Measuring party nationalisation: A new Gini-based indicator that corrects for the number of units

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The study of the territorial distribution of votes in elections has become an important field of the political party research in recent years. Quantitative studies on the homogeneity of votes and turnout employ different indicators of territorial variance, but despite important progresses in measurement, many of them are sensitive to size and number of political parties or electoral districts. This article proposes a new 'standardised party nationalisation score', which is based on the Gini coefficient of inequalities in distribution. Different from previous indicators, the standardised party nationalisation score weights for the sizes of territorial units (such as electoral districts) within a country, and considers the different numbers of territorial units in different countries.

Introduction

The question how national – or how territorialized – politics, and more particularly party politics are, has attracted increasing scholarly interest in recent years. The subject has a particular importance because territorially based parties might "demand distinctive treatment for that region, at levels from the co-operative sharing of powers by federalism up to and including 'national' independence." (Rose/Urwin 1975: 46). *Party nationalisation* is high if party support is equally distributed across the territory of a country. Hence, a political party that is perfectly nationalised would be equally strong in all territorial units of a country, no matter how they are drawn.[1] Usually, for the measure of party nationalisation, we will rely on territorial units that are defined through administrative boundaries, such as provinces, districts, municipalities, neighbourhoods, or even streets. Differences might occur at different levels of aggregation, thus between provinces, or within provinces, between municipalities, and so on. The nationalisation of the party system as a whole is an aggregated measure for the territorial homogeneity of support of all the parties included in the sys-

[1] See Stokes (1967), Claggett et al. (1984), Jones and Mainwaring (2003), Caramani (2004), or Ishiyama (2002). Related terminologies describe, sometimes more, sometimes less explicitly the idea of looking at heterogeneity across electoral districts, speaking of party aggregation (Chhibber/Kollman 2004; Allik 2006), district heterogeneity (Morgenstern/Potthoff 2005), or cross-district linkage/party-linkage across districts (Cox 1999, 1997: 181; Hicken 2005; Moenius/Kasuya: 2004), referring to the idea that locally based candidates (mainly in single-seat district systems, cf. Cox 1997: 181) join national political parties.

tem. This article discusses problems of measurement of party nationalisation and provides a new indicator that avoids possible biases.

Quantitative comparative studies rely on valid indicators to measure empirical reality. Measuring party nationalisation appears to be a particularly delicate issue. In my understanding, the concept of party nationalisation addresses the territorial heterogeneity of party support. Therefore, measures of party nationalisation should only vary as a function of the territorial variance of the votes and be influenced as little as possible by other, external factors. Measures of party nationalisation calculate an indicator of territorial heterogeneity for electoral results of political parties over territorial units (such as regions, municipalities, or electoral districts). Many simple measures appear useful for the comparison of territorial heterogeneity of electoral support for parties of similar sizes, and if electoral results are aggregated in a similar number of similarly-sized territorial units. However, in most cross-country studies, parties will vary in size, and our data will be aggregated in a different number of differently-sized territorial units. This article shows that previous indices of party nationalisation might be affected by the number and size of political parties and by territorial units. For instance, in the case of the Hungarian 1998 elections (single-seat district part), if the nationalisation of the party system is calculated at the level of 20 regions, the score shows a rather high value of 0.87. Exactly the same electoral results, aggregated at the level of 176 electoral districts, would result however in a score of 0.723, which seems low compared to most other countries of the region. Hence, results heavily depend on the data which are used for a comparison, and the number of territorial units. This might be a problem for certain research designs. Eye-catching examples for this problem are studies that are interested in the impact of electoral systems on party nationalisation (Cox/Knoll 2003; Nikolenyi 2008). Most available datasets on the territorial structure of electoral results are aggregated at the level of electoral districts. Henceforth, common measures of party nationalisation do not allow us to investigate whether the number of electoral districts affects party nationalisation, because the number of territorial units, on which the measures rely, affect the measures. For this reason, scores are only comparable when they rely on (roughly) the same number of units. Careful examination of the properties of measures of party nationalisation is needed, in order to show which measures are useful for certain research questions. As will be shown, many research questions require a standardisation, in order to avoid biases.

My new *standardised party nationalisation score*, which relies on a transformation of the Gini coefficient on inequalities in distribution, takes account of varying number and size of territorial units. Tests on electoral data from Central and Eastern Europe show that it is more reliable than previous measures, if party nationalisation should be measured across differently sized electoral

units.[2] Before developing and testing my own measure of party nationalisation, I provide a systematic overview of previous measures, and explain potential problems related to them.

Previous measures of party nationalisation

Measures of party nationalisation basically investigate the diversity of party systems across territorial units. Four families of statistical indicators have been used to describe party nationalisation: frequencies, variances, distribution measures, and inflation measures. In this section, I describe the development of indicators previously used to measure party nationalisation, and relate them to a number of possible biases which might impede comparability (see table 1 for an overview).[3] Some indices are calculated for party systems as a whole, others for single parties. (Formulae for the discussed indices are listed in the appendix.)

a) Indices of frequency (share of contested districts)

The first scholars that measured party nationalisation used *competition indices*. Especially in electoral systems with small constituencies, certain parties do not compete nationwide, but only in some districts. To capture this, Rose and Urwin (1975: 19 et seq.) counted the *number of uncontested seats*, almost identical to Cornford's (1970) number of *safe seats*, counting the number of constituencies in which a party has no competitors. This has been extended to the *territorial coverage index* (Caramani 2004: 61), measuring the percentage of territorial units where a political party runs in elections.[4]

These measures are easy to calculate and to understand. Where applications address the supply side of the electoral market – the offer of parties to voters – they capture the problem best. However, the understanding of party nationalisation remains rather rudimentary: Measuring the share of contested districts gives little information about *regional heterogeneity of party support* (*first problem*). Parties with a very regionally based electorate, but many candidates or own lists in most electoral districts, would appear to be highly nationalised, even if the regional support of its voters would

[2] A program, running under Microsoft Excel, which allows the user to calculate the standardised party nationalisation score, along with a few other indices of party nationalisation, is available from the webpage of the author.

[3] Caramani (2004: 60-3) provides a detailed description of previous party nationalisation measures; some of the information in this section is taken from this book. Stokes (1965) shows measures that allow comparison of the importance of different territorial levels (national, regional, municipal) for inter-election volatility. However, those measures concern the development of electoral support and are not suited to measuring the territorial homogeneity of the electoral support of political parties in a given election. Morgenstern (2004: 124-5) proposes a measure of "concentration of legislators" – measuring how regionally spread the deputes of a certain party are. The measure might be adjusted for the number of districts and the number of seats a party wins.

[4] The index might be adjusted so that it controls for the different size of the territorial units, measured either by the number of seats accorded to each unit, the number of inhabitants in a territorial unit, or the number of voters (or entitled voters). In this way, the real *territorial coverage* would be measured. Further, the measure can easily be expanded into one for party systems, through a weighted mean (weighted by the vote share) over all the parties. Caramani (2004: 61) uses a non-weighted average, overstating the importance of small local parties.

prove this not to be the case. In electoral systems with a single national constituency, frequency indices would by default indicate values of 100% for all parties.

b) Indices of variance (variation of the district results)

A second family of indicators is based on the variance in the vote share of political parties across territorial units. The *index of variation* developed by Rose and Urwin (1975: 28) is the *mean absolute deviation* of regional electoral results from the national ones, in analogy to the Rae index of disproportionality (Rae 1967). The *Lee index* (Lee 1988) is a very similar measure, dividing the summed deviation by 2 instead of by the number of territorial units.[5] The *mean squared deviation,* or the *standard deviation of the vote from the regional mean* (Rose/Urwin 1975: 24), weights for the magnitude of deviations.[6] These indices are familiar to measures of deviation from proportionality.[7] They can also be computed for single territorial units, comparing them to the national mean.

The second to fifth problems can be discussed related to this group of indices: The *second problem* concerns the fact that these indices *lack upper limits*, which has been criticised in the literature (Caramani 2004: 62). Indices that vary in a standardised range are more intelligible.

Third, the index does not consider whether all territorial units within a country are equally large. In many countries, certain units are larger than others. In many empirical cases, not all of the territorial units have the same size; some of the units are much larger than others. Deviances from an even distribution of votes across the country emerge stronger if they occur in an area with small territorial units than in areas with large territorial units. Hence, the measures reflect to some extent the administrative structure, rather than the territorial structure of the vote. Reforms of administrative units would thus strongly and systematically affect the values of party nationalisation, depending on the question whether they particularly target regions where a political party is strong or weak, or if the most substantial reforms occur in regions where the electoral strength is close to the national mean. (For a more extensive discussion, see below.)[8] Further, if party nationalisation measures do not consider the differences in the size of territorial units within a country, they lead to a potential paradox: One desirable property of variance measures is that they

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[5] Index cited in Hearl et al. (1996: 169).

[6] The formula for the *Lee index* looks similar to the Loosemore/Hanby (1971) 'index of distortion' measuring disproportionality, whereas the formula for the *standard deviation of the vote from the regional mean* looks similar to Gallagher's (1991) index of deviation from proportionality. However, the two concepts should not be confused. Whereas the Loosemore-Hanby-index and the Gallagher index compare shares that sum up to 1 (vote shares of parties compared to the seat share of the same parties), an addition of the elements is not equal to 1 in the case of the Lee index and the standard deviation. The Loosemore-Hanby and the Gallagher indices are rather comparable to the *cumulative regional inequality* measure, see below.

[7] In the context of elections, such indicators are used for instance to measure deviations of seats distributions from vote distributions, malapportionment of electoral districts, vote-splitting or inter-election volatility (see Taagepera/Grofman 2003; Monroe 1994).

[8] Jusko (2008) weighs for district size, so that this problem is accounted for.

would indicate increase, as we move votes from a weak stronghold to a more pronounced stronghold of a political party. However, if variance measures do not take into account the size of territorial units, then, moving votes from a unit where the party is stronger than in the national mean to a unit where its electoral strength is even, higher might wrongly indicate lower variance, provided that the second unit is the larger one.

The *fourth problem* that afflicts these indices regards *party size*, or the problem of *scale invariance*. Parties with a small vote share by nature have smaller deviations than large parties. (Other terminologies speak of 'constant relative inequality aversion', Monroe 1994: 133). This problem can be illustrated if we imagine that a large party splits into two exactly equal successor parties, each of them taking half of the votes in each of the territorial units. At a given vote share, the variance of each of the successor parties is cut in half. Thus, for exactly the same pattern of vote distribution, smaller parties have smaller variances than large parties.

As Caramani (2004: 64-66) points out, all the measures of party nationalisation are empirically either positively or negatively correlated to party sizes. We should, however, distinguish empirical correlations from measurement induced biases. Empirically, small parties often rely for their support on local strongholds, and their strength is more heterogeneous. An unbiased measure should thus, when applied to empirical data, typically show more heterogeneity for small parties than for large parties. On the other hand, the absolute variation of vote shares among territorial units is often larger for large parties, solely on the grounds that for larger values variances are usually larger, as shown in the example of the party split. The mathematical concept of *scale invariance* appears thus as the only relevant one to the construction of nationalisation measures; or in other words, indicators should assure that if a party is split in half, the measured values stay the same.

And *fifth*, all of the measures which do not weight the deviations – thus all except for the standard deviation measure – contain the problem of "*insensitivity to transfers*" (Smithson 1982: 261; Monroe 1994: 139; Firebaugh 2003: 79-80). In certain situations, when votes are transferred from a district where a party is weaker to a district where the party is relatively stronger, the (non-weighted) indices are not affected, even if such transfers increase heterogeneity.[9]

All four problems occur frequently among measures of territorial hetereogeneity, and are related to some other indicators too (see table 1 for an overview).

[9] In a fictitious country with four equal-size regions, and a party winning the same amount of votes in two regions, while not competing in the two others, its *index of variation* score would amount to 0.25 (distribution of the party's national vote on the 4 regions: 50% - 50% - 0% - 0%). If its votes would be distributed unequally on the two regions (for instance: 75% - 25% - 0% - 0%), the *index of variation* would still amount to 0.5, even if such a vote distribution is much less equal (cf. Atkinson 1970: 254). Similar, the *Lee index,* the *cumulative regional inequality* index, and the *index adjusted for party size and number of regions* would not be affected by the transfer. This criterion is discussed as "Dalton's principle of transfers" (Taagepera/Shugart 1989: 263).

A number of standardisations have been proposed to tackle the problem of party size or scale invariance. Ersson *et al.* (1985: 175-6) employed the *standardised and weighted variability coefficient,* dividing the variance by the mean of the parties' vote share. Their measure has been criticised due to its lack of an upper limit (Jones/Mainwaring 2003), and because it is biased by the sample size in several regards (see Smithson 1982 for one aspect of the problem, and the discussion below). The *index adjusted for party size and number of regions* divides the Lee index by the average vote share in the territorial units (Caramani 2004: 62). The *cumulative regional inequality* measure takes into account the influences of electoral units' size differences on the degree of homogeneity. It considers whether the distribution of a party's total national vote on sub-national regions corresponds with the population (voter) share of those regions of the national population (Rose/Urwin 1975: 30). Still, these measures are insensitive to *transfers*; the index adjusted for party size and number of regions also does not take into account different-sized territorial units.

c) Distribution coefficients (Gini coefficients)

The Gini coefficient of inequality is usually used to measure unequal wealth distribution among the population (Gini 1921). Jones and Mainwaring (2003) use it in analogy to measure the uneven distribution of vote shares across territorial units, taking the complement of the Gini coefficient. The *regional issue dimensions* indicator suffers from the scale invariance problem (see above), and the two measures based on the Gini coefficient do not take differences in district sizes into account (Chhibber/Kollman 2004: 177; Moenius/Kasuya 2004: 552; Taagepera 2005).

The *sixth problem* concerns the level of aggregation of the electoral data. Generally, if a whole is divided into a larger number of units (lower level of aggregation), and these units are characterised, more fine-grained differences among these units emerge than if the whole is divided into fewer units (higher aggregation). Party nationalisation might be calculated from electoral results from fine-grained units, such as precincts or municipalities. If aggregating these units in larger units, such as provinces, the within-province variation is omitted, and only the across-province variation accounted for. This might be (exceptionally) equal, or (mostly) lower than variance across lower units of aggregation. Henceforth, our indicators are affected by the level of aggregation of the electoral data. This might be a problem of comparability across countries (or within countries, across time), if we were to compare data that is based on a different number of territorial units.

d) Inflation measures (difference between the size of the regional and the national party system)

One class of measures is suited for party system as wholes, but not for single parties. The *inflation measures* compare the number of parties at the national and at the local level. Chhibber and Kollman's (1998: 331) *indicator of party aggregation* subtracts the average of the effective number

of parties at the district level from the same number at the national level. Whereas the indicator might be useful for single-seat district systems, it has its limits for PR systems, when in each district many parties compete. Cox's (1999: 155-6) *inflation score* considers this problem and measures the *relative* difference in numbers of parties between the district and the national level.[10] The *index of party aggregation* (Allik 2006) is the complement of the inflation score, so that 1 stands for high party aggregation, and low values signify low party aggregation. The *inflation index* (Moenius/Kasuya 2004) considers the different size of constituencies.

Inflation measures require slightly less information than other party nationalisation measures. If we had access to the electoral results by districts and overall results at the national level, but were not able to identify the parties correctly and to link the regional results to the national ones, inflation measures could still be calculated. However, inflation measures are not fully reliable, because in certain situations they suggest wrong interpretations. Given that inflation measures have been increasingly used and suggested in the literature, and that there is a general lack of a substantive critique of these measures, the following paragraph demonstrates the errors that might occur.

The problems of inflation measures and a further development

The basic idea behind *inflation measures* is that a territorially heterogeneous party system usually has fewer parties at the local level than at the national level. At the district level, there is Duvergerian two-party-competition, but due to inter-regional differences, substantially more than two parties compete in the national parliament (examples in Chhibber/Kollman 2004). Inflation measures are based on the difference in the number of parties at the local and at the national level, assuming that the number of parties at the local level is smaller than at the aggregated national level. This assumption leads to the *seventh problem* to be discussed, the bias through *large local party systems*. Local party systems might in some districts be larger than the national one. This typically occurs in urban areas, whereas in rural areas some parties are dominant and thus party system fractionalisation is lower. This is illustrated by the Albanian 2005 elections.[11] Overall, the Albanian party system (vote shares in the 2005 single-seat district elections) counts 2.84 effective parties nationwide (thick line in figure 1). In large parts of the country, the two major parties (Democratic party, Socialist Party) have a very dominant position, which is reflected in a number of effective parties just above two (see data points in figure 1). In the Central costal area around Fier and some further districts, however, the third political force (Socialist Movement for Integration) and some

[10] In analogy to the index of *relative reduction in the number of parties* proposed to measure disproportionality (Taagepera and Shugart 1989: 273).

[11] Data: single-seat district part of the 2005 Albanian elections, fractionalisation of the votes, as taken from my database. Similar examples can be found in PR systems, for instance the Macedonian elections in 2006 could be used to show the same bias. Generally, the problem occurs when some parties compete nationally, and in one part of the country, one or several regional parties are added to these. Data taken from Bochsler (2008).

smaller parties gained a substantial vote share, reflected in a larger number of parties around three, above the national average. Thus, there are data points from districts *both above and below the number of parties at the national level*. When one takes the average of the number of parties in the districts, the more fractionalised districts compensate partly for the small party system fractionalisation in other districts. Due to this mutual compensation, the average district party system, 2.64 effective parties, is very close to the national average, despite the widely varying party system from district to district. All the above mentioned inflation measures, however, would use the average regional party system size in order to calculate party nationalisation, and come to a fairly low difference between the regional and the national party system of just 0.20 parties[12] – and underestimate the substantial differences between district party systems and the national one.

xxx Figure 1 about here xxx

Despite these reservations, inflation measures may still be useful, because they are less demanding regarding the quality of data. A slight modification of the indicators of this family of measures would allow for more robust results. I propose a measure which is based on the difference between the national party system and *each* regional party system, instead of the difference between the national party system and an *average* regional party system (formulae are reported in the appendix). Such a measure is comparable to Chhibber/Kollman's measure, but more precise: for my Albanian example, the modified indicator of party aggregation results in a value of 0.37 instead of 0.20 (in the original indicator of party aggregation). It can easily be transformed afterwards according to Cox's (result for Albania 2005: 13.10% instead of 7.06%) or Allik's propositions (86.9% instead of 92.94%). In other countries – where the local party systems (almost) always count fewer parties than the national one, such as Russia or India – the modified measure might lead to (almost) the same results as previously used inflation indicators.[13]

Kasuya and Moenius (2008) propose an alternative version of a party inflation measure: they add two new dimensions to their concept. They still take the difference between the average party system size at the district level and the national party system (party inflation) into account, but besides this, they now also include the variance and kurtosis between districts. This new measure appears much more reliable than their previous one. However, their indicator remains an indirect measure of territorial heterogeneity. In some cases, the new dimensions correct biases of the

[12] The Cox measure would result in 7.06%, and Allik's measure would report high party aggregation of 0.929 (all calculations are my own).

[13] However, there might still be reservations about using the effective number of parties to calculate regional heterogeneity. Would it be possible maybe to construct an example, where the effective number of parties is equal at the national level and in each territorial unit, despite each of the parties having different vote shares from region to region?

previous measure, but the correction might also happen to distort the results, so that new problems emerge (see example in appendix C). It remains questionable if any measure that is based on the effective number of parties in districts instead of party votes might lead to satisfying results. Adding to this, all indicators of this type are only applicable for party systems, and not for single parties.

Which measure is the most suited one?

Table 1 provides an overview over indicators and their shortcomings. Not all the shortcomings are of the same seriousness and type. Whereas some might be just more difficult to understand (cf. lack of upper limit), others cast the applicability of the indicator into question (wrong results). And finally, the characteristic of indicators taking high values for small parties is reported as a problem – but, as will be argued below, it reflects instead the empirical reality that small parties *are* often less nationalised than large ones. Further, the best indicator is not necessarily the one with the smallest number of problems. It matters more, what it is applied for, and whether problems are resolvable.

xxx Table 1 about here xxx

The Gini coefficient to measure regional heterogeneity

Of the indicators described above, the ones which have the lowest number of problems are the *cumulative regional inequality* index, the *party nationalisation score*, the *standardised and weighted variability coefficient*, or the *modified indicator of party aggregation*. What counts more than a purely mechanical count of the shortcomings of these indicators is the question of which of the shortcomings might easily be fixed, or which of the indicators has the best potential to be developed. I choose the complement of the *Gini coefficient,* or the so-called *party nationalisation score,* as basis for further consideration. It is better known than the other indices used, and is based on a powerful measure of heterogeneity in distributions. Below, I describe how the Gini indicator is constructed, before standardising it for both aspects which have been detected as problematic.

The Gini coefficient is a measure for inequalities across the units which are most frequently used to quantify heterogeneity in the distribution of wealth within a society (Jones/Mainwaring 2003: 142). It has also been proposed as a measure of the disproportionality of electoral outcomes (Taagepera/ Shugart 1989: 263). The Gini coefficient can easily be converted into a measure for heterogeneity of the territorial vote distribution of a political party. In the case of a homogeneous distribution (high party nationalisation), every territorial unit will cast a number of votes for this political party which is approximately proportional to the unit's size, or the party will win a similar vote share in every territorial unit. In the case of heterogeneous vote distributions, however, most of the votes are concentrated in a few territorial units.

The calculation of the Gini coefficient can be explained geometrically (see figure 2 below). The territorial units are drawn on the x-axis, ranked by their support share for party P, starting with the unit where party P gets its lowest share of the votes. The y-axis describes the *cumulative function of votes across regions*: thus for the first unit it just shows the number of votes a party P scores in the first unit (with the lowest vote share). For the second unit, the votes scored in the second unit are added to the first, and so on. At the last unit, the y-axis shows the sum of votes scored in all territorial units, thus the total number of votes party P scored in the whole country. From this, a convex line results. In the case of low party nationalisation, the area between the graph and the perfect homogeneity line (connecting the origin and the upper right angle) is large. With higher degrees of party nationalisation (homogeneous vote distribution), the graph approximates the perfect homogeneity line, and the area becomes smaller. The Gini coefficient is actually calculated as the area between the graph and the perfect homogeneity line. In the case of perfect homogeneity (perfect party nationalisation), this area is equal to 0, whereas in the case of extremely unequal distributions it is equal to 1. Jones and Mainwaring (2003) subtract this value from 1, because they do not intend to measure *in*equality, but rather equality or homogeneity, called party nationalisation.

When party nationalisation is to be calculated for a whole party system (instead of single parties), the score is calculated first for each single party, and then the results are weighted by the number of voters per party in the system.

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Developments on the party nationalisation score: the impact of the size of territorial units

For my standardised measure, I tackle two aspects differently from the score of Jones and Mainwaring (2003). Both regard the size of territorial units, on which the calculation of party nationalisation scores is based. Different from previous measures, I take varying sizes of territorial units within countries and across countries into account. On the one hand, I weight exceptional voting behaviour more when it occurs in units with a large population than when it occurs in units with a small population. On the other hand, I take into account that all measures will find more variance across small units of aggregation than across few larger units. Hence, I control for the number of units on which the calculation relies.

Correcting for unequal sizes of units in a country

First, I take into account the share of each territorial unit out of the total number of votes in the country.[14] In analogy to Firebaugh (2003: 126-7), it can be argued that in certain situations, units should *not* be weighted by their size. For instance, this is the case when an empirical comparison of territorial units is used to analyse factors affecting voting behaviour, where each unit is a realisation of an electoral process. Differently, for an analysis of territorial homogeneity, or inequality, inhabitants of large units should count equally as those of small units. I have conceptualised party nationalisation as a measure of territorial homogeneity of electoral support of political parties, and the territory is conceptualised regardless of politically decided administrative boundaries. Henceforth, my measure should be as insensitive as possible to the definition of territorial units through political instances or through statistical offices. An ideal measure of homogeneity should thus be affected as little as possible by changes of administrative boundaries.[15]

Often, the size (in terms of population or area) of administrative units varies considerably within countries. Using non-weighted measures of territorial homogeneity, electoral strongholds in a small and low-populated administrative unit affect our results equally as strongholds in a large and highly populated unit. For instance, taking the case of Canada, and calculating party nationalisation at the level of provinces, a different party landscape on the small province Prince Edwards Island (140.000 inhabitants) is as important as if the whole province of Quebec (7.7m inhabitants) votes differently. Similarly, it might be questionable if different voting behaviour on the Finnish island of Åland (26.000 inhabitants) should weight similarly as the whole province of Western Finland, which counts 70 times more inhabitants (Taagepera 2005). Scholars who developed measures of territorially based inequality in other fields have for the same reasons decided to weight the importance of territorial units by their size (Firebaugh 1999, 2003; Sala-i-Martin 2002). Typically, one might rely on the geographic area, or on the population. Given that electoral representation today is widely understood as a reflection of the will of the population,[16] I use it as a baseline for the weighting of territorial units.

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[14] Given the focus of party nationalisation studies on electoral behaviour, I consider it to be relevant to consider the importance of territorial units based on their electoral importance, rather than the size of the territory, or other possible measures that might be used for weighting purposes.

[15] Certainly, the electoral competition is closely linked to and shaped by administrative units, and occasionally, administrative boundaries are even drawn intentionally to affect the electoral competition (gerrymandering, malapportionment, etc.). My indicator aims at measuring, to the extent possible, the territorial heterogeneity of party support regardless of administrative units, in order to provide a measure that can be employed in research designs for which we need to measure party nationalisation in a way where the measure itself is not biased by the administrative structure of the territory.

[16] Relying on the concept that the vote of each citizen should count equally, regardless of the density of population of the area where she lives in.

Measures that weight territorial units are not sensitive to territorial reforms, such as the split or the merger of territorial units. And, the relevance of the size of units is underlined by the fact that administrative units are often much more populated in urban areas than in rural areas. For instance, in Russia 50% of the counting circles count just 19% of the population. Latvian electoral statistics (for the 2002 elections) count thirty-four counties, but the largest one, the capital, Riga, counts not less than 28% of the countrywide voters, the same number of voters as in the eighteen smallest, often rural, districts combined.[17]

For the calculation of the weighted Gini coefficient, the cumulative vote function can be modified. Instead of just taking the number of units on the x-axis, I draw the cumulative number of voters by unit (see figure 2). The resulting *party nationalisation score with weighted units* is a first step towards my standardised party nationalisation score. It allows the comparison of parties in a country with unequally large electoral units.

xxx Figure 2 about here xxx

The *party nationalisation score with weighted units* is the quotient of the area under the drawn *cumulative function of votes across regions* divided by the area under the perfect homogeneity line. In the case of perfect homogeneity (perfect party nationalisation), the score would take the value 1. In the case of extreme heterogeneity (very weak party nationalisation, the score would be close to zero.[18] The following formula establishes the party nationalisation score with weighted units (PNSw) for a country with *d* territorial units *[1; …; i; ... ; d]*, ordered according to the increasing vote share of party *p*. Each territorial unit *i* has v_i voters, and *pi* of them vote for political party *p*.

$$PNSw = 2 \cdot \frac{\sum_{1}^{d}\left(v_i \cdot \left(\sum_{1}^{i} p_j - \frac{p_i}{2}\right)\right)}{\sum_{1}^{d} v_i \cdot \sum_{1}^{d} p_i}$$

[17] A rural party, not competing in Riga but winning a homogeneous vote share over the other thirty-three counties, would get a very high nationalisation score of 0.97 – despite being completely un-represented in more than a fourth of the country. Another fictitious party that did not get votes in just one of the smallest of the counties where only 1% of the voters live might get the same score. Indeed, the Green and Farmers Union scores very poorly in urban and in industrial areas; yet its party nationalisation score amounts to 0.798. This is almost the same value as for New Era – 0.791, a party that gets considerably fewer than average votes in some smaller counties in Latvia's Eastern Latgale region – but has a rather homogeneous distribution of the votes in the rest of Latvia. However, this fails to take into account that the capital, Riga, with its 28% of the voters counts as just one county – whereas Latgale's eight counties include only 16% of Latvia's voters. Indeed, the New Era party seems to have much more homo¬geneous support throughout the country than the Green and Farmers Union. But regional boun¬daries are drawn in such a way that they report the same heterogeneity in both cases in the same way.

[18] The Gini coefficient can never become exactly 1 – and similarly, the party nationalisation score can never exactly reach the lower limit of 0. This would only be the case if all the votes of a party were concentrated on one tiny point of the whole country – a point that would have to be so small that there were no inhabitants (or voters). However, this unit would be too small for the party to win votes there...

Correcting for the unequal number of units across countries

Secondly, my standardised party nationalisation score considers the number of territorial units in a country, on which it is calculated. This standardisation corrects, to the extent possible, the effect of granularity of territorial data. Generally, if variance is calculated among the characteristics of *n* unequal parts of a territory, then variance will increase, as the number of parts *n*, in which the territory is divided, increases. "Generally, statisticians expect that the lower the number of territorial units the less variation across them because of the larger size of units and the elimination – through aggregation – of extreme and outlying values" (Caramani 2004: 64). Compared to data from many small units, in a few larger territorial units, electoral strongholds will not be any more as pronounced, and not necessarily as recognisable. The larger territorial units are, the more within-unit differences in party support will not be considered by the calculation. Many extreme patterns in party support, which are only visible in fine-grained electoral data, disappear in larger units.[19]

Therefore, for the same parties and exactly the same vote distribution across the territory, measures of homogeneity or variance can vary substantially, depending on the level of aggregation of the electoral data. Usually, studies of party nationalisation due to data availability rely on data from just one level of aggregation, such as electoral districts or provinces. I have constructed a few datasets that allow the comparison across different levels of aggregation. This allows a fully controlled study of the effect of data aggregation on party nationalisation scores. For instance, for the 2001 elections in Poland, I rely on the full results from 2493 electoral precincts, which can be further aggregated into 377 districts, or into forty-one regions. For the same parties, with exactly the same vote distribution, measures of variance that are calculated at different levels of data aggregation lead to impressively different values. For the Self Defence party, the weighted nationalisation score amounts to 0.67, if data is aggregated at the level of precincts. It increases to 0.71, if moving to districts, or even to 0.80 in the case of provinces.

For comparisons of party nationalisation across countries, this is a major problem. Often, regional electoral data is reported for electoral districts, administrative regions, or municipalities. In some cases, only data from very large units exists, overall less than ten units per country. In other cases, the data are fine-grained from hundreds or thousands of electoral or counting districts. Data is

[19] See as well Zucco (2007: 311): "With fewer and larger districts, there is less variation of vote shares across them, and more importantly, much less room for the effects of this variation to be felt."
In terms of general functions of distributions, we can relate the problem to the "population symmetry" problem pointed out by Monroe: after stating a superficially appealing principle, "if two distributions, each with the same mean and with the same inequality value, are combined, the index value for the combined population should be the same as it was for the groups separately" (1994: 134). Monroe shows that a distribution [0; 100] is more unequal than [0; 0; 100; 100]: in the second case, "neither the whole of the good nor the whole of its absence is held by a single individual". In analogy, it might be shown that if the number of units doubles, and single values of the distribution are redoubled (the party nationalisation index would stay the same), but the inequalities would decrease.

comparable only across datasets with the same number of territorial units.[20] Since it is usually not possible to get datasets with a comparable number of units, I define a standard number of territorial units, and estimate party nationalisation at this level of granularity.

If there were a single territorial unit, the measured party nationalisation score would be 1. With an increasing number of units, party nationalisation decreases. The exact shape of this decreasing function is unknown and might vary across countries and parties within countries. Some parties are decidedly regional, but dominate in all municipalities of their regions. These are particular cases that get a low party nationalisation score if a few units are taken into account, so that they get all their votes only in one unit (or a small part of the units). If later we should find data that allow us to measure electoral strength at the municipal or even sub-municipal level, instead of the regional level, we would get almost the same values for such parties. The contrary would be the case for parties that are represented quite homogeneously throughout all regions, but have important strong-holds in some neighbourhoods or municipalities. In such cases, measured party nationalisation is high as long as the calculation is based on regions. Variance (low party nationalisation) can only be seen if data is highly disaggregated (by municipalities or voting circles). No function can precisely capture all the different imaginable patterns of vote distribution and aggregation effects. For certain parties or countries we might find strong electoral differences across regions, while in other cases, electoral behaviour across regions is similar, but varies across municipalities or neighbourhoods. The exact pattern would require us to have exact data for several levels of aggregation, but usually, electoral data is only available for one level of aggregation. This is why we need to make certain assumptions about a typical pattern of variation of party nationalisation when measured at several instances.

Currently, the common implicit assumption that users of party nationalisation measures need to make (as a lack of other measures) is that the level of aggregation (the number of units) has no effect on their results. This is so implausible that we might call the assumption misleading: it would require that there is no within-unit variation within the units where party nationalisation is measured. Any different assumption might fit certain data more, others less, but still, it might possibly in the whole give a good picture and help to construct a useful standardisation. I assume that an increase in the number of units should lead to a steady increase in the heterogeneity that we observe. If we imagine n provinces, and each of them is further divided into n municipalities (so that in total there are n^2 municipalities), then variation among the n provinces should be similar to variation among the n municipalities in each of these provinces. I assume that heterogeneity measured at the lower level, $PNS(n^2)$, corresponds to the squared heterogeneity measured at the

[20] Meleshevich (2006: 118) identifies on the basis of a five-country study comparability problems, even if he changes in some datasets the level of data aggregation in order to get a more comparable number of units.

upper level $PNS(n)$, $PNS(n^2) = PNS(n)^2$. This idea is represented by the concept of the following exponential function, $PNS(d^x) = PNS(d)^x$.

I choose ten as the standardised number of territorial units for which party nationalisation shall be estimated to be comparable across countries. Having calculated party nationalisation $PNS(d)$ for any other number of territorial units d (depending on the level of granularity of the electoral data), the standardised level of party nationalisation PNS_{10} is estimated according to the formula: $PNS_{10} = PNS(d)^{1/\log(d)}$.

The standardisation with $\log(d)$ ignores so far that not all the territorial units are of the same size. Since the units were weighted by their size (number of voters) for the calculation of the Gini coefficient, they should be weighted as well for the standardisation in this step. For instance, four units might give a very differently calibrated picture of the regional voter distribution. If each of the four units counts 25% of the countrywide voters, regional voting differences are captured much more precisely than if one unit counts 50% of the voters, and the others 16.7% each. The effective number of units E (in accordance to the effective number of parties by Laakso/Taagepera 1979) allows us to consider this aspect:

$$E = \frac{\left(\sum_{1}^{d} voters_i\right)^2}{\sum_{1}^{d} voters_i^2}, \text{ and}$$

$$PNS_{10} = \left(2 \cdot \frac{\sum_{1}^{d}\left(v_i \cdot \left(\sum_{1}^{i} p_j - \frac{p_i}{2}\right)\right)}{\sum_{1}^{d} v_i \cdot \sum_{1}^{d} p_i}\right)^{\frac{1}{\log(E)}}$$

Due to the assumptions I have made, that party nationalisation is a phenomenon that decreases steadily with every increase in the number of territorial units, my formula will provide less reliable estimations under particular circumstances. Amongst these might be a political ethnic conflict which is present in between regions, but where party support inside these regions is territorially very homogeneous. I expect my formula to provide good estimations in the absence of such extreme cases, if the measured parties are not too small, and if electoral data is disaggregated in a sufficiently large number of territorial units. Ten territorial units seem to be a usually sufficiently good basis, but an even larger number might be advantageous.

Certainly, other ways of standardisation might be more appropriate for different conceptualisations of party nationalisation. For instance, instead of taking a fixed number of units per country, the cross-country comparison of diversity might rely on territorial units of a fixed size, for instance

comparing units of 100.000 inhabitants. The larger a country, the larger the number of territorial units it would be divided in.[21] Such a measure would measure diversity across a territory, regardless of country borders, asking how large the territory is where are voting homogeneously, where a regional political party is present, or where a regional party system exists. It queries thus the perspective about the *absolute spread* of party support.

Instead, my concept addresses the *relative spread* of party support within a polity. Starting from the territory of a country (or another given polity), it asks (at the *party system* level) how many different regional party systems exist, or how many territorial splits exist in a countries' party politics, or how homogeneously are the votes of a political party spread *within a country*.

Testing the "standardised party nationalisation score" on Central and Eastern European data

In order to test if the standardised party nationalisation score solves the problem of granularity (number of territorial units taken into account), I test it on a series of elections for which data is available on several sub-national levels, such as provinces *and* municipalities. The most common datasets on sub-national electoral results, such as Caramani's (2000) database on elections in Western Europe, or the Essex database on elections in Central and Eastern Europe, provide the results only on one level of aggregation, usually at the level of electoral districts *or* regions/provinces. Datasets that include several countries only include different levels of aggregation of electoral results for the same elections in some exceptional cases. This is why I employ my own database on post-communist elections in Central and Eastern Europe (Bochsler 2008) that provides electoral results for the same elections on two or even three territorial levels for 28 electoral contests, allowing the comparison of party nationalisation measures for different levels of aggregation. The selection of these elections is solely driven by the availability of data. For some elections, my database contains data, for instance, both at the level of counting circles and at the level of electoral districts (see appendix for a listing of territorial units).[22] Those multiple data sets allow a controlled experiment using the party nationalisation measure. Since the data refer to exactly the same elections and the same vote distribution, the only aspect that varies is the number of territorial units taken into account. These are ideal laboratory data for my examination of the standardised score.

I calculated two scores for each of the twenty-eight elections. Thus, for each election, both score at the lower level (for instance municipalities) and at the upper level (for instance electoral districts). Ideally, between indicators that are calculated with the larger data set (lower level, more units) and

[21] I am grateful to an anonymous reviewer for raising this point.

[22] Electoral data on the lower level of aggregation for the Polish 1991, 1993, and 1997 elections was kindly provided by Tomasz Zarycki. Data on the lower level for the Estonian 2007 elections was taken from a database by Sikk and Bochsler (2008).

with the smaller data set (upper level, less units), only random, non-systematic differences should remain. This should lead to a substantial reduction of the differences between both levels (apart from cases where the territorial differences between party strongholds and areas with weaker support strictly follow the boundaries between territorial units at the upper level).

Without standardising, the results of the party nationalisation score range from 0.54 to 0.91, within a variation of 40%. For each pair of data, the score is on the average 12.2% higher if calculated at the upper level of aggregation (table 2) over the twenty-eight pairs of comparison. Hence, the characterisation of a party system might often heavily rely on the number of units taken into account. For instance, the party nationalisation score for Hungary in 1998 at the lower level (176 constituencies, party nationalisation 0.72) would appear to belong to the group of countries with the lowest degree of nationalisation. Only countries with deep ethno-cultural divides, such as Macedonia or Ukraine, report such scores at the upper level. The same Hungarian elections, measured at the upper level of twenty regions, would result in rather high level of party nationalisation (0.87).

The huge difference between the lower and the upper level is eliminated to a high degree through the standardisation (table 2). For the Hungarian elections of 1998, the two values vary only by 3.4% after standardisation (instead of 21%). In 25 out of 28 analysed elections, the standardised score proves to be more reliable than the non standardised one. The systematic deviation was reduced for the dataset under study by more than seven times, from 12.2% to -1.7% (means over all 28 elections).

xxx Table 2 about here xxx

A closer look at single cases shows that six cases remain where the standardised score is not very satisfactory. Specifically, there the difference between both scores is still larger than 5%. These are Macedonia (2006, -8.7%), Latvia (2006, 2nd pair, -14.1%), Slovakia (1992, -9.9%), Moldova (1998, +9.9%), and Ukraine (2006, -18.7% / -11.0%). This, however, should not be fully surprising. As pointed out above, if we have electoral data at one level of aggregation only, we can impossibly conclude on how party nationalisation would look like at a different level. The exact pattern might be different for certain parties and certain countries. All the problematic cases in my sample regard countries with important ethno-cultural divisions that follow (partly) the administrative regions or electoral districts. Then, moving from few territorial units to more fine-grained data from a lower level will report only slightly more heterogeneity, so that our standardisation might overdo. This will be even worse, when our data is aggregated in very few units, as in the case of Slovakia with only four units at the upper level in 1992. In Slovenia, however, with eight electoral districts, the standardisation seems already accurate.

However, these are limits that will occur in every attempt to account for the bias of the number of units: if data are aggregated differently, we never measure exactly the same. I can only provide a solution that is accurate for most, but not for all cases. My measure eliminates the largest part of the bias that is contained in non-standardised measures, and that leads on the whole to reasonably similar results for different levels of aggregation.

Conclusions

There is a growing interest in the study and quantification of party nationalisation, defined as the homogeneity of the electoral strength of a political party across the territory. To measure party nationalisation, one relies on electoral results from territorial units, such as provinces, municipalities, or precincts. In this study, I show that measures of territorial homogeneity are strongly influenced by the number of territorial units that are taken into account for their calculation. Accordingly the administrative division of a country might heavily affect the results of cross-country comparisons of party nationalisation. This study proposes a new indicator that accounts for differently sized units within the same country, and considers the number of territorial units, that were used to calculate party nationalisation. My new indicator allows a comparison of party nationalisation even if the number of territorial units, on the basis of which electoral data is taken, differs substantially across countries that shall be compared. When my new indicator is applied, the results are – to the extent possible – not so heavily influenced by the number of units taken into account. This might be an important property for many studies, not at least because often, for each country, electoral data is available only on one level of aggregation.

Tests on data from Central and Eastern Europe show that my score is quite robust when it is applied on data from different levels of aggregation. Thus, there is no systematic difference between results if the measure is computed on a dataset that includes many territorial units (for instance national electoral results at the municipal level) or few territorial units (regional level).[23] If feasible, datasets with more than ten territorial units should be favoured, since the standardised party nationalisation score might be biased for a small number of units.

[23] In most of the cases, access to sub-national data might be difficult and expensive, and there might not be more than one accessible level of data. Where feasible, I use data at the lowest level of aggregation or the largest number of territorial units, since these data reflect party nationalisation at the most precise degree. This implies as well including a lower level (for instance counting circles) if an upper level of administrative units (for instance electoral districts or provinces) seems more relevant. The latter argument however reflects the question whether territorial boundaries between political parties and administrative borders are congruent or crosscutting. It might be argued that we should only measure the differences of party systems across relevant political units. The latter however is not exactly the same variable as party nationalisation as it is used in this study. Party nationalisation is here defined as the territorial homogeneity of party support, and is not related to administrative borders (and is thus different from approaches which interact territorial heterogeneity with the question if it is congruent with administrative units).

Appendix A: Formulae for the calculation of nationalisation indices

Notation of variables

d	Number of territorial units
p_N	National vote share for party P
P_N	Absolute number of votes for party P, nationwide
$p_1, \ldots, p_i, \ldots, p_d$	Regional vote shares for party P in the territorial units
$P_1, \ldots, P_i, \ldots, P_d$	Absolute number of votes for party P in the territorial units
$\pi_{1,1}, \ldots, \pi_{i,j} \ldots, p_{d,n}$	Indicator if a party j competes in territorial unit i
N_{0V}	Overall number of parties competing in an election
E_N	Effective number of parties at the national level
E_{AVG}	Effective number of parties at the district level
E_{Di}	Effective number of parties in territorial unit i
$voter_i$ / $voter_N$	Number of voters in district i respectively nationwide

Indices

Territorial coverage index (Caramani 2004: 61)	$T = \sum\sum \pi_{i,} / (N_{0V}*d)$
Index of variation (Rose/Urwin 1975: 28) / mean absolute deviation	$V = \sum \lvert p_i - p_N \rvert / d$
Lee index (Lee 1988)	$L = \sum \lvert p_i - p_N \rvert / 2$
Mean squared deviation	$V = \sum (p_i - p_N)^2 / d$
Variance	$V = \sum \lvert p_i - p_N \rvert / d$
Standardised and weighted variability coefficient (Ersson et al. 1985: 176; Smithson 1982: 262)	$V = \sqrt{[\sum (p_i - p_N)^2]} / p_N / \sqrt{d}$
Index adjusted for party size and number of regions (Caramani 2004: 313)	$IPR = \sqrt{n \cdot \frac{\sum \lvert X - \bar{X} \rvert}{2(n-1)\sum X}}$
Cumulative regional inequality (Rose/Urwin 1975: 30) (identical to index of territorial distribution, Panchano 2004)	$CRI = \sum \lvert p_i / p_N - voter_i / voter_N \rvert / 2$
Indicator of party aggregation (Chhibber/Kollman 1998: 331)	$E_N - E_{AVG} = E_N - \frac{1}{d} \cdot \sum_i^n E_{Di}$
Three-dimensional measure	see Kasuya/Moenius (2008)

Appendix B: Dataset for the empirical test

xxx Include table 3 here xxx

Appendix C: Example of a bias in the Kasuya-Moenius index

xxx Include table 4 here xxx

Table 4 shows a fictitious example that illustrates a possible bias of the measure by Kasuya and Moenius (2008). The white fields show a party system with four districts and four political parties. It has a standardised party nationalisation score of 0.56, or measured with Kasuya/Moenius' of 6.9. In a second example, I add a fifth district where voters clearly vote differently than in districts 1-4. Party A, which was the largest in districts 1-4, again gets the largest vote share in district 5. Parties B, C, and D do not exist in the fifth district, and instead, two new parties E and F run only in the fifth district. The addition of the fifth district increases the territorial heterogeneity for parties B to F (and slightly affects the heterogeneity of the vote for party A). For this reason, measures of party nationalisation should report more territorial heterogeneity for the example with five districts, compared to the four-district situation. Accordingly, my standardised party nationalisation score drops from 0.56 to 0.51, which means that heterogeneity *increases*. For the Kasuya-Moenius measure, however, the contrary is the case. Every indicator should report an increase in heterogeneity, but instead, the Kasuya-Moenius index drops from 6.9 to 6.4 (which means that heterogeneity *decreases*). This occurs because their measure relies on a multiplication of three dimensions: inflation (between the effective number of parties at the district level and the national level), variance (between the districts) and kurtosis (between the districts). In my example, the addition of a fifth district increases inflation (from 37.5 to 49.0), but at the same time, variance and kurtosis strongly decrease (from 0.46 to 0.41 / from 3.5 to 1.7), so that overall, the index decreases. This illustrates a bias of the Kasuya-Moenius index, which relies on the fact that its three dimensions are only indirectly linked to the territorial heterogeneity of the party system. In most cases, each dimension somehow corrects for problems by other dimensions, but this correction is not always accurate.

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Figures and tables

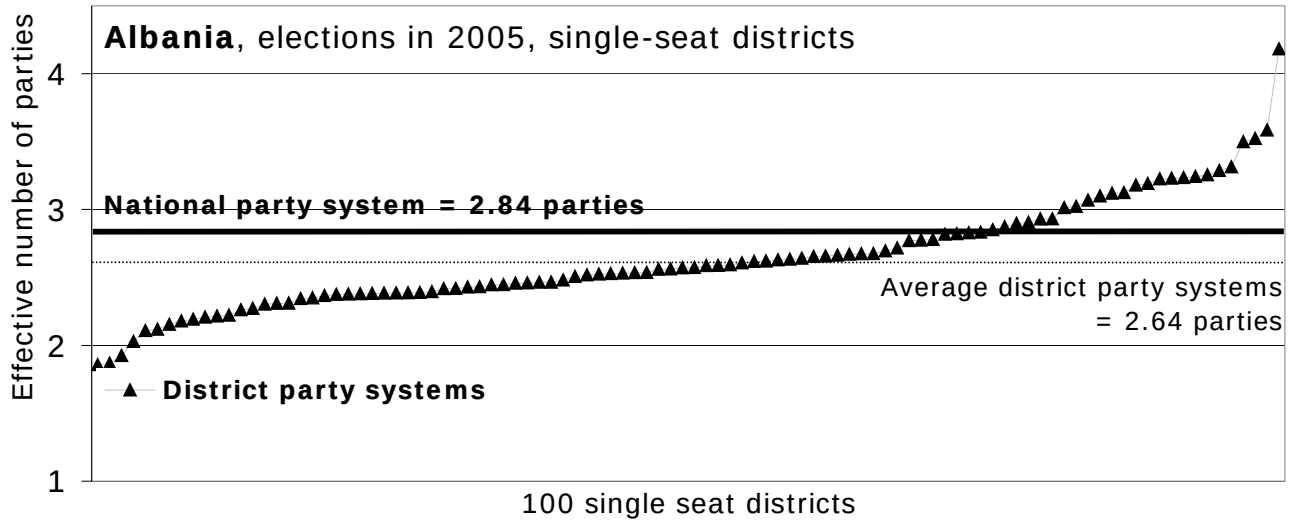

Figure 1: Comparing local party systems and the national party system in Albania (2005, district tier): Effective number of parties at the district level (▲) and at the national level (_____). Districts ordered by increasing number of parties.

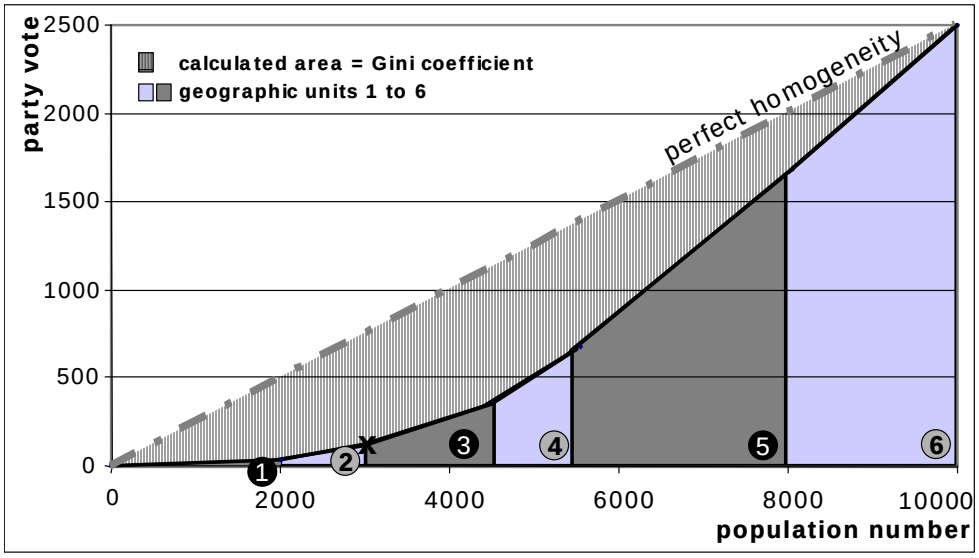

Figure 2: The calculation of the party nationalisation score with weighted units in a fictitious country with 10.000 electors and 6 territorial units. The party for which the score is calculated wins 25% of the total vote – from 2% in the 1st territorial unit up to 42% in the 6th unit. The six units are arranged in order of the relative party support (increasing gradient of the curve). On the X-axis, I reproduce the cumulative number of the population in the units, on the Y-axis the cumulative number of party votes. Example: Point X at the upper right end of unit 2 marks the point with 3000 electors and 120 party votes. This means that 3000 electors live in the added units 1 and 2, where the party wins 120 votes in total.

Index	*Level*	Reported problems (1-7)						
		1. No consideration of party support level	2. Lacking upper limit	3. Does not take different sizes of territorial units into account	4. Lacking scale invariance ("party size problem")	5. Insensitivity to transfers	6. Insensitivity to the number territorial units	7. Large local party system bias
a) Competition indices								
Number of uncontested seats (Rose/Urwin 1975)[a]	*party sys.*	**x**		**x**		**x**	**x**	
Safe seats (Cornford 1970)[a]	single party	**x**		**x**		**x**	**x**	
Territorial coverage index (Caramani 2004)[b]		**x**				**x**	**x**	
b) Indices of variance								
Index of variation (Rose/Urwin 1975) mean absolute deviation	single party or party sys.		**x**	**x**	**x**	**x**	**x**	
Lee index (Lee 1988)			**x**	**x**	**x**	**x**	**x**	
Standard deviation of the vote from the regional mean (Rose/Urwin 1975)			**x**	**x**	**x**		**x**	
Standardised and weighted variability coefficient (Ersson et al. 1985)				**x**			**x**	
Index adjusted for party size and number of regions (Caramani 2004)				**x**		**x**	**x**	
Cumulative regional inequality (Rose/Urwin 1975) / index of territorial distribution						(**x**)[c]	**x**	
c) Distribution coefficients								
Party nationalisation score (compliment of Gini index) (Jones/Mainwaring 2003)	single party or party sys.			**x**			**x**	
d) Inflation measures								
Indicator of party aggregation (Chhibber/Kollman 1998)	party sys.		**x**	**x**			**x**	**x**
Inflation score (Cox 1999) Index of party aggregation (Allik 2006)				**x**			**x**	**x**
Inflation index (Moenius/Kasuya 2004)			**x**				**x**	**x**
Three-dimensional measure (Kasuya/Moenius 2008)			**x**				**x**	
Modified indicator of party aggregation (my modification)			(**x**)[d]			**x**	**x**	

Table 1: Indicators to measure the nationalisation of party systems and their discussed shortcomings.
** Two of the reported shortcomings are discussed in detail in the text below.*

[a] Only for elections in single-seat district systems. [b] Not suitable for multi-tier systems.

[c] Insensitive to transfers of party votes between districts.

[d] Lacks upper limit, unless modified according to Cox (1999) or Allik (2006). For reasons of space only one version is reported.

country	year	Upper level			Lower level			relative difference	
		Units	wPNS	**sPNS**	Units	wPNS	**sPNS**	wPNS	**sPNS**
Czech Republic	2006	14 (11.9)	0.894	**0.901**	91 (73.7)	0.870	**0.927**	2.8%	**-2.9%**
Estonia	2003	12 (11.4)	0.814	**0.823**	248 (42.5)	0.733	**0.821**	11.1%	**0.3%**
Estonia	2007	12 (11.1)	0.828	**0.834**	402 (183.1)	0.735	**0.870**	12.6%	**-4.1%**
Hungary*	1990	20 (14.4)	0.725	**0.738**	176 (169.7)	0.606	**0.755**	19.6%	**-2.2%**
Hungary*	1994	20 (13.3)	0.845	**0.855**	176 (171.4)	0.757	**0.863**	11.6%	**-1.0%**
Hungary*	1998	20 (12.3)	0.874	**0.883**	176 (169.6)	0.723	**0.854**	20.8%	**3.4%**
Hungary*	2002	20 (12.7)	0.909	**0.917**	176 (170.2)	0.821	**0.914**	10.8%	**0.3%**
Hungary*	2006	20 (12.9)	0.907	**0.915**	176 (168.9)	0.841	**0.920**	7.9%	**-0.5%**
Latvia	2002	5 (4.5)	0.817	**0.742**	34 (10.2)	0.756	**0.758**	8.1%	**-2.1%**
Latvia	2006	5 (4.4)	0.811	**0.726**	34 (9.4)	0.747	**0.741**	8.5%	**-2.1%**
Latvia	2006	34 (9.4)	0.747	**0.741**	1005 (579.4)	0.671	**0.863**	11.3%	**-14.1%**
Macedonia	2006	6 (6.0)	0.710	**0.651**	88 (43.4)	0.593	**0.713**	19.8%	**-8.7%**
Poland	1991	37 (33.2)	0.684	**0.766**	2418 (209.8)	0.582	**0.776**	17.6%	**-1.3%**
Poland	1993	52 (40.7)	0.759	**0.839**	2465 (243.8)	0.657	**0.833**	15.4%	**0.7%**
Poland	1997	52 (39.3)	0.809	**0.873**	2478 (226.7)	0.732	**0.870**	10.6%	**0.4%**
Poland	2001	41 (37.7)	0.810	**0.873**	2493 (218.4)	0.727	**0.868**	11.5%	**0.5%**
Russia*	2003	225 (205.2)	0.793	**0.904**	2756 (1415.4)	0.760	**0.915**	4.3%	**-1.3%**
Slovakia	1992	4 (3.5)	0.831	**0.715**	42 (36.7)	0.708	**0.794**	17.5%	**-9.9%**
Slovakia	2002	79 (60.0)	0.695	**0.806**	2917 (224.5)	0.614	**0.800**	13.3%	**0.8%**
Slovenia	1996	8 (8.0)	0.889	**0.879**	88 (83.9)	0.783	**0.877**	13.5%	**0.2%**
Slovenia	2004	8 (8.0)	0.901	**0.891**	88 (83.7)	0.794	**0.885**	13.5%	**0.7%**
Ukraine	2006	27 (21.4)	0.605	**0.685**	33920 (22995.3)	0.542	**0.842**	11.7%	**-18.7%**
Ukraine	2006	27 (21.4)	0.605	**0.685**	225 (192.2)	0.566	**0.770**	7.0%	**-11.0%**
Average								+12.5%	-2.0%

Table 2: Calculation of the relative deviation between the upper level and the lower level for both indicators.
wPNS : party system nationalisation scores, with units weighted by their size
sPNS : standardised party system nationalisation scores, standardised by the number of territorial units
The effective number of units (according to the Taagepera-Laakso formula) is indicated in parentheses.
** Hungary: single-seat districts; Russia: PR tier*

Country	Election(s)	Geographic units
Czech Republic	2006	- 14 electoral districts - 91 municipalities (???)
Estonia	2003, 2007	- 12 electoral districts - 248 municipalities, town circles [for 2003] - 402 counting circles [for 2007]
Latvia	2002, 2006	- 5 regions - 34 counties - 1005 counting circles [only 2006]
Hungary	1990, 1994, 1998, 2002, 2006 (single-seat districts)	- 20 regions - 176 constituencies
Macedonia	2006	- 6 electoral districts - 88 municipalities
Poland	1991, 1993, 1997, 2001	- 37-52 regions - 2418-2493 localities
Slovakia	1992	- 4 regions - 42 districts
Slovakia	2002	- 79 districts - 2917 counting circles
Slovenia	1996, 2004	- 8 electoral districts - 88 counting circles
Russia	2003 (PR-part of election)	- 225 electoral districts - 2756 counting circles
Ukraine	2006	- 27 regions - 225 districts - 33920 polling stations
	23 pairs of comparison from 10 countries	

Table 3: Elections for which the empirical test of the indicator was carried out.

District	Party A	Party B	Party C	Party D	Party E	Party F	Eff. nr
1	200	100	300	0	0	0	2.6
2	150	75	0	225	0	0	2.6
3	200	300	100	0	0	0	2.6
4	300	200	0	0	0	0	1.9
5	300	0	0	0	200	10	2.0

Table 4: Fictitious country with four districts and four parties (white area), and with five districts and six parties (whole table). Votes by party and effective number of parties per district.