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How We Count Counts: The Empirical Effects of Using Coalitional Potential to Measure the Effective Number of Parties

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In comparative political research, the need to quantify the number of parties which operate in a political system is fundamental [See, for example, Sartori (1976), Lijphart (1984, 1999) among many others]. Despite its conceptual centrality to research in comparative politics and the fact that the use of a single measure—Laakso-Taagepera index (LT)—is extensively, if not universally, employed in comparative research, the question of what is the *best* way to “count” parties is far from obvious. This paper will argue that the dominant approach, in general, provides a more accurate measure of the party system in an a priori sense; that is it provides analysts with the best measure of how many parties are competitive (based on the preceding election) at a given time, or over time. On the other hand, the measure to be further elaborated below—the Banzhaf-adjusted index (BZ)—can provide a more intuitive measure of the parties which have a potential for governing *after any given election*, making it, in a sense, an a posteriori measure.¹

This index, an example of a class of indices which measure voting power, was developed by John Banzhaf (1965) as a way to measure the relative power of a voter in an assembly. In the application we are concerned with here, the Banzhaf index assigns weights to parties as a function of the relative frequency that each, when considering the set of all possible winning coalitions, is a “swing” voter.

Thus, BZ incorporates a certain conception of coalitional viability into the party weighting scheme. As a result, given certain party configurations, the two indices, LT and BZ, can give strikingly different results. Though the indices are indeed highly correlated, below I identify 3 types of party constellations in which the differences between them are systematic and statistically significant.

After a brief review of the methods previously proposed for counting parties in the next section, I discuss the most recent attempts to amend or replace LT, including the use of normalized Banzhaf scores as party weights. Using data from 329 elections spanning 24 countries, I then look at the differences in the two distributions, and identify 3 cases in which the two indices produce systematically divergent values.

A Brief Accounting for the Way We Count

Duverger (1954), in a seminal study which laid the foundations for his eponymous “law” regarding the effect of the electoral system on the number of parties, merely counted the parties that were in competition for seats. While this crude approach has simplicity to recommend it, it became clear that it was necessary to somehow weight each party in order to give a more accurate measure of the *effective* number of parties for comparative purposes.

Blondel (1968) undertakes such this task. He develops a typology of two, two-and-a-half, and multiparty systems. There are essentially two problems with such an approach. First, for many purposes a continuous measure of parties is needed. Second, the cutoff point for “half” and “strong” parties is essentially arbitrary (he uses approximately 10% and 40% respectively).

While not precisely a measure of the number of parties, Rae’s (1967) fractionalization index was the first attempt to construct a measure which is continuous and takes into account *all* parties which have won seats, while also systematically weighting them by their seat shares. Rae’s formula is worth reproducing here:

$$F = 1 - \sum s_i^2$$

where s_i is the proportion of legislative seats for party i . The index, based on seat shares of *every* party in the system, is a useful summary of the relative size and number of parties in a system. Nonetheless, its interpretation is not straightforward, and it does not give a ready measure of the number of parties operating in a system.

Because of this, scholars continued to work on a simple yet more readily interpretable single measure to represent the shape of a political party system. Laakso and Taagepera (1979) develop what would become the standard for comparative political research. Construction of the Laakso-Taagepera (1979) index (LT) involves only the same (minimal) amount of data that is required for the fractionalization index. It is calculated as follows:

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

where, again, s_i is the seat share of party i in the parliament.

It is also worth pointing out its relationship to Rae’s fractionalization index:

$$LT = \frac{1}{\sum_{i=1}^n (s_i)^2} = \frac{1}{1 - F}.$$

Laakso-Taagepera: Current Debates

According to Arend Lijphart, “in modern comparative politics a high degree of consensus has been reached on how exactly the number of parties should be measured.” (Lijphart, 1994, p. 68) Nonetheless since he wrote those words and despite his optimism regarding the nearly universal agreement on a disciplinary standard, there have been several attempts to elaborate substitutes or complements to LT. These include Molinar (1991), Taagepera (1999), Dunleavy and Boucek (2003), and Dumont and Caulier (forthcoming).ⁱⁱ

Recognizing that, in the case of “absolute dominance” (i.e., a single-party majority) LT can sometimes produce seemingly unrealistic values, Taagepera (1999) proposes a supplementary indicator—the reciprocal of the largest party’s seat share—in an attempt to obviate this irregularity. This supplementary measure, despite having the appealing property of falling below two only in the case of absolute dominance, is nonetheless only a supplementary measure and cannot be used on its own.

Molinar (1991) combined LT with the largest party seat-share, to create an index denoted NP. Now, while the values which obtain under NP are generally quite similar to those of the largest component approach, NP can yield a value less than 2 even when there are perhaps 3 or more parties which are relevant in the coalition building sense (Taagepera 1999).

Dunleavy and Boucek (2003) consider an index, Nb, which is simply the average of LT and the largest party seat share. They claim that this “produces a highly correlated measure, but one with lower maximum scores, less quirky patterning and a readier interpretation.” Though Nb does yields results which are marginally more intuitive than that produced by LT, it fails to entirely correct the problem created by a single-party majority party system.

While *LT* remains the most frequently used measure of party system shape, there are certain seat-share distributions in which it is likely to produce misleading results. Many of the disadvantages of *LT* stem from the fact that it tends to overestimate the actual number of *relevant* parties, by giving excess weight to parties which are entirely irrelevant from the standpoint of governance *in any given election*. The index weights each party by its (proportional) seat share, but does so without regard to the distribution of the remainder of the seats among the other parties. For example, if party *i* has 10% of the seats, its weight in the index will be the same whether the remaining 90% of the seats are evenly divided between nine other equally-sized parties or are all occupied by one super-dominant party. In other words, the index does not take into account the *coalition-building potential* of each party.

It is widely held that party competition tactics are strongly influenced by the number of parties. Sartori (1976, p. 120) writes, “...in particular, the tactics of party competition and opposition appear related to the number of parties; and this has, in turn, an important bearing on how governmental coalitions are formed and are able to perform.” From this quote it is clear that Sartori envisions competition as taken place in two distinct arenas: the electoral arena and the legislative arena. These two aspects of competition manifest themselves in party (or electoral) competition, and coalition formation (i.e., post-election bargaining within the legislature) respectively.

In the decades following Sartori’s seminal piece, this distinction would be made explicit. Laver (1989) writes,

“The process of party competition is generally divided, by both theorists and empirical researchers, into a number of component parts. Two of the most important of these components are electoral competition and legislative behaviour. Within the realm of legislative behaviour, the single most important process in the typical Western European parliamentary system is the formation and support of an executive. Since most Western European systems do not have a majority party, this typically involves a process of bargaining between legislative parties over the fate of a coalition executive. Thus, for many practical purposes, party competition in Western Europe comprises an interaction between electoral behaviour and the politics of coalition”. (p. 301)

For the purposes of this exposition, the most beneficial aspect of *BZ* is that it incorporates both of these crucial aspects of competition identified by Laverⁱⁱⁱ. On the one hand, *BZ*, like *LT*, takes into account seat shares—which are the ultimate result of electoral competition. Crucially, *BZ* goes one step further by also incorporating simplified, yet nonetheless useful, aspects of the “politics of coalition.” Moreover, *BZ* incorporates this second important feature of party competition without requiring *any* more data than what is required by *LT*^{iv}.

According to Dumont and Caulier (forthcoming), the *LT* is usually “interpreted in comparative political science as the number of hypothetical equal-sized parties competing or being influential for the building of a majority government.” It would appear that when we are talking about “competing” in this sense, it must mean electoral competition. Thus, it would make sense, if we have an application which requires the use of the effective number of parties in a context that is meant to reflect *electoral* competition—e.g., electoral volatility—then the *LT* is likely to be a more accurate measure. However, if we encounter an application in which it is important to consider the effective number of parties from the standpoint of coalitional viability—e.g., cabinet duration—then *BZ* is likely to be the wiser choice.

Because of the anomalous behavior of the *LT* in several special types of party constellations (more on that below), an alternative construction of the party weights has been suggested by several scholars^v, including—most recently and elaborately—Dumont and Caulier (forthcoming). This way of constructing the party weights ensures that the parties are weighted according to their potential to form a party of the governing coalition. Therefore, parties with different vote shares but nonetheless identical coalitional potential, will have identical weights. This aspect of *BZ* is more amenable to identification of certain broad types of party configurations, as a large set of different seats-share distributions can lead to identical *BZ* values^{vi}. This fact will become clearer in section IV.II. It is important to note that *BZ* and *LT*, despite the difference in notation, are indices of the same format; they differ only in their construction of the weights for each party. This format—the reciprocal self-weighted average format, differs, however, from some of the other formats that have been suggested, such as an entropy-based format due to Wildgen (1971).

The Banzhaf Index

The Banzhaf Index is just one of a class of a priori voting power indices. Others include, *inter alia*, Shapley-Shubik, Coleman and Owen. Voting power indices can be used in any case where “blocs” of votes exist, and it is reasonable to assume that the blocs—at least in terms of voting—are unitary actors, i.e., they vote as a bloc. A voting power index can be applied in any case where there is “weighted voting.” An a priori index requires only 2 inputs: the decision rule and the distribution of vote shares. In our case, the decision rule is simple majority (50% + 1 votes), and the distribution of vote shares is merely the proportion of seats controlled by each party in the parliament.

In this construction, each party is weighted by counting the number of times it is a “swing” voter out of all possible winning (i.e. majority) coalitions (WCs). This number is then normalized by dividing by the total number of swings out of all of the possible

winning coalitions. A party is defined as a swing within the context of a particular (winning) coalition if its removal from a coalition renders an otherwise winning coalition a losing one.

The normalized Banzhaf score is calculated by taking the number of times party i is a swing voter divided by the aggregate number of swings in all possible winning coalitions. For party i the index would be:

$$\frac{\eta_i}{\sum_{i=1}^n \eta_i} = \beta_i, \text{ where } \eta_i \text{ is the number of times } i \text{ is a swing voter.}$$

The final step is analogous to the construction of the effective number of parties (LT):

$$BZ = \frac{1}{\sum_{i=1}^n (\beta_i)^2}, \text{ where } \beta_i \text{ is the normalized Banzhaf score for party } i, \text{ and}$$

replaces s_i as the weight for each party.

This index, BZ , referred to by Dumont and Caulier (2003) as the “effective number of relevant parties^{viii}” can avoid many of the anomalies displayed by LT . In the case of one-party dominance, BZ always gives a value of one (because the only swing voter is the party with the majority of seats), thus avoiding the counterintuitive result displayed in the usage of LT . Moreover, BZ can be calculated using the *very same* data necessary for construction of LT .

An Empirical Comparison of BZ and LT

Comparison of the Two Distributions

Using data from Mackie and Rose (1997) I calculate LT and BZ for 329 post World War II elections in 24 countries. Table 1 provides summary statistics for these calculations. As might be expected I find that the mean is lower for BZ , partly a result of the fact that, as discussed above, it always returns a value of 1 when there is a single party majority. Also, note that standard deviation is higher.

	Table 1			
	Mean	Std. Dev.	Min	Max
BZ	2.83	1.58	1	8.22
LT	3.41	1.25	1.54	8.42
$LT-BZ$	0.58	0.89	-3.76	3.89

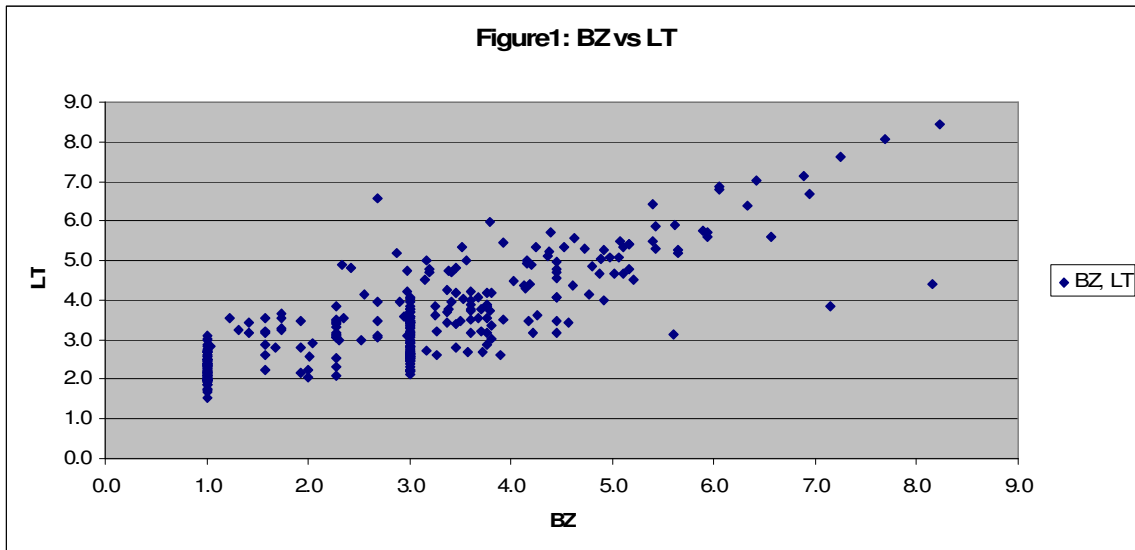
Of course, the difference in the means is highly significant ($p < 0.000001$).

Table 2 displays the (arithmetic) mean values of each of the indices by country as well as the difference between two indexes. Note that in all cases except two, LT is larger than BZ and in these two cases the difference between the two is small. The largest

difference is the case of Japan, at 1.41. The *BZ* score (1.53) seems more representative of reality for the time period covered, for most of which Japan was dominated by the Liberal Democratic Party (the case of Japan will be discussed more thoroughly in the next section).

Table 2

Country	Avg <i>LT</i>	Avg <i>BZ</i>	<i>LT-BZ</i>
Australia	2.50	1.92	0.58
Austria	2.45	2.34	0.12
Belgium	5.08	4.72	0.36
Canada	2.37	1.74	0.64
Denmark	4.57	3.75	0.82
Finland	5.03	4.75	0.28
France	3.41	2.27	1.14
Germany	3.18	3.46	-0.28
Greece	2.19	1.66	0.53
Iceland	3.84	3.38	0.46
Ireland	2.82	2.30	0.52
Israel	4.44	4.50	-0.05
Italy	3.79	3.44	0.35
Japan	2.94	1.53	1.41
Luxembourg	3.30	3.14	0.15
Malta	2.00	1.00	1.00
Netherlands	4.67	4.60	0.07
New Zealand	1.96	1.05	0.91
Norway	3.35	2.30	1.05
Portugal	3.01	2.03	0.98
Spain	2.71	1.93	0.78
Sweden	3.33	2.40	0.93
Switzerland	5.21	4.46	0.74
United Kingdom	2.12	1.30	0.83



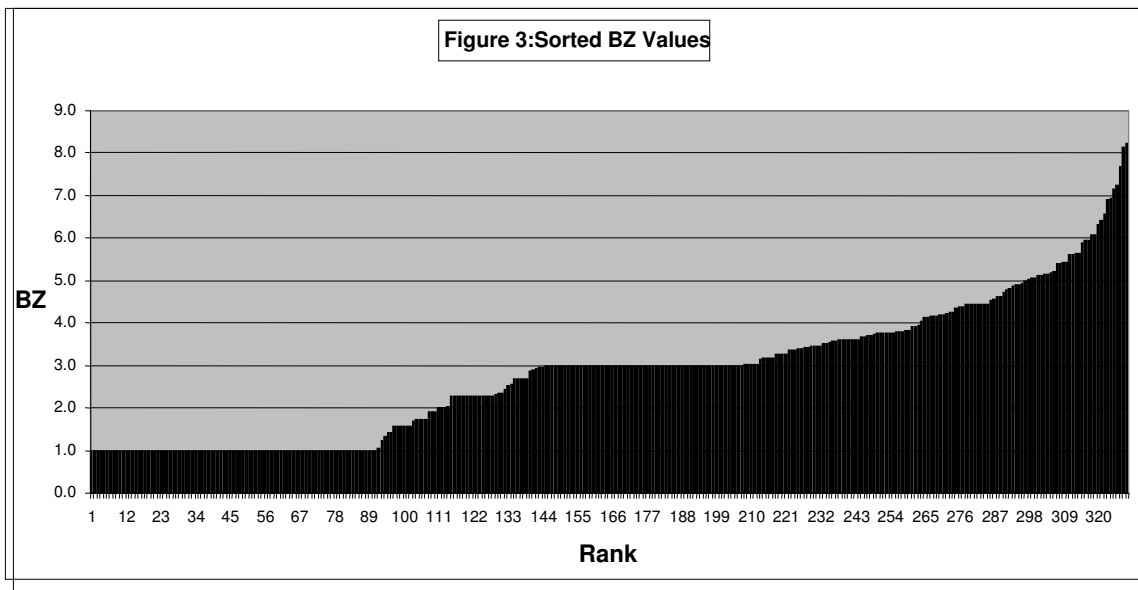
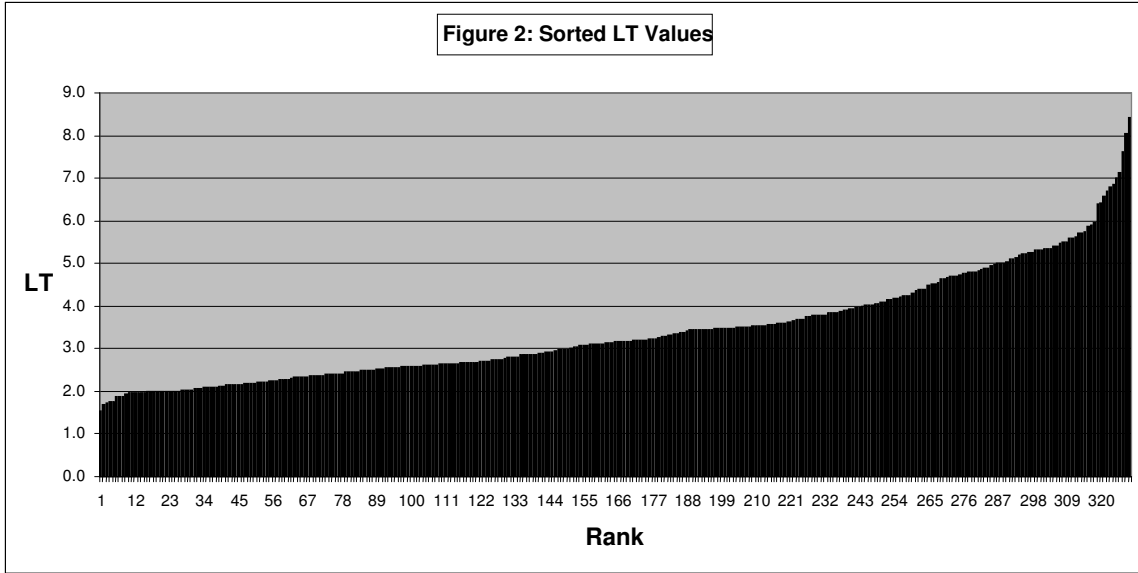
As mentioned above, LT and BZ are highly correlated indices. For this dataset, the coefficient of correlation between the two is 0.84. Moreover, regressing LT on BZ yields the following regression equation: $LT = 1.48 + 0.68 * BZ$ (with the coefficient for BZ significant at $\alpha = 0.001$). While it is not surprising that the indices *are* highly correlated, the more exciting parts are where they differ dramatically and/or systematically.

Above, in Figure 1, we have, for each election in the sample, the value of BZ plotted against the value of LT. First, note that in this case, the assumption of linearity involved in an OLS regression is a reasonable one; aside from extremely low values of the two indices, the relationship appears to be more or less linear. With this scatter plot, the tendency for BZ to indicate certain values becomes apparent. Two cases are of particular importance. This is the case when $BZ=1$ and $BZ=3$ (when there appears to be two vertical “lines” in the data). There are 92 cases of $BZ=1$, and the value of LT, when $BZ=1$, ranges from more than 3 to about 1.5. There are 61 cases in which $BZ=3$, and in these cases LT ranges from about 2 to about 4. Given their frequencies and the systematicity these clusters will be investigated more thoroughly below.

Although, in general, *BZ* is more likely to produce lower values than *LT*, when a country has many parties (like the Netherlands) the difference is slight. However, as is discussed below, there are three particular types of distributions which are likely to produce widely disparate values. These are the case of one-party majority, and the two different cases of a particular (approximately) three-party constellation. However, since super-dominant majorities are rare, then the most realistic one-party majorities are those which are barely majorities—those that are just slightly over 50%. With bare majorities, however, comes an increased likelihood of party seat-shares just *under* 50%. Since two of the three cases where the two measures are most likely to drastically diverge are likely to be present across time in the same electoral environment, it could be the case that the two effects may cancel each other out, and then on average, the effective number of parties may be fairly similar. To summarize, this implies that by using averages across time, we may be under-estimating the true magnitude of the difference between the two measures. This indicates that LT might be better interpreted as the shape of the party system *over time*.

First, in order to be sure that we are dealing with *statistically* different distributions, some sort of non-parametric test is required. Using the Wilcoxon Rank-Sum test, a test in which the null hypothesis is that the two distributions are identical. Using the Wilcoxon test, we obtain $z = 4.73$, which leads to the rejection of the null hypothesis (i.e., the claim that the two distributions are identical) at $\alpha = 0.001$. Therefore, while highly correlated, it is clear that these two indices are measuring different things. It is the remainder of this project to explore—in a systematic way—these differences.

As a first attempt to analyze the systematic differences in the distributions, consider figures 2 and 3.



Figures 1 and 2 contain the sorted values, from smallest to largest, of the LT and BZ distributions respectively. Notice that in the former case, the values of the index are slowly but steadily increasing, reflecting the fact that even very small changes in seat shares will cause a change in the index value. In the case of BZ, however, we can note two wide plateaus in the distribution. These occur at $BZ=1$ and $BZ=3$. There are 92 cases of $BZ=1$, meaning that there are 92 cases (out of 329) where a single party controls the majority of seats^{viii}. Thus, ‘absolute dominance’ is not only theoretically interesting from our point of view, but empirically important as well.

The second plateau arises at $BZ=3$. There are 61 cases where BZ is exactly equal to 3, which can happen if and only if 3 parties share *all* of the possible swings equally among them. In this case, however, there are two different types of party configurations which will yield this index value. The two configurations are one in which there are 3 roughly equally sized parties with many smaller parties (all with absolutely no coalitional potential), and one in which there are two roughly equally sized large parties (with seat shares in the 40% range) and a third, but much small party, which is large enough to form a winning coalition with either of the other two parties.

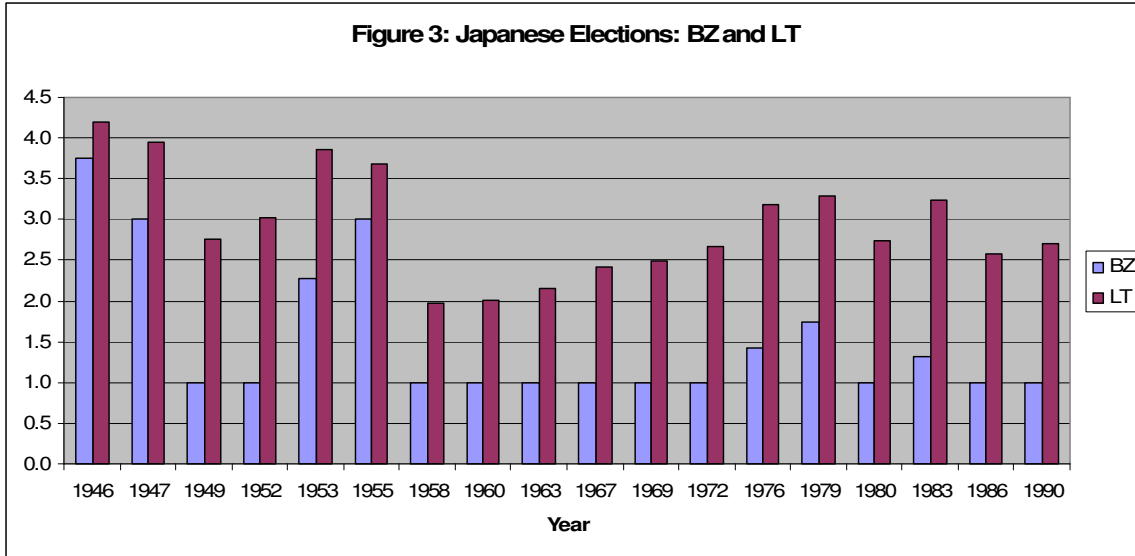
In these three types of party constellations, BZ and LT differ systematically. In the next section, I examine more in depth these three types of party configurations.

Three Illustrative Cases

As we have seen, LT generally yields large values than BZ . In fact, Dunleavy and Boucek (2003) and Molinar (1991) claim that LT exaggerates fragmentation by overstating the number of relevant parties. I will discuss three cases in which LT and BZ differ significantly and systematically. In two of these cases, LT does in fact *always* produce lower values than BZ , but in the third, BZ is quite often larger than LT .

Constellation 1: Single-Party Majority. In this case, in which one party single-handedly has a parliamentary majority, we would expect the number of effective parties to be close to one, as one party presumably has the power to single-handedly push legislation through the parliament. BZ , by construction, takes the value of one if and only if there is a one-party majority. In the case of LT , however, the value under a majority party configuration can be as high as 3 or more. Given its empirical prevalence, then it follows that the method of ‘counting’ political parties in this case can lead to significantly different classification of party systems.

Given that nearly 30% of our cases are of a single-party majority, this case is empirically relevant. For an illustration of the stark differences that obtain under this constellation, I use the example of Japan. In the post World War II period, Japan has been regarded by many as a one-party democracy, with the Liberal Democratic Party (LDP) dominating the political landscape (both electorally and legislatively) until very recently. Our data include elections from 1946 to 1990, and show that, on average, $LT=2.94$ while $BZ=1.53$. This high value of LT is despite the fact that in 11 of the 18 elections held during this period the LDP obtained an absolute majority. In this case, LT is on average nearly twice as high as BZ . Figure 3 displays the BZ and LT values for each of these 18 Japanese elections under consideration. In addition to these important differences in Japan, in the 92 cases in which there is a one-party majority, the LT is larger on average by 1.26 parties.



Constellation 2: Balanced Tri-Partism. In a case where we have 3 medium, roughly equally-sized parties (each with the same number, 2, of swings) and many small, non-pivotal ones, LT is likely to be significantly larger than BZ. Though this type of party configuration is relatively rare (at least in the data analyzed herein), it is an example of the most common critique of LT—that it gives excessive weight to (irrelevant) small parties, thus exaggerating the extent to which the party system is fractionalized. I take for an illustrative example the results from the 1982 elections in the Netherlands, which are displayed in Table 3.

Table 3: Results from the Netherlands Election 1982

Party	Seat Share (%)
Labor Party	31.3
Christian Democratic Appeal	30.0
People's Party for Freedom and Democracy	24.0
Democrats '66	4.0
Pacifist Socialist Party	2.0
Political Reformed Party	2.0
Communist Party of the Netherlands	2.0
Political Party Radicals	1.3
Reformatory Political Federation	1.3
Reformed Political Alliance	0.7
Center Party	0.7
Evangelical People's Party	0.7

For this particular seat-share distribution, $LT=4.02$ and $BZ=3$. LT is greater than 4 despite the fact that only 3 parties (those which are highlighted) have any coalitional potential. Which index is better to use in this situation would largely depend on the context in which it is being applied.

Constellation 3: Unequal Tri-Partism. Though it is typically the case the LT is larger than BZ, this constellation—what I have termed *Unequal Tri-Partism*—will always produce BZ values larger than the LT values. This case is characterized by two large, roughly equally sized parties (with seat shares in the 40% range) and one smaller party that is able to form a winning coalition with either of the other two parties.^{ix} The reason that in this case BZ is higher than LT is that LT is not giving as much weight to the third, smaller party. Though BZ will always be higher in this case, the difference between the two will be less to the extent that there are more (and larger) non-pivotal parties. The size of the non-pivotal parties, taken together, is of course constrained by the restrictions on the three relevant parties.

The two Austrian examples found in Table 4 are typical for this constellation. Moreover, they are typical for the country as well. In fact, 9 out of the 16 Austrian elections in the sample result in this constellation. Always in such a situation BZ=3, and in the Austrian cases of this phenomenon, the LT value ranged from 2.1 to 2.9. However, this constellation manifests itself in other countries as well. In total, there are 36 cases of this in the data, with the BZ being greater, on average, by 0.43 parties.

Table 4: Unequal Tri-Partism in Austria

Party	Seat Share 1970 (%)	Seat Share 1983 (%)
Social Democratic Party	49.1	49.2
Austrian People's Party	47.9	44.3
Freedom Party of Austria	3	7.0
BZ	3	3.0
LT	2.12	2.3

Conclusion

While several scholars have advocated the wholesale replacement of LT, it nonetheless remains the measure that is used in nearly all applications. This is not without good reason. LT provides an easily calculated and readily interpretable unique measure of party system shape. Attempts at modifying the underlying formula to correct for some of LT's alleged shortcomings, such as Wildgen (1971), Molinar (1991) and Dunleavy and Boucek (2003), have been largely unsuccessful. This is because, while they may partially remedy some of LT's limitations, they come with their own set of deficiencies, and are, in most cases, more difficult to construct.

BZ (or, ENRP to use Dumont and Caulier's terminology) is an attempt to merely redefine the weights attributed to each party. These redefined weights are based on the coalitional potential of each party rather than simply on their seat shares. In redefining the weights thusly, the measure takes on correlated, yet in some cases strikingly divergent, values. Given the high degree of correlation between the two measures, for many party configurations the choice between these two indices may not be terribly important. In the three particular configurations (Single-Party Majority, Balanced Tri-Partism, and Unequal Tri-Partism) identified above however, the choice may be quite important, and might very well depend on the context in which the measure is applied. If

one is interested in a phenomenon, such as electoral volatility, which is inherently defined over time, then LT would seem to be a more fitting measure. If, on the other hand, one is interested in an election-specific phenomenon, such as cabinet duration, then BZ is likely to give a more accurate representation of the true state of affairs.

Moreover, depending on which index is used, different conclusions regarding the empirical classification of party systems and the validity of Duverger's Law are likely to be drawn.

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ⁱ This informal use of a priori and a posteriori should not be confused with the distinction between a priori and a posteriori voting power indices, with the former including the Banzhaf index.

ⁱⁱ Additionally, there has been at least one other attempt at an entirely different method of counting the number of parties. Wildgen's (1971) "multipartism" index by multiplying each party's share by its natural log, effectively gives extra weight to small parties.

ⁱⁱⁱ Schofield (1993) also notes the dual nature of party competition. He puts forth a model where "parties are concerned with policy outcomes but choose party positions both with a view to electoral consequences and as a basis for coalition bargaining." Here, Schofield is concerned with *policies*. The reason policy has not been addressed in this paper is because the Banzhaf index is an *a priori* power index, meaning that it treats the formation of all winning coalitions as equally likely. While this may not be ideal from a predictive or case-study standpoint, it has decided advantages for large-N cross-national comparative research. For criticism of the Banzhaf index in this vein see Gelman et al, 2002 and Margolis (1982).

^{iv} Though the basic data required is the same, due to the necessity of identifying *all possible* winning coalitions for each distribution of seat-shares, the computational requirements are greater for BZ. Despite this, there are two websites, which given a seat-share distribution and a decision rule, will automatically calculate voting power indices (including Banzhaf, Shapley-Shubik, Coleman, Zipf, and Owen among others). One website, called Powerslave, is hosted by the University of Turku's (Finland) research group on voting power: <http://powerslave.val.utu.fi/>. Another is run by Dennis and Robert Leech of Warwick University and the University of London respectively: <http://www.warwick.ac.uk/~ecaae/>. In this project, the Powerslave application was used to calculate all of the BZ scores.

^v Independently, Grofman (2006) briefly discusses the possibility of constructing such a measure.

^{vi} While such a situation is theoretically possible in the case of LT, it is highly improbable.

^{vii} The addition of "relevant" is an explicit reference to Sartori's notion of relevance; i.e., a party having either coalitional or blackmail potential.

^{viii} This is, in fact, the *only* way that BZ can ever be exactly equal to one.

^{ix} A further necessary condition is that these three parties are the only with any swings.