The Number of Parties: New Evidence from Local Elections[1]

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July 24, 1998

[1]Prepared for delivery at the 1998 Annual Meeting of the American Political Science Association, Boston Mariott Copley Place and Sheraton Boston Hotel and Towers, September 3–6, 1998. Thanks to Gábor Tóka for comments and to Péter Kovács at the OZSH, Budapest for his invaluable assistance in compiling these local election data. The full data set and Gauss code used in this paper are currently partially available from the author via his web site `http://www-vdc.data.fas.harvard.edu/staff/ken_benoit/` and will be deposited as a replication dataset at the ICPSR in 1998.

Abstract

Theory: Duverger's "Law" concerning the structural and psychological consequences of electoral rules has been much studied in both single cases and in multinational samples, but these suffer from several common theoretical and empirical shortcomings that make their estimates suspect. Besides resort to experimental data, another solution is to select a carefully controlled election dataset where the precise nature of the processes generating the data is understood. Local elections provide a means to control social cleavages as well as to provide a potentially large number of observations.

Hypotheses: The size of electoral districts, as well as the type of electoral formula, will influence the number of parties that compete, the concentration of support for these parties, and the number of parties that win seats, even when the elections are confined to one country at the subnational level. In addition, the greater number of observations should provide very precise estimates of these effects.

Methods: Regression analysis of district magnitude with an interactive term characterizing rules as proportional or plurality. The data come from 8,377 Hungarian local elected bodies consisting of municipal councils, county councils, town councils, and mayors.

Results: The results extend previous research on Duverger's effects, providing more precise estimates that may be compared directly to previous results. In addition, the analysis of rare multi-member plurality elections reveals a counter-intuitive result about candidate and party entry in response to these rules, suggesting several directions for future investigation of MMP rules.

No problem in the history of the research on electoral systems has occupied so much attention as the question of how different electoral rules shape a nation's political party system. In recent scholarship this research agenda has been refined to focus on the number of parties active in a country's legislature (Amorim-Neto and Cox 1997; Taagepera and Shugart 1993; Ordeshook and Shvetsova 1994; Riker 1976; Wildgen 1972), in fact a classic question in the literature of political science. Maurice Duverger (1951b) provided the most explicit formulation of this proposition—variants of which now bear his name—but the notion that electoral rules influence the number of parties is at least as old as Horwill (1925) and Hogan (1945).[1]

In determining the central features of electoral systems which shape party systems, the concept of *district magnitude*—the number of seats allocated in an electoral district—occupies the center of the institutional stage (Ordeshook and Shvetsova 1994; Taagepera and Shugart 1993; Rae 1967; Blais and Carty 1991; Palfrey 1989). What determines the number of parties active in a nation's national assembly? "History, present issues, and institutions all intervene. But if one had to give a single major factor [that] determines the number of parties... it would have to be the district magnitude," according to Taagepera and Shugart (1993, 455). Similar emphasis on district magnitudes has been echoed by other prominent electoral scholars such as Cox (1997), Lipjhart (1994), and Rae (1967). The theory behind the shaping force of district magnitude is expressed by "Duverger's Law," asserting that "the simple-majority single-ballot system favors the two-party system" (Duverger 1951b, 217), and widely acknowledged as one of the most durable and reliable hypotheses in political science. By providing structural constraints and their concomitant incentives, according to this view, the number of seats to be awarded in a district directly shapes the composition of the political parties that can win, and hence that will attempt to contest, parliamentary power.

The effects of district magnitude, according to theory, operate in two ways. Part of this effect will be "mechanical," where the electoral rules simply impose mathematical constraints on the number of parties that may win parliamentary seats. At its simplest, when m represents district magnitude, a maximum of only m parties may win seats. This effect comes directly from the character of electoral structure which intervenes between parties shares of the vote and their shares of parliamentary seats. It deals

[1]Similar propositions have been advanced by such prominent scholars as V.O. Key and C. J. Friedrich. For a history see Riker (1982).

only with the number of parties in parliament, not the number contesting the election (Taagepera and Shugart 1993, 456). The second effect is "psychological," operating on both voters and party elites, affecting electoral competition given the anticipation of the mechanical effect. Voters will not wish to waste their support on small parties whom the electoral rules will in all likelihood prevent from winning any seats. Likewise, party leaders who expect not to win seats may be encouraged to form coalitions, withdraw candidacies in certain districts, or even disband their party. The psychological effect therefore affects the distribution of votes, while the mechanical factor affects the distribution of seats. These two mechanisms are distinctly different, yet as Blais and Carty (1991, 80) point out, this distinction is not always clearly drawn.[2]

Theoretically, the reasons for district magnitude's effect on the number of parties has been developed both formally (Feddersen 1993; Palfrey 1989) and informally (Duverger 1986; Duverger 1951a). Empirically, on the other hand, the issue as a research problem has proven more elaborate. Sample sizes tend to be small and the number of other variables (as possible intervening factors) large. The character of party systems and voters tends to differ widely between electoral rules, and there are numerous electoral rule considerations other than district magnitude which complicate empirical analyses. The result has been either a disdain for purely empirical estimates of the determinants of the number of parties (Taagepera and Shugart 1993; Taagepera and Shugart 1989), or attempts to incorporate the differences with control variables while still maximizing the number of cases in cross-national samples (Amorim-Neto and Cox 1997; Ordeshook and Shvetsova 1994).

As a consequence the debate over the consequences of district magnitude has no single metric focus similar to that surrounding the "cube law," for example. This paper aims to remedy this lack, arguing that better empirical estimates are possible, outlining a theoretical framework for the study of electoral system determinants of the number of parties and then applying this framework to a uniquely large and controlled dataset of elections to 8,377 Hungarian local bodies held in December 1994. The results provide more precise estimates than previously possible, as well as demonstrating some counterintuitive results concerning the interaction between district magnitude and electoral formula.

[2]Reed (1990) makes this distinction clearly, although Taagepera and Shugart (1989), Riker (1986), and even Duverger (1951b) do not.

1 Issues in Modeling the Number of Parties

All empirical attempts to estimate Duverger's effects must consider several theoretical and practical pitfalls, delineated and discussed in this section.

Aggregation issues. The first problem is one of choosing the proper unit of analysis. What, precisely, do we mean by "electoral system," and how can we calculate a corresponding district magnitude for this unit? At the most aggregate level, a time series of elections using similar but non-identical election rules might be grouped for a single country. This is Lijphart's approach, for example, when he considers that an electoral system is "a set of essentially unchanged electoral rules under which one or more successive elections are conducted," including changes in district magnitude up to 20 percent in the definition of "essentially unchanged" (1994, 13). The most common level, however is that of the national electoral system. The problem with defining a unit at this level, however, is that most observations will not have a simple legally defined district magnitude. Most will instead have multiple districts with different magnitudes, perhaps even using different allocation formulas altogether. This is common with systems using two ballots, for example, or compensation tiers. The practical solution–for the studies which construct continuous scales of district magnitude—has been to use a weighted-average magnitude (Lipjhart 1994), median magnitude (Amorim-Neto and Cox 1997), or "effective magnitude" (Ordeshook and Shvetsova 1994; Taagepera and Shugart 1989). The problem with the former two, however, is that they package together a considerable variation of districts using possibly different rules into a single number. The problem with "effective magnitude," acknowledged even by its proponents, is that because it makes assumptions about the number of parties, it "itself is an endogenously determined parameter that is a function, in part, of the variable we attempt to predict" (Ordeshook and Shvetsova 1994).

The only way to avoid the aggregation problem is to use electoral districts as the unit of analysis. This may range from a single-candidate election, such as Massachussett's fifth Congressional district where magnitude is one and a plurality rule determines the winner, to the entire country of the Netherlands consisting of a single proportional representation district from which 150 seats are awarded. This ensures the association of a single, legally- and exogenously-defined district magnitude, linked to a single electoral rule, with a single number of parties in both the competition for and the seat awards from the electoral contest. In fact, while the empirical stud-

ies have apparently paid little heed to their calls, theorists have frequently argued for using district-level analyses (Cox and Shugart 1991; Taagepera and Shugart 1989, 115; Taagepera and Shugart 1989, 214). Accordingly, in this study I follow the urging of Amorim-Neto and Cox (1997, 168) that "electoral studies ought to move toward constituency-level evidence."

Interaction of district magnitude and electoral rules. A fundamental distinction exists between proportional rules that allocate seat shares more or less according to vote shares, and "majoritarian" rules that reward the parties or candidates with the largest vote shares with all of the seats. This dichotomy formed the basis of Duverger's propositions (1951b) and has influenced much subsequent research (Blais and Carty 1991; Blais and Carty 1987; Rae 1967). While for proportional type formulas it will be true that larger district sizes will yield more parties, this effect is reversed when plurality rules decide the winners (Taagepera and Shugart 1989; Blais and Carty 1987). It is therefore surprising that this basic dichotomy is absent from many research designs designed to predict the number of parties. For instance, Amorim-Neto and Cox (1997), Ordeshook and Shvetsova (1994), and Taagepera and Shugart (1993) all include both plurality-based systems such as the Unites States, Great Britain, and Japan, as well as a myriad of PR and mixed systems using different specific PR formulas. None of these studies, however, attempt to control for the in-kind differences between PR and plurality systems. This omission is potentially serious since the type of electoral formula can completely change the direction of the influence of district size on the number of parties.

One aim of this paper is to demonstrate is that the focus exclusively on district magnitude causes its properties to be misunderstood when electoral rules are not considered. It is unnecessary to debate in the abstract about whether district magnitude seems to have a greater impact than does electoral formula (e.g. Taagepera 1986) when we can simply include both variables a single analysis. A combined analysis would confirm the interaction effect between district size and electoral formula found in the few studies that combine them (Blais and Carty 1987).

Too Few Cases. A basic constraint imposed by the use of cross-national samples has been that there are only a limited number of democratic countries for which reliable data is available. Although much progress has been made in both the spread of democracy and in the availability of electoral data, even the largest samples stop at around 50 cases.[3] To enlarge the

[3]The exception are studies that use time series of elections in addition to cross-sections,

data beyond this number requires either counting elections from the same countries separately, along with the corresponding increase in the time horizon, or looking at smaller units. The latter is the course which this study takes, since analyzing district-level results not only deals with the separate problem of aggregation, but also considerably increases the number of cases.

One way to solve the problem of having too few cases is to redefine the unit of analysis. If national-level elections cannot yield more than 50 or 60 distinct electoral systems, then we should consider examining local elections in systems where these provide variation on relevant electoral rule variables. This would also solve many problems of needing to hold other factors constant: the ancient problem of comparing apples and oranges in cross-national samples. One of the purposes of this study and the creation of the dataset on which it draws is to demonstrate that local elections represent a rich and largely untapped resource for the advancement for the study of electoral systems.

Endogeneity Bias. The final problem which must be confronted in studying Duverger's effects has to deal with the possible endogeneity of electoral rules to the parties whose number they purportedly determine. If the electoral rules are in fact shaped according to the needs of pre-existing political parties, then electoral rules cannot be treated as exogenous determinants of the number of parties. Estimates of the effect of electoral rules on party systems which ignore this will have the problem of endogeneity bias. Although this problem has been largely overlooked by electoral systems researchers, several case studies provide strong evidence that many electoral systems features are endogenous (Benoit and Schiemann 1996; Brady and Mo 1992). The best non-technical solution and the one I implement here follows the urging of Benoit (1998a, 24) is to "know the sample."

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such as some of the regressions in Ordeshook and Shvetsova (1994). Yet most analyses eschew such designs because of the additional problems posed by the time series structure, although there is no inherent reason why a panel data model could not deal with these problems.

2 Data and Methods

2.1 Local Electoral Systems in Hungary

To estimate the relationship between electoral systems and the number of parties I have drawn from an extensive database of Hungarian local elections. The sample for Hungary comes from the elections to local town councils, provincial councils, and mayors held on December 11, 1994. The Hungarian law on local elections[4] establishes rules covering all of the local bodies in the country. All voting, therefore, is conducted on the same day according to uniform rules. There are four different kinds of electoral bodies, each with distinct rules, each varying formulaically in district magnitude. These are two types of municipal councils, from either towns and villages of 10,000 residents or less, or cities of more than 10,000 residents; county assemblies, including the Budapest assembly; and mayoral elections.

Towns and Villages. Municipalities of 10,000 inhabitants or less in Hungary use "small lists" where the municipality forms a single, multi-member district, and seats are awarded using a plurality, or "first-past-the-post" formula. (This format is sometimes used in U.S. local elections, known as the "at-large" ballot.) Ballots contain lists of candidates, and each voter can cast as many votes as there are available seats (m) in the district. After the balloting, the top m candidates are awarded seats. In 1994 there were 2,985 such electoral bodies. This is the system known as *multimember plurality* (MMP) but also called the "bloc vote" (Carey and Shugart 1995) or the "pure at-large" system (Engstrom and McDonald 1993).

Cities. Municipalities of more than 10,000 inhabitants use mixed electoral rules to elect their town councils. Each such municipality is divided into single-member districts; each voter casts a single-vote, candidate-based ballots in the single-member constituency corresponding to his or her address. In each SMD, the candidate with the most votes wins the seat (plurality). A compensation list for the entire municipality forms the other part of the system, using votes cast for parties in the SMD contests that did not go towards winning an SMD mandate.[5] Compensation list seats are awarded to parties from lists of candidates that parties have submitted before the election. A special version of the Sainte-Lagüe highest average proportional

[4] Act LXII of 1994 on the Election of Members of Municipal Governments and Mayors.

[5] Joint candidates without joint lists will have their mandates distributed proportionally among the joined parties.

	Elected in Each Locality	
Residents	**SMD Seats**	**List Seats**
0–100	–	3
101–600	–	5
601–1,300	–	7
1,301–2,999	–	9
3,001–4,999	–	11
5,001–9,999	–	13
10,001–25,000	10	7
25,001–50,000	14	9
50,001–60,000	15	10
60,001–70,000	16	11
each additional 10,000	+1	–
each additional 15,000	–	+1

Table 1: District Magnitudes in Hungarian Local Elections

representation formula[6] then determines the allocation of seats. There were 162 such settlements in 1994, together containing a total of 2,073 single-member districts and 162 compensation lists.

In both types of settlements, district magnitude and the number of SMDs are determined by a standard formula according to population (Table 1), a recipe which has several highly desirable effects from a research standpoint. First, it ensures considerable variance in district magnitudes, especially at lower levels of district magnitude (between 3 and 15). Second, because the district magnitudes are determined legally and uniformly according to population, the assignment rule for this variable cannot be endogenous to the number of parties at the district level. Finally, because the formula is based on population, it ensures a roughly constant population or population-per-seat for each district.

County Assemblies. Hungary is divided into 19 counties each having a proportionally-elected council, plus the capital Budapest with its 66-member "Metropolitan Council." Parties compete for seats from list ballots, awarded using the Hungarian version of the Sainte-Lagüe PR method. A legal thresh-

[6]The "Hungarian" Sainte-Lagüe uses the series $1.5, 3, 5, 7, \ldots$, slightly different from the traditional Sainte-Lagüe starting with a 1, or the "modified" Sainte-Lagüe series of $1.4, 3, 5, 7, \ldots$. See (Gallagher 1991).

County	Total Seats	Elected in Each Locality: Seats from Municipalities: over 10,000	under 10,000
Budapest ("Metropolitan")	66	66	—
Baranya	40	11	29
Bács-Kiskun	46	19	27
Békés	40	18	22
Borsod-Abaúj-Zemplén	59	19	40
Csongrád	40	15	25
Fejér	40	6	34
Győr-Moson-Sopron	41	9	32
Hajdú-Bihar	40	16	24
Heves	40	10	30
Jász-Nagykun-Szolnok	40	18	22
Komárom-Esztergom	40	18	22
Nógrád	40	10	30
Pest	80	42	38
Somogy	40	9	31
Szabolcs-Szatmár-Bereg	48	9	39
Tolna	41	15	26
Vas	40	11	29
Veszprém	40	16	24
Zala	40	5	35

Table 2: District Magnitudes in 20 County Assemblies

old requirement also states that no party with less than 4% of the total votes in the county or municipal election may receive seats.

Parties may submit two lists in each county: one for voting in municipalities of less than 10,000 inhabitants, and one for voting in municipalities of more than 10,000 inhabitants. Ballots are counted and seats awarded separately according to the classification of municipal size. There are 19 counties and Budapest, making a total of 39 list elections (since there is no small-settlement list for Budapest). District magnitudes for each type of list are determined according to the schedule in Table 2.

Mayors. Mayors are elected in each town, village, and city according to single-member plurality rules: the single candidate with the most votes be-

comes mayor. In the 1994 sample there were 2,985 mayors elected from small municipalities, 162 from large municipalities, and one from Budapest.[7]

There are several reasons which justify the examination in this study of the set of Hungarian local elections rather than a cross-national sample. First, because the dataset comes from a single country, the basic party system and the issue and cleavage dimensions from which it stems are held constant while only electoral rules vary. While this may be a weakness of the dataset—since a different party system might respond differently to variations in electoral rules—this is also its greatest strength, since we can be certain that rule variation, and not cultural, political, or national variations are driving the variation in the number of parties. Furthermore, at least regarding Duverger's *mechanical* effect, the specific sample characteristics are less important than the fact that they represent a large sample of actual results from elections with different parties and different electoral rules. Second, Hungary's local election samples provide something which few cross-national samples can: variation in district magnitude at small values, rather than the typically large average district sizes found in many national election laws.

Finally, the problem of endogeneity bias—a potentially serious problem in our ability to draw conclusions about the causal effect of electoral institutions on party systems—is absent in the Hungarian sample. As documented below, the key explanatory variable of district magnitude is exogenously and uniformly determined by a legal formula which links the number of seats in a district to its population. Furthermore, the political parties in Hungary with the authority to shape electoral institutions organize at the national level and are unlikely to vary at the local level where any possible endogeneity would have to occur. For these reasons the electoral systems variables in the sample of Hungarian local elections can be reasonably declared exogenous to the dependent variables of party systems.

2.2 The Dataset

The final dataset of elections and electoral systems contains 8,377 different observations, each consisting of a district election held according to a wide variety of different electoral rules, differing especially with respect to district

[7] The dataset contains information on only 3,136 mayoral elections (out of 3,147), because not all of the mayoral races were valid.

	District magnitude								
Formula	**1**	**2–5**	**6–9**	**10–15**	**16–20**	**21-30**	**31–40**	**41–66**	**Total**
Plurality	5,199	1,136	1,495	346	0	0	0	0	8,176
Proportional	0	1	126	41	12	12	7	2	201
Total	5,199	1,137	1,621	387	12	12	7	2	**8,337**

Table 3: District Magnitude Frequencies in 1994 Hungarian Local Elections

magnitude.[8] Table 3 summarizes this dataset according to electoral formula and district magnitude.

Several variables from this dataset will be of interest to this study, all single quantities calculated from elections to a single electoral body. These are:

M District magnitude, or the number of seats awarded in the district. Since each elected body has only one district magnitude, this number is not an average but rather the precise number of seats awarded in the district election constituting the observation.

PR A dummy variable taking a value of 1 if the election used used any form of proportional representation, and 0 if it took place under plurality rules. Plurality rules here are defined as those governing the 3,136 elections and the 2,977 small list elections, for reasons explained below.

EFFNELEC The "effective" number of parties contesting the election. This quantity is calculated as $1/\sum v_i^2$ for all parties eligible to receive votes, where v_i represents party i's proportion of the vote. Because this measure discounts parties with small vote shares, it measures the voter appeal of parties rather than the simple number of parties.

ACTNELEC The simple or actual number of parties contesting the election.

[8]The dataset also includes simulated elections 2,211 PR elections whose results were simulated using actual votes but 10 additional types of proportional elections rules; however, these simulated elections are excluded from the data analyzed in this paper. This dataset, a codebook, the constituent datasets of Hungarian electoral and geographical data, and Gauss code used to create the final dataset used in this paper are available at `http://www-vdc.data.fas.harvard.edu/staff/ken_benoit/dissertation.html`.

EFFNPARL The effective number of parties winning seats, calculated as $1/\sum s_i^2$ for all parties receiving seats, where s represents the party i's proportion of the vote. This measure is widely used to provide a more realistic representation of seats in the parliament, since it counts parties with many seats more strongly than parties with relatively few seats.

AVGCOALP The number of parties joined in a coalition, averaged over the total candidacies (or number of party lists). For example, in a district where three candidates represented single parties, two candidates were jointly supported by two parties each, and a sixth candidate was backed by a three-party coalition, AVGCOALP would be $(1+1+1+2+2+3)/6 = 1.67$.

MAXCANDP The vote proportion of the winning candidate or largest vote-winning party.

WINSEATP The seat proportion of the winning candidate or largest vote-winning party.

BONUSRAT The bonus ratio of seats to votes awarded to the party winning the largest number of votes, calculated as WINSEATP/MAXCANDP.

DISPRLS Gallagher's least-squares disproportionality index, ranging from 0 to 100, similar to the well-known Loosemore-Hanby index (Loosemore and Hanby 1971) but registering small discrepancies less than large ones (Gallagher 1991). It is calculated as $\sqrt{\frac{1}{2}\sum_i (v_i - s_i)^2}$, and ranges from 0 to 100. A zero indicates perfect proportionality, and a 100 means that somehow a candidate with no votes won a seat.[9]

[9] This happens once in the simulated results using the Adams and Equal Proportions methods.

Elected Body	EFFNELEC	ACTNELEC	Prop. Indeps.	AVGCOAL	MAX-CANDP	EFFNPARL	BONUSRAT	DISPRLS	n
Mayoral	1.92	2.79	0.83	1.09	70.97	1.00	1.57	26.00	3,136
City SMDs	4.17	6.06	0.11	1.49	37.13	1.00	2.90	50.44	2,063
City PR	5.27	7.46	–	1.35	28.98	4.37	1.13	7.97	162
Town MMP	10.87	14.36	0.93	1.02	18.51	6.36	1.17	14.02	2,977
County PR	5.44	9.49	–	1.25	31.01	4.55	1.12	5.61	39
Total	5.74	7.83	–	1.17	42.99	2.99	1.74	27.32	8,377

Table 4: Quantities of Interest by Type of Electoral Rule

Sample means for each of the main quantities of interest, broken down by type of election, are presented in Table 4. These values provide a simple benchmark for comparisons but are provided primarily in order to better understand the inferential statistics presented in the sections which follow.

2.3 Modeling Electoral Systems Consequences

The statistical model I use here follows the curvilinear function used often in previous studies (e.g. Amorim-Neto and Cox 1997; Ordeshook and Shvetsova 1994; Taagepera and Shugart 1993; see Sartori 1986 for a rationale). This model assumes that while number of parties is hypothesized to be a monotonically increasing function of district magnitude, we expect this effect to diminish as district magnitude increases. To accomplish this I use the (base-10) logarithm $\log M$ instead of the simple value of district magnitude in all estimations, consistent with previous research (Amorim-Neto and Cox 1997, Taagepera and Shugart 1993, Taagepera and Shugart 1989).

Several of the models below also include the dummy variable PR to distinguish proportional from plurality rules, since it has been argued that "the relationship between district magnitude and proportionality is reversed under plurality, compared with PR. High M and PR lead to relative proportionality, while high M and plurality lead to extreme disproportionality" (Taagepera and Shugart 1989, 23).[10] In the current study, however, this argument is treated as a hypothesis to be tested. In the dataset the elections coded as having values of $PR = 0$ are the 3,136 mayoral elections and the 2,977 multi-member plurality elections.[11]

In general, the specification is:

$$Y = b_0 + b_1 \cdot \log M + b_2 \cdot PR \cdot \log M + b_3 \cdot PR + e \qquad (1)$$

The first term is a constant; the second term, $b_1 * \log M$, indicates the log-linear effect of district magnitude. The third and fourth terms indicate the interaction of using PR rules with larger district magnitudes instead

[10] This claim includes the extreme case of "winner-take-all" systems where the plurality party automatically wins all of the seats in the district, but even for standard MMP systems Taagepera and Shugart (1989, 23), such as those used previously in Turkey and Norway, "the outcome is likely to be highly disproportional."

[11] The SMD elections for large-municipality elections are classified as $PR = 1$ because they are part of a mixed system joined to PR compensation lists. They exhibit different characteristics as a result, discussed more below.

of the base case of plurality rules. Using this pair of terms permits both the magnitude and the average values of the relationship to change when changing from plurality to PR rules. When plurality rules are used both the third and fourth terms will be zero, yielding the case of:

$$Y = b_0 + b_1 \log M + e \tag{2}$$

When PR rules apply, the relationship will be:

$$Y = (b_0 + b_3) + (b_1 + b_2) \log M + e \tag{3}$$

Ordinary least-squares (OLS) estimation is used for all models, primarily to maintain continuity with previous research and because the simplicity of interpreting this model in the current context outweighs the gains from making more sophisticated distributional assumptions. The remainder of this paper analyzes the data according to the two effects attributed to electoral laws: the psychological and mechanical effects. Since the number of parties which compete limits the range of possible outcomes through which the mechanical effect operates, I analyze the the psychological effect first.

3 Estimating the Psychological Effect

The psychological effect consists of the anticipations and subsequent behavior of both elites and voters of how actual or potential political parties would fare in an election governed by a specific set of electoral rules. When "restrictive" rules make it difficult for more than a few parties to win, fewer parties over the long term should compete for seats in a contest where only a few large parties have hopes of winning. On the other hand, more open systems with larger district magnitudes and more proportional rules that make it feasible for even small parties to win should encourage many parties to form and compete for seats.

The psychological impact of electoral systems can be measured at two levels, according to whether the structural incentives operate on voters who must decide which parties to support or on the political elites deciding to form parties (Blais and Carty 1991). The first can be measured by the degree of fractionalization of the vote, measured by EFFNELEC. In proportional systems of high district magnitude where even small parties stand a good chance of winning seats, EFFNELEC should be higher than in elections

	Dep. Var: EFFNELEC		Dep. Var: ACTNELEC	
	MMP &	PR	MMP &	PR
Indep.	Cty. PR	Dummy	Cty. PR	Dummy
Variable	(1)	(2)	(3)	(4)
Constant	-5.57	3.80	-9.65	-14.91
	(.479)	(.490)	(.552)	(.534)
$\log M$	13.51	17.57	28.48	35.06
	(.560)	(.578)	(.646)	(.631)
$PR \cdot \log M$	–	-16.02	–	-32.94
		(2.941)		(3.211)
PR	–	7.24	–	21.65
		(3.84)		(4.201)
σ^2	4.67	4.43	5.38	4.83
R^2	.16	.25	.39	.51
n	3,016	3,016	3,016	3,016

Note: Standard errors are in parentheses; σ^2 is the standard error of the estimate.

Table 5: OLS Estimates of the Psychological Effect

held under more restrictive systems, where voters supporting smaller parties "stop doing so because they feel it would be a waste of their vote" (Taagepera and Shugart 1989, 65). Furthermore, when seats are distributed according to plurality rules, we should expect the vote to be "more polarized... as voters refrain from wasting their votes on minor parties" (Blais and Carty 1991, 83).

Table 5 presents estimates of both types of psychological effect, using both simple and interactive regression models of the number of parties on electoral structure. Results (1)–(2) represent the response of voters to the structural incentives of electoral rules, estimating the effect of district magnitude on the fragmentation of the vote. Results (3)–(4) represent the response of parties and party elites to the effects of district magnitude, using the actual number of parties in the electorate as the dependent variable. All four of the regressions use all of the multi-member elections as their sample, drawn from the town MMP and county PR lists.[12]

[12]The city PR elections are not included because they are a compensation mechanism for which no ballots are directly cast. The SMD elections were not added to the sample because their extremely high numbers concentrated at $m = 1$ obscured the qualitatively different effects coming from the multi-member districts (see Table 4). Finally, the loga-

The main results of the psychological effect are visible in results (2) and (4), which employ the dummy variable to distinguish PR from plurality systems as per Equation 1. The difference from the pooled sample in results (1) and (3) illustrates the bias caused by omitting the variable of electoral rule type. Specifically, the pooled sample overestimates consequences of district magnitude for PR systems, and underestimates the relationship from the data for the plurality elections. The clear difference in the patterns from the two samples is portrayed in Figure 1. The MMP sample ranges from 3 to 13 in district magnitude, and the number of parties increases significantly as m increases, both for the effective and actual numbers of parties. The number of parties in the PR sample, on the other hand, also increases as log$M$ increases, but at a much smaller rate than in the MMP elections. The coefficient for log$M$ combining the dummy variable estimate in result (2) is 1.55, not dissimilar to previous estimates from nationally aggregated samples.[13] This value indicates, for example, that under PR rules, when $m = 10$ we would expect 1.6 effective parties, 2.0 effective parties at $m = 20$, and 2.30 effective parties at $m = 30$.

rithmic specification for M precludes the existence of effects at $M = 1$, since $\log(1) = 0$.

[13] Amorim-Neto and Cox (1997, 164), for example, estimated the result of the logged median district magnitude on EFFNELEC to be .48 in a sample of 51 national elections; similar estimates were obtained by Ordeshook and Shvetsova (1994, 113) using the same data. Although these samples apparently did not include MMP elections, the omission of the plurality-PR variable would be consistent with the bias caused by omitting the plurality variable, if its effect on the outcome operated as expected.

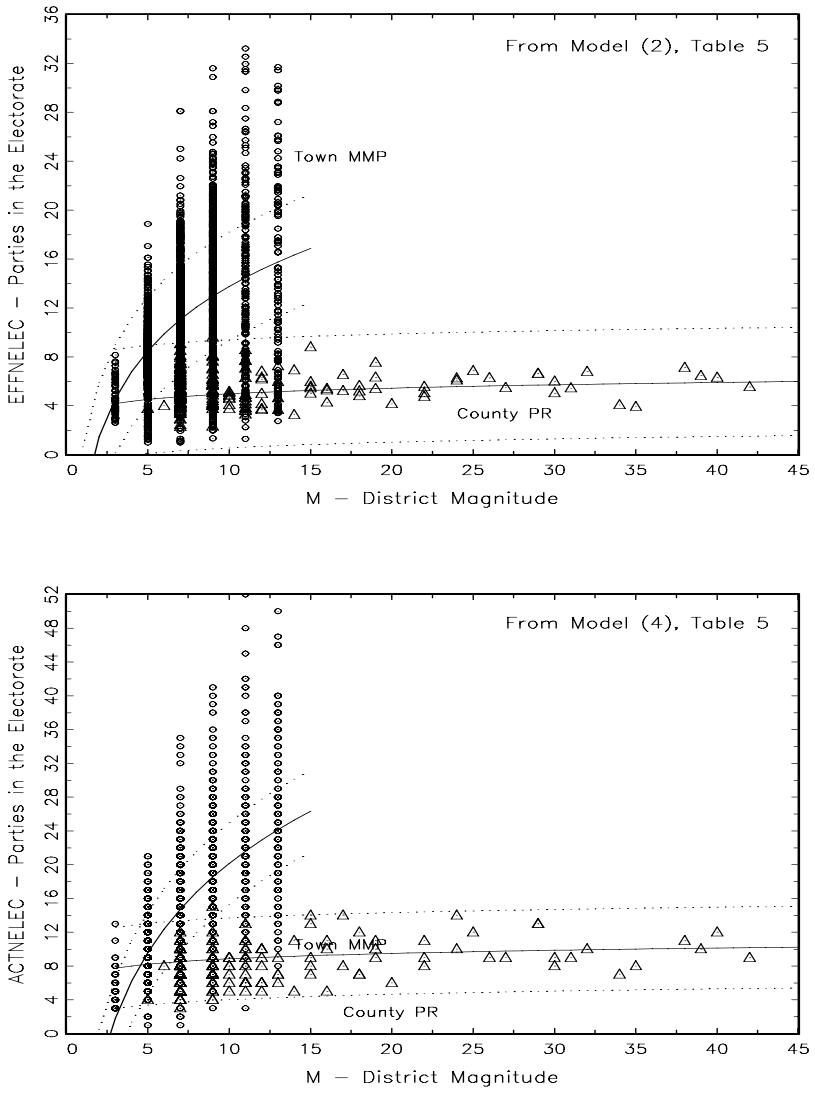

Figure 1: The Psychological Effect: Competing Parties by M

Indep. Variable	INDRATIO MMP only (5)	AVGCOALP MMP & Co. PR (6)	MAXCANDP MMP & Co. PR (7)
Constant	-.20	.89	22.43
	(.01)	(.009)	(1.221)
log$M$	0.33	.15	-4.59
	(.013)	(.010)	(1.442)
$PR \cdot \log M$	–	-.23	-5.32
		(.053)	(7.342)
PR	–	.46	21.56
		(.069)	(9.603)
σ^2	0.10	.08	11.05
R^2	.17	.15	.02
n	2,977	3,016	3,016

Note: Models (6) and (7) also include the 39 county PR elections. Standard errors are in parentheses; σ^2 is the standard error of the estimate.

Table 6: Additional Evidence from Multi-Member Districts

The extremely high correlation between district magnitude and the number of parties in the MMP elections, however, seems to run directly contrary to the expectations expressed previously. In the Hungarian data, more parties contest the elections and parties receive more fragmented votes as the number of seats in a district increases. Furthermore, this increase occurs at a far higher rate than under proportional rules. This results apparently contradicts the finding of Blais and Carty (1991, 89) that "the psychological factor seems unambiguous in plurality systems, working exactly as predicted by Duverger." How can this counterintuitive finding be explained?

The explanation appears to lie in the nature of personalistic ties in the towns and villages, combined with the pressures for personal rather than partisan appeals offered by the unusual MMP rules. Most of the municipalities using MMP are small villages of less than 3,000 inhabitants where personalities are well-known and a strong party identification or organization may be lacking. In these elections the proportion of independents was .93, compared to just .11 in the SMD elections held in the larger municipalities. Furthermore, there are almost no costs to establishing candidacies in towns and villages. Table 6 presents three tests designed to gain insight into

the apparently counterintuitive proliferation of parties under MMP systems. The first (result 5 in column 1) indicates that the ratio of independent to total candidates does indeed raise commensurate with district size. It is impossible to tell from the dataset, however, which of the thousands of "independent" candidates were genuinely independent and which were in fact known to be affiliated with a political party.[14]

There is strong evidence in Hungary that many parties chose to run their candidates in towns and villages as independents rather than as party candidates for political reasons. This would explain the proliferation of independent candidacies as district size increases, since each party has an incentive to run M candidates, this being the smallest number of candidates which permits a bloc win of all M seats while not having to share the party's votes with an $(M+1)$th candidate.[15] Because of the increased personal contact and the fact that nearly all candidates are likely to be known personally in the towns and villages which use the MMP rules, candidates are more likely to emphasize their personal appeal rather than their party affiliations. This incentive in turn eliminates the party coordination of candidate entry seen at the county and national levels in Hungarian elections, leading to a proliferation of individuals all seeking independently to win one of the multiple seats available. This is precisely the consequence predicted by Carey and Shugart (1995, 430) who stated that "rather than decreasing, the importance of personal reputation actually increases with magnitude in those systems in which copartisans compete with each other for votes and seats." The results based on the rare sample of MMP elections provides empirical evidence supporting this claim.

Despite the puzzle pertaining to independents, secondary analysis of

[14] The rules for counting parties consider each independent candidate as a separate party. Another explanation I considered was that the number of parties and candidacies increased as a function of population, indicating that the needs for representation depended on the social complexity of demands rather than institutional incentives. Regressions of the number of mayoral candidates (where district magnitude is held constant) on municipal population (included in the dataset), however, indicated no substantive support for this hypothesis.

[15] Although the balloting for the mixed-system used in the large municipalities is also plurality (in single-member districts), the number of independent candidates is much less in these types of elections, only about 1 in 10. This is probably because the compensation list linked to these contests excludes votes from independent candidates, meaning that these votes are truly "lost" in the large municipal list allocations. Tests of the psychological effect not shown, however, indicate that there is no empirical relationship between the size of the compensation list attached to a city SMD and the number of parties which contested the SMD seat.

the psychological effect using alternative measures reveals some of the more standard expected patterns which the simply measuring the number of parties tends to conceal. The final two columns of Table 6 present further evidence of a psychological effect consistent with the findings related to the number of parties. Result (6) estimates the average number of coalition partners AVGCOALP as a function of log$M$, finding a significant positive relationship between coalitions and M in MMP elections, and a significant negative relationship between coalitions and M in PR systems. Despite the increase in independent candidacies (and hence the number of parties), therefore, a candidate who does decide to run under a party labels remain tends to be supported by more than one party as M increases under MMP rules. Under PR rules where higher district magnitudes lower the barriers to winning seats, fewer coalitions are observed as M increases. Both results are consistent with the prior theoretical expectations concerning the psychological effect of district magnitude. Finally, result (7) estimates the effect of log$M$ on MAXCANDP, the proportion of votes received by the winning candidate, a further test of the psychological effect on voters. The results indicate that the maximum candidate's proportion declines significantly in MMP elections, but even more significantly in PR elections: 9.9 percent for every 10 seat increase in district magnitude.

On the whole these results are consistent with expectations in the literature concerning district magnitude. With the very interesting exception of the independent candidacies in the MMP elections, voters support more parties and political elites enter more candidacies as district magnitude increases. The strong finding that in the MMP elections the proportion of independent candidacies is a systematic function of increasing district magnitude cannot be ruled out as a mere "exception" to the psychological effect. Instead it needs to be investigated further to see if the mechanism described by Carey and Shugart (1995) is indeed operating, which would indicate a definite psychological effect, albeit rather different than the type generally expected under plurality rules.

4 Estimating the Mechanical Effect

The mechanical effect of electoral systems refers to the character of the transformation by the electoral rules of votes into seats. The more seats that exist, the more shares to be distributed. When these shares are allocated proportionally, the effect should be both greater proportionality as well as

Indep. Variable	Dep. Var: EFFNPARL MMDs Only (8)	Dep. Var: BONUSRAT All (9)	Dep. Var: DISPRLS MMDs Only (10)
Constant	-1.92	1.56	18.03
	(.184)	(.010)	(.411)
log$M$	9.91	-0.46	-4.81
	(.217)	(.016)	(.486)
$PR\cdot$ log$M$	-8.51	-1.25	-3.70
	(0.602)	.043	(1.348)
PR	4.93	1.33	-2.04
	(0.601)	(.015)	(1.346)
σ^2	1.66	.61	3.72
R^2	.43	.55	.19
n	3,178	8,377	3,178

Note: "MMDs Only" indicates that only the districts with $m > 1$ were included in the sample.

Table 7: Estimates of the Mechanical Effect of District Magnitude

a higher number of effective parties in the parliament. District magnitude "affects the proportionality of PR more than do the various mathematical translation formulas... the smaller the district the lesser the proportionality and, conversely, the larger the district the greater the proportionality" (Sartori 1986, 53). Of course, as previously stated, the expectation is that this relationship will be reversed when plurality rules are employed, justyfing the use of the PR dummy variable in estimating the mechanical effect as well.

Table 7 presents estimates for the mechanical effect of district magnitude on three quantities. The first (result 8), the effective number of parliamentary parties EFFNPARL, produces statistically significant coefficients on log$M$ of 9.9 for the MMP elections and 1.4 for the PR elections. This is once again confirmation of the "rule of thumb that the smaller the district the lesser the proportionality and, conversely, the larger the district the greater the proportionality" (Sartori 1986, 53) Once again, however, the same effect holds true for the plurality elections, although theoretically we would expect to observe the opposite result (see also Figure 2, upper panel).

How should these results be interpreted? First, it should be recognized that the (unlogged) slope of the relationship between district magnitude and the number parties elected is constrained between zero and one.[16] The estimates in column (8) of Table 7 fall within this boundary, as do those from previous research. Previous estimates from nationally aggregated election data of the coefficient on $\log M$ range from .34 (Ordeshook and Shvetsova 1994, 111) to approximately 2.30 (Taagepera and Shugart 1993, 461). The estimate of 1.4 in the Hungarian dataset is quite precise and its differences from previous estimates may have to do with the fact that it is district data rather than aggregated (as have been all previous studies of this issue), and possibly due to the fact that a single PR formula governs all elections (rather than different formulas having been average together, as previous research has also done). In comparative terms, the Hungarian Sainte-Lagüe formula has been shown to be ranked in the upper middle of PR formulas in terms of disproportionality (Benoit 1998b).

[16] For a more detailed discussion see Benoit (1998a)

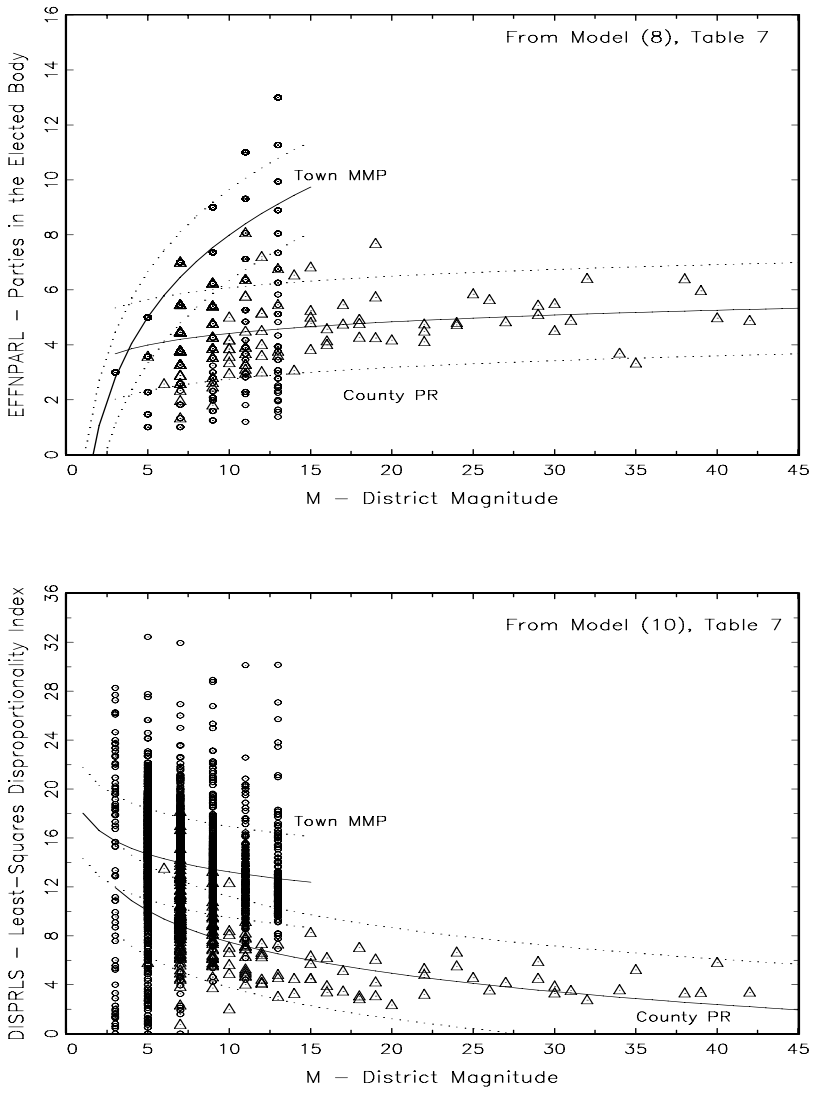

Figure 2: The Mechanical Effect: Elected Parties by M

Another explanation of the result points to the high number of independent candidacies. In fact, the results point one of the principal problems of estimating the mechanical effect when there a psychological effect has also been demonstrated. Because the mechanical effect's allocation of seats depends on a given distribution votes, and because the distribution of votes (and candidacies) is shaped by the psychological effect, estimates of the mechanical effect taken through cross-election samples are fundamentally flawed. The results presented in column (8) of Table 7 support this interpretation. The stronger link between the number of elected parties and M using plurality rules is driven by the psychological effect discussed earlier causing a proliferation of independent candidacies Likewise, the mild positive relationship of the psychological effect also drive the mildly positive estimates for the PR subsample. The comparison underscores the problem with measuring the mechanical effect in this fashion: the fragmentation of parties elected depends heavily on the fragmentation of the parties competing for seats. Interpreting the "mechanical effect" by estimating the relationship between m and the number of elected parties will therefore always produce coefficients which are generally correct, but always precisely meaningless in terms of their comparability to similar estimates from different data.

Models (9) and (10) of Table 7 attempt to provide estimates that avoid this endogenous cycle. Model (9) is the regression of the bonus given to the largest party on $\log M$. If indicates that while the ratio of seats won to votes won for the largest party declines under MMP with increasing M, it declines at a steeper rate for PR. This sample includes the SMD races from the mixed city elections (considered in this context as a special case of PR with $M = 1$), which means that at $M = 1$ for PR the largest party's seat proportion is 2.89 its share of the vote. When $M = 10$, on the other hand, this bonus will be only 1.18, and at $M = 20$, 0.67. Model (10) considers the discrepancy between votes and seats for all parties, summarized in the least-squares disproportionality index. The estimated coefficients are well in accord with theoretical expectations: the global disproportionality of the result declines more sharply as a function of increasing district magnitude under PR rules than in the MMP subsample. Figure 2 graphically portrays this relationship in the lower panel.

A comparison of the results of the different models of the mechanical effect suggest that using disproportionality as the dependent variable is an appropriate practical solution to the endogeneity of the mechanical to the psychological effect when this effect is present. Another solution would be

to use carefully controlled experimental data.

5 Concluding Remarks

The examination of Duverger's psychological and mechanical effects presented here are designed to provide a well-structured remedy to several extant problems in previous attempts to estimate these quantities. In particular, the results demonstrate the critical importance of considering the interaction between electoral formula and district magnitude. The effect estimated for the PR subsample for the psychological effect, for example, is consistent with previous estimates, although this effect is completely lost without the separation of this effect through the PR dummy variable. Although the previous studies to which the estimate of the psychological effect of 1.55 is compared apparently did not include the rare case of multi-member plurality elections, the results presented here demonstrate the large differences in estimates which the omission of electoral rule variables have the potential to cause. Future research on the number of parties should carefully and explicitly consider the different interactive effects of formula and district magnitude before drawing conclusions.

Other obstacles in estimating the number of parties point to the use of some alternative measures developed and demonstrated here, especially the bonus ratio but also the average number of electoral coalitions and the vote percentage received by the leading party. Finally, the introduction of the publicly available Hungarian local election dataset provides researchers with new empirical material for extending the study of electoral research. The advantages from this dataset—control of other variables and large-sample size—suggest that extension to the local elections of other countries offers a promising avenue for future research.

The most interesting new result to emerge from the examination of Hungarian local elections is the pattern of proliferating candidacies in the towns and villages using MMP. Previous investigations of multi-member plurality rules have primarily taken place in the context of the debate on the minority representation in the United States (e.g. Engstrom and McDonald 1993). These results need to be renewed and extended in the context of different party systems. The possibilities suggested by the patterns in Hungarian towns and villages offer both puzzles for future formal work as well as the empirical data for testing them. For example, as m increases

under the Hungarian MMP, the threshold of exclusion increases while the threshold of inclusion decreases (see Rae, Hanby, and Loosemore 1971). In other words, the proportion of ballots on which a candidate must be voted in order to *guarantee* her a seat under MMP ($M/(M+1)$) rises as a function of district size, the minimum proportion of votes with it is *possible* to win a seat (M/n) gets smaller as the total number of candidates increases, since each voter can cast up to M votes on her ballot. This implies that the number of candidacies will depend both on how many seats are available to win, as well as each prospective candidate's calculation of how many other competitors will decide to enter, suggesting the decision for entry is a combination of rule incentives and a signalling game with other candidates. These and other interesting puzzles remain to be clarified concerning the theoretical and empirical properties of the unusual MMP type of electoral rule.

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