Measuring Party System Concentration Including the Cabinet Level

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Eric Linhart & Johannes Raabe [*]

Abstract: *»Die Messung der Konzentration von Parteiensystemen unter Berück-sichtigung möglicher Regierungsbildungen«*. Accurate evaluation of electoral systems requires precise measurement of both the disproportionality and the concentration of party systems. While the measurement of disproportionality has been investigated systematically and clear guidance for measurement exists, such treatment is lacking for the concentration dimension. This paper clarifies the theoretical concept of concentration in focusing on the directness of the voter-government link and differences between types of coalitions. In light of this concept, a new measure is introduced, and the different measures are compared theoretically as well as empirically. In conclusion, the effective number of parties measure provides a fruitful framework, but should be applied to the cabinet instead of the parliament level in order to clearly identify substantial features of party system concentration.

Keywords: Party system, concentration, fragmentation, effective number of parties, electoral systems.

1.   Introduction

When assessing party systems with respect to the performance of electoral systems, researchers are usually concerned with two key dimensions: the (dis)proportionality of the seat distribution relative to the vote distribution and the concentration of the ensuing party system. The first dimension addresses the question of whether the parliament accurately, i.e. proportionally, reflects different voter groups. At its core, the latter examines the type of government

the election results lead to and whether there exists a direct link between voters' choices and government formation (Farrell 2011; Lijphart and Grofman 1984; Nohlen 1984; Raabe and Linhart 2018). In the case of necessary coalition negotiations the direct link would be distorted and government accountability potentially weakened (Powell 2000). Depending on the coalition structure, this distortion can be minor or severe as we will discuss more broadly in section 2. When it comes to the evaluation of concrete electoral systems, we need adequate measures, which allow for both the identification of polar scenarios and accurate distinctions between intermediate outcomes.

While the measurement of the proportionality dimension is relatively straightforward and the differences between various indices have been discussed rigorously (see Gallagher 1991; Lijphart 1994; Monroe 1994; Taagepera and Grofman 2003), the situation is different concerning the concentration dimension. While different measures have been proposed and while the merits of particular measures have been discussed (see, e.g., Golosov 2010; Taagepera 2007, 47-64), there is a critical gap still to be addressed: in particular with an eye on intermediate cases of concentration, we will show how existing measures struggle to clearly distinguish between different types of coalition governments which become feasible after an election – a seemingly crucial requirement for making nuanced judgments about intermediate cases of party system concentration. This paper seeks to tackle this problem by proposing a measurement approach that includes the cabinet level and takes differences between types of coalition governments into account. By subsequently subjecting this new approach and existing alternatives to a comprehensive, systematic comparison with regard to their aptitude to capture key developments of party system concentration, we seek to supply measurement advice. The key requirement characterizing a good measure is considered to be performing well with regard to both the identification of polar and intermediate cases.

Therefore, it is first necessary to clearly define the concept which we seek to measure, the concentration of a party system. The focus here lies on the directness of a voter-government link as a continuous phenomenon (section 2). We then introduce the different indices applied in order to measure party system concentration (section 3) and propose our new measurement approach (section 4). In section 5, we discuss these different measures' strengths and weaknesses in light of the theoretical concept and point out the indices' characteristics with help of selected empirical illustrations. We conclude with a short summary and a discussion of implications (section 6).

2. The Concept of Party System Concentration – What Are We Trying to Measure?

Before considering the measurement of the concept of party system concentration, we need to clearly map out what this concept entails (see Goertz 2008; Sartori 1970). Specifically, we focus on what this concept entails from the perspective of electoral system research since "how we count depends on where we look" (Blau 2008, 167). When the evaluation of an electoral system with respect to the concentration dimension is the task at hand, the central empirical question usually becomes whether or not a single party is able to obtain a majority of the parliamentary seats (Farrell 2011, 10-1). Yet, this empirical question is tied to the more substantial question of whether there exists a direct link between the voters' choices and government formation (Duverger 1984). Based on such a direct link, so the argument goes, voters can hold the government accountable at the next election as they are able to assign responsibility in a straightforward manner (e.g. Powell 2000; Powell and Whitten 1993).[1] Such a direct link is seen as a central benefit of two-party systems – typically emerging in majoritarian electoral systems – which usually produce single-party governments (Hellwig and Samuels 2008, 73). Consequently, its absence in cases where coalition bargaining becomes necessary has been criticized as a drawback of multiparty systems, typically resulting under proportional representation electoral rules (see Fisher and Hobolt 2010). What is central here is that the conceptual focus primarily lies on the cabinet level as opposed to the electoral and parliamentary levels (see also Blau 2008). While the seat distribution in the parliament obviously constrains government formation, the structure of the resulting government and how it affects the voters' ability to hold it accountable are clearly of central interest.

Although the above discussion makes it seem that measurement of party system concentration in light of electoral system evaluation should be fairly straightforward by simply distinguishing between those constellations where one party holds a majority of the seats and all other cases, things are not that easy. Obviously, there are important differences between those 'other' cases where no single-party government ensues (see Mair 2002). Crucially, the concept of party system concentration is not dichotomous but continuous (Rose 1984). If there is no single-party majority, it is of substantial importance how close election outcomes get to the threshold of single-party majority and what types of coalitions are able to form the government. This also, if somewhat implicitly, includes minority coalitions where the governing party (or parties) require additional support from other parties to organize legislative majorities.

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[1] Of course, a plethora of (institutional) factors affect voters' ability to hold governments accountable in practice (Hellwig and Samuels 2008).

The emphasis on the type of support needed is warranted because different types of coalitions imply different levels of directness of the voter-government link. Concerning the question of whether election outcomes clearly lead to government formation and how far voters are removed from the process of selecting who will be part of the government, it is of crucial importance whether one party receives close to 50 percent of the seats and forms the government alongside a small partner with the large party only being vulnerable to a large multiparty coalition – this was the case in the United Kingdom in 2010 where the Conservatives won 47.2 percent of the seats and in New Zealand in 2011 where the National Party missed an absolute majority by just two seats – or whether no party receives such a clear mandate to govern. The latter is the case when there exist many coalition options, multiple of which excluding the strongest party (or even the two strongest parties as was the case in the Netherlands in 2010 and in Israel in 2013) from the government and subsequently force two or even multiple moderately to large sized parties to enter a coalition. Clearly, different sets of coalition options carry very different potential to heavily distort the voter-government link via the stage of coalition formation.

The continuous nature of the concept and the relevance of taking size distributions into account when considering a government's policy output are also highlighted by research on the accountability of different types of coalition governments. It is what Hobolt et al. (2013, 169) term "government clarity" based on the coalition structure that is crucial for the voters' ability to assign responsibility. For example, a coalition between two large parties might make it very difficult for voters to assign responsibility, while a coalition of a large party with a considerably smaller partner, might impose fewer constraints on a voter's ability to do so (see Banaszak and Doerschler 2012; Fisher and Hobolt 2010, 360; Hobolt et al. 2013).[2] Thus, while from an electoral system perspective reaching the threshold of single-party government in any case fulfills the requirement of a direct voter-government link, the absence of a single-party majority does not necessarily suggest the complete absence of said connection. The structure of the possible coalition governments and changes to this structure are therefore important to consider when assessing party system concentration. In sum, the concentration dimension is concerned with the set of government options and the likely size structure of the ensuing government resulting

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[2] The fact that coalition governments might not fully distort a direct voter-government link is also highlighted by the occurrence of pre-electoral coalitions (party blocs typically consisting of a larger party and one or more smaller partners). Voters think of such bloc-coalitions as government options instead of singular parties and then are able to hold these coalitions accountable (Bargsted and Kedar 2009; Gallagher 2005, 562-3; Mair 2002, 106; Shugart 2001, 25-6; Shugart and Wattenberg 2001). Studies of voting behaviour have recently shown that voters do take the structure of possible coalition governments into account when making their choice (e.g. Bytzek et al. 2012; Duch et al. 2010; Hobolt et al. 2013).

from an election with single-party government as one "polar characteristic" (see Sartori 1976, 273, 315).

What we seek to measure is thus not just *whether* but *to which extent* the voter-government link is a direct one. Furthermore, it is the structure of the government which we are ultimately concerned about. Thus, next to the constraining parliamentary seat distribution it is especially the concentration on the cabinet level which lies at the heart of what party system concentration implies. Concretely, an appropriate index for the measurement of party system concentration with regard to government clarity has to fulfill three demands. First, it must clearly distinguish between the cases with completely undistorted voter-government links (i.e. cases with single-party majorities) and the other cases. Second, it should indicate how strongly the voter-government link is distorted for the cases without single-party majorities. And third, it should not suggest variation when there is no substantial difference with regard to the concept. This implies in particular that all cases with fully undistorted voter-government links should be evaluated equally.

3. Measuring Party System Concentration: An Overview of Existing Measures

When it comes to the indices applied to measure the concentration dimension, these stem from a pool consisting of both indices initially devised to measure fragmentation as a more general characteristic of a party system as well as of indices devised for more specific purposes. In this section, we discuss the different measures and the conceptual problems with regard to the concentration dimension which have sparked the development of respective alternatives. In the same spirit, we will later suggest a way of measuring concentration which comes closer to what the theoretical concept implies than existing measures by including the cabinet level in a nuanced fashion.

The different approaches taken so far may be ordered roughly from those indices which focus solely on the parliamentary level to those which take the cabinet level (and therefore the majority threshold) into consideration. The most simple fragmentation measure counts the number of parties holding seats in the parliament, treating all parties as equals (N; e.g. Sartori 1976, 119-20). As this procedure does not take into account the relative size of different parties, alternative measures of fragmentation were devised. Both Rae's (1967) F and Laakso and Taagepera's (1979) "effective number of parties" (from here on referred to as N_{LT}) convey the exact same information about the fragmentation of a party system (see Laakso and Taagepera 1979, 4). However, as N_{LT} has the intuitive interpretation of signaling to the researcher the "number of hypothetical equal-size parties that would have the same total effect on fractionalization of the system as have the actual parties of unequal size" (Laakso and Taagepera 1979, 4), it quick-

ly became the most widely used measure of party system fragmentation (Golosov 2010, 173). N_{LT} takes into consideration the relative size of the parties (via their vote share or, as in this case, seat share s):

$$N_{LT} = \frac{1}{\sum_{i=1}^{N} s_i^2} .$$

It is already well-known that N_{LT} fails to properly identify situations in which a single party holds a large amount of the seats while no other party is coming close to it (see Bogaards 2004; Molinar 1991; Pedersen 1980). As a response to the critique and based on previously proposed alternatives (Dunleavy and Boucek 2003; Molinar 1991), Golosov (2010) has developed a closely related alternative to N_{LT}:

$$N_G = \sum_{i=1}^{N} \frac{s_i}{s_i + s_1^2 - s_i^2} ,$$

where s_1 denotes the seat share of the largest party. The main difference with respect to N_{LT} lies in the fact that in N_G the largest party becomes the reference for the assessment of the relative size of all remaining parties. Thus how these latter parties impact the overall N_G depends not only on their seat shares but important-ly also on their relative seat shares compared to the largest party (Golosov 2010, 183). Due to this computation, N_G does not have quite an intuitive interpretation as N_{LT} in that it provides a measure of the 'effective' number of parties with respect to the largest party which counts as one while smaller parties count as fractions of one based on their relative size compared to the largest party.

Clearly focusing on the majority threshold, Taagepera (1999) has suggested considering only the largest party for an additional measure of party system con-centration, supplementing N_{LT}. Taagepera (1999, 502) tries to alleviate the prob-lem that N_{LT} typically fails to identify one-party-majorities by also reporting the inverse of the share of the largest party:[3]

$$s_1^{-1} = \frac{1}{s_1} .$$

This focus on the predominance of the largest party at least implicitly shifts the focus from the parliamentary to the cabinet level where the key question revolves around whether or not the largest party will be able to form a single-party gov-ernment.

The cabinet level and thus the concrete government options are explicitly in-cluded in measures which are based directly on the decision rule of majority. Viewed in a dichotomous way, and hence largely neglecting the structure of the parliamentary seat distribution, the researcher could simply consider concentra-tion to be present if there is a single-party majority (*SPM*) and to be absent if no single party holds a majority of the seats. Going beyond this simplistic perspec-

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[3]   Taagepera (1999) uses the inverse as it places s_1^{-1} into a common mathematical framework with N_{LT}. Obviously, the information is the same if one simply reports the share of the larg-est party. Shugart (2001, 31-2) also provides a variant of this measure, capturing "majority approximation" by dividing the majority quota of 0.5 by the seat-share of the largest party and assigning the value 1 to all cases where the largest party holds a majority of the seats.

tive, an alternative is to consider the extent to which parties are relevant for government formation. Referring to the notion of the relevance of parties given their coalition viability (Sartori 1976, 122), several authors have suggested to use indices of voting power based on the (mathematical) coalition viability of parties in order to assess their relative weights (see Caulier and Dumont 2005; Grofman 2006; Kline 2009; Taagepera and Shugart 1989, 259). Based on work by Caulier and Dumont (2005) who suggest using the normalized Banzhaf index of voting power,[4] Kline (2009, 264) presents the "effective number of relevant parties":

$$N_{Bz} = \frac{1}{\sum_{i=1}^{N} Bz_i^2} \, .$$

Focusing not only on the largest party but on all parties which are viable for coalition government (by being a swing voter in at least one winning coalition) means taking the majority threshold fully into account. This then pairs the identification of single-party majorities with additional information, especially including stronger consideration of small-sized but pivotal parties (see Sartori 1994, 35).

4. Shifting the Focus to the Cabinet Level: A Modified Measure

Based on the theoretical concept, we suggest including the cabinet level even more strongly. Given the importance of taking the coalition structure into account leads to the question of how concentrated the government will be (see Blau 2008, 168; Carey and Hix 2011, 387-8; Fisher and Hobolt 2010, 364). However, we still aim to measure party systems generally and not the singular governments to which they led under specific conditions. Precisely, we consider the potential coalition size structures and what they imply for eventual government formation. In this way, we will be able to assess election outcomes' implications for government formation by considering which coalition options become feasible after an election instead of only reporting the structure of the actual government.

Staying in the well-established logic of N_{LT}, we measure how fragmented a coalition government is in order to find out which type of coalition voters are confronted with. Specifically, investigating whether voters will be governed by a coalition which consists of one large party and one small partner or by a coalition without a clear leader (e.g. a grand coalition or a coalition of multiple

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[4] The normalized Banzhaf index-score Bz_i of party i is calculated by dividing the amount of times this party is a swing voter in any of the winning coalitions, Sw_i, by the total amount of swing voters existing in all winning coalitions (see Banzhaf 1965): $Bz_i = \frac{Sw_i}{\sum_{j=1}^{N} Sw_j}$. Having a swing means, that a party turns a winning coalition into a coalition without majority when leaving it.

small-to-moderately sized parties), we here apply the effective number of parties measure *within* a coalition C:

$$N_{LT}(C) = \frac{1}{\sum_{\substack{i=1 \\ i \in C}}^{K_C} s_i(C)^2}$$

with K_C denoting the (pure) number of parties in coalition C and $s_i(C)$ denoting the relative seat share of party i in coalition C.[5] $N_{LT}(C)$ thus increases with the number of parties in a coalition, but also with the similarity of these parties' sizes. For example, a senior-junior coalition of party A (holding .41 of the parliamentary seats) and party B (.1) would lead to $N_{LT}(C) = 1.46$, while a grand coalition of two identically-sized partners would lead to $N_{LT}(C) = 2$, and a multi-party coalition of A (.24), B (.19), and C (.16) to $N_{LT}(C) = 2.92$. Obviously, $N_{LT}(C) = 1$ for all single-party governments.

We here use seat shares in order to approximate parties' sizes. An alternative would be to estimate party sizes by their shares of cabinet posts within a government. This option might be more desirable from a theoretic standpoint (Blau 2008; Fisher and Hobolt 2010), but is not applicable practically since distributions of cabinet posts are only observable for actual governments but not for potential ones. As seat shares are a nearly perfect predictor for the share of portfolios (Gamson 1961; Warwick and Druckman 2006) a critique that seat shares are a substitute is only of little empirical relevance.

Being interested in the question of how fragmented a coalition in a certain party system must at least be in order to hold a majority, we denote by $N_{LT}(C)_{min}$ the effective number of parties in the most concentrated winning coalition:

$$N_{LT}(C)_{min} = \min_{C \in WC} N_{LT}(C).$$

This new indicator for party system concentration conveys what is the minimum effective number of parties within a government.

Why do we not focus on actual governments formed (Carey and Hix 2011) but on the most concentrated coalition? Indeed, with a view to actual government formation, considering only the minimal winning coalition with the lowest effective number of parties may be highly misleading as, for example, ideological considerations might render this coalition unlikely. It is important to understand that, nevertheless, the focus on the most concentrated winning coalition leads to the more appropriate measure. Although we formally focus on one specific coalition in choosing the minimum $N_{LT}(C)$ value, this does not mean that we seek to predict the eventual government coalition. On the contrary, the theoretical concept of party system concentration asks for the *potential* that a certain party system structure has for government formation, not for an explanation of why a certain government has formed including further varia-

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[5] Formally, $s_i(C) = s_i \Big/ \sum_{\substack{j=1 \\ j \in C}}^{K_C} s_j$.

bles that are not or only partially influenced by electoral systems. The question, thus, is not how (coalition) governments *did* look like but how they *could* look like when assuming they need support of a majority in a specific parliament. The exclusion of further variables and the focus on the most concentrated government are therefore not shortcomings of our approach but necessary specifications in order to capture the concept optimally.[6]

This approach to measuring the concentration dimension thus promises to provide us with more helpful and easily comprehensible information regarding which types of coalitions may form after an election and to fill this attention gap in the canon of party system concentration measures. In subjecting all here discussed indices measures to an in-depth assessment in light of the theoretical concept, the next section will assess the relative merits of different measures and especially investigate to what extent $N_{LT}(C)_{min}$ is able to deliver on its promise.

5. Comparing Measures as to Their Conceptual Quality

In the following, we will assess the conceptual quality of the different measures with regard to the demands as formulated in section 2. In a first step, we discuss the fulfillment of these demands rather from a theoretical standpoint but at the same time illustrate our arguments using an empirical application based on a large-n dataset (the parlgov dataset provided by Döring and Manow 2012) which includes complete results for all parties winning seats of 549 parliamentary elections in 34 OECD countries. In a second step, we deepen the comparison by focusing on selected country cases – the United Kingdom, Germany, and the Netherlands – which provide a broad sample of party systems covering polar and intermediate levels of party system concentration. With a rather concentrated (UK), an intermediate (Germany), and a fragmented (Netherlands) party system, we trace mechanisms of single indices and show that our newly

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[6] As an aside, with a conscious exclusion of variables beyond concentration like policy aspects, $N_{LT}(C)_{min}$ is completely in line with hitherto existing indices. In a three-party system with parties of equal size, for example, neither N_{LT} nor N_{Bz} ask whether or not all two-party combinations are likely, but just result in the number of 3. Apart from the theoretical argument, empirical applications show that $N_{LT}(C)_{min}$'s formal focus on one specific, the least fragmented, government option does not prevent it from supplying information about a party system's concentration more generally. Further data analyses on the basis of the parlgov dataset (Döring and Manow 2012, see section 5) show that for cases in which no single-party majority ensues, the median difference between $N_{LT}(C)_{min}$ and $N_{LT}(C)$ of the second most concentrated coalition is a mere .05 with only ten percent of the cases leading to a difference higher than .28. Furthermore, there is virtually no correlation (r = .02) between $N_{LT}(C)_{min}$ and the difference between $N_{LT}(C)_{min}$ and N_{LT} of the second most concentrated coalition, meaning that the index is as reflective of multiple government options in fairly concentrated systems as it is in highly fragmented ones.

proposed index is better able to detect significant changes in party system developments than traditional indices are for most different cases.

5.1 Theoretical Discussion and Illustration on the Basis of a Large-n Dataset

5.1.1 Clear Identification of Cases with Single-Party Majorities

We start the discussion of the indices' conceptual quality with the question of whether or not they are clearly able to differentiate between the cases with single-party majorities and those without. For the sake of completeness, we shortly also refer to obviously overly simplistic measures like N and SPM.

It is well-known already that N_{LT} does not indicate single-party majorities with a clear value or range of values (e.g., Taagepera 1999; Golosov 2010). While N_{LT} generally becomes smaller when party system concentration rises, it is easy to construct examples showing that the N_{LT} value for a party constellation with a single-party majority may be larger than the effective number of parties in a constellation where a coalition is needed to form a majority. For example, in a three-party system with the seat shares (.48, .47, .05), $N_{LT} = 2.20$; in a six-party system (.54, .13, .11, .09, .07, .06), $N_{LT} = 2.97$. Also the simple number of parties, N, by and large, increases in higher fragmented party systems. The same example shows that for N a clear cut point does not exist either. A computation of N_G values for this example results in 2.16 for the three-party system without single-party majority and in 2.21 for the six-party system with. The conceptual similarity between N_{LT} and N_G, thus, is reflected by both indices' disability to detect cases with single-party majorities.

The remaining measures remedy this problem. This is obvious for the dummy variable SPM which takes the value of 1 by definition if a single party holds a majority and 0 if this is not the case. Also s_1^{-1} clearly suggests when there is a single-party majority. This is the case once s_1 is larger than .5 and thus s_1^{-1} is below 2. Conversely, if the strongest party does not hold an absolute majority of the seats, $s_1 \leq .5$ and $s_1^{-1} \geq 2$.

N_{Bz} and $N_{LT}(C)_{min}$ share the property of taking on the value of 1 in cases with single-party majorities.[7] Then, only one party is needed to form a winning government. Thus, this party is the only one getting a 'swing point,' whereas all other parties hold a Banzhaf value of 0. Applying the effective number of relevant parties to such a situation, this leads to $N_{Bz} = 1$. Conversely, $N_{Bz} = 1$ can only occur if there is a single-party majority. If there is not, this means that at least one minimal winning coalition with at least two parties exists. As a consequence, at least these two parties get 'swing points' and, thus, $N_{Bz} > 1$.

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[7] For N_{Bz} see already Caulier and Dumont (2005).

Similarly, $N_{LT}(C)_{min} = 1$ if (and only if) one party holds an absolute majority. This party, then, may form a winning 'coalition' on its own, and $N_{LT}(C)$ equals 1 for this coalition, what is also the possible minimum. On the other side, if there is no single-party majority, all winning coalitions include at least two parties with $s_i > 0$. Therefore, $N_{LT}(C)$ is larger than 1 for all these coalitions and hence the minimum, $N_{LT}(C)_{min}$, will be too.

Thus, while SPM, s_1^{-1}, N_{Bz}, and also the newly introduced $N_{LT}(C)_{min}$ all clearly signal when the voter-government link is completely undistorted, N, N_G, and the often used N_{LT} measure are unable to clearly identify this polar case of full concentration.

5.1.2 Omission of Meaningless Variation within Single-Party Majority Cases

The second criterion which we formulated refers to variation within the single-party majority cases. Since all these cases share the characteristic that the voter-government link is fully undistorted, variance within these cases is meaningless in the sense of the concept and thus should be avoided. Furthermore, within-group variation is problematic for technical reasons. Assume the existence of a cut point x that divides all cases in those with and those without single-party majorities, and assume further, without loss of generality, that the single-party majority cases are represented by values smaller or equal to x. If three party systems with index values $x–2\varepsilon$, x, and $x+\varepsilon$, are compared, obviously the first two are identical with respect to governance clarity, whereas this index would suggest a higher similarity of party systems 2 and 3. In particular, the usage of such an index in statistical analyses could therefore be highly misleading.

We showed in section 5.1.1. that N_{Bz} and $N_{LT}(C)_{min}$ take the value of 1 if and only if one party holds an absolute majority of the seats in a parliament. This means that there is no meaningless variation within this group for these two indices. Obviously, the same is true for the dummy indicator SPM.

On the other hand, while s_1^{-1} is able to clearly discriminate the cases with single-party majorities from the others, it is confronted with the problem of meaningless variation as it depends on the exact seat share of the strongest party. A lack of a clear cut point, as it is the case for N, N_G, and N_{LT}, automatically results in variation within the single-party majority category, too.

In order to illustrate this argumentation, we contrast results of those indices which do not vary within the single-party majority cases (N_{Bz} and $N_{LT}(C)_{min}$) with those that do (N, N_G, N_{LT} and s_1^{-1}).[8] The results base on the parlgov dataset as described above.

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[8] We do not show results including the dummy variable *SPM*.

Figure 1: Comparing Different Measures Empirically
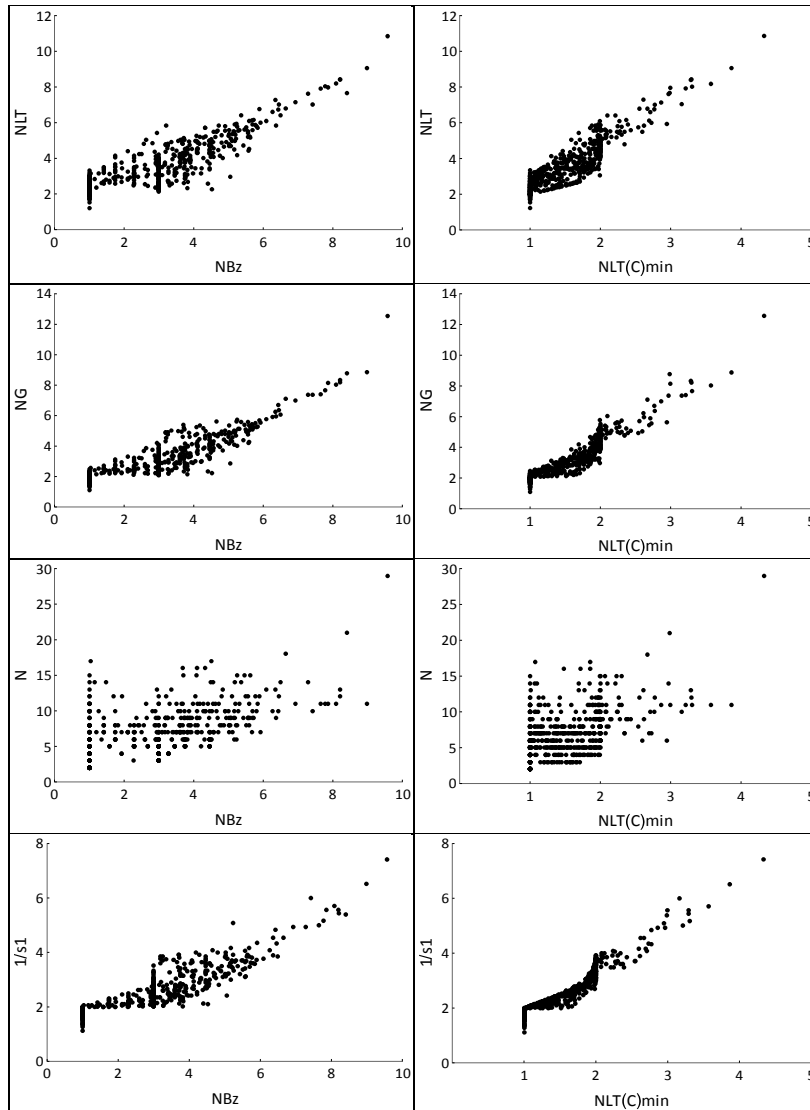
Notes: Summary statistics (549 cases) are the following: N_{LT}: mean = 3.57 (standard deviation = 1.35); N_G: 3.15 (1.37); N_{Bz}: 2.97 (1.64); N: 6.93 (3.28); s_1^{-1}: 2.56 (.83); $N_{LT}(C)_{min}$: 1.53 (.52).

Figure 1 highlights the discussed structural differences empirically. The meaningless variation can be detected where N_{Bz} and $N_{LT}(C)_{min}$ equal 1. The respective vertical lines indicate that party systems with single-party majorities take

N_{LT} values between 1.22 and 3.33. Strikingly, also one third (139 of 410) of the cases without single-party majorities lie in this range and thus cannot be separated from the single-party majority cases with the help of N_{LT}. Comparing the most fragmented (according to N_{LT}) party system with a single-party majority (Lithuania after the 1996 elections) with the most concentrated (Malta in 1945), N_{LT} would suggest that 496 party systems are more similar to Lithuania in 1996 than Malta in 1945 was – including 358 of the 410 party systems (87.3 percent) without single-party majorities. Whereas these results might make sense regarding general party system patterns, they are highly misleading when it comes to the measurement of governance clarity. The empirical application underlines that meaningless variation is not a mere theoretical problem.

Figure 1 shows that N_G and N are confronted with this problem in a similar way but to different degrees. Whereas it is not surprising that we get almost no information about governance clarity from N, N_G reduces the problems just discussed. Here, the vertical lines at N_{Bz} and $N_{LT}(C)_{min} = 1$ are shorter, i.e. the meaningless variation here is smaller compared to the whole index variation. Indeed, N_G only ranges from 1.11 to 2.48 for single-party majority cases, and only 86 of the cases without single-party majorities take N_G values within this range, too. However, N_G likewise indicates a higher similarity between Lithuania in 1996 and two thirds (274; 66.8 percent) of the cases without single-party majorities, than between Lithuania in 1996 and Malta in 1945.

Finally, Figure 1 illustrates the hybrid character of s_1^{-1}. The value of 2 clearly separates the party systems with single-party majorities from those without. As a consequence, no party system without a single-party majority can be found in the range between 1.11 (again Malta in 1945) and 1.99 (the United Kingdom after the elections of October 1974). However, searching for cases without single-party majorities and which s_1^{-1} indicates as more similar to the case of the UK in October 1974 than Malta in 1945, we again find 259 such party systems, which is more than three fifths (63.2 percent) of the cases without single party majorities.[9]

5.1.3 Meaningful Variation for Party Systems without Single-Party Majorities

Focusing on the third criterion, it is obvious that all indices but *SPM* provide variation for the cases without single-party majorities. This variation is already shown in the different panels of Figure 1. The important question, therefore, is

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[9] Of course, one could force such a measure to take on a common value for single-party majority cases (see Shugart 2001). Such a modified index is not confronted with the problem of meaningless variation for these cases. However, it still fails to capture differences between cases without full government clarity in a meaningful way, as we will show in sub-section 5.1.3.

in which terms this variation is meaningful. Are the indices able to differentiate systemically between completely fragmented party systems in which only grand or multi-party coalitions own majorities, and moderately fragmented party systems in which still two-party senior-junior coalitions are possible?

A further look at Figure 1 reveals that, apart from N, the indices highly correlate with each other. While pairwise correlations including N lie between r = .48 (with $N_{LT}(C)_{min}$) and r = .64 (with N_{LT}), the correlations excluding N range from r = .87 (N_{LT} and N_{Bz}) to r = .98 (N_G and s_1^{-1}). These high correlation values are misleading in the sense that one could believe that all indices but N evaluate the fragmentation of party systems more or less identically. Figure 1 shows that this is indeed true for highly fragmented party systems. On the other side, we see that different indices lead to different interpretations about which party systems come closest to the polar cases of single-party majorities. Most distinctly, this can be seen in the upper right panel where the cases cluster between $N_{LT}(C)_{min}$ = 1 and 2. This observation is supported by correlation measures: While the correlation between $N_{LT}(C)_{min}$ and N_{LT} equals .92 for all cases, it goes down to .85 for the 499 more concentrated party systems with $N_{LT}(C)_{min} \leq 2$ and further shrinks to .69 for the 292 cases with $N_{LT}(C)_{min} \leq 1.5$. This means that, despite generally high correlations, the indices are not replaceable by each other. Since $N_{LT}(C)_{min}$ is explicitly constructed in order to accurately capture party system differences with respect to possible cabinet fragmentation, this further demonstrates that the other indices are only partially able to accurately measure governance clarity.

Two stylized examples of hypothetical party systems (Table 1) strengthen this argument. In the first example, a senior-junior coalition is still possible, namely that between the strongest and the third party, and no two-party winning coalition can be formed against the strongest party. This party system can therefore be interpreted as one in which government clarity is at least partially given. On the contrary, in the second example each combination of two of the three strongest parties could form a winning coalition, so that the question of which parties are in the government depends more strongly on the parties' negotiations there. Further, although a coalition between the strongest and the third party still is kind of senior-junior, the strongest party's leadership is less distinct than in the first example, and the respective cabinet can be assumed to be more fragmented.

Table 1: Index-Values for Stylized Examples

Parliamentary seat shares	N	N_{LT}	N_G	N_{Bz}	$N_{LT}(C)_{min}$	s_1^{-1}
(.38, .36, .13, .11, .02)	5	3.30	3.04	3.76	1.61	2.63
(.45; .26; .25; .04)	4	2.99	2.47	3.00	1.85	2.22

The stylized example shows that the indices (partially) based on the parliamentary level, N, N_{LT}, N_G, N_{Bz} and s_1^{-1}, fail to capture this argumentation. They all

suggest a lower level of fragmentation for the second example. However, $N_{LT}(C)_{min}$ accurately indicates the latter scenario as more fragmented by focusing on the cabinet level. Thus, $N_{LT}(C)_{min}$ does not only clearly signal when there is a single-party majority (value equals 1) but also gives an indication as to how close to this polar situation the actual government can maximally come. Further, for some cases it uncovers information which the other indices are unable to detect and therefore strongly adds to our understanding of the structure of the party systems. As an aside, even the supplement approach by Taagepera (1999, 502), hoping that the usage of both N_{LT} and s_1^{-1} balances out each other's weaknesses, still fails to provide us with the needed information about the cabinet level as the examples in Table 1 show.[10]

5.2 Three Illustrative Country Cases

Next to an overall empirical discussion of the different measures and stylized examples such as those shown in Table 1, a complete assessment demands a closer look at important nuanced differences by considering specific, factual cases. Therefore, this sub-section seeks to deepen the comparison by focusing on the selected country cases of the United Kingdom, Germany, and the Netherlands, which provide for a broad sample of party systems covering polar and intermediate levels of party system concentration. We show that our newly proposed index is better able to detect significant changes in party system developments between 1945 and 2010 than traditional indices. For the sake of parsimony, we from here on omit the overly simplistic measures N and SPM. Further, we do not continue discussing N_G as this index is so closely related to N_{LT} that all conclusions with respect to N_{LT} can be read to also hold for N_G with the only difference being that N_G tends to report a slightly lower effective number of parties where one party is especially large.

5.2.1 The United Kingdom

The significant changes – from the electoral system perspective – to the party system of the United Kingdom occurred in 1974 (February) and in 2010, when the elections did not lead to single-party majorities but to 'hung parliaments' forcing coalition negotiations. As discussed in section 5.1, both N_{Bz} and $N_{LT}(C)_{min}$ will clearly signal once a party system deviates from full concentration and thus do so for the British case (see Figure 2). While N_{LT} each time suggests that the party system has become more fragmented compared to the last legislature, N_{LT} does the same for, e.g., 1955, 1992, and 2005 where each

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[10] This is not meant to be a general critique. More general indices like N_{LT} are highly appropriate to measure party system concentration from other perspectives such as an indicator of party system consolidation in new democracies (see, e.g., Olson 1998) or as a result of the impact of political cleavage structures (e.g., Ordeshook and Shvetsova 1994; Coppedge 1997).

time a single-party majority existed. N_{LT} also suggests higher levels of fragmentation after the 2005 election than after the 1974 (February) election, although the voter-government link was distorted in 1974 but not in 2005. Furthermore, N_{LT} suggests no change between the two elections in 1974 whereas the October election actually provided a single-party majority and thus marked a tremendous development from the standpoint of the theoretical concept.

Figure 2: Different Indices for the United Kingdom
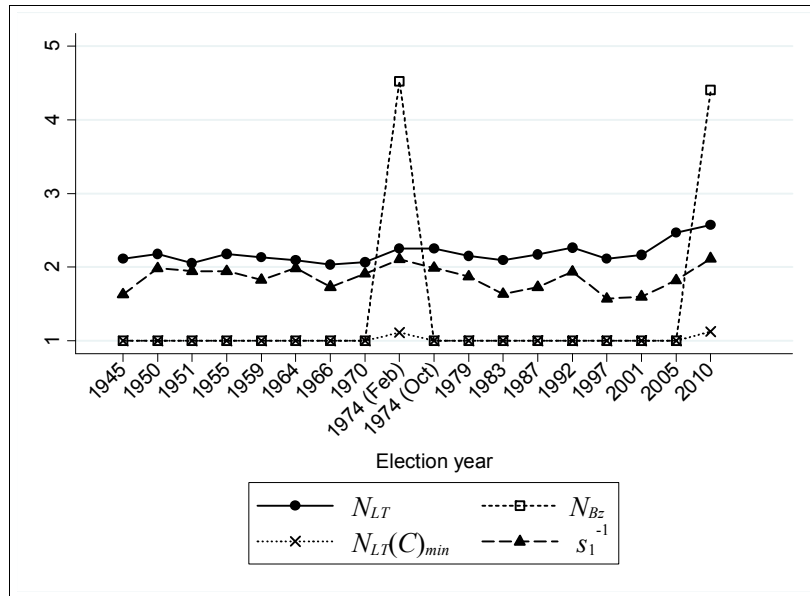
While able to signal full concentration, looking at specific elections highlights how the N_{Bz} measure is prone to overestimate the diminishing effect on party system concentration caused by the presence of small parties. The spikes in Figure 2 emphasize that N_{Bz} often suggests very low levels of concentration where actually one party has received a large bulk of seats and is able to govern with very little additional support due to the presence of multiple potential junior partners. In this rather extreme tendency, N_{Bz} actually suggests a full breakdown of concentration in 1974 (February) and in 2010, making the UK party system seem similar to that of the Netherlands (see Figure 4) although each time the largest party held close to 50 percent of the seats and could govern in a senior-junior coalition.

This structural aspect is accurately and clearly reflected by $N_{LT}(C)_{min}$ and s_1^{-1} which each signal only a minor but important change to the party system with respect to its concentration. s_1^{-1} and $N_{LT}(C)_{min}$ thus both capture the important

change to a hung parliament but also signal that there is potential for a rather lopsided senior-junior coalition government. For the UK case, s_1^{-1}'s ignorance towards all parties except the largest does not lead to a problematic empirical performance as indeed in each case where there was no single-party majority, a relatively small partner was available to form a government. However, the UK case does highlight that with respect to the concept of party system concentration s_1^{-1} suggests variation where no meaningful changes occur (e.g., between 2001 and 2005, s_1^{-1} varies while each time a single-party majority exists). Such non-meaningful variation can be especially misleading if one compares changes in s_1^{-1} without considering the majority-threshold: one could, for example, believe that the British party system changed more between 1945 and 1950 than between 1970 and 1974 (February) by looking at absolute changes. From an electoral system perspective, quite the opposite is true.

5.2.2 Germany

As regards the German party system as a moderately fragmented case, major changes to be considered are the development from a multiparty to a three-party system between 1949 and 1961, a stable phase with two larger and one smaller party until 1983 and the electoral success of two further parties thereafter. Special cases regarding party system concentration are the single-party majority of the Christian Democrats (CDU/CSU) in 1957 as well as the party system after the 2005 election which made any two-party senior-junior coalition impossible for the first time since 1949 (see Figure 3).

First, while all measures are able to capture the dramatic increase in concentration following the first election in 1949, N_{LT} again fails to identify the presence of a single-party majority in 1957 and cannot distinguish that election from those between 1969 and 1976. Second, N_{Bz} highlights the stability of the amount of coalition viable parties between 1961 and 2002. Yet, in neglecting size structure, N_{Bz} fails to recognize crucial developments regarding the type of coalition government in suggesting a constant level of concentration. For instance, it is unable to distinguish between the 2009 and, for example, the 1969 elections where s_1^{-1} and $N_{LT}(C)_{min}$ highlight that the largest party needed considerably more support in 2009. Third, considering the important change of coalition structure in 2005, Figure 3 shows that while N_{LT} suggests less concentration in 2009, s_1^{-1} and, even more so, $N_{LT}(C)_{min}$ and N_{Bz} suggest otherwise and thus are able to capture the increase in party system concentration based on coalition structure.

Figure 3: Different Indices for (West) Germany
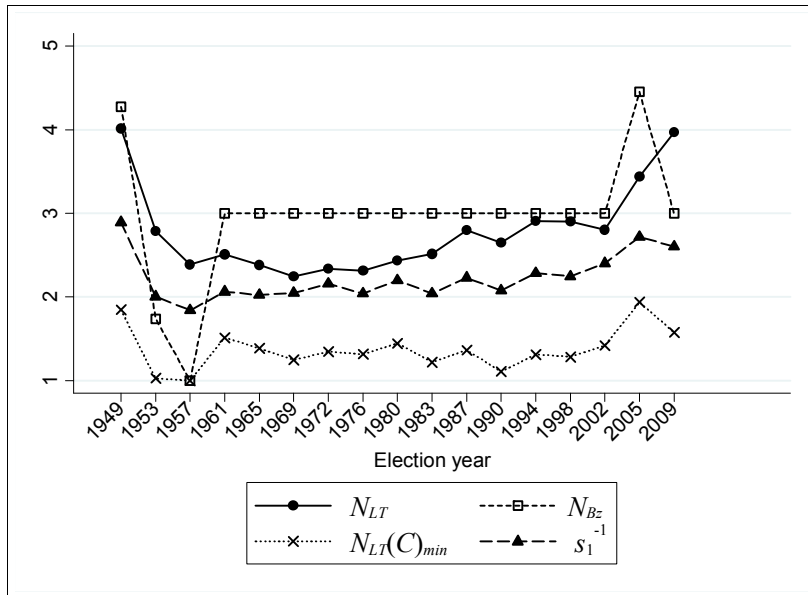
Finally, Figure 3 also shows the subtle but important differences between $N_{LT}(C)_{min}$ and s_1^{-1}. The development of the German party system between 1961 and 1969 highlights how s_1^{-1} might miss important developments concerning coalition structure by taking into account only the largest party. In this period, the Free Democrats (FDP) went from holding 13.4 percent of the seats in 1961 to only 6 percent in 1969 – while the stability of the s_1^{-1} scores suggests that the largest party in each case would only need a rather small partner to form a winning coalition, the decrease of $N_{LT}(C)_{min}$ conveys that the best-case senior-junior coalition became more and more lopsided over time. Furthermore, the relative stability of s_1^{-1} and the increase of N_{LT} from 2005 to 2009 highlight that a failure of the supplement-approach is not merely a theoretical problem – this approach would not capture the important development of coalition possibilities while $N_{LT}(C)_{min}$ does.

5.2.3 The Netherlands

The Dutch party system has always been rather fragmented and multiparty coalitions have been the norm. The entrance of new parties (especially during the 1960s) as well as party-mergers (e.g. the Christian Democratic parties KVP, ARP, and CHU merging into the CDA before the 1977 election) influenced the

overall structure of the party system. In 2010, five parties were each holding between 10 and 20.7 percent of the seats.

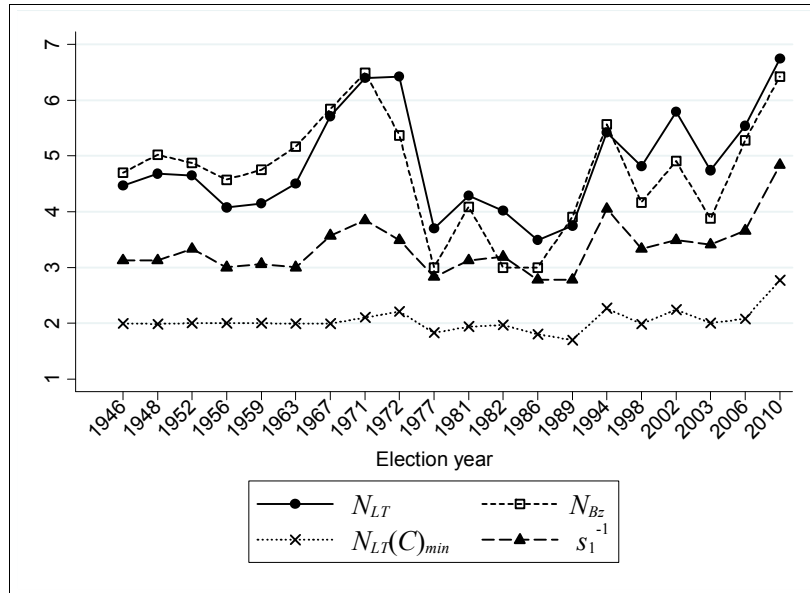**Figure 4:** Different Indices for the Netherlands

Figure 4 shows how the different measures disagree as regards the early development of the party system: between 1946 and 1967, $N_{LT}(C)_{min}$ suggests high stability of party system concentration, while N_{LT} and N_{Bz} show that the effective number of (relevant) parties varied widely on the parliamentary level. s_1^{-1} highlights variation with regard to the largest party. While during this timeframe the party system became more fragmented (as captured especially by N_{LT}), the coalition structure basically remained stable: from 1946 to 1967 a winning coalition would have either had to include the two largest parties or needed multiple at least moderately sized parties and thus a high level of government-fragmentation was necessary in each case. For example, in 1956 the most concentrated winning coalition would have been a PvdA-KVP grand coalition (N_{LT}(PvdA-KVP) = $N_{LT}(C)_{min}$ = 2), the second most concentrated coalition option would have been a PvdA-led four-party coalition consisting of 2.02 effective government parties. Similarly, in 1963 a KVP-PvdA grand coalition would have been the most concentrated option (N_{LT}(KVP-PvdA) = 1.99) with the second most concentrated option being a five-party coalition this time being led by the KVP and consisting of 2.02 effective government-parties. These findings also highlight that the clustering of $N_{LT}(C)_{min}$ around the 2-mark

is not based solely on grand coalitions usually consisting of about two effective parties. It again shows, in contrast, that $N_{LT}(C)_{min}$ does not strongly depend on one certain – maybe unrealistic – potential coalition but captures the fragmentation structure of potential coalition governments more generally.

The situation of the party system moderately changed in 1971 which marked the first election where a coalition between the two largest parties was not possible anymore (the Social Democrats [PvdA] and the KVP combined for only 49.3 percent of the seats). Thus, in light of the theoretical concept, $N_{LT}(C)_{min}$ signaling stagnation with respect to party system concentration seems warranted in this case and enables the researcher to clearly detect changes to the cabinet level such as that from 1967 to 1971. On the contrary, the other indices signal a more pronounced change from 1963 to 1967 whereas the coalition structure hardly differed. Obviously, as regards the pool of potential government parties, N_{LT} and N_{Bz} clearly signal changes to this pool while $N_{LT}(C)_{min}$ (especially before 1977) clusters at the 2-mark suggesting that even the ideal scenario would lead to a low level of concentration on the cabinet level.

After this period, all measures capture the important changes of the concentration of the Dutch party system in 1977.[11] There is another (minor) disagreement between measures going from the 1981 to the 1982 election: while N_{LT} and N_{Bz} suggest an increase in party system concentration, s_1^{-1} and $N_{LT}(C)_{min}$ signal the opposite. Here, the former measures react to the success of the VVD (24 percent) which joined the PvdA (31.3) and the CDA (30) as a third major party and the relative decline of the liberal D66 (11.3 in 1981 vs. 4 in 1982). Yet, the latter measures signal no meaningful change as the largest party (or the second largest, for that matter) would still need the support of an almost equal sized or multiple moderately to small sized partners. After 1982, then, all measures are very much in agreement about the development of the party system.

6.   Conclusion

Crucially, the electoral system perspective shifts our attention to the cabinet level and highlights the importance of coalition structure. The above investigation illustrates that with measuring concentration accurately the devil is in the detail. In our theoretical part, we elaborated three demands which an index should satisfy in order to accurately measure party system concentration from an electoral system researcher's perspective. While indices like N_{LT} and N_G are able to paint clear pictures of the parliamentary level, they lose much of their viability as one tries to make inferences about the possible structure of the

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[11] The 1977 election marked the first postwar election in which it became at least possible for a larger party to govern alongside a considerably smaller partner as the PvdA (35.3 percent) or the CDA (32.7) could have reached a majority via the support of the liberal VVD (18.7).

ensuing government. Table 2 summarizes in how far the indices under research in this paper fulfill our demands and shows that only our newly introduced measure $N_{LT}(C)_{min}$ meets all three demands.

Strikingly, the well-established N_{LT} measure fails to satisfy any of the criteria. In terms of a substantial interpretation, it is often unclear what a decrease in N_{LT} actually implies for the cabinet level and thus for the directness of the voter-government link. The same is true for related indices like N_G. N_{Bz} especially suffers from largely neglecting parties' relative sizes. Therefore, a shift in N_{Bz} does not convey much information as to how the government may look like based on the election outcomes and, as the UK example highlights, N_{Bz} may exaggerate developments of concentration.

Table 2: Summary of the Key Results

index	clear identification of single-party majority cases	no meaningless variation within the single-party majority cases	meaningful variation within the cases without single-party majorities
N	no	no	no
N_{LT}	no	no	no
N_G	no	no	no
N_{Bz}	yes	yes	no
$N_{LT}(C)_{min}$	yes	yes	yes
SPM	yes	yes	no
s_1^{-1}	yes	no	no

While, as expected, the simplistic N is useless in the light of the theoretical concept, the even simpler SPM meets at least two of three demands. However, it importantly misses to differentiate between moderately and totally fragmented party systems. The meant-to-be supplement s_1^{-1}, on the other hand, is clearly able to identify single-party majority cases but is not helpful regarding the further criteria.

$N_{LT}(C)_{min}$'s properties have shown to be well-suited for measuring party system concentration. The index could be shown to fulfill the demand of capturing key developments within party systems by distinguishing between polar (single-party majorities, highly fragmented governments) and intermediate (senior-junior coalitions) levels of concentration. $N_{LT}(C)_{min}$ reports the best concentration level attainable, distinguishing clearly between types of coalitions, and assigns the same value to all cases of full concentration. Thinking about voters trying to ascribe responsibility, $N_{LT}(C)_{min}$ yields the minimum number of hypothetical equal-sized parties which voters have to consider when assigning responsibility to parties and evaluating the government. In sum, we advocate moving away from the almost universal application of N_{LT} and suggest using $N_{LT}(C)_{min}$ for measuring party system concentration when evaluating electoral systems, as $N_{LT}(C)_{min}$'s focus on the cabinet level renders it more apt to also identify more nuanced differences between intermediate levels of concentration.

For electoral system research, the potential advantages of applying a cabinet-focused measurement approach are quite clear. For a more nuanced understanding and evaluation of institutions such as electoral systems trying to balance competing demands of representation and concentration, taking coalition structure into account should yield a clearer picture of how such systems perform with respect to both key dimensions of electoral systems. Furthermore, by capturing crucial developments which go beyond the simple distinction between single-party majorities and highly fragmented systems, the proposed measurement approach could also help to increase the precision of analyses of, for example, government stability based on party system concentration (see also Somer-Topcu and Williams 2008).

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