7				
70	2.3	2.1					6.2	5.6								
1	2.3	2.2	4.6	4.3	4.5	3.9									4.1	3.8
2							6.0	5.5			2.9	2.8				
3					7.1	6.9			6.1	4.6						
4			4.5	4.2											3.5	3.4
5	2.3	2.2			5.6	5.4	5.9	5.3					2.7	1.7		
6											2.9	2.8				

sponding fractionalization indices can be easily calculated using Eq. 9.

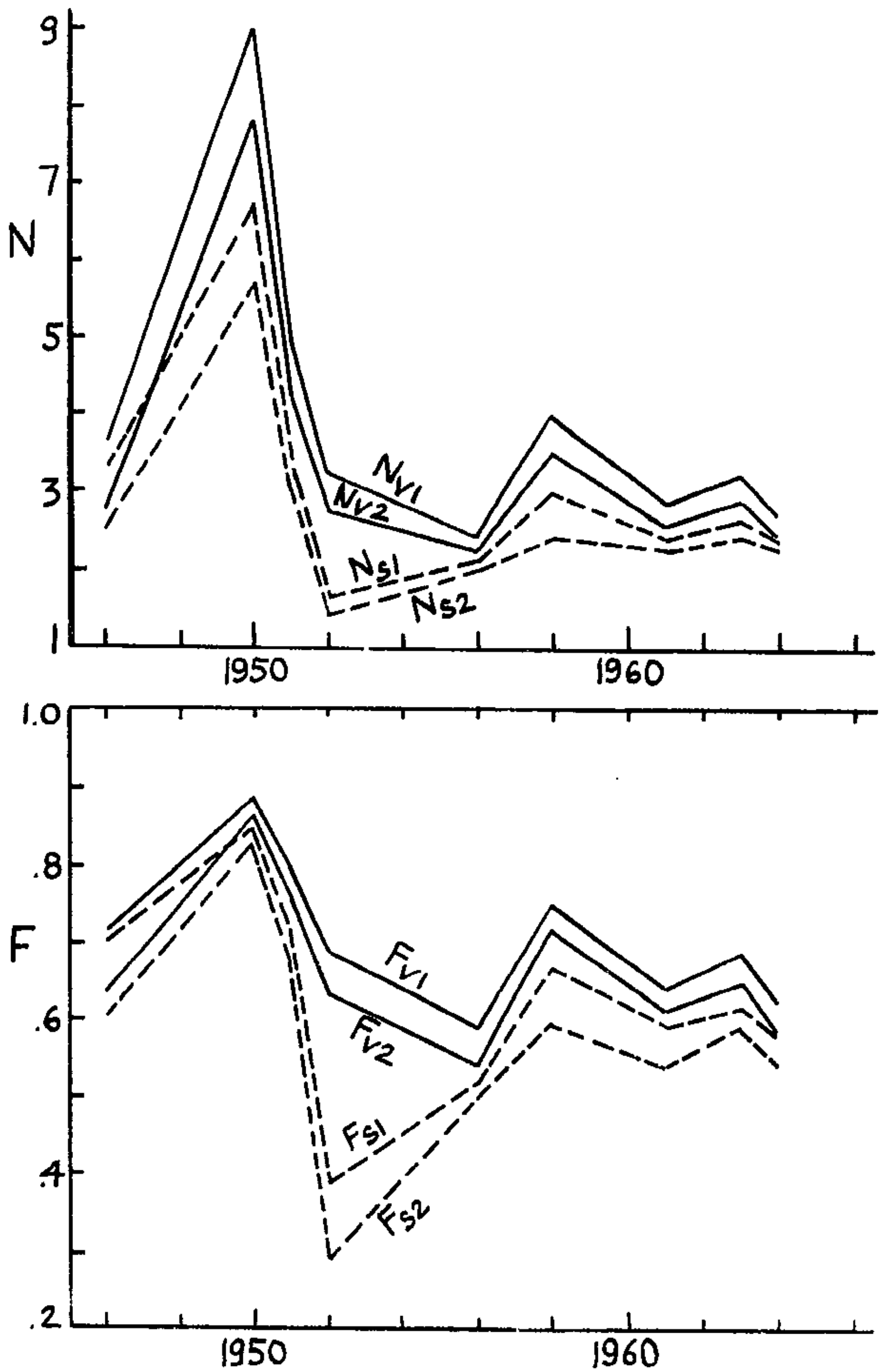
Figure 2 shows all eight indices (four N-values and 4 F-values) plotted versus time for the Greek elections from the end of World War II to the 1967 military coup. Greece was chosen as the sample country because its extreme electoral instability made it reach West European records both for the highest (N_{v1} = 9.0 for 1950) and for the lowest (N_{s2} = 1.4 for 1952) effective number of parties. Thus, the Greek graph illustrates a large variety of constellations. The general pattern of the N and the F graphs is expectedly similar, except for very fractionalized and very concentrated cases. The proliferation of parties from 1946 to 1950 is emphasized by N (with N_{v1} going from 4 to 9) but underplayed by F (with F_{v1} going only from .7 to .9) because of the closeness of the ceiling on F at 1.0. The drastic elimination of parties by the 1951 electoral reform (which gave heavy bonuses to large parties) is well reflected both by N and F. Any N smaller than 2 (and F smaller than .5) implies that one

TABLE 1 (Continued)

	Ireland		Italy		Netherlands		Norway		Sweden		Switzerland		United Kingdom	
Year	N_V	N_S	N_V	N_S	N_V	N_S	N_V	N_S	N_V	N_S	N_V	N_S	N_V	N_S
1945							4.1	3.2					2.5	2.0
6			4.7	4.4	4.7	4.5								
7											5.3	5.0		
8	3.7	3.4	2.9	2.6	5.0	4.7			3.3	3.1				
9							3.6	2.7						
50													2.4	2.1
1	3.2	3.2									5.5	4.8	2.1	2.0
2					5.0	4.6			3.3	3.1				
3			4.2	3.5			3.5	3.1						
4	3.2	3.0												
5											5.0	4.7	2.2	2.0
6					4.2	4.1			3.3	3.2				
7	3.0	2.7					3.4	3.0						
8			3.8	3.4					3.3	3.2				
9					4.5	4.2					5.0	4.7	2.3	2.0
60									3.3	3.1				
1	3.2	2.8					3.5	3.2						
2														
3			4.1	3.7	4.8	4.5					5.0	4.8		
4									3.4	3.2			2.5	2.1
5	2.7	2.6					3.8	3.5						
6													2.4	2.0
7					6.0	5.5					5.5	5.1		
8			3.9	3.5					3.1	2.8				
9	2.8	2.4					3.5	3.2						
70									3.5	3.3			2.5	2.1
1					7.1	6.4					6.1	5.6		
2			4.0	3.6	7.6	6.4								
3	2.8	2.6					5.0	4.1	3.5	3.4				
4													3.1	2.3
5											5.8	5.0	3.1[a]	2.3[a]
6			3.5	3.2					3.6	3.4				

SOURCES: Elections data in Rokkan and Meyriat (1969) and Keesing's Contemporary Archives (1965-1976), processed using Eq. 1.
a. Second election during preceding year.

party has absolute majority. However, F distinguishes clearly between the heavy one-party dominance (82% of the seats!) in 1952 and the two-party balance (55% and 44% of the seats, respectively) in 1956, with F_{S2} going from .3 to .5, while the change seems small on the N scale (N_{S2} increases from 1.4 to 2.0). Since N distinguishes clearly between moderately and heavily fragmented systems, it is able to detect, in the case of Finland, small but politically important changes that look insignificant on the F scale (Laakso and Taagepera, 1979). On the balance, both N and F seem to be adequate indicators. We just find it easier to say "Sweden's Parliament is effectively a 3.1 to 3.4 party system" rather than "Sweden's Parliament is a system with a fractionalization index of .67 to .70."



NOTE: Data from Table 1. Calculations based on data in Rokkan and Meyriat (1969).

Figure 2: Effective Number of Parties and Fractionalization for Greek Votes and Seats Distributions 1945-1964 at Exponent Levels a = 1 and a = 2

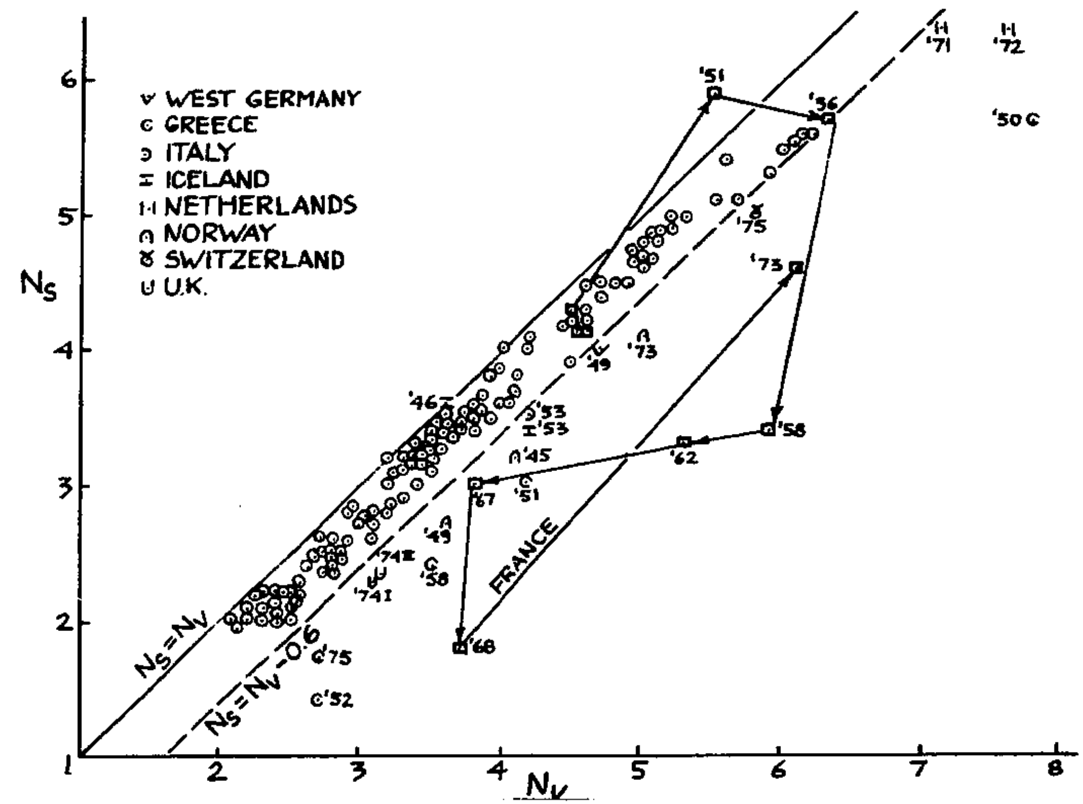
Comparing now the curves with a = 1 to those with a = 2, in Figure 2 we find similarity except that the a = 1 curves are always higher. Throughout our study, we found N_1 to be 2% to 45% larger than N_2, with nearly equal values ($N_1 = 6.0$, $N_2 = 5.9$) for the French 1951 seats, and with the largest difference ($N_1 = 4.8$, $N_1 = 3.3$) for the French 1962 seats (cf. Figure 1). Similar observations apply to the relative values of F_1 and F_2. The largeness of the large parties is stressed by a = 2; the existence of numerous splinter parties is brought out by a = 1. Ease of calculation and connection with existing HH and F indices adds pragmatic support for a = 2, while the theoretical preeminence of the concept of entropy argues in favor of a = 1. In our opinion, the dilemma is solved in favor of a = 2 by the need for reproducibility of results as described below.

Tabulations of election data often lump small parties into a single "Other" or "Diverse" category which may be entered into calculations of N or F as if it were a single party, leading to an underestimate of fragmentation (cf. hypothetical distribution, in Figure 1). Alternatively, the "Other" category may be thought to consist of a very large number of tiny parties; this would lead to an overestimate of fragmentation. As a specific example, the main table in Rokkan and Meyriat (1969) assigns 63 West German 1949 seats (15.7% of the total) to "Other parties" which vanished soon after 1949. A footnote (which may be neglected by many users) leaves only 15 seats (3.7%) as residual "Other parties." If one uses only the main table, N_1 could range from 4.1 to 7.9, and N_2 from 3.7 to 4.1, depending on whether the "Other parties" seats are treated as a single party or as 63 distinct parties. The additional information in the footnote reduces the possible range for N_1 from 5.1 to 5.6, while N_2 becomes 4.0 irrespective of the distribution of the 15 residual seats. Thus, N_1 is overly sensitive to small party data which often are not available, while N_2 is rather stable. The same argument applies to F_1 and F_2.

TRENDS IN THE NUMBER OF PARTIES

We will first compare the effective number of parties (N_2) on popular votes (N_V) and assembly seats (N_S) levels.

Figure 3 shows N_S plotted versus N_V for all 142 elections listed in Table 1. The results confirm (and extend to the 1965-1976 period) those of Rae (1967): there are effectively fewer parties in the assembly than in the popular votes distribution, with only two exceptions—Iceland 1946



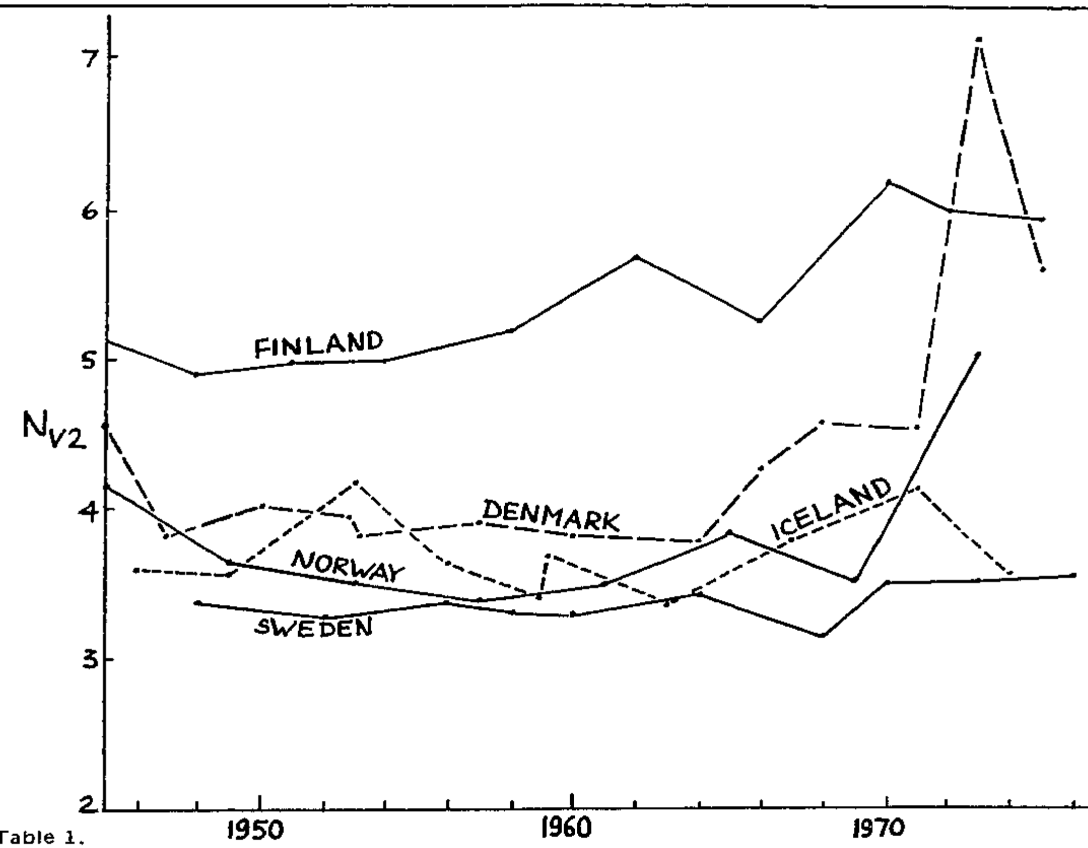
NOTE: Country and year are indicated for points with large N_V and N_S. Data from Table 1. N_V and N_S are short forms for N_{V2} and N_{S2}, respectively.

Figure 3: Effective Number of Parties: Seats Versus Votes

and France 1951. There are only 21 elections, however, where the electoral rules lower the effective number by more than 0.6 parties. Of these elections, 10 occur in Greece or France, which also happen to be the only countries studied where Taylor and Hudson (1972) record an "irregular executive transfer." In other countries large $N_V - N_S$ differences (more than 0.6 parties) have occurred only during the postwar adjustment period (1945-1953, five cases) and since 1971 (six cases). The French pattern has been the most picturesque (cf. Figure 3). After a strong rise in number of parties and large fluctuations in $N_V - N_S$ difference, the 1958 electoral law (favoring large parties) reduced the six effective vote-getting parties to only three effective parties in the national assembly. By 1967 the party system seemed to have adjusted itself to the new rules by shrinking to only four vote-getting parties. However, by 1973 the traditionally splintered French political system seemed to have adjusted itself only too well: more parties not only shared the vote, but also managed to gain seats in spite of a system designed to discourage small parties.

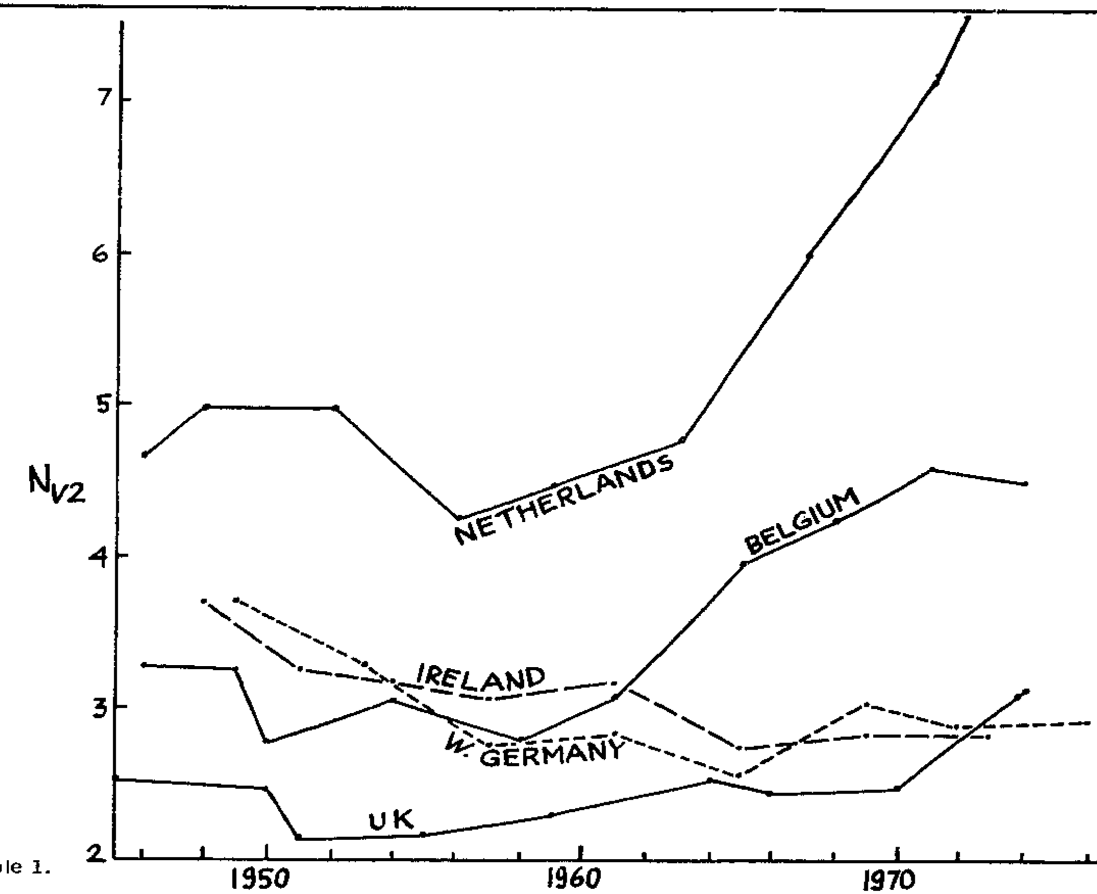
Figures 4 to 6 show the evolution of the effective number of vote-getting parties (N_V) over time in all 15 countries. The curves for the number of assembly parties (N_S) follow similar patterns, except for Greece (cf. Figure 2) and France (cf. Figure 3). The patterns in Figures 4 to 6 are quite varied: fairly steady (Sweden, Iceland); slow decrease (Ireland, Austria, also Italy and West Germany), slow increase (Finland, also United Kingdom); fairly steady followed by recent sharp increase (Denmark, Norway, Netherlands, Belgium, Switzerland); and quite irregular (France, Greece).

An overall pattern emerges when the average N_V for all 15 countries is calculated (Figure 7). The typical West European elections around 1949 involved effectively 4.2 parties. (For countries which had no elections in 1949, the closest elections year was used for averaging.) Some of these parties, born from wartime and postwar disturbances, were eliminated by 1953, and the typical elections settled to about 3.7 effective parties for 15 years (1953 to 1967). The early 1970s saw a sudden steep rise to 4.5 effective parties. The causes for the rise seem to be multiple; along with continentwide factors such as economic depression and the rise of the New Left, apparently purely national factors seem to play a major role: ethnic rift in Belgium, disagreement over Common Market membership in Denmark and Norway, protest over presidential control of traditional parties in Finland, increasingly skilled manipulation of electoral rules in France, and so on. Such local factors were at play pre-



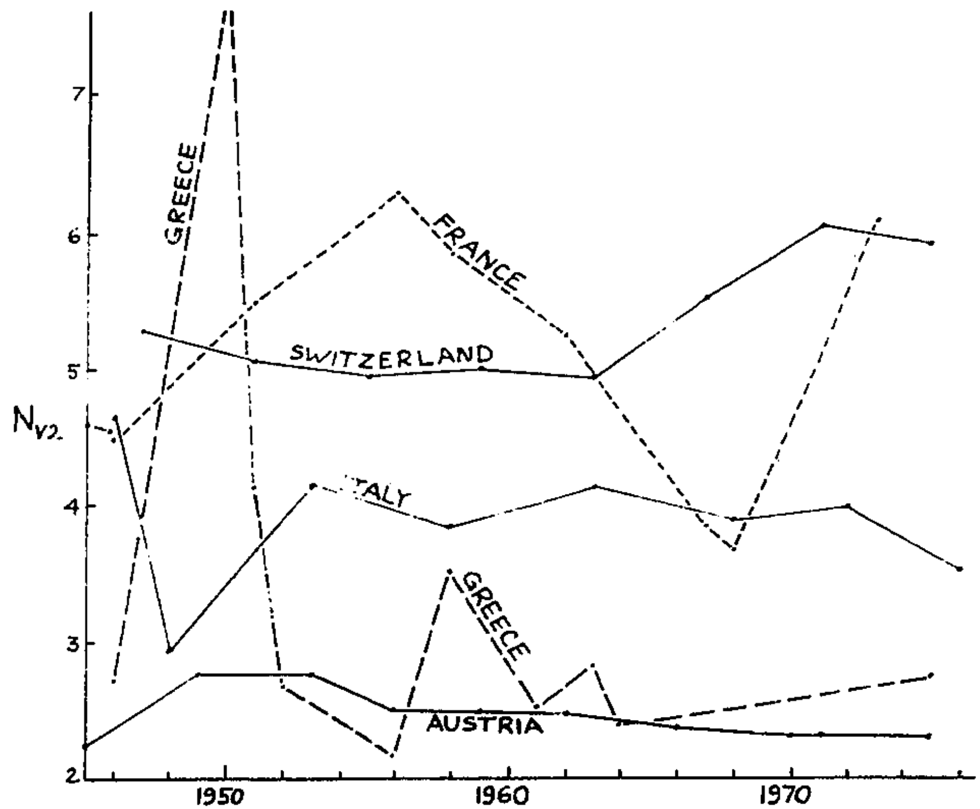
NOTE: Data from Table 1.

Figure 4: Evolution in Time of Effective Number of Vote-Getting Parties in Northern Europe



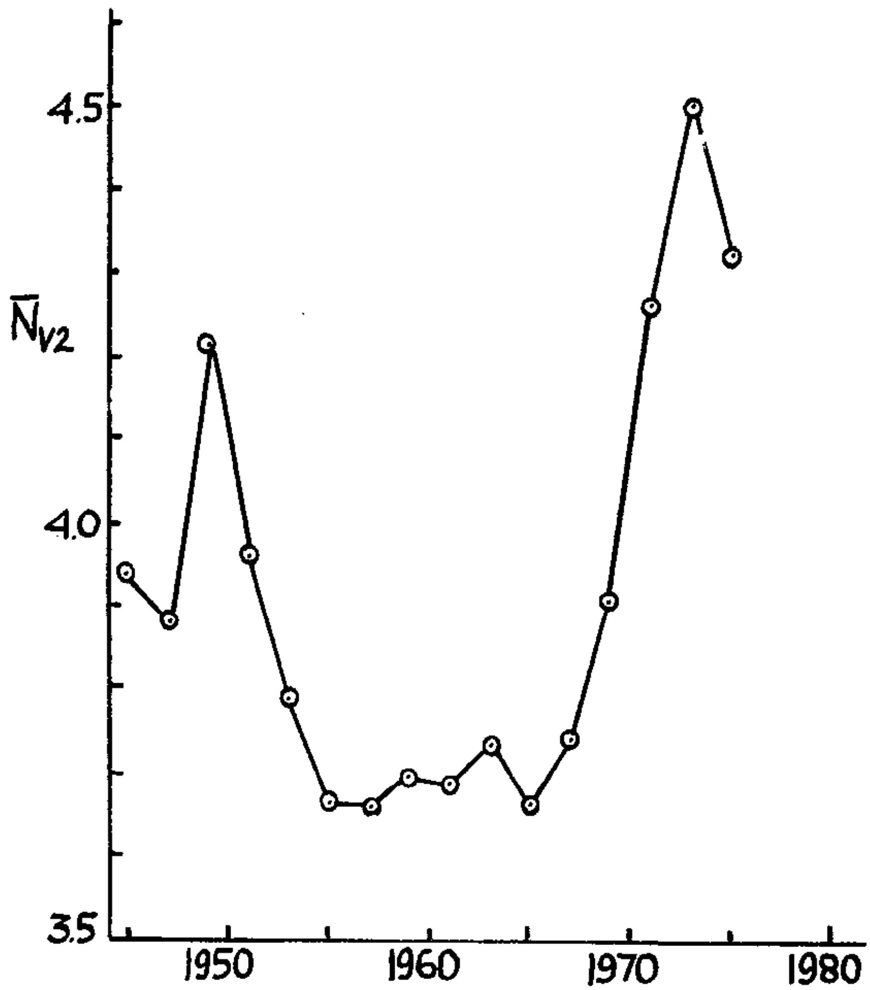
NOTE: Data from Table 1.

Figure 5: Evolution in Time of Effective Number of Vote-Getting Parties in West-Central Europe



NOTE: Data from Table 1.

Figure 6: Evolution in Time of Effective Number of Vote-Getting Parties in Southern Europe



NOTE: The N_V values from Table 1 were averaged using for each country the election year closest to the year considered.

Figure 7: Evolution in Time of the West European Average Effective Number of Parties

viously as well—witness the considerable fluctuations in the number of French, Greek, Finnish, Icelandic, Dutch, and Belgian parties between 1953 and 1968; but they managed to cancel each other out in the Europe-wide average. Since 1970 the trend has been upwards or stable in almost all countries considered. What may look like a purely national phenomenon in the study of each country separately becomes part of a wider trend when one uses the notion of effective number of parties for a systematic cross-national study. The pattern in Figure 7 reminds us of what one could expect to obtain if one plotted European economic difficulties or the general public's lack of confidence in the future; but we do not have suitable indicators on hand.

EFFECT OF NUMBER OF PARTIES ON POLITICAL STABILITY

In order to discuss meaningfully this important question with which our article started, we need an operational measure not only of the number of parties but also of instability.

What does political instability mean? One might want to equate it with Przeworski's (1975) "deinstitutionalization" based on change of vote shares of parties from t-th to the (t + 1)-th election:

$$D(t) = \frac{1}{2} \sum_{i=1}^{n} \left| p_i(t+1) - p_i(t) \right|. \qquad [10]$$

However, a two-party system with fairly regular but infrequent alternation of majorities (somewhat like the United Kingdom) may have a high D and yet have long-lived governments, while a multiparty system with fairly stable party vote shares may have a low D and yet have short-lived coalition governments (somewhat like Italy). We must distinguish between party system stability (of which the effective number of parties is one aspect) and governmental leadership stability. By "political instability" people usually seem to mean governmental instability, be it caused by party system instability or other factors. Having found no existing operational measure of executive stability, we propose the following (admittedly imperfect) one. For the years 1948-1967, Taylor and Hudson (1972) list the yearly number of "regular" and "irregular" executive transfers. Regular transfers may represent institutionalized routine, such as the yearly change of the Swiss formal head of state, or nonroutine political events, such as the fall of a government due to loss of parliamentary majority. The Swiss example suggests that one transfer per year may not reflect instability. Discounting the first regular executive transfer of each year yields the sums listed in Table 2, where the two irregular transfers listed by Taylor and Hudson (Greece 1953 and France 1958) have arbitrarily been assigned five times the weight of a regular transfer.

Table 2 also shows the arithmetical averages $\overline{N}$ of the effective number of parties for all elections in a country, both on votes and seats

TABLE 2
Effective Number of Parties and Executive Stability for West European Countries (1945-1976)

Country	$\bar{N}_V$	$\bar{N}_S$	$1-\frac{\bar{N}_S}{\bar{N}_V}$	Fluctuation[a] f_V	f_S	Executive Instability[b]
Greece	3.36	2.56	.23	.67	.60	22+5
Italy	3.47	3.10	.11	.29	.32	4
France	5.02	4.04	.20	.21	.34	9+5
Denmark	4.43	4.21	.05	.21	.24	1
West Germany	3.11	2.80	.10	.20	.18	6
Norway	3.81	3.25	.15	.17	.15	1
Netherlands	5.42	4.99	.08	.12	.11	0
Belgium	3.55	3.21	.10	.11	.11	3
Iceland	3.67	3.47	.05	.11	.07	0
Austria	2.44	2.24	.08	.09	.08	1
Ireland	3.09	2.83	.08	.08	.07	1
UK	2.52	2.09	.17	.10	.04	0
Finland	5.41	5.01	.07	.08	.05	10
Sweden	3.37	3.17	.06	.05	.07	0
Switzerland	5.33	4.96	.07	.06	.06	0

SOURCES: Table 1 and Taylor and Hudson (1972).
a. Countries are arranged in decreasing order of ($f_V + f_S$), as calculated using Eq. 11.
b. Executive instability: number of regular executive transfers in excess of one per year, plus five times the number of irregular transfers, from Taylor and Hudson (1972).

levels. There is little correlation between $\bar{N}$ and executive instability, in agreement with Taylor and Herman (1971) who found little correlation (r = −0.4) between fractionalization of seats and duration of governments.

Could a country be destabilized by a large discrepancy between $\bar{N}_v$ $\bar{N}_S$ which implies that the electoral preferences of many voters are frustrated? Figure 3 suggests that elections with $\bar{N}_v - \bar{N}_S$ larger than 0.6 tend to belong to reputedly unstable systems: France, Greece, Italy, Norway prior to the 1953 electoral reform (Rokkan and Hjellum, 1966), and West Germany prior to the elimination of several postwar parties. However, there is little correlation between executive stability and $\bar{N}_V - \bar{N}_S$ or its normalized version $1 - \bar{N}_S/\bar{N}_V$ shown in Table 2.

Large fluctuations in N_V or N_S by definition indicate instability in the identity or size of parties which may or may not correlate with governmental instability. We chose to define our fluctuation index f as

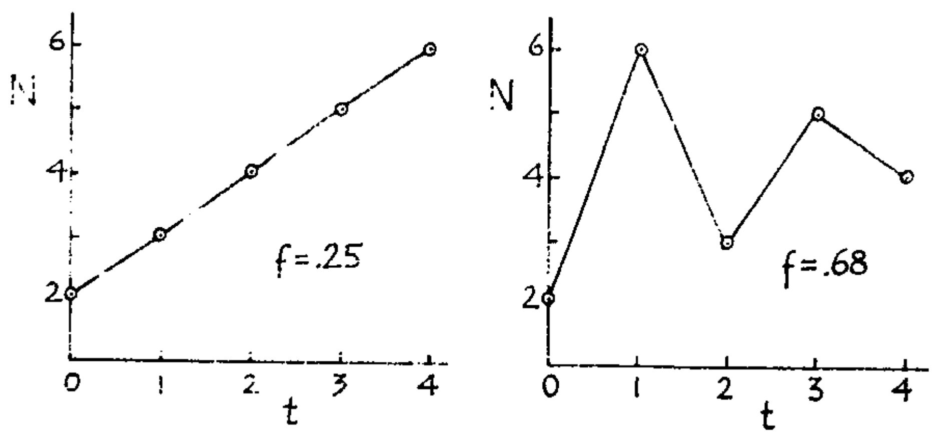
$$f = \frac{1}{\bar{N}}\left[\frac{1}{T}\sum_{t=1}^{T}(N_t - N_{t-1})^2\right]^{\frac{1}{2}}, \qquad [11]$$

where t labels the successive elections (starting with t = 0), T is the number of elections minus one, and $\bar{N}$ is the arithmetic average of N over all the elections in a country. The expression for f is similar to that of standard error (standard deviation divided by the average) except that inside the summation $\bar{N}$ is replaced by the preceding term (N_{t-1}), and the first term (t = 0) is not summed for lack of such a preceding term. The meaning of f as compared to standard error is illustrated by the two hypothetical time series in Figure 8. Both series have the same average and standard error, but one increases smoothly while the other fluctuates, a fact well expressed by a markedly higher f value. Standard error is not concerned with the time sequence of items considered, while f is. (For other possibilities to measure party system stability see Dodd, 1976; Przeworski and Sprague, 1971; Taylor and Herman, 1971; and Blondel, 1978.)

In general, f would be strongly affected by sudden appearence or disappearence of a party with an appreciable number of votes or seats (e.g., the formation of RPF in France, 1951), by formal fusion or separation of related parties or factions (e.g., Italian Socialists and Communists, 1948 and 1953), by minor parties losing out to major parties (e.g., Danish Communists and Conservatives to Social Democrats and Liberals, 1951), and by drastic changes in electoral law (French seats, 1958). A gradual rise or decline of a party (e.g., the fading of Austrian FPÖ and WdU, from 1949 to 1956) affects N but has little effect on f. A bloc of votes or seats shifting from one major party to another (e.g., Labour to Conservative or vice versa, in the United Kingdom) has little effect on N and hence on f, as long as both parties still retain major blocs.

Table 2 lists the fluctuation index on the vote (f_V) and seat (f_S) levels. The countries are arranged by decreasing order of $f_V + f_S$. The extremes of this scale agree with conventional ideas about politically stable and unstable countries: Greece, Italy, and France have the highest fluctuations in effective number of parties, and Switzerland and Sweden have the lowest. The middle of the scale deviates from conventional wisdom: Denmark is not felt to be less stable than Finland. A classification of countries according to N_V and f_S is shown in Table 3.

Figure 9 shows f_s plotted versus the executive transfer number. Any correlation that may exist depends heavily on the single outlaying point for Greece. In the Italian case the number of transfers does not seem to reflect adequately the governmental instability, possibly because new cabinets based on the same parties were not counted as transfers by Taylor and Hudson (1972). Finland, on the other hand, seems to have



NOTE: Both examples use the same average ($\bar{N}$ = 4) and standard error ($s/\bar{N}$ = 0.40), but with different fluctuation index (Eq. 11).

Figure 8: Hypothetical Examples of Steady Increase and Fluctuation

actually combined a remarkable stability in party structure with a high instability of governmental coalitions.

CONCLUSIONS

We have developed a generalized framework to express concentration, fractionalization, and effective number of components for any system of qualitatively similar components which differ in size. As particular cases, this framework includes entropy-based indices (Soares-Noronha-Kesselman multipartyism and Wildgen hyperfractionalization), and indices based on the sum of shares squared (Herfindahl-Hirschman concentration, Rae-Taylor fractionalization, Laakso effective number of components).

We have calculated eight different indices for every one of 142 parliamentary elections in 15 European countries, in order to see what each of those indices tells and fails to tell us. Entropy-based indices were found to be oversensitive to the smallest components, the shares of which are often poorly known. Indices based on the sum of shares squared seemed to be adequate in all cases. Among these, Herfindahl-Hirschman concentration and Rae-Taylor fractionalization emphasize the difference between systems which effectively have 1.5 and 2 parties, but they understate the distinction between systems with 4 and 6 parties. For the study

TABLE 3
Classification of West European Countries According to the Number of Effective Parties and Party System Instability

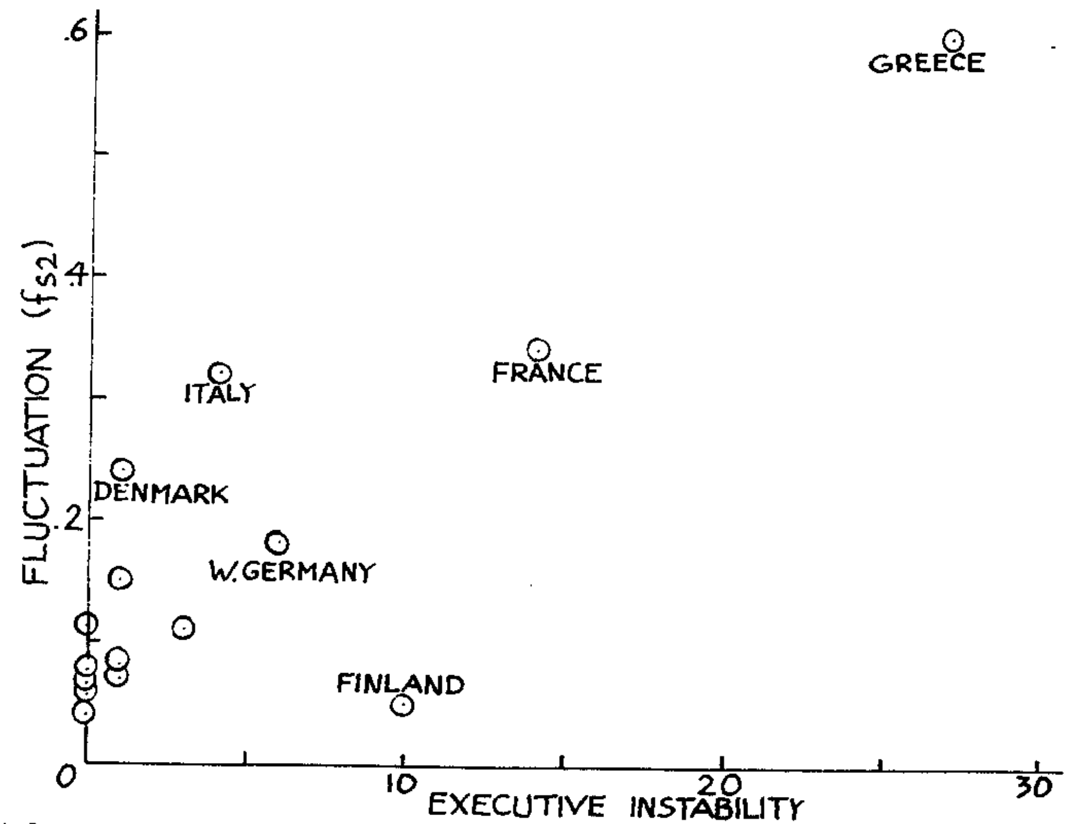
		Instability (f_s) high (>.30)	Instability (f_s) medium (.10-.30)	Instability (f_s) low (<.10)
Effective number of parties (N_v)	high (>5.0)	France	Netherlands	Finland Switzerland
	medium (3.0-5.0)	Greece Italy	Belgium Denmark Norway West Germany	Iceland Ireland Sweden
	low (<3.0)			Austria UK

of such multiparty systems, the Laakso effective number of parties ($N = 1/\Sigma p_i^2$) is the most suitable index. The political implications of a given number of effective parties are also easier to visualize than those of a given value of a concentration or fractionalization index.

The most interesting political finding in this article may concern changes of the average number of parties in the 15 countries studied. This average was found to decrease from a high of 4.2 effective parties in 1949 to 3.7 in 1953, only to rise again after 1966 to a new record of 4.5 effective parties in 1973. These changes may coincide with changes in economic outlook. Graphs for individual countries sometimes buck the general trend. The effective number of parties tends to be smaller on parliamentary seats level than on popular votes level; large discrepancies may be a cause or a result of political instability.

A fluctuation index has been defined. Fluctuation in effective number of parties expresses instability in the party system. Governmental instability may or may not be correlated with such fluctuation; it certainly is not correlated with the mere effective number of parties in our sample of 15 countries.

We have used the effective number of components for characterizing electoral systems. But this analytical tool can be applied elsewhere: for



NOTE: Data from Table 2.

Figure 9: Fluctuation in Effective Number of Parliamentary Parties Versus Executive Transfer Number

example, the effective number of countries in the world can be calculated on the basis of area, population, or GNP, and trends over time could be investigated.

NOTES

1. Proof is available on request from Rein Taagepera at this address: School of Social Sciences, University of California, Irvine, California, 92717.
2. The results are available on request from Rein Taagepera at the above address.

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