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Rethinking Duverger's Law: Predicting the Effective Number of Parties in Plurality and PR Systems – Parties Minus Issues Equals One*

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ABSTRACT

Attempts to predict the number of political parties emerging in democracies have usually been based on one of two seemingly incompatible approaches: (1) the 'institutional' approach (e.g., Duverger's Law and Hypothesis) focuses on the nature of the electoral system and also on the number of seats per district; (2) the 'ideological' approach stresses the nature and extent of social cleavages. This article attempts a synthesis by showing that election system and cleavage type interact to affect the number of parties, with the former factor determined in part by the latter. Our most striking finding, however, is that the effective number of parties tends to be obtained by adding 'one' to the number of issue dimensions. Within this broader framework, Duverger's Law emerges as a special case for polities with a single issue dimension, and Duverger's Hypothesis is replaced by a much more quantitative prediction as to the effective number of parties.

1. THE HYPOTHESES

Two seemingly incompatible approaches have been tried to predict the number of political parties that will emerge in democracies. The first, associated with Duverger (1946a, b, 1951, 1954) and Sartori (1968), has focused on the nature of the electoral system. The second approach, associated with Downs (1957) and Lipset and Rokkan (1967), focuses on the nature and magnitude of the ideological cleavages within a society. In the first approach, institutional structures are the main driving forces. In

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the second approach, it is ideology which is paramount. Inspired in part by Lijphart (1984), we shall here attempt a synthesis of the two approaches.

Duverger's Law asserts that plurality elections favour two-party competition. Duverger has further proposed the hypothesis that majority runoffs and proportional representation (PR) systems favour multipartyism. Sartori (1968) has proposed that, within a multi-member district PR system, district magnitude (the number of seats in the district) is the best predictor of the number of parties that can be expected to contest the district – i.e., *ceteris paribus*, the larger the district magnitude, the greater the number of political parties.

Empirical support has been found to a greater or lesser extent for all these propositions. The UK, the USA, and New Zealand all have plurality elections and what is effectively two-party politics. Of the major countries using plurality elections, only India lacks a two-party system (Riker, 1982). Canada, which might appear another exception, with three major parties, has at the local level two-party politics – the two parties are simply not always the same two throughout the country. As for Duverger's hypothesis that majority runoffs and PR favour multipartyism, appreciable support is found for the latter proposition, especially if we amend it to substitute 'list PR' for PR (see Duverger, 1985 forthcoming; cf. Sartori, 1985 forthcoming).

The arguments which lead us to believe list PR should facilitate multipartyism may or may not apply to the single transferable vote (STV), the other major form of PR. Furthermore, the arguments why list PR might foster multipartyism are considerably more compelling than the arguments for majority runoffs having that effect. Indeed, because of the use of single-seat districts, majority runoff may behave more like a plurality system than a PR system, and we will so treat it, although we later point out special features of French electoral politics under the two-ballot system which foster something like four-party politics (cf. Duverger, 1980).

There are four cases cited by Riker (1982) as counter-examples to Duverger's hypothesis that PR fosters multipartyism: West Germany, Austria, Australia and Ireland. All but one of these cases can be distinguished away. West Germany has 'too few' parties for PR, but this may be a consequence of a relatively high threshold (5% of votes) and the partial use of single-member districts which presents a psychological barrier to voters who do not wish to resort to ticket splitting. Moreover, Germany does have (as we shall show below) a 2½-party system rather than a pure two-party system. Ireland may have 'too few' parties, but Ireland uses districts of unusually low magnitude (three to five seats) which cannot allocate seats to many more than three parties. Moreover, as we shall later see, Ireland in fact has a nearly three-party system and is thus not really a good counter-example. Australia has the alternative vote, a form of runoff, which we regard as more akin to plurality than to PR, and it has 2½-party politics – albeit the third party is somewhat of an appendage to one of the two major parties. Austria, however, has been a true counter-example to Duverger's hypothesis because it has had effectively two-party politics despite list PR (the recent admission of the small, third party into the cabinet may change that).

There is another way in which Riker may have overstated the extent to which these four countries contradict Duverger's hypothesis. Asserting that the number of Australian parties has increased from two to three and then stabilized, Riker goes on to state: '*If the hypothesis* [about PR fostering multipartyism] *were true, however, the* *number should continue to increase*. It has not.' (1982, emphasis ours.) Similarly, in discussing Ireland, Riker (1982) notes that the number of parties has *decreased* (since 1927) despite use of STV. However, there is no need to interpret Duverger's hypothesis about PR and multipartyism as requiring that the number of parties must *increase over time*. All Duverger's hypothesis implies is that it is easier to have more than two parties under (list) PR than under plurality.

This is an important point, because, even if we accept Duverger's hypothesis, it tells us nothing about how many parties (more than two) we can expect. There is in fact great variation across PR systems as to the 'effective number' of parties – with numbers ranging from just above two to over five (Lijphart, 1984). The effective number of parties, N, is calculated, following a procedure developed by Laakso and Taagepera (1979) and used by Lijphart (1984):

$$N = \frac{1}{\sum_{i=1}^{n} s_i^2} \quad (1)$$

where s_i is the seat share of the i-th party. We shall focus on effective number of parties because we thus avoid the problem of whether to count the many minuscule splinter parties that may exist. The usual way to deal with them is introduce some cutoff point below which parties will not be regarded as significant in analysis, but this is fundamentally arbitrary.[1]

One of the most important extensions of Duverger's analysis from the institutionalist perspective is due to Sartori (1968), who focuses on the importance of district magnitude. Sartori's (1968) hypothesis that district magnitude will have a major impact on the number of parties in the system is well supported. Regardless of the seat allocation formula used, the 'Break-even Percentage' of votes (at which a party starts obtaining its proportional share of seats, or more) shifts upwards as M increases (Taagepera and Laakso, 1980). This means that at smaller M fewer parties tend to obtain representation. Taagepera (1984) has found that the effective number of parties (N) in national assemblies tends to increase with increasing magnitude (M) approximately as

$$N = 1.15(2 + \log M) \quad (2)$$

when decimal logarithms are used. Note that list PR with $M = 1$ is identical to plurality in single-member districts; the formula yields $N = 2.3$ in this case. This formula represents a quantitative generalization of Duverger's Law. For a slightly different data base consisting of 39 electoral systems in 29 countries with a total of 350 elections, Taagepera (1985) obtained an r^2 value of 0.75 for a relationship slightly steeper than the one in Equation 2: $N = 2.03 + 1.45 \log M$.

Turning from the 'institutionalists' to the 'ideologues', it is much harder to find testable propositions. Lipset and Rokkan (1967) and Lijphart (1984, 149) may be interpreted as standing for the proposition that 'the more axes of cleavage there are within a society, the greater will be the number of political parties.' Note that this latter assertion is independent of the nature of electoral systems. It would appear to require that, if a society has few (many) axes of cleavage, it should have few (many) parties regardless of the nature of the electoral system used.

Clearly, it ought to be possible to synthesize these two approaches. Consider, for example, the following fourfold table (Table I).

TABLE I

	'Plurality'	'PR'
A single issue dimension	two-party	?
Multiple issue dimensions	?	multi-party

The question marks in two of the cells indicate that it is not obvious how to predict outcomes in those cells. The institutional determinism model would tell us that list PR systems should have multipartyism even if there was only a single axis of cleavage in the society, and that plurality systems should have only two parties even in the presence of many cleavages. The ideological approach would deny this. We have also put 'plurality' and 'PR' in quotation marks because the dichotomy puts the majority rule runoff or the alternative vote systems under the 'plurality' label provided that those methods are used in conjunction with single-member districts, and the dichotomy puts nonlist multimember districts systems such as the Irish STV and the Japanese single nontransferable vote under the 'PR' label. We propose the following tentative resolution, the predictive accuracy of which we shall examine later in the paper:

Hypothesis1: The link between ideology, election type, and number of parties is as described in Table II.

TABLE II

	Plurality or majority in single-member districts	PR or semi-PR in multimember districts
A single issue dimension	two parties	two–three parties
Multiple issue dimensions	two–three parties	three or more parties

We shall now propose an even more specific hypothesis for the multiple-issue dimensions PR cell for list PR systems in that cell. Let I be the number of issue dimensions and N be the effective number of parties. Then it is proposed that for list PR systems, the effective number of parties (N) tends to be the number of issues plus one. Plurality elections can be thought of as a special case of list PR, with $M = 1$. Thus, if we apply this same proposed formula to plurality as well as list PR systems we find that, when $I = 1$, $N = 2$, and we can generalize:

Hypothesis 2: For the two cases on the main diagonal of Table II (i.e., one-issue dimension in single-member plurality or majority districts and multiple-issue dimensions in PR multiseat districts)

$$N = I + 1 \tag{3}$$

Thus, the hypothesis worded as 'parties minus issues equals one' in the title of this article is now proposed to be applicable to plurality systems as well as to list PR systems (and to other systems). When I = 1 (a single left–right dimension, say) and plurality is used, we expect two-party politics, i.e., we have derived from Eqn (3) *Duverger's Law as a special case.* If I = 2 and list PR is used, we expect three-party politics, etc. Thus, N = I + 1 can be thought of as a generalization of Duverger's Law.

In contrast to Eqn (2), Eqn (3) embodies an ideological, not an institutionalist, perspective.[2] Thus, to call 'N = I + 1' a generalization of Duverger's Law might seem to be misleading, since Duverger's Law, as originally stated, is commonly seen to stress the importance of electoral institutions, i.e., the plurality mechanism is seen as one which generates both 'mechanical' and 'psychological' pressure to hold the number of political parties down to two. This view, however, is in large part erroneous; while Duverger's Law is often thought of as a law about the functioning of plurality elections, we shall show that it is actually a law about the functioning of plurality elections in the *one*-dimensional context.

To make this argument precise we need to review the logic underlying the mechanism by which a plurality system facilitates two-party politics in the one-dimensional context.

Proposition 1. When voter ideal points are arrayed along a line (i.e., in single dimension) and voters choose the party/candidate which is closest to their ideal, the alternative corresponding to the ideal point of the median voter can receive a majority of the votes in pairwise competition against any other alternative.

Proof: See Black (1958).

Proposition 2. When voter ideal points are arrayed along a line and voters choose the party/candidate which is closest to their ideal, if there are only two political parties and each is driven by concern for vote-maximizing, then each will seek to locate at the position held by the median voter.

Proof: See Downs (1957).

Consider two parties L and R, with the voters and the parties arrayed along a line:

M

L R

We have identified the position of the median voters as M. Clearly, if L moves towards M it will gain votes; the same is true for R. This position is in (Nash) equilibrium. As long as one party stays fixed, the other party cannot improve its vote share.

Proposition 3. If we now introduce an additional centrist party, C, the combination of a 'mechanical effect' and a 'psychological effect' under simple plurality will tend to eliminate one of the three parties.

Proof: Consider the following configuration:

M

L C R

Here, we would expect L to move towards M, and R to move towards M, since voters to the left of L or the right of R really have no choice (except abstention) that might be preferable to their voting for the party nearest their ideal point. If this happens, C is squeezed even if located exactly at M. Losing votes, it will lose even more in terms of seats. This is what Duverger (1951) refers to as the 'mechanical' effect of plurality in making it impossible for one of the three parties to compete successfully:

M

L C R

Only in the central half of the segments from LC to CR does C get votes. If C's supporters are concerned about their ability to influence political outcomes, they will come to desert C and cast votes for L or R, the only two parties which have a real chance at victory. This is what Duverger (1951) refers to as the 'psychological effect'. In the social choice literature, it is known as the pressure towards strategic voting (Cain, 1978).

The diagrams and discussion above show that in one dimension, three-party competition is *unstable*, but two-party competition *is* stable.[3] The reason that Duverger's Law cannot be expected to apply when there is more than one issue dimension is that in such a case there will in general be no analogue to the median voter ideal point, i.e., no point which a majority prefers to each and every other point in the space and thus no single point in the space to which the mechanics of the pursuit of electoral advantage will inexorably draw each party. It is well known in the social choice literature that, in general, two-dimensional voting games (or voting games set in still higher issue dimensions) do not have a core, i.e., do not have a single point which is majority preferred to each and every other point in the space (McKelvey, 1978, 1979; Schofeld, 1978). When voting games lack a core the electoral dynamics posited by Duverger's Law simply cannot apply. Thus, Duverger's Law is really about one-dimensional political competition or, at least, political competition in which there are no cycles of majority preference – and in practice, that may amount to the same thing (Riker, 1982; cf. Feld and Grofman, 1985a, b).

For multi-dimensional plurality contests, even though two-party competition may be inherently unstable, certain configurations of three parties may be stable. For example, in the two-dimensional three-party case with three large, roughly equal-sized blocs of voters concentrated in the vicinity of X, Y and Z with other (smaller numbers of) voters scattered throughout the space, three parties located at these concentrations might be stable if the arrangement was like an equilateral triangle. But such stable configurations are empirically highly unlikely.

Having shown that Duverger's Law is fundamentally linked to the operations of plurality in one-dimensional issue space, we now turn to a test of our hypotheses linking the effective number of parties both with issues and electoral institutions.

2. EMPIRICAL TESTING

In order to test Hypotheses 1 and 2, we require specification of the number of issue cleavages in the society. Here we follow Lijphart (1984). Lijphart identifies the following seven dimensions, of which the first six closely follow the dimensions recognized by earlier analysis (Taylor and Laver, 1973; Sartori, 1976, 336–7; Dodd, 1976): Socioeconomic; Religious; Cultural–ethnic; Urban–rural; Regime support; Foreign policy; and Postmaterialism. Table III (taken from Lijphart, 1984: Table 8.1, p. 130 and Table 7.3, p. 122) shows the number of issue dimensions and the effective number of parties for 22 post-war democratic polities (France IV and France V are counted separately). The number of issue dimensions is not always an integer because Lijphart scored an issue dimension of medium salience as a half. The following hypotheses reflect the dichotomies in our earlier Table II:

TABLE III. Issue dimensions and effective number of parliamentary parties in 22 democratic systems, 1945–80

Country	Number of dimensions	Effective number of parties
Single-member districts		
United States	1.0	1.9
New Zealand	1.0	2.0
United Kingdom	1.5	2.1
Canada	1.5	2.4
Australia	2.5	2.5
France V	3.5	3.3
(West Germany)	2.0	2.6
Multimember districts		
Ireland	1.0	2.8
Austria	2.0	2.2
Luxembourg	2.0	3.3
Sweden	2.5	3.2
Denmark	2.5	4.3
Japan	3.0	3.1
Iceland	3.0	3.5
Italy	3.0	3.5
Belgium	3.0	3.7
Israel	3.0	4.7
Netherlands	3.0	4.9
Switzerland	3.0	5.0
Norway	3.5	3.2
Finland	3.5	5.0
France IV	4.5	4.9

Source Lijphart, 1984 (Table 8.1, p. 130; Table 7.3, p. 122).

Hypothesis 1(a). Countries with unidimensional cleavages and elections in single-member districts have two-party systems.

There are two cases, the USA and New Zealand, both of which confirm the hypothesis.

Hypothesis 1(b). Countries with unidimensional cleavages and multimember districts will have between two and three parties.

There is only one case, that of Ireland, which with N = 2.8 confirms the hypothesis.

Hypothesis 1(c). Countries with multidimensional cleavages and single-seat districts will have between two and three parties.

There are five cases in this cell of Table II if we treat Australia's alternative vote as akin to a plurality system, as we believe it appropriate to do (cf. Katz, 1980), and also treat West Germany's mixed system as psychologically akin to plurality. Australia (with N = 2.5), West Germany (with N = 2.6), Canada (with N = 2.4), and the UK (with N = 2.1) confirm our hypothesis. France V (with N = 3.3) narrowly oversteps the limit (three parties), but France's unique second-round coalitional alliances, in which certain parties by pre-concert drop out of the race in deference to a coalition partner with higher first-round voting support, encourage four-party politics nationally even while only two principal parties contest at the second round in each district (cf. Duverger, 1985 forthcoming and Duverger, 1980).

India is not among the countries considered by Lijphart (1984), but it, too, roughly fits our model with multidimensional cleavages and N = 3.2. We regard this account of India as more plausible than that in Riker (1982) which attempts to fit India into a one-dimensional situation which gives special status to the Congress party as a Condorcet (majority) winner and permits centrist parties which are Condorcet winners to have parties to both their right and left, thus allowing for multiparty plurality politics. There are two difficulties with Riker's model. First, multi-ethnic politics in India makes it hard to fit into a one-dimensional framework. Second, even if the centrist party in a one-dimensional space were a Condorcet winner, it is not clear why its voting strength would not be nibbled away from both right and left (cf. Sartori, 1985 forthcoming), as was the case for the British Liberals around 1930.

Hypothesis 1(d). Countries with multidimensional cleavages and multimember districts will have three or more parties.

There are 14 cases in this cell of Table II; for 13 of these our hypothesis is confirmed. The exception is Austria, with I = 2.0 and N = 2.2.

In sum, then, our first proposed reformulation of Duverger's Law and Duverger's hypotheses fits the data quite well. Now let us turn to Hypothesis 2, which states that for certain groups of countries we should have $N = I + 1$.

Before we look at the data, we must put the reader on notice as to one methodological point. Because of the nature of Lijphart's definition of issue dimension, there is a linkage between N and I. When estimating the number of issue dimensions (I) for a given county, Lijphart considers an issue dimension highly salient (1 point credit) or moderately salient (0.5 point) only if it is 'dividing the significant or "relevant" parties – the parties that have either coalition or "blackmail" potential' (Lijphart, 1984, 128). Issues which divide parties internally (e.g., the language issue in pre-1970 Belgium) are not considered, nor are those which delineate minor parties.

Despite this linkage between issues and parties, Lijphart's (1984) definition in no way requires I to be any particular function of N. Assume for the moment that every issue dimension can contain only two opposite stands. Then one issue dimension can delineate only two separate parties. With two issue dimensions (e.g., ethnic and religious), the number of parties could be as low as two (perhaps Orthodox Greeks and Muslim Turks in Cyprus) or as high as $2 \times 2 = 4$ (German Protestants, French Protestants, German Catholics, French Catholics in a hypothetical Switzerland). In general, for a given value of I, the number of parties generated could be as low as two and as high as 2^I. The highest values of I Lijphart finds (for Finland and France) are around 4, leading to a possible number of parties ranging from two to 16. This essentially covers the entire range of the number of parties ever observed in any democratic country. If we allow an issue dimension to contain more than two distinct positions (e.g., Protestant, Catholic, Muslim), the range shifts from somewhat more than two to considerably more than 2^I.

The point here is that Lijphart's estimates of the issue dimensions do not circularly emerge from the existing number of parties. For a given I, any practically conceivable number of parties remains possible. Conversely, for a given N, it takes very few issue dimensions to account for the number of parties, and countries tend to have more issue dimensions than they 'need' to generate the number of parties observed. What this means is that N and I are not rigidly interconnected by the very definition of these quantities. In principle, a wide range of combinations is possible for values of N and I.

We show in Figure 1 a plot of N versus I for all 22 of our cases. The regression line is

$$N = .834I + 1.264 \tag{4}$$

with a correlation coefficient of .75. This is very close to $N = I + 1$, and indeed this equation yields an almost equally high correlation.[4] Of course, we are looking at effective number of parties; counting minor parties would give us higher values of N.

Our second hypothesis is specifically about the 16 main diagonal countries in Table III. Thus we should consider the best fit when omitting the UK, Canada, Australia, France V, West Germany, and Ireland. A glance at Fig. 1 shows that no appreciable improvement in fit is achieved. The plurality systems (Canada, UK, West Germany) fit the general pattern. The single STV case (Ireland) has unexpectedly many parties, and the single-member districts with runoff or alternative vote (France V and Australia) have unexpectedly few parties, but the number of cases is much too small

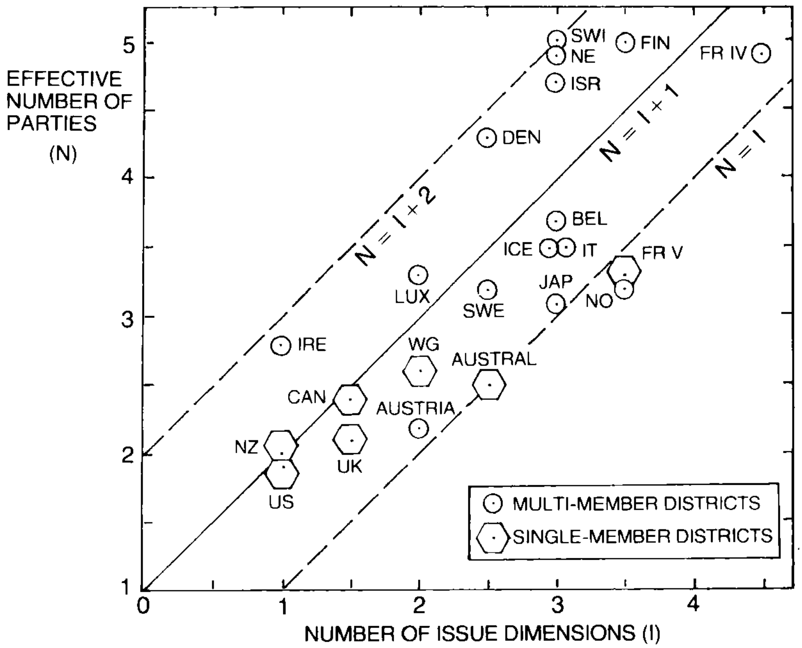

Fig. 1. The relationship between N and I in 22 democracies

to draw any conclusions. The rule $N = I + 1$ seems to apply to all cells in Table II, with an error range of ± 1.

Thus we see that I alone can account well for differences in N across countries, even if we do not take electoral system into account. However, there is a link between type of election system and number of issue cleavages. Above 2.5 issue dimensions, multimember districts are the rule (the only exception being France V). Below 2.0 issue dimensions, single-member districts are the rule (the only exception being Ireland). It may well be that countries with many issue dimensions do purposely pick electoral systems which enable more than two parties to survive (see Note 2). In particular, they may choose district magnitudes to satisfy this purpose. While the format of Eqn (2) suggests that M affects N, the reverse is also possible. Combining Eqns (2) and (3) could then express the tendency of issue dimensions to affect the choice of district magnitude.[5]

The connection between N and I was first established by Lijphart (1984: Table 8.4, p. 48), who provides a 3×3 cross-tabulation of countries grouped by low, medium, and high values of N and I. It is apparent from this table that N and I are interrelated and Lijphart (1984, 148) reports a .75 correlation between them.[6] However, Lijphart does not look at the slope of the regression line and thus does not derive the relationship $N = I + 1$. Given the remarkable strength of this relationship, it would seem that we have identified an important empirical rule. Nonetheless, although it is clearly important to have found a functional relationship such as $N = I + 1$ with such striking predictive power, it would still be desirable to hypothesize a mechanism which could account for that predictive power. This task, however, will require a separate paper.

NOTES

1 For the parliamentary seat constellation .25–.25–.25–.25 one would expect and does obtain $N = 4$. For .35–.30–.15–.10–.05–.05 one also obtains $N = 4.00$ so that this distribution is roughly equivalent to one with four equally large parties. The rather improbable constellation .49–.02–.02–... .02–.01 (with 25 parties of 2% each) would also yield $N = 4.00$. The effective number of parties is connected to the well-known Rae 'fractionalization' index F (Rae, 1971) through $N = 1/(1-F)$. For a small number of effective parties, N is roughly equal to the actual number of parties with at least 10% of the vote, but N is more descriptive of the party strengths than the simple count in cases like the following two: .40–.40–.10–.10 and .40–.40–.09–.09–.02. If anything, the latter case has slightly more parties, as reflected in N increasing from 2.94 to 2.97, but the party count based on a 10% cutoff would suddenly drop from 4 to 2.

2 An alternative form of synthesis of the institutionalist and ideological approaches to predicting the number of parties would require longitudinal modelling of an interactive sort, i.e., the nature of issue cleavages in the society could affect the society's initial choice of election system, and the way in which political conflicts were resolved by existing electoral mechanisms could, over time, have an impact on the nature or the salience and intensity of societal cleavages.

3 Of course, we may have a multimodal distribution of voter preferences, or abstention from alienation/indifference effects, each of which will complicate the analysis, but still not really fundamentally affect the result except under very special circumstances. If, for example, there is also an 'alienation' effect, i.e., voters too far away from their most preferred choice abstain out of alienation from the political process, we'll have both L and R moving towards (but perhaps not quite reaching) the central location in M.

4 It often tends to be forgotten that the calculation of correlation coefficient r is symmetrical in x and y, but the same is not true of regression of y on x. In our case the regression of N on I yields $N = 0.834I + 1.264$, but the reverse regression of I on N yields the equivalent of $N = 1.481I - 0.370$. The simple equation $N = I + 1$ lies in between, although much closer to the first equation.

5 A formal combination of Eqns (2) and (3) yields $M = 0.07(7.4)^{I}$. For $I = 1$, $M = .5$; for I V $= 2$, $M = 3.8$; and for $I = 3$, $M = 28$. It is, however, still too early to evaluate the merits of this cumbersome and non-intuitive formula.

6 Instead of using the effective number of parliamentary parties (i.e., N based on seat shares), one could also consider the effective number of electoral parties (i.e. based on votes shares) for which data are also available in Lijphart (1984, 160). Lijphart calculates the correlation of I with N (seats) only, and we agree that this is preferable on theorectical grounds. The correlation of I with N (votes) is slightly less good.

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