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Party system nationalization, number of parties and social diversity's unclear role

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Abstract

Most scholars have recognized cross-district homogeneity of partisan support (i.e. party system nationalization) as being theoretically crucial to make the effects of Duvergerian propositions move from the local to the national level. Surprisingly, however, this dimension has never been included directly in an empirical model of party system fragmentation, resulting in omitted variable bias. Two of the reasons for this absence, however, are probably the fair concerns about measurement and reciprocal causation types of endogeneity that may exist between these phenomena. In this research, I propose a solution to such gap, first by using Bochsler's Gini based measure of party nationalization instead of the party inflation indices usually employed. Second, by explicitly modelling the possibly reciprocal causation through a nonrecursive system of equations. By doing so, I will show that the effect of party nationalization on the number of parties is clear and strong, while the other way around is doubtful and weak. Then, I also show how this inclusion of party system nationalization in the model of number of parties, through a system of equations, changes the role played by variables present in the literature about this subject, like the canonical social diversity.

Introduction

It is surprising that cross-district homogeneity of partisan support has never been directly included in the empirical models of party system fragmentation, beyond sparse side-related efforts (e.g. Chhibber and Kollman, 1998, 2004; Cox, 1997, 1999). Certainly, scholars have been offering increasingly elaborate treatments of the other covariates of number parties. From the original sociological factors (Duverger, 1954; Grumm, 1958; Lipson, 1959; Lipset e Rokkan, 1969; Rose e Urwin, 1970; Campbell, 1989) and from the dominant electoral institutions (Duverger, 1954; Rae, 1971; Sartori, 1976; Riker, 1982; Taagepera e Shugart, 1989, 1993; Lijphart, 1984, 1990), to the recently modeled interaction between both (Amorim Neto and Cox, 1997; Coppedge, 1997; Jones, 1994; Ordeshook and Shvetsova, 1994; Taagepera, 1999; Peñas, 2004; Clark and Golder, 2006; Stoll, 2008). However, since we operationalize these covariates at the national aggregate level, missing what puts the electoral districts together - to use Cox's (1997) words – might be a problem.

The importance of what connects the results of each electoral district comes from the recognition that the national party system of a given country in a given election is, in fact, a junction of the many (possibly dissimilar) party systems that arise from each national electoral district. Hence, the number of parties that are effectively important (Laakso and Taagepera, 1979) in a country is, *ceteris paribus*, also a function of how homogeneous, from one district to the other, are the electoral supplies offered by the parties and the electoral demands represented by voters' choices. That final degree of cross-district homogeneity has received different names, like cross-district aggregation (Chhibber and Kollman, 1998,

2004) and, very often, cross-district linkage or just linkage[1]. It has been also the object of a specific research subfield, where it is referred to as one of the types of party system nationalization (see Caramani, 2004 for a great review and Schattschneider, 1960; Claggett et. al., 1984; for the foundations).

Still, although that role of party system nationalization in the causation of the effective number of parties is, certainly, often acknowledged in a theoretical perspective, it is almost never dealt with empirically. As I intend to demonstrate, the risk of not including a measure for the degree of such cross-district homogeneity of partisan electoral support in the empirical models of party system fragmentation is to incur in omitted variable bias. A bias that makes many of the established findings in the literature to become dubious. Nevertheless, I will propose that scholars might have had their reasons for avoiding such proper specification of the models of party system fragmentation. Mostly, they have been probably afraid of two types of endogeneity that can reasonably exist between party system nationalization and the number of national parties - the measurement endogeneity and the simultaneity (reciprocal causality) endogeneity.

I will try to address both problems. Firstly, I will resort to the literature on party system nationalization for an external Gini based measure (Bochsler, 2010) that escapes the measurement endogeneity peril. As for the reciprocal causality endogeneity, I follow the claim that the better way we can deal with such a menace in the context of observational data is to model explicitly the reciprocity (c.f. Antonakis et. al. 2010). By doing so, I will be able to include cross-district homogeneity of partisan electoral support in an empirical model of number of parties for the first time. This will show that by curing the former omitted variable bias, the canonical results found for some covariates on the national number of parties are changed. For instance, the effect of social diversity upon the party system fragmentation changes from the usual direct effect pointed by literature to an indirect effect only, which is mediated by the party system nationalization. In all the analysis I will employ a new data on 62 countries with democratic electoral results since 1945 disaggregated at the electoral district level.

1 - The omitted party system nationalization

At present, it seems firmly established that Duverger's (1954) propositions, as well as their consolidation by Cox (1997) in the $M + 1$ rule, operate at the electoral constituency level only (cf. Leys, 1959; Wildavsky, 1959; Cox, 1997)[2]. It means that it is within electoral districts[3] that the number of seats at contest and the electoral rules can restrict or permit the fragmentation of partisan choices made by voters. These district-level electoral institutions would impose an upper limit to the fragmentation of political choices that are demanded by - or at least related to - the socio-political cleavages of these electoral districts (Ordeshook and Shvetsova, 1994; Amorim Neto and Cox, 1997; Coppedge 1997; Cox 1997; Peñas, 2004; Jones 1994, 1997; Taagepera, 1999; Clark and Golder, 2006; Geys, 2006).

However, because these effects all happen at the district level, each district of a country might end up having different degrees of electoral choice fragmentation and, in fact, even different parties

[1] Although "cross-district linkage" or only "linkage" are concepts that have been frequently used to talk about the overall aspects of the electoral cross-district homogeneity, it is important to notice that when it was coined by Cox (1997) that concept actually referred only specifically to the offer of candidates across districts. It means that linkage was originally meant as the degree to which parties decide to offer candidates rather than to withdraw from disputes, across the electoral district.

[2] Although such acknowledgment took much longer to become common matter in the discipline, it is worth recalling that Duverger had established at the very beginning that "simple-majority single-ballot system (...) tends to the creation of a two-party system inside the individual constituency; but the parties opposed may be different in different areas of the country" (1954:223).

[3] The terms electoral constituency, or even better electoral circumscription, are certainly more accurate than the widely used electoral districts. However, for consistency with the literature being reviewed and employed here, I will stick with the latter.

chosen by voters. By consequence, in reality the final national party system and its degree of fragmentation would be the result of the aggregation of these many district-level party systems that happen to be chosen across the territory of a given country (Cox, 1997, 1999, Chhibber and Kollman, 1998, 2004, Hicken, 2009; Hicken and Stoll, 2008, 2011). For instance, even if in a plurality system each district may have, in accordance to Duverger's main proposition, only two effective electoral parties, in case the two parties are not the same across the districts, then the final national party system electoral fragmentation would positively become greater than two. It is what happens, for instance, in Canada and India (e.g. Riker, 1982; Gaines, 1999; Chhibber and Kollman, 1998, 2004).

Generalizing this idea, let D be the number of districts d in a given country, each with magnitude M_d where up to $M_d + 1$ effective parties tend to emerge (Cox, 1997). The final national effective number of parties can range from the minimum value of $M_d + 1$ if chosen parties were the same in all districts; up to a theoretical maximum of $\sum_{d=1}^{D}(M_d + 1)$ if chosen parties were different in each district. However, in practice, of course one can expect it to be very distant from this theoretical celling[4], since approximating it would require an unrealistically diverse party system across districts. Hence, while at the district level the effective number of electoral parties ($ENEP_d$) is approximated by the $M_d + 1$ rule, the effective number of electoral parties at the national level ($ENEP_{nat}$) will actually fall at some point of the interval:

$$\min_{1 \leq d \leq D}\{M_d + 1\} \leq ENEP_{nat} \lll \sum_{d=1}^{D}(M_d + 1) \qquad (1)$$

At exactly which point of this interval, it will be, therefore, a matter of how similar across districts are the partisan options (supply) offered to and chosen by voters (demand). That is, how homogeneous are the averaged electoral support of parties across the electoral districts.

The mechanisms behind the degree of such similarity have been theorized in different ways. In the supply-side, Cox's commonly used concept of cross-district linkage deals with the extent to which "(...) would-be legislators from different districts find it necessary or valuable to link together in [common] national parties" (1997:201). The decision of parties on entering or withdrawing the competition in each district might have to do not only with the conditions of the local (within district) competition, but might be also a sub-product of candidates and parties bargaining across districts. Consequently, Cox proposes that with regard to Duverger's main proposition, "if all candidates find it necessary to join a party that runs candidates in all districts [i.e. nationally], then local bipartism will indeed turn into national bipartism" (1997:201). Another take in the side of partisan supply also includes the extent to which parties are willing and able to spread their organization, campaigning, resources, appeal and support from one district to the other, going from regional to more national organizations (c.f. Sartori, 1976; Rose and Urwin, 1975; Cox, 1997; Caramani, 1996, 2004; Chhibber and Kollman, 1998, 2004).

In the demand-side, it is dubious how much the voters would be able to coordinate strategically their choices across the boundaries of their electoral districts as Leys (1959), for instance, has imagined. More than that, it is also uncertain if such coordination would even make practical sense (Cox, 1997, 1999). By the other hand, it looks reasonable that the degree of similarity of partisan choices made by voters across districts might also depend on the extent to which these voters in different parts of a given country deeply share their political identities and preferences. It is, as such, a sociological, or a socio-economic structural feature, that has to do with what Schattschneider (1960) has described as the process of nationalization of the electorate. In Caramani's (1996:206) words, the "homogenisation of political

[4] Empirically, it is certainly not usual for $ENEP_{nat}$ to approximate this ceiling $\sum_{d=1}^{D}(M_d + 1)$. In fact, it would be more precise to expect that $(\exists\, ENEP_{nac} \in \mathbb{R}^{+})\,(\forall\, M, d \in \mathbb{N}) \mid \left(ENEP_{nat} \ll \sum_{d=1}^{D}(M_d + 1)\right) \propto \left(\sum_{d=1}^{D}(M_d + 1) \ggg \min_{1 \leq d \leq D}\{M_d + 1\}\right)$.

characters (...) [when] political identities are moulded by wider environmental contexts, and parochial memberships are replaced by cosmopolitan identities" (see also Sartori, 1976; Caramani, 1996, 2004; Chhibber and Kollman, 1998, 2004).

Regardless the theoretical subtleties, all these are talking about the nuances of the process that has been called nationalization of the electoral dispute. In fact, although usually forgotten, the exceptions Duverger (1954) himself made to his propositions were a few countries with strong regional parties - such as pre-war Belgium, Denmark and Sweden, as well as modern Canada. Noticing this and reformulating the propositions to accommodate the exceptions, Rae probably became the first to recognize explicitly the impact regional parties could have on the functioning of Duvergerian reasoning: "Plurality formulae are always associated with two-party competition except where strong local minority parties exist" (1971:95). After him, others have suggested that, theoretically, regional parties (Riker, 1982; Sartori, 1976; Geddes and Benton, 1997), regional social cleavages (Rose and Urwin, 1975; Kim and Ohn, 1992) or geographically heterogeneous party systems (Cox, 1997, 1999; Chhibber and Kollman, 1998, 2004) can raise the final national party system fragmentation in comparison to what the electoral systems would allow to expect otherwise.

However, while scholars may implicitly recognize such important role played by party system nationalization, this is a dimension seldom accessed empirically in the literature about party system fragmentation[5]. The following equation represents the most general form of the model of number of parties given by the literature, omitting the party system nationalization ($PtyNat$):

$$ENEP_{nat} = \beta_0 + \beta_j \sum_{j=1}^{J} X_j + \zeta \qquad (2)$$

Yet, we know from theory that $ENEP_{nat} = f(PtyNat)$, so

$$E[ENEP_{nat}|PtyNat] \neq 0$$

Then if $E\left[X_j\middle|PtyNat\right] \neq 0$,

Therefore $E\left[X_j\middle|\zeta\right] \neq 0$

It means that by missing $PtyNat$ at the right hand side, the usual models in the literature are likely victims of endogeneity. The reason is that it only displaces $PtyNat$ (and its effect on $ENEP_{nat}$) into the error term ζ. The consequence is that β_j found for covariate X_j will be biased in case such X_j is related to $PtyNat$. Even worse, if as usual this is a model with more than one explanatory variable ($J > 1$), we cannot even know the direction of the bias. Further mathematical proof is in the annex.

This can have important consequences for our previous knowledge about the number of parties. Suppose the number of parties is strongly related to party system nationalization (what is quite likely according to theory) but we model $ENEP_{nat}$ without using $PtyNat$ as a covariate (as we know scholars

[5] This is especially problematic when we consider how scholars measure the quantities of interest in this field of study: it is rare that scholars do model such relationship empirically at the district level (one exception is Geys, 2006, on the Swiss system). In reality, published works on the determinants of the party system fragmentation always resort (as I will do here, following them) to some sort of aggregation. They generally (and I will) model the final $ENEP_{nat}$ instead of each districts' $ENEP_d$. They usually use (as I will) the national average/median of districts' magnitudes as covariate, instead of each districts' M. As well as they always employ (as I also will) social diversity measured at the national level of countries instead of at each electoral district of each country. Consequently, a theory we know works at the local level can only be empirically tested by using national aggregations. One of the most important consequences of this problem, usually neither clear nor made clear, is precisely the fact that it leads us to end up encapsulating the issue of party system nationalization in our models and inadvertently hiding them from our analyses. It means, we empirically model $ENEP_{nat}$, not $ENEP_d$, but omit from the set of covariates the party nationalization that has generated $ENEP_{nat}$ from the many $ENEP_d$. To do that means flirting with an especially problematic omitted-variable bias.

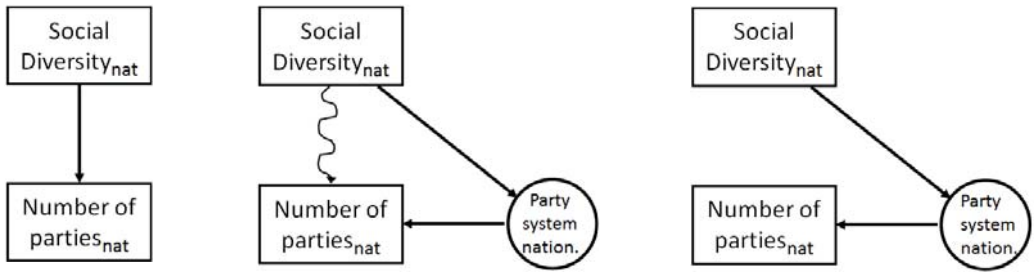
have been doing). At the same time, suppose that an important covariate such as social diversity can be expected to affect both $ENEP_{nat}$ and $PtyNat$ (what is reasonable, as I will argue and demonstrate). How can we know whether the effect of social diversity in the model of number of parties is not actually only or mostly related to the omitted variable party system nationalization?[6]

Figure 1 – Confounding variable problem of omitting party system nationalization from the models of number of parties at the national level

a) omitting party system nationalization

b1) part of the effect of social diversity actually comes through party system nationalization

b2) all effect of social diversity actually comes through party system nationalization



It is hopefully clear at this point that to disentangle this, it is necessary to include party system nationalization as an additional variable that explains number of parties. Yet, there might be, of course, good reasons for scholars to have refrained, for so long, from doing so. While to the best of my knowledge, no one has ever clearly stated a reason for such notorious absences, I would argue that authors have benn, quite likely, usually concerned with two other types of potential endogeneity that could be present were they to include party system nationalization as covariate of number of parties. One is the measurement endogeneity and the other is the reciprocal-causation type of endogeneity.

2 - The endogeneity obstacles for including party system nationalization

The concern about measurement endogeneity is, of course, easily justified if we recall that literature has often assessed party system nationalization, cross district aggregation or linkage by what has been called party inflation indices (Chhibber and Kollman, 1998; Cox, 1999; Hicken, 2009; Hicken and Stoll, 2008, 2011). However, these indices, from the original version proposed by Chhibber and Kollman (1998) to the further enhancements made by Cox (1999) and by Moenius and Kasuya (2004), actually do not measure the cross-district homogeneity of partisan support in itself. They measure the very impact that this has on the national number of parties., since the core of all different versions of these indices rely on the subtraction of the average number of parties at the districts from the total national number of parties ($ENEP_{nat} - \sum_{d=1}^{D} ENEP_d/D$). The problem, here, is that as national number of parties is a constituent part of the indices, party inflation obviously cannot be used as an explanatory variable in models where the national number of parties is the response variable[7]. In reality, this

[6] Incidentally, the same applies the other way around, that is, for the literature on the predictors of party system nationalization. By not including number of parties in the equation, how can we know whether an explanatory variable in the model of party system nationalization is not actually related to the omitted number of parties?

[7] In fact, as a side note, I would also be cautious about the overall use of party inflation indices as dependent variable as well. If our empirical knowledge on the determinants of the number of parties was given by models at the district level as it should be, then there would be no problem, since in all versions of the inflation indices the $\sum_{d=1}^{D} ENEP_d/D$ is subtracted and therefore goes out. However, as our empirical knowledge actually comes usually

measurement endogeneity clearly precludes any possibility of estimating a model where both national number of parties and party inflation indices are present in different hand sizes of a same equation.

Let $PtyInf$ represent party inflation measures. The following model cannot be unbiasedly estimated as such:

$$ENEP_{nat} = \beta_0 + \beta_1 PtyInf + \beta_j \sum_{j=2}^{J} X_j + \zeta \quad (3)$$

$$\text{Because } PtyInf = f(ENEP_{nat})$$

Yet, we can opt for a different way to assess party system nationalization that allows us to disentangle its effect on the national number of parties, instead of mixing them together even more. Here is where the empirical party system nationalization literature reveals to be particularly advantageous. There is quite a developed debate on the better ways to measure the degree of homogeneity of the electoral support of parties and of party systems (for a comprehensive summary of them, see Caramani, 2004; Bochsler, 2010; Morgenstern et. al., 2014). Most of the recent ideas are based on regional coefficients of variations or regional measures of dispersion, what is good because none of these is mathematically related to any usual way we measure number of parties (i.e. Laakso and Taagepera, 1979). My option here will be the increasingly used Bochsler's (2010) index of party nationalization. It is essentially the inverse of a weighted regional Gini index of inequality calculated for the electoral support of parties across electoral districts. There is no reason to suppose *a priori* that a Gini index formula is endogenous to the national number of parties at the measurement or matemathical levels.

Undoubtedly, however, it still leaves the problem of party nationalization and national number of parties possibly being endogenous at the theoretical level. First, because these two phenomena surely can be thought of as sharing political and social determinants, as well as sharing omitted determinants. Secondly, and much more important, because they can be reasonably thought of as reciprocally causing each other. As I have mentioned, higher party system nationalization is usually expected to decrease number of parties. But it is not absurd to think that more effective parties in a country should difficult the nationalization of the party system as well. For instance, more parties could mean increased difficulty in the cross-district coordination, i.e. in deciding who enters and who quits competition across electoral districts. As well as a greater probability that some party may try (and eventually succeed) to conquer regionalized electorates of a country.

In the end, it still looks like a saddening choice between harmful omitted variable bias and hurtful reciprocal endogeneity. It is not difficult to visualize such trade-off. Consider that the conceivable reciprocal causation between number of parties and party nationalization, specified in equation format, has the following general form:

$$\begin{cases} ENEP_{nat} = \gamma_{1,0} + \gamma_{1,1} PtyNat + \sum_{j=1}^{J} \beta_{1,j} X'_j + \zeta_1 & (4) \\ PtyNat = \gamma_{2,0} + \gamma_{2,1} ENEP_{nat} + \sum_{k=1}^{K} \beta_{2,k} X''_k + \zeta_2 & (5) \end{cases}$$

Where γ represents the coefficients of the effect of one endogenous variable on the other; β represents the coefficients of the effects of exogenous variables; X'_j and X''_k are the sets of exogenous variables of each equation; and ζ_1 and ζ_2 represent the error or disturbance terms of each equation.

from modelling $ENEP_{nat}$, the confounded effects when using party inflation indices as dependent variable can become unpredictable.

One can easily notice why estimating the equation 4 alone would be problematic. The explanatory variable $PtyNat$ would be correlated with ζ_1, since an increase in ζ_1 would increase $ENEP_{nat}$, who in turn would increase $PtyNat$ in the absent equation 5, creating a loop. Hence, $E(PtyNat, \zeta_1) \neq 0$, what means that this explanatory variable introduces endogeneity in equation 4. The same reasoning, of course, is true for $ENEP_{nat}$ and ζ_2 in equation 5. This is a treacherous scenario for researchers because it violates one of the most important assumptions for usual estimation techniques, since it means that a simple *separate* estimation of each of the above will be biased and inconsistent. However, as we have seen, omitting $PtyNat$ from equation 4, as literature has been doing, does not exactly solve the problem as well.

Fortunately, there is another option that improves on these two. One can stop omitting $PtyNat$ but, instead of estimating equation 4 only, one can estimate the whole system of equations jointly. It means specifying explicitly the reciprocity, hence testing and controlling for it, instead of vainly trying to avoid the problem. Moreover, this also actually follows more closely the theoretical specification we usually have in mind: if we think of the subject as a system of equations, why not estimate it as such? In the econometric literature, these multi-equation systems with reciprocal causation are known as nonrecursive simultaneous equation models (c.f. Bollen, 1989; Kaplan, 2008; Greene, 2011, Wooldridge, 2010)[8] and are considered one of the types of quasi-experimental techniques (Antonakis et. al., 2010). This type of model can be estimated by the separate-equation instrumental variable approach (2SLS, WSLS) or, as I will do here, truly simultaneously by iterating the system to parcel out the endogeneity that the dependent variable of one equation introduces in the other equation (3SLS, MLE)[9].

For any of these options to become possible, each equation will need at least one excluded covariate, i.e. at least one exclusive explanatory variable working as an instrument, for the system to become mathematically over-identified[10]. If the model includes a correlation between the error terms ζ_1 and ζ_2, then more than one exclusive covariate will be necessary. There is also an additional advantage of using a system of equations instead of estimating only equation 4. More than just see which covariates of $ENEP_{nat}$ still have significance when $PtyNat$ is included, the system of equations enables us to precisely find, calculate and test which are the covariates that have direct effect on $ENEP_{nat}$ from the ones that have an indirect effect through $PtyNat$.

3 - Description of dataset and of variables

To make these analyses possible, I have built an original dataset[11] that covers nearly all democratic elections in 62[12] countries, from 1945 to 2012. Starting from 1945, I have considered for inclusion any democratic period of all countries in the world that had at least three consecutive democratic elections. The ones for which data were found in time for this version of this paper were

[8] A very good introduction for social scientists in general on the specification, estimation and assessment of nonrecursive models can be found in Paxton et. al. (2011).

[9] Limited information techniques like 2SLS estimate one equation at a time, but using instrumental variables to deal with the endogeneity. Their advantage is that they do not carry misspecification error from one equation to the other. But they also disregard possible correlations between the error terms of equations, i.e. between ζ_1 and ζ_2 in our system above. Full information techniques estimate the two (or more) equations at the same time, thus allowing for this possible correlation between errors to be specified, but they also spread eventual misspecification error from one equation to the other(s). In this research, I will opt to present results of ML estimations, as in one of the models presented for comparison I will specify correlation between the errors. However, all main models were also tested with 2SLS to check for misspecification robustness, and results were very similar.

[10] Although just-identification is enough for the estimations to be reliably performed, actually we want the models to be over identified. Otherwise, assessment tests become either unavailable or unreliable.

[11] The electoral data come from a broader original dataset that contains electoral results for each party, in each tier, disaggregated at the constituency level. Here, all partisan data will be used aggregated for the party system at each election tier of each country.

[12] There will be 80 countries in the final version of the paper. Their data are already pre-processed, but there was not enough time to mount them into the dataset before this version of the paper was prepared.

included, covering all continents and a wide variety of institutional, historical and social backgrounds. A detailed list is in the annex. Notice that the cases I will work with are country-tier-elections, not countries. For instance, each German election appears once for its proportional tier, once for its single-member district tier[13].

Although this procedure is not always used in the literature, it should be, once the effects of electoral rules are supposed to be tier-specific. Of course, this choice can raise a concern about the fact that different tiers in mixed systems quite possibly affect each other's electoral results (for a recent debate on this, see Crisp et. al., 2012), being therefore inherently correlated. It is a justified concern, but one that can be dealt with if authors resort to multilevel models or, in my case here, to clustered standard error estimation. It is always better to address this issue at the estimation stage, where non-independence can be explicitly modeled, than to mix countries' tiers by an arbitrary procedure (average, summing, etc) at the data preparation level, or to throw away data. Besides, models with many elections for each country should always employ techniques that account for clustering anyway.

3.1 - Endogenous variables

As previously explained, there will be two dependent variables, each also appearing as an explanatory variable of the other. The traditional effective number of electoral parties as proposed by Laakso and Taagepera (1979) will be the measure of party system electoral fragmentation at the national level ($ENEP_{nat}$)[14]. Meanwhile, my measure of static party system nationalization ($PtyNat$) will be based on the standardized Party Nationalization Score (PNS_s) proposed by Bochsler (2010). This score applies a weighted Gini index of regional inequality to the share of votes each party receives in each electoral constituency, accounting for differences in population size across constituencies. Then, a log function is used to standardize it, accounting for differences that exist in countries' number of districts. I have used bootstrapping to calculate the PNS_s of each of the about 18300 parties-election-tier covered by my data. Then, to get a party system version ($PSNS_s$), I have used the weighted average of all parties in a given election-tier-year. $PSNS_s$ can range from 0 (total party system regionalization) to 1 (perfect party system nationalization). Figure number 2 shows the time-averaged $PSNS_s$ of each country-tier in the dataset, with confidence intervals, as well as the time-averaged $ENEP_{nat}$.

Notice that the graphic is ordered from the lowest to the highest estimate of $PSNS_s$. It broadly confirms the notion that to the extent $PSNS_s$ increases, the cloud of grey points formed by $ENEP_{nat}$ tends to decrease. Additionally, this graphic shows that $PSNS_s$ does not vary according to the electoral type of tier being considered. This is good news. Otherwise the very use of this measure would become problematic, because since we already know electoral type of tier is strongly correlated with $ENEP_{nat}$, it would become unfeasible to disentangle the effects of $PSNS_s$, $ENEP_{nat}$ and tier type alltogether.

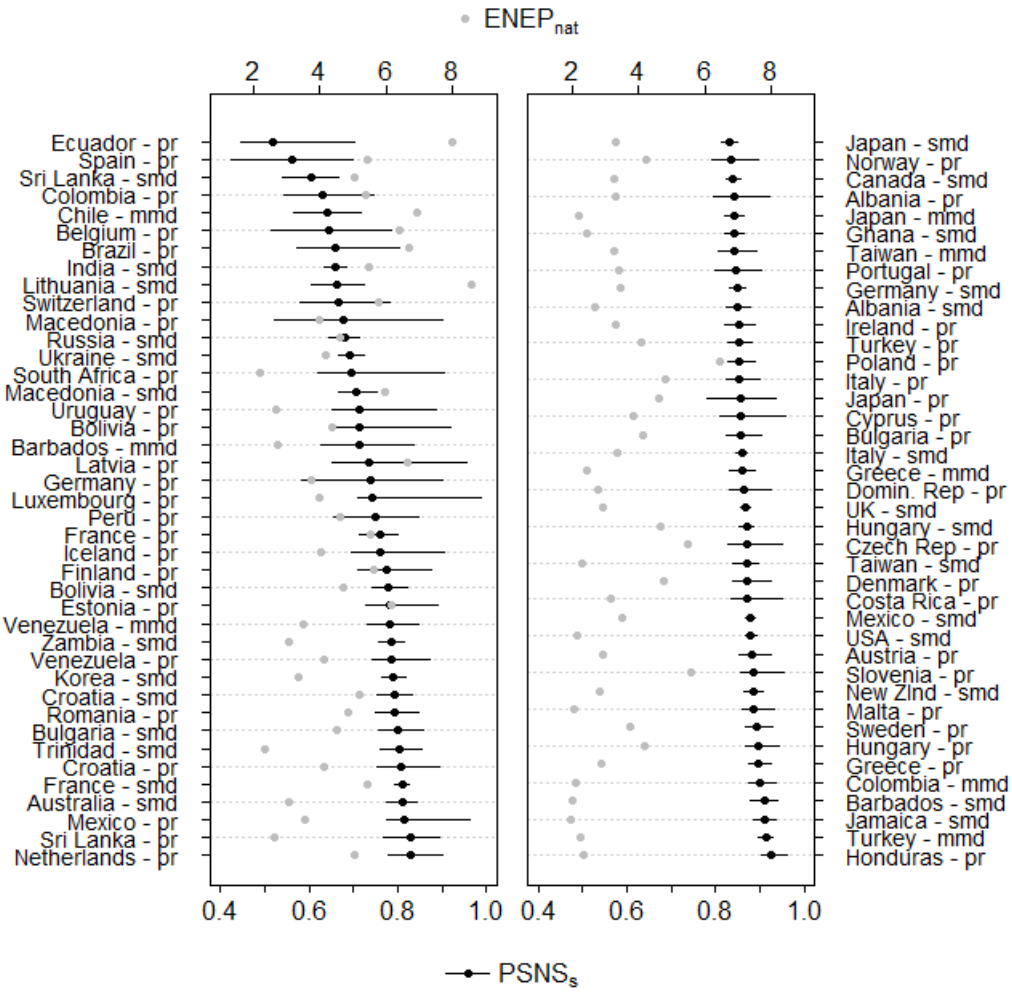
3.2 - Exogenous variables

The main covariate mobilized by scholars to explain countries' effective number of parties is, of course, some national aggregation of districts' magnitudes. Likewise, here I employ the usual average of magnitudes as a covariate in the $ENEP_{nat}$ equation, also adopting the usual log transformation ($\ln(M_{avg})$). There is no established theory about the possible direct effect of $\ln(M_{avg})$ on party nationalization. Even though, many authors (e.g. Caramani 2004; Hicken 2009; Bochsler, 2010; Hicken and Stoll, 2011) suggest that number of districts may affect party nationalization; and since $\ln(M_{avg})$ is

[13] However, countries' tiers that have only one nationwide constituency were, of course, dropped from the dataset, as it becomes pointless to calculate nationalization in such cases. The country list in the annex has a list of these dropped tiers.

[14] I have tried variants of this measure that claim to correct for the presence of the aggregated 'others' category in the electoral results (e.g. Taagepera, 1997), even if few elections have such category in my dataset. Using these alternatives did not yield any different results, so for the sake of simplicity I opt for the usual index calculation.

Figure 2 - Party system nationalization (PtyNat) with bootstrapped measurement uncertainty and Effective number of electoral parties ($ENEP_{nat}$), per country-tiers



Since the data have multiple time points for each country-tier, graphic is showing time-averaged figures

also certainly related to number of districts, it could become important to include it in the models of party nationalization. However, as previously mentioned, because our measure for $PtyNat$ is standardized by the number of districts, this concern is not necessary. Moreover, additional tests with the inclusion of number of districts or $\ln(M_{avg})$ as controls in the party nationalization equation did not have different overall results.

The second crucial covariate in the literature is social diversity. There is a great variety of measures for it that were proposed by the political and by the econometric literatures, but roughly all of them are based on identifying the linguistic, ethnic and, sometimes, religious groups present in each country. Then, these indices calculate some sort of effective number of groups or its mathematically equivalent fractionalization index. From the many available, the reference measure I will adopt is the

recent ethno-linguistic fractionalization measure based on politically relevant groups, delivered by Cederman et. al. (2009). This is the only recent dataset on ethnic groups in a sort of panel format instead of covering a static point of countries in time[15], what better suits the format of my sample. However, Stoll (2008) has undeniably shown that the role played by social diversity in the model of effective number of parties is not robust to measurement variability, meaning that the measures of social diversity we choose in fact alter the results we get. Therefore, the importance of testing results with different measures cannot be overlooked. I will also replicate my main model 19 times, each with a different measure of social diversity[16]. All of them in the format of fractionalization indices, i.e. the probability from 0 to 1 that two individuals picked at random would not belong to the same social group. More details on each social diversity measure can be found in the online supplementary material.

Additional exogenous controls will be also included in the model.

$VtrsGeoHomog$ is the degree of how much homogeneous vs. concentrated is the distribution of voters across the territory of a country in a given year. It is measured using the same logic as PNS_S, but for total voters[17]. This, of course, can be an important instrument for party nationalization. It makes sense to expect that in countries with stronger regional concentrations of population, more regional parties and more regionalized party systems would tend to emerge. But there is no reason to expect it to have a direct effect on $ENEP_{nat}$.

$PersVoting$ is a binary identification of which country-tiers allow vote pooling, i.e. allow voters to choose specific candidates instead of only parties (c.f. Karvonen, 2010; Norris 2002; Colomer 2009). I have followed Renwick and Pilet (2011)'s typology[18] and applied it to information provided by Bormanna and Golder's (2013). It is clear that the ability of choosing different candidates from a same party can alter the strategic calculations voters do within their districts (e.g. Carey and Shugart, 1995). Duverger's psicological effect can become much harder to happen, as strategic voting may be harder to achieve (Cox, 1997). However, there is no established theory to make us suspect *a priori* that cross-district coordination of parties would become more or less difficult.

$Federalism$ is Gerring et. al.'s (2005) scale of unitarianism inverted and divided by two, so in the end it ranges from 0 - descentralization to 1 - strongly federative. Lijphart (1994), Jones (1997), Geddes and Benton (1997) and Gaines (1999) offered some of the few theorizations about how federalism could be expected to affect the party system fragmentation. The general idea is that there is a "propensity of parties in federal systems to split" due to "the viability of parties that play an important role in provincial politics even though they have little weight nationally" (Geddes and Benton, 1997:7). This line of theorization suggests that federalism may affect $PtyNat$ directly and $ENEP_{nat}$ only indirectly, through $PtyNat$.

$UpperTierSize$ is the percentage of seats distributed at compensatory upper tiers[19], "(...) within which unused votes (and sometimes unallocated seats) from primary electoral districts are aggregated

[15] There were two older datasets that covered more than one time point. Krain (1997) had specific estimates of ethno-linguistic fractionalization for the 1940s, 1950s, 1960s and 1970s, while Roeder (2001) used the 1960s and 1980s versions of the famous soviet data.

[16] For the sake of space, I will only replicate models using measures of ethnic, linguistic and ethno-linguistic diversity, not religious. The literature on number of parties does not often include it and its inclusion does not change qualitatively the results.

[17] To anticipate concerns with possible measurement endogeneity between $PtyNat$ and this measure of $VotersHomog$, I have also tested the main models measuring this covariate differently. Instead of valid votes across electoral districts I have used demographic figures across the highest subnational administrative divisions of countries. These data came from various editions of the *The World almanac and book of facts*. As the general findings were the same, I have opted to report here only the results using $VotersHomog$.

[18] They are: Open list PR, Block vote, Cumulative vote, Limited vote, SNTV, Single Transferable Vote.

[19] It is worth noticing that not necessarily compensatory upper tiers have to be neither nationwide tiers nor exclusive. Austria is a good example of country where after the primary proportional tier where voters cast their votes, two

and distributed" (Cox, 1999:157)[20]. Following Cox (1999), Hicken and Stoll (2011) and others, I expect it to alter the incentives for cross-district coordination of parties. First, because the more nationalized parties are the ones who tend to better profit by the seats' allocation at compensator upper tiers. Second, because countries that have such tiers normally have nationwide electoral thresholds for parties to be included in this last stage of seat distribution. $HorizontalTierSize$ is, in mixed electoral systems, the percentage of seats distributed at the other primary tier (e.g. SMD) that is parallel to the primary one being considered (e.g. PR)[21]. Take for instance a voter deciding his or her vote at one of the two (majoritarian or proportional) tiers in a mixed system. Holding everything else constant, the more important he or she thinks the other tier is (and consequently the less he or she fells the one being considered is), the weaker will be the incentive for him or her to pursue a strategic vote. The sources of information to create both measures are Bormanna and Golder's (2013) dataset, the *Electoral System Change in Europe since 1945* website[22], and additional information collected specifically for this research.

Finally, $OldDem$ is a binary variable that identifies which countries have had uninterrupted democratic elections since at least the end of the Second War. The main idea here is to control for possible differences in party system development, a feature that can be expected to affect both the party system fragmentation as well as possibly the party system nationalization (Caramani, 1996, 2004). $President$ is a binary variable detecting presidential systems, a control for the possible impacts of the existence of presidential powers and presidential elections in a given country. The literature about how these presidential system characteristics may impact on the $ENEP_{nat}$ (Cox, 1997; Amorim Neto and Cox, 1997; Jones, 1994; Hicken, 2009; Hicken and Stoll, 2011), on the party nationalization (Morgensterns et. al., 2009; Peñas, 2004) or on both (Hocken and Stoll, 2011) is abundant. Therefore, $President$ will be a variable included as shared covariates in all models.

4 - Results

Altogether, I will present results from 5 different models. Two of them will be also replicated 19 times, as mentioned above, each with a different measure of social diversity. The first model will serve for comparison purposes, as it is a naïve separate OLS estimation of each equation in our system, one for $ENEP_{nat}$ omitting $PtyNat$ and another for $PtyNat$ omitting $ENEP_{nat}$. The other models are the proper simultaneous equations, where the whole system of equations is estimated at the same time by Maximum Likelihood estimation robust to non-normality (Asymptotic Distribution Free - ADF) and with clustered standard errors. Let's recall that simultaneous estimation of the two equations means that models 2 to 5 must have excluded covariates in each equation working as instruments.

In more detail, model number 2 specifies only $\ln(M_{avg})$ as exclusive covariate of $ENEP_{nat}$ and $VtrsGeoHomog$ as exclusive covariate of $PtyNat$. This is important to show that the specification in the next model, number 3, makes also empirical sense besides theoretical. Because model 3 uses both $\ln(M_{avg})$ and $PersVoting$ as exclusive covariates of $ENEP_{nat}$ and both $VtrsGeoHomog$ and $Federalism$ of $PtyNat$. Lastly, the importance of having these extra exclusive covariates in model 3 is for comparison with model 4, which is the one allowing covariance between the equations' error terms. Recall that we need more than one exclusive covariates per equation to estimate and assess an error covariance model properly.

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other compensatory levels complement the seat distribution. One is an upper tier formed by macro regions and the next is a nationwide upper tier.

[20] Examples of countries with upper tiers are Austria, Denmark, Norway, Sweden, Venezuela before 2000, among others.

[21] Examples of countries mixed-system, with two horizontal tiers, are are German, the Hungarian, the New Zealander since 1996, the Bolivian since 1997, the Venezuelan since 1993, the Italian of 1994-2001, among others.

[22] http://www.electoralsystemchanges.eu

Figure 3- Simultaneous Eq. Models of the reciprocal relationship between party system nationalization (PtyNat) and effective number of electoral parties ($ENEP_{nat}$)

	Model 1 OLS		Model 2 MLE		Model 3 MLE		Model 4 MLE	
	Coef.	Rob.SE	Coef.	Rob.SE	Coef.	Rob.SE	Coef.	Rob.SE
$ENEP_{nat}$ ON:								
Intercept	3.43	(0.49)	2.27	(0.71)	2.20	(0.43)	2.16	(0.46)
ln(PtyNat)			-5.72	(2.54)	-5.03	(2.00)	-5.40	(2.81)
$\ln(M_{avg})$	0.27	(0.13)	0.19	(0.11)	0.20	(0.11)	0.19	(0.16)
PersVoting	1.11	(0.34)	0.82	(0.33)	0.86	(0.31)	0.86	(0.30)
HorizontalTierSize	1.63	(0.57)	1.25	(0.51)	1.40	(0.54)	1.37	(0.54)
SocialDiversity	1.67	(0.62)	0.55	(0.66)	0.78	(0.66)	0.69	(0.82)
President	-0.72	(0.37)	-0.58	(0.28)	-0.53	(0.23)	-0.53	(0.23)
OldDem	-0.68	(0.31)	-0.42	(0.28)	-0.39	(0.24)	-0.39	(0.23)
UpperTierSize	1.30	(1.73)	2.07	(1.62)	1.91	(1.60)	1.97	(1.62)
Federalism	-0.52	(0.36)	-0.16	(0.34)				
R^2:	0.20		0.45		0.43		0.44	
ln(PtyNat) ON:								
Intercept	-0.51	(0.09)	-0.40	(0.10)	-0.38	(0.10)	-0.37	(0.16)
$ENEP_{nat}$			-0.01	(0.01)	-0.02	(0.01)	-0.02	(0.02)
VtrsGeoHomog	0.35	(0.09)	0.30	(0.08)	0.29	(0.08)	0.29	(0.11)
Federalism	0.07	(0.03)	0.06	(0.03)	0.05	(0.02)	0.05	(0.02)
UpperTierSize	0.13	(0.06)	0.15	(0.06)	0.14	(0.06)	0.15	(0.08)
SocialDiversity	-0.19	(0.06)	-0.18	(0.05)	-0.17	(0.05)	-0.17	(0.06)
President	0.07	(0.04)	0.05	(0.04)	0.05	(0.04)	0.05	(0.04)
OldDem	0.04	(0.02)	0.03	(0.02)	0.02	(0.02)	0.02	(0.02)
HorizontalTierSize	-0.09	(0.04)	-0.07	(0.04)	-0.05	(0.04)	-0.05	(0.05)
PersVoting	-0.04	(0.02)	-0.02	(0.03)				
$\ln(M_{avg})$	0.01	(0.01)						
R^2:	0.33		0.44		0.47		0.49	
Disturbances covariance:								
	fixed at zero		fixed at zero		fixed at zero		0.01	(0.06)
Over-all fit assessment:								
M.fit Chi^2 p-value			0.23		0.50		0.20	
CFI / TLI			1.00 / 0.94		1.00 / 1.03		0.99 / 0.92	
Pr(RMSEA)≤ .05 / SRMR			0.60 / 0.01		0.93 / 0.01		0.69 / 0.01	
AIC / SampleSize Adj.BIC			1531 / 1565		1532 / 1563		1534 / 1566	
N	832 (both)		832		832		832	

- Model 1 has separate equations estimated by OLS with clustered standard errors. Models 2 to 4 are system of equations estimated jointly by Maximum Likelihood, with standard errors and chi-square test statistics that are robust to non-normality and non-independence of observations (clustered).
- Parameters with p-values greater than 0.10 are in grey, to ease visualization of inference.
- In models 2 to 4, equation-level R^2 are the Bentler-Raykov's (2010) adjusted version for explained variance in nonrecursive models.
- In these models, the measure for Social Cleavages is the ethno-linguistic fractionalization index based on politically relevant groups (Cederman et. al., 2009).

Therefore, model 4 will be exactly the same as model 3, but allowing for the possibility of error covariance. To allow such covariance means we assume $ENEP_{nat}$ and $PtyNat$ can have (and test if they do have) additional shared omitted covariates, due to the possible reciprocity. It is a trickier model to estimate, because in case our additional instruments are weak or theoretical grounds for considering the variables as exclusive covariates are flawed, results of model 4 would become doubtful. Model 3 is more parsimonious. However, testing the differences between a preferred model (the number 3) and its version with correlated disturbances, is a crucial step for the reliability of results (see Antonakis et. al., 2010). Finally, model 5 is also exactly the same as the prefered model 3, but it includes an interaction between $\ln(M_{avg})$ and $SocialDiversity$ in the $ENEP_{nat}$ equation, following the recent mainstream of the literature on the subject[23]. All exogenous variables that were not explicitly mentioned as being exclusive covariates will be always included in both equations (shared covariates). The specialized software *Mplus 7.11* was used for estimation, with connection to *R 3.0.2* through the package *MplusAutomation*.

The table in Figure 3 has the results of models 1 to 4. Model 1 gives the results with the omitted variable bias, resembling the general approach that is common in the literature. First, notice that even this naïve approach gives some support for my theoretical expectations about the variables that should be exclusive covariates in the next models. For instance, as expected, $\ln(M_{avg})$ and $PersVoting$ do not have statistically significant effects on $PtyNat$, only on $ENEP_{nat}$ even under this omitted variable bias. A result confirmed by model 2 under the simultaneous equation framework. Since there is no evidence that these two variables may have direct effects on $PtyNat$, what comes in accordance to the fact that no established theory expects so, we may move on using them as the exclusive covariates of $ENEP_{nat}$ in the next models. The same can be said about $Federalism$ and $VtrsGeoHomog$ as exclusive covariates of $PtyNat$[24]. Models 3 and 4 use these additional exclusive covariates.

Model 3 has, in general, the same results as model 2, but it is the only model where the direct effect of $ENEP_{nat}$ on $PtyNat$ is also statistically significant. It means, where there is ready evidence of the reciprocal causality between number of parties and party nationalization. Model 4 shows, for instance, that this very same model specification, but allowing the possibility of covariance between the error terms of the $ENEP_{nat}$ and of the $PtyNat$ equations, once again makes the reciprocal causation not significant.

However, there is evidence that the error covariance is not statistically significant. What means that we cannot reject the null hypothesis that $ENEP_{nat}$ and $PtyNat$ have no additional shared covariate left out from our model. Or phrasing it differently, we cannot reject the null that the model is not omitting additional shared covariates between equations. It also means that, as there is no evidence of error covariance, we should stay with the more parsimonious models, like models 2 or 3. Being the number 3 the one with the best fit, as it can be seen by the probability RMSEA is lesser than .05 and by the greatest Chi^2 p-value[25].

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[23] I could not include $\ln(M_{avg})$ in the $PtyNay$equations because one variable has to be left as exclusive covariate, but if we, for instance, include it and exclude $PersVoting$, the result is qualitatively the same.

[24] Of course, also $VotersHomog$ clearly is a covariate with not even expectation to directly affect $ENEP_{nat}$, what is confirmed by alternative model specifications not presented in here due to similarity of results

[25] Talking about model selection, models 2 to 4 all have similarly good CFI, TLI and SRMR absolute fit statistics for the system of equations, as well as reasonably good equation-level Bentler-Raykov's (2010) R^2 - which is an adjusted version for nonrecursive systems. In addition, all the three models pass safely in the Chi^2 tests of model fit, rejecting the null hypothesis that misspecification issues may have affected the fit to the data. Under ML, these Chi^2 tests are also the tests for validity of instruments (Antonakis et. al., 2010), showing that the set of instruments in the two models are valid in all our simultaneous models. Lastly, the AIC and BIC measure of relative model fit are quite similar between models. Still, model 3 has a much better probability that RMSEA is lesser than 0.05, what is a sensible and therefore powerful indication of absolute fit. As well as it has the greatest Chi^2 p-value. Therefore, and because its version with disturbance covariance proved to be not necessary, model 3 will be used hereafter as the preferred model specification. As robustness checks, additional specifications with different combinations of excluded variables were tried and yielded the same general results.

The greatest difference across models was the effect of $PtyNat$ on $ENEP_{nat}$, i.e. the existence of reciprocal causation. This result proved to be quite sensible to model specification. But in general, the models with better fit showed a statistically significant reciprocal path[26]. This should be enough to claim that in general lines, to include $PtyNat$ in the models of $ENEP_{nat}$ without either modeling the reciprocal causality or at least using instrumental variable estimation, would mean to risk having unaddressed endogeneity depending on the rest of the model specification. However, the results make even clearer that not including it at all is definitely a problem. Looking back at model 1, it can be seen that in the usual OLS framework with omitted variable bias, some shared covariates have statistically significant effect on both $ENEP_{nat}$ and $PtyNat$, like $SocialDiversity$, $HorizontalTierSize$, $OldDem$ and $Presidential$. Yet, once we address the omitted variable bias by introducing $ENEP_{nat}$ and $PtyNat$ as covariates of each other, thus also explicitly specifying the possible reciprocal causation, the results for these shared covariates change quite radically. In all models 2 to 4 the direct effect from $HorizontalTierSize$, $OldDem$ and $Presidential$ become only statistically significant to $ENEP_{nat}$, not anymore to $PtyNat$. While, even more important for the canonical literature on this field, $SocialDiversity$ loses the statistical significance of its direct effect to $ENEP_{nat}$, as well as the strength of such coefficient is halved. At the same time, the direct effect of $SocialDiversity$ to $PtyNat$ stays significant, with similar strength and expected sign.

This is a clear indication that party nationalization, or cross-district linkage, have a mediator role for social diversity. It means, the effect of social diversity on number of parties only comes through first altering the party nationalization. But instead of just conjecturing such indirect effects, an additional gain we have for modelling the relationship between $ENEP_{nat}$ and $PtyNat$ through a system of equations is that we can easily decompose the direct and indirect effects of all covariates, as well as their statistical inference. Assessing that is important, because a significant relationship between the endogenous variables not necessarily means that the covariates of one of them have indirect effects on the other. Conversely, a non-significant relationship between the endogenous variables not necessarily prevents indirect effects from being relevant. Consequently, the coefficients of indirect effects must have their inference tested separately. I present in Figure 4 the indirect effects from all variables in previous model 3.

Overall, we can see in this table that no covariate of $ENEP_{nat}$ has an indirect effect on , but all important covariates of $PtyNat$ do have statistically significant indirect effects on $ENEP_{nat}$. With the exception of $Federalism$, whose effect on $PtyNat$ seems not to be strong enough to reach $ENEP_{nat}$. A first interesting finding among these covariates is the result of $VtrsGeoHomog$. It shows that, actually, even the degree of demographic regionalization of population in a country ends up strongly affecting the national number of parties indirectly, what is quite possibly something we are not used to think about. Even more importantly, as we can see social diversity and the size of upper tiers, two commonly used variables to explain the number of parties, are in fact only indirectly related with it. Compare the results to the model number 1 in the previous figure, with the results of omitted variable biased OLS estimation. The indirect effects of $SocialDiversity$ and of $UpperTierSize$ on $ENEP_{nat}$ are of similar strength to their direct effects on $ENEP_{nat}$ when $PtyNat$ is omitted. Therefore, their effects indeed exist, are significant and are quite strong. However, they reach the national number of parties only by altering the party system nationalization, not directly as we may be used to think, especially in the case of $SocialDiversity$. The theoretical underpinning of this is important. It means that, at least as far as the available measures can tell, we actually do not have evidence of social diversity being relevant for the within district electoral coordination. The evidence that scholars in general have been collecting seems to point, in reality, more to the role that social diversity has in changing the cross-district coordination.

[26] In the supplementary material I show that different expectations of measurement error for $PSNS_s$ also bring different results for the reciprocal causation. To the extent we assume more measurement error, it becomes more likely that the reciprocal path is statistically significant.

Figure 4 - Indirect effects to effective number of electoral parties ($ENEP_{nat}$) and to party ystem nationalization (PtyNat) in previous Model 3

Indirect effects to:	$ENEP_{nat}$			ln(PtyNat)		
Indirect effects from:	Coeff	S.E.	p-val	Coeff	S.E.	p-val
$\ln(M_{avg})$	0.02	(0.01)	0.13	-0.00	(0.00)	0.24
PersVoting	0.09	(0.05)	0.08	-0.01	(0.01)	0.25
HorizontalTierSize	0.44	(0.23)	0.06	-0.03	(0.02)	0.16
SocialDiversity	1.04	(0.52)	0.05	-0.03	(0.02)	0.12
President	-0.33	(0.25)	0.19	0.02	(0.01)	0.13
OldDem	-0.17	(0.14)	0.24	0.01	(0.01)	0.21
VtrsGeoHomog	-1.63	(0.91)	0.07	0.03	(0.01)	0.01
Federalism	0.28	(0.19)	0.13	-0.00	(0.00)	0.12
UpperTierSize	-0.61	(0.36)	0.09	-0.02	(0.03)	0.44
ln(PtyNat)	-0.50	(0.23)	0.03	0.10	(0.04)	0.01
$ENEP_{nat}$	0.10	(0.04)	0.01	-0.00	(0.00)	0.29

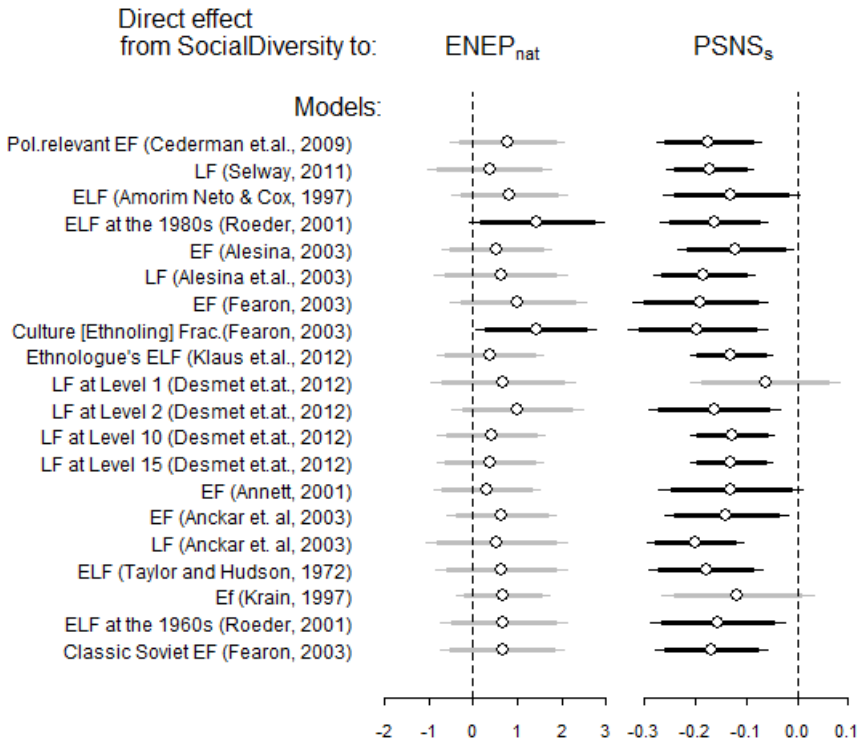
- Model was estimated by Maximum Likelihood, with standard errors robust to non-normality and non-independence of observations (clustered).
- Parameters with p-values greater than 0.10 are in grey, to ease visualization of inference.
- In this model, the measure for Social Cleavages is the ethno-linguistic fractionalization index based on politically relevant groups (Cederman et. al., 2009).

Recall, nonetheless, that we know since Stoll (2008) that different measures of social diversity can bring different results about its impact on the number of parties. Hence, we still have to check whether the results I have found are robust to different measures of social diversity. This is what I will present as a final evidence. I replicate model three 19 times, and in each I have used a different variable to measure social diversity. Figure 5 shows, from these replication models, the coefficients of the direct effects of $SocialDiversity$ in each equation. Other coefficients are omitted for the sake of space.

The difference is quite clear. While the impact of $SocialDiversity$ on the number of parties is almost never statistically significant, its impact on the party system nationalization is almost always significant, with expected sign, and quite strong. There are only two exceptions. One is Desmet et. al. (2012)'s measure of linguistic fractionalization at their level 1 of linguistic tree aggregation. But even though, this has clearly to do with their procedures to qualify language diversity according to different levels of language in the *Ethnologue*'s language tree, since if we use their measures at any other of their 14 levels, results are again consistent with other social diversity proxies. The other only exception is Krain's (1997). With this result, it seems clear that, fortunately, the results presented here do not suffer from the measurement sensitivity found by Stoll (2008) regarding the original debate.

Lastly, I now introduce my model number 5, which is basically the same as model 3, but with an interaction term between $\ln(M_{avg})$ and $SocialDiversity$. It is important to try this specification since it has recently become the standard way of translating the main theory on the determinants of the number of parties. It means, the idea that the permissiveness of the electoral system works as a break or an incentive for latent social and political cleavages to increase the number of parties (Duverger, 1954; Amorim Neto and Cox, 1997; Ordeshook and Shvetsova, 1994; Clark and Golder, 2006; Stoll, 2008). Again, I replicate this model 19 times, each with a different measure of social diversity. Figure 6 shows the conditional direct effects of $SocialDiversity$ on $ENEP_{nat}$ for each value of $\ln(M_{avg})$, in each of the replicated versions of model 5.

Figure 5 - Coefficient of the direct effects of SocialDiversity in 19 replicated versions of previous Model 3, each with a different measure for SocialDiversity



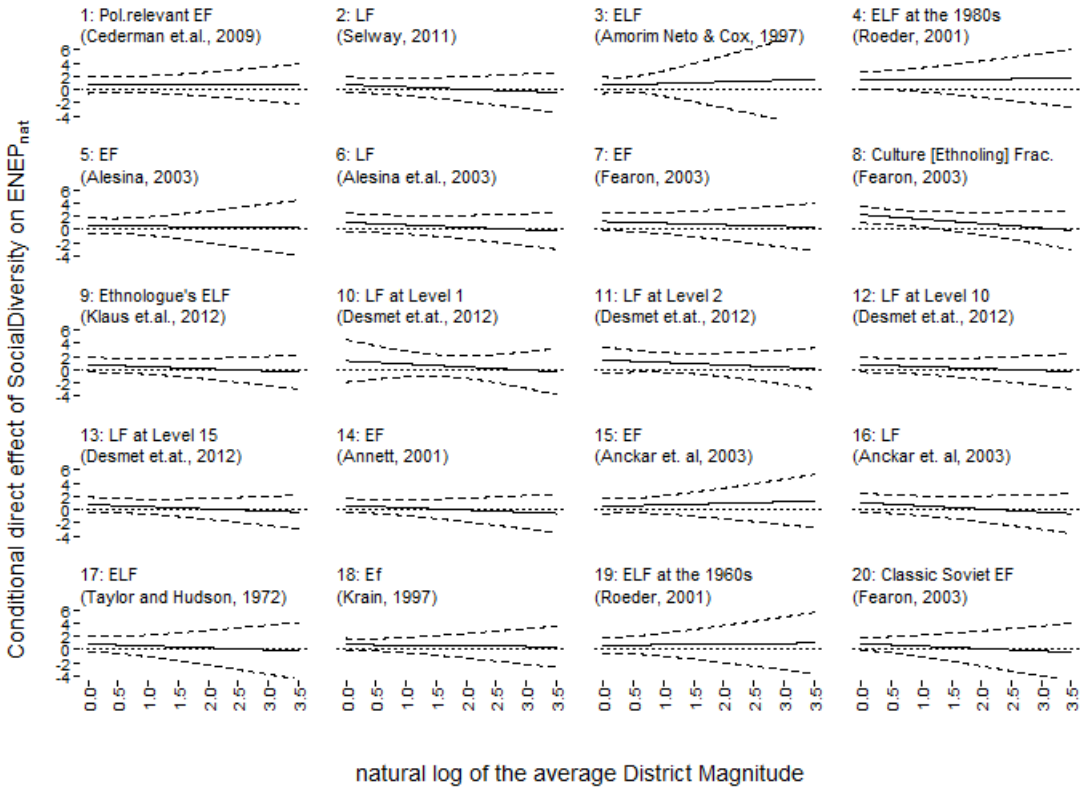
Notes: LF = Linguistic or Language Fractionalization; EF = Ethnic Fractionalization; ELF = Ethno-linguistic Fractionalization. Thicker bars = 0.10 confidence intervals; thinner bars = 0.05 confidence intervals. Thicker bars crossing zero are colored in grey; otherwise they are in black. All other parameters of each model are omitted for direct comparison, but are available upon request.

Figure 6 clearly shows that, once we include party nationalization in the equation of number of parties and also account for the possible reciprocity between them, there is no unmediated (direct) effect of social diversity on $ENEP_{nat}$, not even moderated by districts' magnitudes. Again, all effect of social diversity on the number of parties actually is mediated by party system nationalization, coming to $ENEP_{nat}$ only indirectly. The only exception is the measure of social diversity called Culture Diversity, by Fearon (2003). It is an ethnic fractionalization index that takes into account cultural distance of languages and is the only that has part of its conditional effect not crossing the zero line in the graphics above. Even though, only the very beginning of its plot is significant, meaning that only in cases with low average magnitudes social diversity measured by such measure would have a real impact on $ENEP_{nat}$. Besides, it has the opposite direction than expected. Greater average district magnitude appears to decrease the conditional effect of this measure of social diversity on $ENEP_{nat}$, what is inconsistent with the theory. Therefore, it is clear that the results point in the general direction found in the previous figures, i.e. social diversity only affects number of parties by first affecting party system nationalization.

Conclusion

Primarily, I have shown a way through which we can start including party system nationalization in the models of number of parties. I argue that, actually, no empirical research modeling number of parties at the national level should ever omit such a constitutive term. However, although I have found evidence

Figure 6 – Conditional direct effects of Social Cleavages on the effective number of parties ($ENEP_{nat}$), in 19 replication versions of Model 5, each with a different measure for SocialDiversity



Notes: LF = Linguistic or Language Fractionalization; EF = Ethnic Fractionalization; ELF = Ethno-linguistic Fractionalization. All other parameters of each model are omitted for direct comparison, but are available upon request.

suggesting that there may be a reciprocal causation between party nationalization and number of parties, thus leading to simultaneity endogeneity, I have also pointed that this result is non-robust to different specification and is weak. Still, researchers that want to stop omitting party nationalization from the models of number of parties should not risk the possibility that their specification is suffering from endogeneity.

To deal with it, I have proposed that researchers can model this through a simultaneous system of equations. But of course, considering the lack of strong and consistent evidence on the reciprocal causation, one could also model number of parties with party nationalization as covariate and estimate the model using simpler instrumental variable techniques. I would claim that this is probably the most generalizable solution: to not omit cross-district linkage from the models of national number of parties, but to estimate always in an instrumental variable framework. I have even offered here some initial suggestions of good instruments for party nationalization. Measures of federalism seem to be one. But above all, measures of geographical distribution of population or of voters seem to be the best options. In addition, if a researcher is operating in a simpler framework, out from the simultaneous equation world, another obvious option would be using a temporal lag as instrument (getting closer to an Arellano and Bond approach). I hope these first findings can help scholars to feel freer to explore directly the relationship between number of parties and cross-district coordination.

Furthermore, I have shown that all this effort is not a detail. By including party system nationalization in the model we actually alter consolidated results present in the literature. Or rather, we displace them to their correct location. Given the evidence usually mobilized by the literature, national-level measures of social diversity and upper tier size are variables that do not affect strategic voting at the electoral level. They change the degree of cross-district homogeneity of partisan electoral support. They change party system nationalization. It is not my intention to make the bolder theoretical claim that social diversity does not matter at all within electoral districts. They may have a role there as well, it is just that we really have no evidence as we usually think we do. The evidence that we usually relied on is spurious. In the end, it is only a matter of defending once more the idea, now empirically, that we should not make local conclusions using our aggregate data. Interestingly, we still lack good theories about why and how social diversity would alter the level of cross-district linkage of parties, candidates and voters. Maybe this is a good start to incentive future efforts in this direction.

References

ALESINA, A., DEVLEESCHAUWER, A., EASTERLY, W., Kurlat, S., WACZIARG, R., 2003. Fractionalization. Journal of Economic Growth vol. 8 (no. 2), 155–194 June.

AMORIM NETO, O and COX, G. Electoral institutions, cleavage structures and the number of parties. American Journal of Political Science, v. 41, p. 149-74, 1997.

ANTONAKIS, John, BENDAHAN, Samuel, JACQUART, Philippe and LALIVE, Rafael. 2010. On making causal claims: a review and recommendations. In: *The Leadership Quarterly*, n. 21

BENTLER, P. M., and T. RAYKOV. 2000. On measures of explained variance in nonrecursive structural equation models. Journal of Applied Psychology 85: 125-131.

BOCHSLER, D. Measuring party nationalisation: a new Gini-based indicator that corrects for the number of units. Electoral Studies, v. 29, n. 1, p. 155-68, March 2010.

BOCHSLER, Daniel. 2006. "Ethnic diversity, electoral system constraints and the nationalisation of political parties. A triangle model, applied on the Central and Eastern European countries." CEU Political Science Journal 1 (4):6-37.

BOLLEN, Kenneth. 1989. Structural Equations with Latent Variables. Wiley-Interscience.

BORMANNA, Nils-Christian and Matt GOLDER. 2013. Democratic Electoral Systems around the world, 1946–2011. Electoral Studies, Volume 32, Issue 2, June 2013.

BRANCATI, Dawn. Global Elections Database [computer file]. New York: Global Elections Database [distributor], Date Accessed 2013. Website: http://www.globalelectionsdatabase.com.

CAMPBELL, P. e ALISTAIR, C. French Electoral Systems and elections since 1789. Aldershot: Gower, 1989.

CARAMANI, D. The nationalisation of electoral politics: conceptual reconstruction and review of the literature. West European Politics, v. 19, n. 2, p. 205-24, April 1996.

CARAMANI, D. *The nationalization of politics - the formation of national electorates and party systems in Western Europe*. Cambridge: Cambridge University Press, 2004.

CAREY, John M e SHUGART, Matthew S. 1995. Incentives to Cultivate a Personal Vote: A Rank Ordering of Electoral Formulas. Electoral Studies, vol. 14, no 4, pp. 417-439.

CEDERMAN, Lars-Erik; Brian MIN; Andreas WIMMER. 2009. Ethnic Power Relations dataset, http://hdl.handle.net/1902.1/11796 UNF:5:k4xxXC2ASI204QZ4jqvUrQ== V1

CHHIBBER, P. K. e KOLLMAN, K. Party Aggregation and the Number of Parties in India and the United States. American Political Science Review v. 92, n. 2, p. 329—42, June 1998.

CLAGGETT, W., FLANIGAN, W. e ZINGALE, N. Nationalization of the American Electorate. American Political Science Review, v. 78, n. 1, p. 77-91, March 1984.

COLOMER, J. (2009). Personal Representation: The Neglected Dimension of Electoral Systems.

COOPEDGE, M. District magnitude, economic performance and party-system fragmentation in five Latin-American countries. Comparativa Political Studies, v. 30, p. 156-85, 1997.

COX, G. Electoral rules and electoral coordination. Annual Review of Political Science, v. 2, p. 145-61, 1999.

COX, G. W. Making Votes Count: strategic coordination in the World's electoral systems. New York: Cambridge University Press, 1997.

CRISP, Brian F.; Joshua D. Potter, and John J. W. Lee. Entry and Coordination in Mixed-Member Systems: A Controlled Comparison Testing the Contamination Hypothesis. The Journal of Politics, Volume 74, Issue 02, April 2012.

DESMET, Klaus; Ignacio ORTUÑO-ORTÍN and Romain WACZIARG. Journal of Development Economics, 2012.

DUVERGER, M. Political Parties. London: Methuen & CO. LTD, 1954.

FEARON, J., 2003. Ethnic and cultural diversity by country. Journal of Economic Growth, vol. 8 (no. 2), 195–222 June.

GAINES, Brian J. 1999. "Duverger's Law and the Meaning of Canadian Exceptionalism". Comparative Political Studies 32: 835-861.

GEDDES, B. e BENTON, A. The effect of Federalism on Latin America party systems. Conference on The Transformation of Argentina. Argentina: Universidad de San Andrés, 1997.

GERRING, J; S THACKER and C. MORENO. 2005. Centripetal Democratic Governance: A Theory and Global Inquiry. American Political Science Review 99(4):567-81.

GEYS, B. District magnitude, social heterogeneity and local party system fragmentation. Party Politics, v. 12, n. 2, p. 281-97, 2006.

GOLDER, M. 2006. Presidential coattails and legislative fragmentation. American Journal of Political Science, 50(1), 34-48.

GOLDER, M., & CLARK,W. (2006). Rehibilitating Duverger's theory: Testing the mechanical and strategic modifying effect of electoral laws. Comparative Political Studies, 39(6), 679-708.

GREENE, W. Econometric Analysis. Prentice Hall; 7 edition, February 13, 2011.

GRUMM, J. G. Theories of electoral systems. Midwest Journal of Political Science, v. 2, p. 357-76, 1958.

HICKEN, Allen and Heather STOLL. 2008. Electoral Rules and the Size of the Prize: How Political Institutions Shape Presidential Party Systems. Journal of Politics 70(4), 1-19.

HICKEN, Allen and Heather STOLL. 2011. Presidents and Parties: How Presidential Elections Shape Coordination in Legislative Elections. Comparative Political Studies 44(8).

HICKEN, Allen. 2009. Building Party Systems in Developing Democracies. New York: Cambridge University Press.

JONES, M. P. e MAINWARING, S. The nationalization of parties and party systems: an empirical measure and an application to the Americas, . Party Politics, v. 9, n. 2, p. 139-66, 2003.

JONES, M. P. Federalism and the Number of Parties in Argentine Congressional Elections. The Journal of Politics, v. 59, p. 538-49, 1997.

JONES, M. P. The political consequences of electoral laws in Latin America and the Caribbean. Electoral Studies, v. 12, n. 1, p. 59-75, 1993.

JONES, Mark. (1994). Presidential election laws and multipartism in Latin America. Political Science Quarterly, 47, 41-57.

KAPLAN, D. 2008. Structural Equation Modeling: Foundations and Extensions. SAGE Publications, Inc; 2nd edition.

KARVONEN, L. (2010). The Personalisation of Politics. A Study of Parliamentary Democracies. Colchester 2010: ECPR Press, 124 pp.

KAWATO, S. Nationalization and partisan realignment in congressional elections. American Political Science Review, v. 81, p. 1235-50, 1987.

KIM, J.O. e OHN, M.-G. A theory of minor-party persistence: election rule, social cleavage and the number of political parties. Social Forces, v. 70, n. 3, p. 575-99, 1992.

KOLLMAN, K., HICKEN, A., CARAMANI, D., & BACKER, D. 2013. Constituency-level elections archive [data file and codebook]. Ann Arbor, MI: Center for Political Studies, University of Michigan

LAAKSO, M. e TAAGEPERA, R. Effective number of parties: a measure with application to West Europe. Comparative Political Studies, v. 12, n. 1, p. 3-27, April 1979.

LEYS, C. Models, theories, and the theory of political parties. Political Studies, v. 7, p. 127-46, 1959.

LIJPHART, A. *Democracies: patterns of majoritarian and consensus government in twenty-one countries*. London: Yale University Press, 1984.

LIJPHART, A. The political consequences of electoral laws, 1945-85. *American Political Science Review*, v. 84, p. 481-96., 1990.

LIPSET, S. e ROKKAN, S. Party Systems and Voter Alignments: Cross-National Perspectives. New York: The Free Press, 1969.

LIPSON, L. Party system in the United Kingdom and the older Commonwealth: causes, resemblances and variations. Political Studies, v. 7, p. 12-31, 1959.

LUBLIN, David. Election Passport. American University. http:///www.electionpassport.com. 2013.

MAR. (2009). Minorities at Risk Dataset. College Park, MD: Center for International Development and Conflict Management. Retrieved from http://www.cidcm.umd.edu/mar/ on: Feb 2014.

MOENIUS, J and KASUYA, Y. Measuring Party Linkage across Districts: Some Party System Inflation Indices and their Properties. Party Politics, V.10/No.5, 2004.

MOENIUS, J and KASUYA, Y. The nationalization of party systems: Conceptual issues and alternative district-focused measures. Electoral Studies, Volume 27, Issue 1, March 2008.

MORGENSTERN, S., SWINDLE, S. M. e CASTAGNOLA, A. Party nationlization and institutions. The Journal of Politics, v. 71, n. 4, p. 1322-41, October 2009.

MORGENSTERN, Scott; John POLGA-HECIMOVICH and Peter M. SIAVELIS. Seven Imperatives for Improving the Measurement of Party Nationalization with Evidence from Chile. Electoral Studies, Volume 33, March 2014.

MUSTILLO, Thomas, and Sarah MUSTILLO. 2012. "Party Nationalization in a Multilevel Context: Where's the Variance?" Electoral Studies.

NORRIS, P. Ballot Structures & Legislative Behavior. Paper for the conference "Exporting Congress? The Influence of the U.S. Congress on World Legislatures" Jack D. Gordon Institute for Public Policy and Citizenship Studies, Florida International University, University Park Campus, Miami, Florida December 6-7, 2002

ORDESHOOK, P. e SHVETSOVA, O. Ethnic heterogeneity, district magnitude and the number of parties. American Journal of Political Science, v. 38, p. 100-23, 1994.

PAXTON, Pamela M., John R. HIPP, Sandra MARQUART-PYATT. 2011. Nonrecursive Models: Endogeneity, Reciprocal Relationships, and Feedback Loops. SAGE Publications, Inc; 1 edition.

RAE, D. W. The Political Consequences of Electoral Laws. Yale: Yale University Press, 1971.

RENWICK, Alan and Jean-Benoit PILET. The Personalization of Electoral Systems: Theory and European Evidence. Paper prepared for presentation at the ECPR General Conference, University of Reykjavik, 25-27 August 2011.

RIKER, W. H. The two-party system and Duverger's Law: an essay on the history of Polilitical Science. American Political Science Review, v. 76, p. 753-66, 1982.

ROEDER, P. (2001). Ethnolinguistic fractionalization (ELF) indices, 1961 and 1985. Retrieved Dez 2013 from http://weber.ucsd.edu/~proeder/elf.htm

ROSE, R. e URWIN, D. W. Persistence and change in Western party systems since 1945. Political Studies, v. 18, p. 287-319, 1970.

ROSE, R. e URWIN, D. W. Regional differentiation and political unity in Western Nations. v. 1. n. 06-007. London: SAGE Publication, 1975. (SAGE Professional Papers in Contemporary Political Sociology).

SARTORI, G. Parties and party systems: a framework for analysis. Cambridge: Cambridge University, 1976.

SCHATTSCHNEIDER, E. E. The Semisovereign people: a realist's view of Democracy in America. New York: Holt, Rinehart and Winston, 1960.

SELWAY, Joel. 2011. The Measurement of Cross-cutting Cleavages and Other Multidimensional Cleavage Structures. Political Analysis 19(1): 48-65.

STOLL, Heather. Social Cleavages and the Number of Parties How the Measures You Choose Affect the Answers You Get. Comparative Political Studies. Volume 41 Number 11. November 2008.

SUNDQUIST, J. L. Dynamics of the party system: alignment and realignments of political parties in the United States. Washington, DC: Brooking Institution, 1973.

TAAGEPERA, R. e SHUGART, M. S. Seats and votes: the effects and determinants of electoral systems. New Haven: Yale University Press, 1989.

TAAGEPERA, R. Predicting the number of parties: a quantitative model of Duverger's mechanical effect. American Political Science Review, v. 87, n. 2, p. 455-64, June 1993.

TAAGEPERA, R. The number of parties as a function of heterogeneity and electoral system. Comparative Political Studies, v. 32, n. 5, p. 531-48, August 1999.

TAAGEPERA, Rein. Effective Number of Parties for Incomplete Data. Electoral Studies, Vol. 16, No. 2, 1997.

WILDAVSKY, A. A methodological critique of Duverger's political parties. Journal of Politics, v. 21, p. 303-18, 1959.

WOOLDRIDGE, J. 2010. Econometric Analysis of Cross Section and Panel Data. The MIT Press; second edition.

WUCHERPFENNIG, J., N. B.WEIDMANN, L. GIRARDIN, L.-E. CEDERMAN, and A. WIMMER (2011). Politically relevant ethnic groups across space and time: Introducing the GeoEPR dataset. Conflict Management and Peace Science, Forthcoming.

Annex A – List of countries' elections per tier that are present in the sample

Country	Tier	Election years	N. Elec.	Country	Tier	Election years	N. Elec.
Albania*°	PR	2009-2013	2	Japan	MMD	1947-1993	18
	SMD	1996-2005	4		PR	1996-2012	6
Australia	AV	1946-2010	26		SMD	1996-2012	6
Austria	PR	1945-2008	20	Korea°	SMD	1948-2008	19
Barbados	MMD	1966	1	Latvia	PR	1993-2011	7
	SMD	1971-2008	9	Lithuania*°	SMD	1992-2008	5
Belgium	PR	1946-2010	21	Luxembourg	PR	1945-2013	15
Bolivia	PR	1985-2009	7	Macedonia*	PR	2002-2011	4
	SMD	1997-2009	4		SMD	1994	1
Brazil	PR	1945-1962	5	Malta	PR	1966-2013	11
		1982-2010	8	Mexico	PR	1991-2012	8
Bulgaria	PR	1991-2009	6		SMD	1991-2012	8
	SMD	2009	1	Netherlands	PR	1946-2012	21
Canada	SMD	1945-2011	22	New Zeal. °	SMD	1946-2011	23
Chile	MMD	1989-2009	6	Norway	PR	1945-2009	17
Colombia	MMD	1958-1990	12	Peru	PR	1963	1
	PR	1991-2010	6			1980-2011	8
Costa Rica	PR	1953-2010	15	Poland	PR	1991-2011	7
Croatia*°	PR	1995-2007	4	Portugal	PR	1976-2011	13
	SMD	1992	1	Romania*°	PR	1990-2004	5
Cyprus	PR	1981-2011	7	Russia°	SMD	1993-2003	4
Czech Rep.	PR	1990-2013	8	Slovenia*	PR	1996-2011	5
Denmark	PR	1945-2011	24	South Afr. °	PR	1994-2009	4
Domin. Rep.*	PR	1962-2010	12	Spain	PR	1977-2011	11
Ecuador	PR	1979-2009	12	Sri Lanka	PR	1960-1977	6
Estonia	PR	1995-2011	6		SMD	1989-2010	7
Finland	PR	1945-2011	19	Sweden	PR	1948-2010	20
France*	PR	1986	1	Switzerland	PR	1947-2011	17
	SMD	1973-1981	3	Taiwan°	MMD	1992-2044	5
		1988-2012	6		SMD	2008-2012	2
Germany	PR	1949-2009	17	Trin y Tobago	SMD	1966-2010	12
	SMD	1949-2009	17	Turkey	MMD	1950-1957	3
Ghana	SMD	1996-2008	4		PR	1961-2011	13
Greece*	MMD	1952,1956	2	Ukraine	SMD	1994-2012	4
	PR	1946,1951	2	United King.	SMD	1945-2010	17
		1958-2007	14	United States	SMD	1946-2012	34
Honduras	PR	1981-2009	8	Uruguay	PR	1954-2009	11
Hungary	PR	1990-2010	6	Venezuela*	PR	1958-2000	11
	SMD	1990-2010	6		SMD	2005-2010	2
Iceland	PR	1959-2013	21	Zambia	SMD	1968	1
India*	SMD	1977-2004	9			1996-2011	5

Ireland	PR	1948-2010	18			
Italy	PR	1948-1992	11	Overall	MMD	47
		1994-2008	5		PR	506
	SMD	1994-2001	3		SMD+AV	276
Jamaica	SMD	1962-2011	11	Total		829

*Missing elections: Albania (1992/smd); Croatia (2011/pr); Dominican Republic (1990/pr); France (1945-1977/smd); Greece (1950/pr); India (1951-1977/smd); Lithuania (2012/smd); Macedonia (1998/smd); Romania (2008-2012/smd); Slovenia (1992/pr); Venezuela (1993/pr, 1993-2000/smd).

°In some or all elections, these countries also had an additional PR tier with only one nation-wide constituency, which was dropped from the sample since they make it meaningless to talk about cross-district homogeneity: Albania (1992-2005); Croatia (1992 and 1995); Korea (1963-2012); Lithuania (1992-2012); New Zealand (1996-2011); Romania (2008-2012); Russia (1993-2011); South Africa (1994-2009); Taiwan (1992-2012).

Annex B - Proof of endogeneity in models of $ENEP_{nat}$ that do *not* include $PtyNat$, due to omitted variable bias

Let us suppose that, as usual, a researcher does not include party system nationalization ($PtyNat$) in a model of number of parties ($ENEP_{nat}$), like the following:

$$ENEP_{nat} = \beta_0 + \beta_1 SocDiversity + \sum_{j=2}^{J} \beta_j X_j + \zeta$$

Where $SocDiversity$ is the social diversity (but could be any other variable of interest), X_{1,j_1} is the set of additional explanatory variables and ζ is disturbance term. The assumption of regular regression estimation is that all variables at the right hand side of the equation are not correlated with ζ.

However, theory clearly tells us that $E[ENEP_{nat} \mid PtyNat] \neq 0$. Therefore, in the initial equation $PtyNat$ is being absorbed by ζ:

$$\zeta = \gamma_1 PtyNat + \varepsilon$$

Where ε_1 is the true disturbance term of $ENEP_{nat}$, were $PtyNat$ included in the model as a covariate.

Now suppose that $Cov(PtyNat\,,\ SocDiversity) \neq 0$, i.e. that they are correlated. Because $PtyNat$ is within the error term ζ, the consequence is that $SocDiveristy$ ends up being correlated with this error term as well.

To understand why we substitute the formula of ζ into $Cov(SocDiversity\,, \zeta)$.

$$Cov(SocDiversity\,, \zeta) = Cov(SocDiversity\,, \gamma_1 PtyNat + \varepsilon)$$

$$= Cov(SocDiversity\,, \gamma_1 PtyNat) + Cov(SocDiversity\,, \varepsilon)$$

Here the last term can be canceled out since the expected covariance between $SocDiversity$ and ε_1 is zero, otherwise it would mean that there are additional omitted variables confounding the effect of $SocDiversity$ on $ENEP_{nat}$.

Then

$$Cov(SocDiversity\,, \zeta) = \gamma_1 Cov(SocDiversity\,, PtyNat)$$

Therefore, if $\gamma_1 \neq 0$ (i.e. $PtyNat$ in fact has an effect on $ENEP_{nat}$) and if $Cov(SocDiversity\,, PtyNat) \neq 0$ (i.e. $PtyNat$ is related to $SocDiversity$), not including $PtyNat$ in the original equation would make

$SocDiversity$ to be endogenous, i.e. related to the error term $Cov(SocDiversity, \zeta) \neq 0$. This scenario will yield biased and inconsistent estimation of β_1, i.e. of the effect of $SocDvsty$ on $ENEP_{nat}$.

In order to see why, it is easier to represent the terms $\beta_1 SocDiversity + \sum_{j=2}^{J} \beta_j X_j$ with matrices. Let X_{1xp} be a matrix of all p explanatory variables in the model while B_{px1} is the matrix the coefficient of their effects on $ENEP_{nat}$.

The parameter estimates will be usually given by the following formulae:

$$\hat{B} = (X'X)^{-1}X'Y$$

Then we substitute Y

$$\hat{B} = (X'X)^{-1}X'(XB + \gamma_1 PtyNat + \varepsilon)$$

$$= (X'X)^{-1}X'XB \ + \ (X'X)^{-1}X'PtyNat\gamma_1 \ + \ (X'X)^{-1}X'\varepsilon$$

$$= B \ + \ (X'X)^{-1}X'PtyNat\gamma_1 \ + \ (X'X)^{-1}X'\varepsilon$$

As the expectation of ε_1 is zero as its mean is assumed to zero, the last term of this equation can be canceled out. So,

$$\hat{B} = B \ + \ (X'X)^{-1}X'\gamma_1 PtyNat$$

Where $(X'X)^{-1}X'\gamma_1 PtyNat$ is the bias that makes $\hat{B}$ to deviate from B. Notice that this bias depends on both γ_1, i.e. the effect of $PtyNat$ on $ENEP_{nat}$ and also on the correlation between $PtyNat$ and the other explanatory variable being considered, due to $(X'X)^{-1}X'PtyNat$.

Besides, as the correlation between $SocDiversity$ and the omitted $PtyNat$ has the same sign as the correlation between $PtyNat$ and $ENEP_{nat}$, i.e. a negative, we can also advance that the bias in the estimation of the effect of $SocDiversity$ on $ENEP_{nat}$ in original model with omitted variable is positive. I.e. the omission of $PtyNat$ artificially increases the result of the effect

Annex C - Proof of endogeneity in models of $ENEP_{nat}$ that include $PtyNat$, *if* they do not explicitly model the possible reciprocal causation between these variables

Let us suppose that a researcher naïvely includes party system nationalization ($PtyNat$) in a model of number of parties ($ENEP_{nat}$), like the following:

$$ENEP_{nat} = \ \gamma_{1,0} + \gamma_{1,1} PtyNat + \sum_{j=1}^{J} \beta_{1,j} X_j' + \zeta_1$$

Where X_j' is the set of additional explanatory variables and ζ_1 is disturbance term. The assumption of regular regression estimation is that all variables at the right hand side of the equation are not correlated with ζ_1.

However, although not specifying it, the researcher is afraid that the following relationship may also be true:

$$PtyNat = \gamma_{2,0} + \gamma_{2,1} ENEP_{nat} + \sum_{k=1}^{K} \beta_{2,k} X_k'' + \zeta_2$$

Where $Other_2$ is the sets of exogenous variables of this equation and ζ_2 is its disturbance term.

The proof that $E[PtyNat \mid \zeta_1] \neq 0$ in the first equation is as follows. First we isolate $PtyNat$, what I will do here by substituting the first equation into the second. In this step, I will omit the intercepts of both

equations to simplify the mathematical steps. Dropping the intercepts for this proof is usual practice and does not alter anything. So,

$$PtyNat = \gamma_{2,1}\left(\gamma_{1,1}PtyNat + \sum_{j=1}^{J}\beta_{1,j}X'_j + \zeta_1\right) + \sum_{k=1}^{K}\beta_{2,k}X''_k + \zeta_2$$

$$PtyNat = \gamma_{2,1}\gamma_{1,1}PtyNat + \gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j + \gamma_{2,1}\zeta_1 + \sum_{k=1}^{K}\beta_{2,k}X''_k + \zeta_2$$

$$PtyNat - \gamma_{2,1}\gamma_{1,1}PtyNat = \gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j + \gamma_{2,1}\zeta_1 + \sum_{k=1}^{K}\beta_{2,k}X''_k + \zeta_2$$

$$PtyNat(1 - \gamma_{2,1}\gamma_{1,1}) = \gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j + \gamma_{2,1}\zeta_1 + \sum_{k=1}^{K}\beta_{2,k}X''_k + \zeta_2$$

$$PtyNat = \frac{1}{1 - \gamma_{2,1}\gamma_{1,1}}\left(\gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j + \gamma_{2,1}\zeta_1 + \sum_{k=1}^{K}\beta_{2,k}X''_k + \zeta_2\right)$$

Assuming $\gamma_{2,1}\gamma_{1,1} \neq 1$, we can transform the above into the reduced form equation for $PtyNat$:

$$PtyNat = \Pi_{2,1}X' + \Pi_{2,2}X'' + \mathrm{Z}_2$$

Where

$$\mathrm{Z}_2 = \frac{\gamma_{2,1}\zeta_1 + \zeta_2}{1 - \gamma_{2,1}\gamma_{1,1}}$$

As a result, if the reciprocal path in fact exists, i.e. $\gamma_{2,1} \neq 0$, then $PtyNat$ is a function of ζ_1. It means that $PtyNat$ and ζ_1 are not independent in the first equation. In more detail, here is why $Cov(PtyNat\,, \zeta_1) \neq 0$. We substitute the last structure form equation for the $PtyNat$ inside this Cov function:

$$Cov(PtyNat\,, \zeta_1) = Cov\left(\frac{\left(\gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j + \gamma_{2,1}\zeta_1 + \sum_{k=1}^{K}\beta_{2,j}X''_k + \zeta_2\right)}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right)$$

$$= Cov\left(\frac{\gamma_{2,1}\sum_{j=1}^{J}\beta_{1,j}X'_j}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right) + Cov\left(\frac{\gamma_{2,1}\zeta_1}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right) + Cov\left(\frac{\sum_{k=1}^{K}\beta_{2,j}X''_k}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right) + Cov\left(\frac{\zeta_2}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right)$$

By definition, the first, third and fourth terms in the above equation are equal to zero. The first and the third because it is assumed that $Cov(X'_j\,, \zeta_1) = 0$ and $Cov(X''_k\,, \zeta_1) = 0$ as they are specified as exogenous variables. The fourth term because here we are also assuming $Cov(\zeta_1\,, \zeta_2) = 0$ for simplicity. One of the models in the paper considers the possibility that this is not the case, but its results show that such null specification between the error terms holds true. As a result of canceling these thee terms here, we end up with:

$$Cov(PtyNat\,, \zeta_1) = Cov\left(\frac{\gamma_{2,1}\zeta_1}{1 - \gamma_{2,1}\gamma_{1,1}}\,, \zeta_1\right)$$

$$= \frac{\gamma_{2,1}}{1 - \gamma_{2,1}\gamma_{1,1}}Var(\zeta_1)$$

Therefore, provided that there is a reciprocal path, i.e. $\gamma_{2,1} \neq 0$, $Cov(PtyNat\,, \zeta_1)$ will certainly be different from zero as well. Thus, $PtyNat$ will be endogenous.

Of course, all the reasoning in this proof also applies for $ENEP_{nat}$ and ζ_2 in equation two.