COUNTING THE NUMBER OF PARTIES: AN ALTERNATIVE INDEX

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I propose an alternative index to operationalize the variable number and size of parties *in a party system. To support it, I present a critical overview of the two most common indices, Laakso and Taagepera's* effective number of parties *and Kesselman and Wildgen's* hyperfractionalization, *showing the causes of their weakness. Then I explain the computational logic of my alternative, "number of parties," and compare it with the other two, using hypothetical cases. After that, I contrast the Laakso–Taagepera index with mine, using data from actual elections between 1945 and 1981. I conclude that my index outperforms the other two as an operationalization of the variable number and size of parties.*

Since the classic works of Duverger (1954) and Rae (1967), the number of parties has been used as the basic criterion to classify party systems, and as a variable to explain several of their features. But counting the parties in a system has not been easy, and a considerable number of indices have been proposed.[1] I will review and critique the two most commonly used indices and introduce a new one. The reviewed indices are *effective number of parties* (N) and *hyperfractionalization* (I). The new one is *number of parties* (NP).

Index N is a derivation of the *fractionalization index* (F) proposed by Rae (1967), which in turn is derived from the *concentration* index (HH) (Herfindahl 1950; Hirschman 1945). Applied to parties, HH is defined as follows:

$$HH = \sum_{i=1}^{n} P_i^2$$

where P_i is proportion of votes (or seats) of the ith party.

HH is the probability that two randomly chosen voters vote for the *same* party.[2] The limits of HH are one if there is only one party and zero if the number of parties tends to infinity. F was introduced later as the probability that two randomly chosen voters vote for *different* parties. Index F, thus, is equal to $1 - HH$. Index F has limits in zero if there is only one party and one if the number of parties tends to infinity. HH provides a nonarbitrary way to weigh parties so that the larger ones count more than the smaller. Laakso and Taagepera (1979) reformulate HH as N to get numbers that make more intuitive sense. Thus, *effective number of parties* (N) has limits in one if there is only one party and infinity if the number of parties tend to infinity.

$$N = 1/\sum_{i=1}^{n} P_i^2$$

$$= 1/HH = 1/(1 - F)$$

On the other hand, the *hyperfractional-*

Table 1. Values of *N* and *I* for Several Hypothetical Cases

Case	Division of Vote (or Seats) Among Parties (in %)							Indices N	Indices I
1	100							1.00	1.00
2	50	50						2.00	2.00
3	33	33	33					3.00	3.00
a	51	42	5	1	1			2.28	2.58
b	51	26	11	11	1			2.84	3.41
c	40	37	11	11	1			3.11	3.55
d	40	37	9	9	5			3.17	3.73
e	51	49						2.00	2.00
f	70	5	5	5	5	5	5	1.99	3.15

ization index (I) was introduced in communication studies as a measure of entropy (Shannon 1948; Shannon and Weaver 1959; Theil 1972). In political science literature it is also known as the Kesselman–Wildgen index (Kesselman 1966; Wildgen 1971). Index I has the same limits as N, and it is defined as follows:

$$I = \text{antilog}[-\sum_{i=1}^{n} (P_i^2 \log P_i)],$$

where P_i is proportion of votes (or seats) of the ith party.

The advantages and weaknesses of N and I are clearly shown with the cases included in Table 1. For the formats of k parties of the same size (cases 1–3), both N and I work well, delivering precisely k; but they do not behave well when applied to less obvious cases. Consider cases a–f, which are the same examples that Taagepera and Shugart use to illustrate the N index (1989, 80): Taagepera and Shugart affirm that cases a–d might be classified as two-party systems and that cases c and d, at most, might be considered two-and-a-half-party systems. But N and I yield higher values. The problems of N and I are not restricted to those cases. As can be seen in comparing cases e and f, N gives the same value to a single-party as to a two-party system. The performance of I is worse: it returns the higher value to the single-party system case. The evidence found in cases a–f suffices to show that N and I do not discriminate between different party systems and that I is worse than N. They perform poorly for different reasons: N counts the largest party as more than one in certain situations, and I is too sensitive to small parties.

Table 2 makes clear what is wrong with N and I. Notice that the square of the winning party size is .49, or 97.5% of the sum of P_i^2, that is, .49/.5025. Thus, 97.5% of the value of N, 1.99, is explained by the winning party alone, which is counted as 1.94 parties. That is why N does not work well. A similar analysis of the computation of index I for case f shows that the winning party contributes 22% of the value of the index I for case f (3.15), that is, −.245/−1.148. This means that the winning party is counted as only .68 of a party. In contrast, each small party, which contributes 13% of the index I, that is, −.145/−1.148, is counted as .41 parties.

Index NP avoids both problems ("overcounting" of large parties and excessive sensitivity to small ones). The overcounting of the winning party can be avoided through a reformulation of N, as follows:

$$NP = 1 + N \frac{\left(\sum_{i=1}^{n} P_i^2\right) - P_1^2}{\sum_{i=1}^{n} P_i^2}$$

Table 2. Detail of the Computation of N and I for the Hypothetical Case f

Case f	(P_i)	Computation of N P_i^2	Computation of I $(\log P_i)P_i$
Winning party	.70	.49	-.250
Minor party	.05	.0025	-.150
———	—	—	—
———	—	—	—
———	—	—	—
Minor party	.05	.0025	-.150
Total	1.00	.5025	-1.148
		$N = 1.99$	$I = 3.15$

where

$$N = 1/\sum_{i=1}^{n} P_i^2$$

and P_i^2 is proportion of votes of the winning party, squared.

The trick in *NP* is to count the winning party differently from the rest, *counting the winning party as one* and weighting N by the contribution of the minority parties,

$$\left(\sum_{i=1}^{n} P_i^2\right) - P_1^2.$$

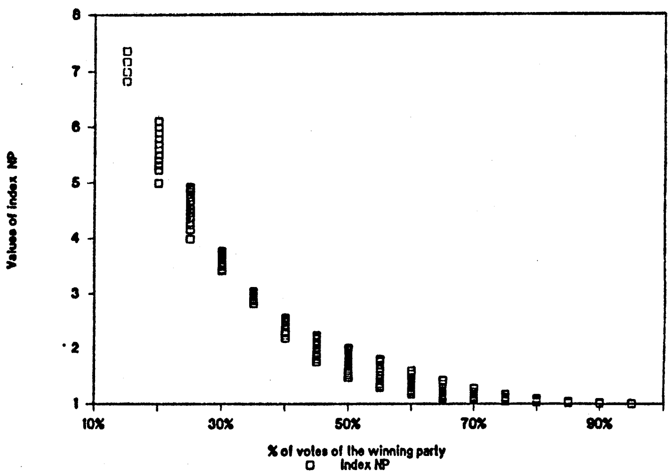
Coming from N, index *NP* is also a probability measure: it weighs the probability that two randomly chosen voters belong to the same minority party by the probability that two randomly chosen voters belong to the same party (winner or not). Although *NP* comes from N, it carries an extra bit of information—the distinction between the winning party and the rest, which is a key feature of party systems.[3] The conventional counting of the winning party as one is intuitively clear: even if a coalition of minority parties exclude the winning party from government, a good counting rule should always count the winning party as one, regardless of its size. That clear advantage of *NP* over N and I is not its only edge. Consider Table 3, where all previous cases and their indices values are presented, sorted by their *NP* values.

NP adequately captures the different

Table 3. Sorting of Cases by the Value of Index *NP*

Case	Division of Vote (or Seats) Among Parties (in %)							Indices N	I	NP
1	100							1.00	1.00	1.00
f	70	5	5	5	5	5	5	1.99	3.15	1.06
b	51	26	11	11	1			2.84	3.41	1.74
a	51	42	5	1	1			2.28	2.58	1.93
e	51	49						2.00	2.00	1.96
2	50	50						2.00	2.00	2.00
c	40	37	11	11	1			3.11	3.55	2.56
d	40	37	9	9	5			3.17	3.73	2.61
3	33	33	33					3.00	3.00	3.00

Figure 1. Performance of the Index *NP* (389 cases)

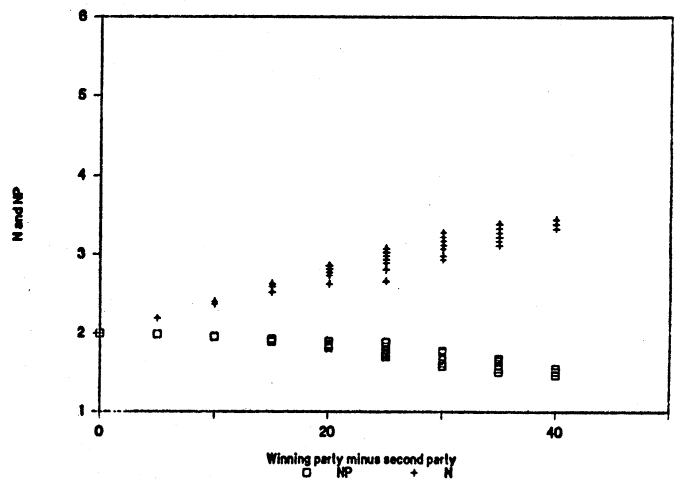


cases. It gives values around 2.6 to cases c and d, which Taagepera and Shugart considered two-party or, at most, two-and-a-half-party systems. *NP* also distinguishes single-party from the two-party systems (compare case f with cases a and e). In short, *NP* smoothly sorts the array of cases reflecting the increasing number of relevant parties. To show that the edge of *NP* over *N* and *I* is general, a comparison of the indices is made using a model of formats of party competition. The model is a systematic set of 389 cases that starts with a format of 95–5, moves to 90–5–5, then to 90–10, to 85–15, to 85–10–5, and so on, including cases with up to eight parties (its last case is 15–15–15–15–15–15–10). The rationale of the model is that the operationalization of the variable *number of parties* should consider at least three features of a party system: size of the winning party, gap between the two larger parties, and degree of concentration of the minority parties. It is intuitively clear that the number of relevant parties in a system will be inversely related to the size of the winning party. Figure 1 presents the values of *NP* for the 389 cases as a function of the size of the winning party. Similar plots for *I* and *N* are not shown for the sake of brevity.

The three indices are highly correlated and they vary, as expected, in an inverse relation with the size of the winning party. But *I* and *N* return higher values, and have higher variance, than *NP*. It is the case that *N* and *I* (but especially the latter) "overreact" to small changes in the size of the winning party. Both *I* and *N* return values of two or more *too soon*—*N* at the level of 65%, and *I* at 80%. Worse, *I* delivers values of three or more when the winning party is as large as 70%. Indeed, *I* is a very disorderly, almost atonic statistic; for the sake of brevity, I shall therefore now concentrate on *N* and *NP*.[4] *NP* stays low until the size of the winning party decreases substantially: it delivers values of two or more until the winning party size drops below 50% and values of three or more until it drops to around 33%. In this respect, the three indices vary as expected; but it is clear that *NP* behaves better.

Regarding the other two aspects of party system, the contrast is sharper. If

Figure 2. Comparison of *N* and *NP*, Holding Winning Party Constant at 50%



the size of the winning party is not controlled, the indices vary inversely with the gap between the two largest parties, as expected; but if the size of the winning party is controlled, the behavior of *NP* and *N* differs qualitatively.[5] While *NP* *decreases* if the gap between the two largest parties widens, *N* tends to *increase*. This behavior is plotted in Figure 2.

Generally, *NP* captures better the number and relevance of parties, because, ceteris paribus, an increase in the gap between the two largest parties in a system means a reduction of its competitiveness; and that, in turn, implies a decrease in the relevance of minority parties. Yet competitiveness and number of parties are related, but not identical, concepts; and there are situations where the supriority of *N* or *NP* might be controversial and subject to external considerations, such as coalition possibilities or spatial distributions of parties. I discuss this point using the cases shown in Table 4.

The first three cases of Table 4 form a sequence of swings from the second party to a third, holding the size of the winning party constant. *N* follows this sequence, departing from two- toward three-party-system values, while *NP* values decrease. Which is better? Some will prefer the increase in values because a third party has appeared; but others may prefer the decrease, because the swing produces a format that resembles a dominant party system. Both things happen. In general, when the winning party holds a majority, *NP* captures the changes in the format better than *N*; but if the winning party is only a plurality, the evaluation is more controversial.

Now consider cases j and k of Table 4:

Table 4. Comparison of Indices *N* and *NP* in Several Hypothetical Cases

Case	Division of Vote (or Seats) Among Parties (in %)				Indices *N*	Indices *NP*
g	55	45			1.98	1.79
h	55	35	10		2.30	1.70
i	55	25	20		2.47	1.62
j	41	39	20		2.78	2.48
k	41	20	20	19	3.52	2.44
l	41	39	12	8	3.28	2.49
m	41	39	10	10	3.30	2.49

Table 5. Comparison of Indices *N* and *NP* in Several Actual Cases

	N and NP Values for Six Countries (Means for the 1945–1981 Period)			
	Seats		Votes	
Country	*N*	*NP*	*N*	*NP*
Japan (1958–72)	2.5	1.5	2.5	1.5
Norway	3.2	1.8	3.9	2.1
Sweden	3.2	1.9	3.4	2.0
France (Fifth Republic)	3.6	2.3	4.9	3.7
Israel	4.5	2.5	4.8	2.7
Italy	3.5	2.2	3.9	2.5

Source: Data from Mackie and Rose 1984. Author's computations.

case j is a clear two-and-a-half-party system; and case k, which shows a swing from the second party to a fourth, presents four relevant parties, because all of them are large enough to be included in minimal winning coalitions. In this sequence, *NP* remains stable, while *N* jumps toward four. Again, some observers may prefer the increase in the index because the additional party is relevant; then again, stability may be justified because the position of the winning party as the pivotal (dominant?) party has been enhanced.[6]

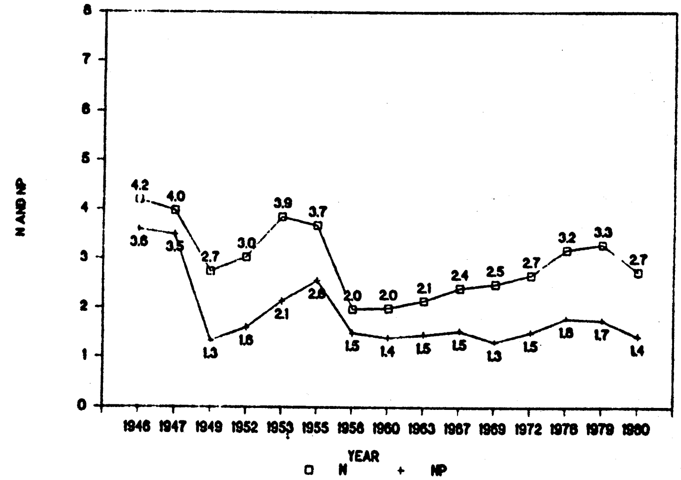
The indices also differ in their variation against changes on the concentration of the minority party votes, holding the level of the winning party constant.[7] *NP* is less sensitive than *N*, and it varies in the opposite direction. Again, it is possible to argue for either *N* or *NP*. Compare the sequence from case j to l with that from case j to m in Table 4. In the former, the swing from the third party to a fourth changes nothing, because the fourth cannot join any minimal winning coalition while the third party remains relevant. The rise in *N* is misleading and the stability of *NP* is adequate. Yet in the sequence from j to m the fourth party is as relevant as the third, and the increase in *N* might capture the change better; although it is possible to argue that m is still a two-and-a-fragmented-half-party system.

The Indices in Empirical Cases

It is useful to compare *N* and *NP* in real situations. In some cases, like the two-party systems of Austria, New Zealand, the United States, and the United Kingdom, the difference between indices is negligible. In others, such as Finland, the French IV Republic, Netherlands, or Switzerland, the difference is relatively large, but it would not lead to different classifications of party systems. But there are cases where the difference in index value is very significant, suggesting a change in the classification. Table 5 presents a summary of the more interesting of them.

Japan after 1955 is a case that clearly supports *NP*, because its values (around 1.6) make more sense than those of *N* (around 2.5). Japan has properly been classified by observers and by Japanese politicians as a one-and-a-half-party system (see Figure 3). Other cases may be controversial: Sweden and Norway, which are usually classified as multiparty systems, would have to be reclassified as dominant party systems. Albeit debatable, such classification is not baseless. Despite the persistence of several parties, Sweden and Norway have been dominated by one party, the Social Democrats and Labour, respectively. This dominance is reflected in the infrequency of coalition cabinets. Besides, *NP* shrinks toward 1.5 when the dominant parties get majorities and surpasses two whenever alternative coalitions governed or could have governed.[8] In this, *NP* supports Sartori's contention that "it is only banal to say that both are multiparty systems. The question is, instead, whether Norway and

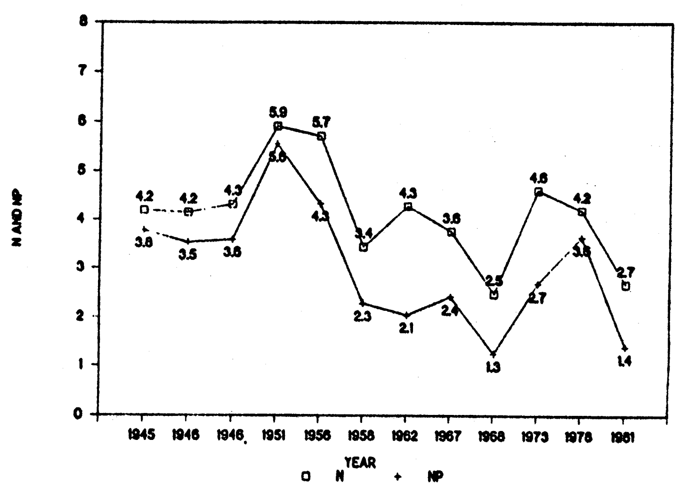
Figure 3. Differences Between *N* and *NP*: Parliamentary Seats in Japan



Sweden should not be assigned to the predominant party systems" (1976, 174). *NP* captures the distinction between multiparty systems with or without dominant party. This is relevant, because the mechanics of a system is at least as determined by the saliency of a party as by the multiplicity of parties (Blondel 1968).

NP also makes sense in the French case. *NP* values for votes between 1958 and 1981 vary between 5.2 to 2.1, reflecting the totality of the electorate.[9] The contrast of *NP* and *N* in the French case is larger with regard to seats: while the lowest *N* is 2.5 in 1968, *NP* yields 1.3 and 1.4 in 1968 and 1981 (see Figure 4). These values conflict with the multiparty classification of France, but they reflect the dominance of the Gaullists in 1968 and of the Socialists in 1981. *NP* captures what

Figure 4. Differences Between *N* and *NP*: Parliamentary Seats in France



Sartori describes as "the persistence and coexistence of opposite pulls: the traditional voting distributions of the Fourth Republic, as against the constraints of the [Fifth Republic] constitution" (1976, 179).

Israel and Italy are the most difficult cases, because they are usually classified as extreme examples of multiparty systems. However, recent studies have emphasized the dominance of one party in each of these systems, and the alternation of party in government in Italy (Aronoff 1990; Di Palma 1990). In both cases, *NP* values would suggest a reclassification as two-and-a-half-party systems. The values of *NP* for Israel vary between 3.1 and 1.8. In this case, despite the remarkably high number of parties and factions that get seats in the Knesset, two great blocks, the Labor and Likud camps, have dominated the system and have interacted with the small parties that enter in the alliances or alter the strategies of competition.[10]

As for Italy, *NP* has been stable at around 2.4 between 1963 and 1979. Such numbers certainly seem both very low and very stable, but some features of the Italian support the two-and-a-fragmented-half-party count: the Christian Democrats always had the option of building several alternative coalitions without requiring the participation of the Socialists (who did join the government coalitions when required). The left pole has never been large enough to build an alternative majority coalition even if all the socialists parties joined a Communist-led coalition. The fragmentation of both the Socialist party and of the rest of the small parties resembles the fragmented half.[11]

Conclusion

N and *I* are weak indices of the variable number and size of parties. *N* is weak because in certain situations it overstates the size of the largest party, while *I* overstates the relevance of small parties. To solve these problems, I propose a modification of the *N* index, in which a value of one is conventionally assigned to the winning party and the other parties are weighted using a nested *N* formula that is normalized with *N*. Index *NP* outperforms *N* and *I*. The advantage of *NP* relative to *N* and *I* is that *NP* behaves better in relation to the size of the largest party and to the gap between the two largest parties.

Notes

I thank Fernando Cortés, Gary Cox, Federico Estevez, Matthew Shugart, Kaare Strom, Rein Taagepera, and especially Wayne Cornelius, Arend Lijphart, and Jeffrey Weldon for their helpful comments.

1. See Elkips 1974; Laakso and Taagepera 1979; Pfeiffer 1967; Rae 1967; Rae and Taylor 1970; Sartori 1976; Taagepera 1979; Taylor and Herman 1971; Theil 1969, 1972; Waldam 1976; Wildgen 1971.

2. Or that two randomly chosen legislators belong to the *same* party, when applied to parliament members.

3. *NP* can be expressed in terms of *N* as follows:

$$NP = 1 + N^2 \left(\sum_{i=2}^{n} P_i^2 \right),$$

where

$$\sum_{i=2}^{n} P_i$$

stands for the sum of all the minority parties.

4. When compared to *NP*, *I* is similar to *N* but with higher variance and higher values.

5. The decision to hold the size of the winning party constant is based on the assumption that the size of the winning party is the most relevant of the three analyzed features of party systems. The behavior of the indices is similar holding constant the size of the winning party at any level.

6. Three different minimal winning coalitions may be formed in case j, and the winning party is in two of them; in case k four different minimal winning coalitions are possible, the winning party is in three of them, and the fourth one consists of the three minority parties.

7. Again, the behavior of the indices is similar holding constant the size of the winning party at any level. *Concentration* is defined as *HH* but applied only to the nonwinning parties.

8. Berglung acknowledges that "five parties and two political blocs have long dominated the Scandinavian political landscape" (1981, 80).

9. Interestingly, while in general N has greater variance than NP, in the French case NP has greater variance than N.

10. Elazar, for instance, distinguishes these three great "camps" and asserts that "government coalitions generally consisted of some two thirds of the Labor camp, plus two thirds of the religious camp, plus a small crossover element from the civil camp" (1979, 10).

11. Only in 1983 did such a coalition become feasible, since a coalition of the parliamentary fractions of the Communists, the Socialists, and the Social Democrats would have been a majority. For that year, NP returns 3.0.

References

Aronoff, Myron. 1990. "Israel under Labor and the Likud: The Role of Dominance Considered." In *Uncommon Democracies*, ed. T. J. Pempel. Ithaca: Cornell University Press.

Berglung, Sten, Pertti Pershonen, and Gylfi Gislason. 1981. "Political Party Systems." In *Nordic Democracy*, ed. Erik Allardt, *et al.* Copenhagen: Det Danske Selskab.

Blondel, Jean. 1968. "Party Systems and Patterns of Government." *Canadian Journal of Political Science* 1:180–203.

Di Palma, Giuseppe. 1990. "Establishing Party Dominance: It Ain't Easy." In *Uncommon Democracies*, ed. T. J. Pempel. Ithaca: Cornell University Press.

Duverger, Maurice. 1954. *Political Parties.* New York: John Wiley.

Elazar, Daniel. 1979. "Israel's Compound Polity." In *Israel at the Polls*, ed. Howard Penniman. Washington: American Enterprise for Public Research.

Elkips, David. 1974. "The Measurement of Party Competition." *American Political Science Review* 68:682–700.

Herfindahl, Orris. 1950. "Concentration in the Steel Industry." Ph.D. diss., Columbia University.

Hirschman, Albert O. 1945. *National Power and the Structure of Foreign Trade.* Berkeley: University of California Press.

Kesselman, Mark. 1966. "French Local Politics: A Statistical Examination of Grass Roots Consensus." *American Political Science Review* 60: 963–73.

Laakso, Markuu, and Rein Taagepera. 1979. "Effective Number of Parties. A Measure with Application to Western Europe." *Comparative Political Studies* 12:3–27.

Mackie, Thomas, and Richard Rose. 1984. *The International Almanac of Electoral History.* London: Macmillan.

Pfeiffer, David. 1967. "The Measurement of Inter-Party Competition and Systemic Stability." *American Political Science Review* 61:457–67.

Rae, Douglas. 1967. *The Political Consequences of Electoral Laws.* New Haven: Yale University Press.

Rae, Douglas, and Michael Taylor. 1970. *The Analysis of Political Cleavages.* New Haven: Yale University Press.

Sartori, Giovanni. 1976. *Parties and Party Systems.* Vol. 1. New York: Cambridge University Press.

Shannon, Claude. 1948. "A Mathematical Theory of Communication." *Bell System Technical Journal* 27:379–423. (Cited in Theil 1972, p. 1.)

Shannon, Claude, and Warren Weaver. 1959. *The Mathematical Theory of Communication.* Urbana: University of Illinois Press.

Taagepera, Rein. 1979. "Inequality, Concentration, Imbalance." *Political Methodology* 6:275–91.

Taagepera, Rein, and Matthew Shugart. 1989. *Seats and Votes: The Effects and Determinants of Electoral Systems.* New Haven: Yale University Press.

Taylor, Michael, and V. M. Herman. 1971. "Party System and Government Stability." *American Political Science Review* 65:28–37.

Theil, Henri. 1969. "The Desired Political Entropy." *American Political Science Review* 63:521–25.

Theil, Henri. 1972. *Statistical Decomposition Analysis.* London: North Holland.

Waldam, Loren. 1976. "Measures of Party Systems Properties: The Number and Size of Parties." *Political Methodology* 3:199–214.

Wildgen, John. 1971. "The Measurement of Hyperfractionalization." *Comparative Political Studies* 4:233–43.

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