Online Appendix: Conceptualization and Measurement of Party System Nationalization in Multilevel Electoral Systems

Party system nationalization expresses the degree to which a party system is territorially integrated. Most scholars conceive a highly nationalized party system as one whereby parties receive equal vote shares across the territory whereas a denationalized party system is characterized by parties which receive all or most of their vote share in a particular territory. Social scientists use party nationalization scores to compare and contrast different party systems or to sketch the evolution of a particular party system over time. Typically, measurements of party nationalization take the party as a unit of analysis and are exclusively applied to federal (national) elections. This research has undoubtedly produced interesting findings but it represents a limited outlook on party system nationalization in multilevel electoral systems.

A multilevel electoral system is defined as holding elections to at least two tiers of government. India is an example of a multilevel party system because it holds federal and state election (in addition to local or municipal elections). Party system nationalization obtains a broader meaning when applied to elections at multiple levels. In addition to studying the extent to which parties are able to win equal vote shares across the territory one may also explore the degree to which *states* are nationalized or territorially integrated. In other words, the unit of analysis not only includes the party but also the state. Furthermore, a multilevel electoral system perspective allows for an exploration of party system nationalization in federal as well as in state elections.

In this appendix we discuss our measurements of nationalization in multilevel electoral systems. First we will discuss measurements of nationalization of *parties* and subsequently we will elaborate on the indicators for the nationalization of *states*. Then we proceed with a discussion on the different kind of insights the various indicators may generate with regard to the causes of party system nationalization.

We will explain our measurements according to an example displayed in figure A1. The top box with solid lines displays the results for one federal election and the bottom box with solid lines presents the outcomes of four state elections. The measures for *party* nationalization (PNSS) are presented within the double solid line boxes. Our indicators for the nationalization of *states* (congruence) are shown in the boxes with the dashed lines. The measurements of nationalization rely on different types of vote shares. Federal election results can be aggregated to the federal (FF) or disaggregated to the state level (FS). Similarly, one can look at state election vote shares in a particular state (SS) or at the federal level (SF). Below we explain how we clustered state election results in order to obtain state election results at the federal level. There are four parties (P_A through P_D) and four states (S_W through S_Z) and in this example we assume that each state has an equal number of voters.

The nationalization of parties
A party is highly nationalized when it receives equal vote shares across the territory whereas a denationalized party wins votes in one or few jurisdictions in the country. Most measurements of party system nationalization take the party as a unit of analysis and in this article we apply the party nationalization score standardized by the number and weight of territorial units (PNSS; Bochsler 2010b). In our example (table A1) all four parties win 25 per cent of the federal vote at the federal party system level (FF) but receive varying vote shares in the states (FS; the cells in table A1). Party A (P_A) obtains equal vote shares across the states and receives the highest score of 1 (PNSS-F). The vote shares for the other three parties (P_B, P_C, and P_D) are unequally distributed across the states and therefore receive lower scores (respectively, 0.32, 0.20, and 0.20).

Figure A1: Nationalization of party systems, parties and states in federal and state elections

Federal election: cells display *FS*					
	S$_W$	S$_X$	S$_Y$	S$_Z$	**FF**
P$_A$	25	25	25	25	**25**
P$_B$	0	50	50	0	**25**
P$_C$	0	0	25	75	**25**
P$_D$	75	25	0	0	**25**

PNSS-F
1.00
0.32
0.20
0.20
$\bar{X}$ = 0.43

Electorate congruence federal election FF-FS					
	S$_W$	S$_X$	S$_Y$	S$_Z$	
P$_A$	0	0	0	0	
P$_B$	25	25	25	25	
P$_C$	25	25	0	50	
P$_D$	50	0	25	25	$\bar{X}$ =
DIS	50	25	25	50	37.5

State elections: cells display *SS*					
	S$_W$	S$_X$	S$_Y$	S$_Z$	**SF**
P$_A$	0	25	25	25	**18.8**
P$_B$	0	50	50	0	**25**
P$_C$	0	0	25	75	**25**
P$_D$	100	25	0	0	**31.3**

PNSS-S
0.62
0.32
0.20
0.18
$\bar{X}$ = 0.30

Electorate congruence state elections SF-SS					
	S$_W$	S$_X$	S$_Y$	S$_Z$	
P$_A$	18.8	6.3	6.3	6.3	
P$_B$	25	25	25	25	
P$_C$	25	25	0	50	
P$_D$	68.8	6.3	31	31	$\bar{X}$ =
DIS	68.8	31.3	31.3	56.3	46.9

Election congruence FS-SS					
	S$_W$	S$_X$	S$_Y$	S$_Z$	
P$_A$	25	0	0	0	
P$_B$	0	0	0	0	
P$_C$	0	0	0	0	
P$_D$	25	0	0	0	$\bar{X}$ =
DIS	25	0	0	0	6.3

Party system congruence FF-SS					
	S$_W$	S$_X$	S$_Y$	S$_Z$	
P$_A$	25	0	0	0	
P$_B$	25	25	25	25	
P$_C$	25	25	0	50	
P$_D$	75	0	25	25	$\bar{X}$ =
DIS	75	25	25	50	43.8

A multilevel party system perspective lead us to apply the PNSS to federal (PNSS-F) as well as to state (PNSS-S) elections. In our example, vote shares are similar between federal and state elections for all states except for state W (S$_W$). P$_A$ receives 25 per cent in the federal but zero per cent in the state election whereas P$_D$ increases its vote share from 75 to 100 percent between the federal and state elections. As a result, the PNSS scores for P$_A$ and P$_D$ are lower for state elections (respectively 0.62 and 0.18) than for the federal election (respectively, 1.00 and 0.20) indicating lower degrees of party nationalization in state elections.

PNSS-scores can also be derived at the party system level by taking a weighted average across parties ($\bar{X}$ weighted by their vote shares at the federal level, i.e. FF or SF). Party system nationalization is higher for the federal election ($\bar{X}$ PNSS-F = 0.43) than for the state elections ($\bar{X}$ PNSS-S = 0.30). Since the unit of analysis underlying PNSS-scores is the party we can relate the denationalization of state elections to lower party nationalization scores for P$_A$ and P$_D$.

The nationalization of states

The PNSS –as many other nationalization indicators– are particularly apt to measure the nationalization of parties but they do not inform us about the extent to which states are nationalized. A highly nationalized state is one in which the vote is similar to the other states whereas a denationalized state is characterized by a completely different party system than in the rest of the country. Figure A1 introduces four measures on the nationalization of states (congruence) which are based on a dissimilarity index:

$$Dissimilarity\ index = \frac{1}{2}\sum_{i}^{n}|X_{ijk} - X_{ijk}|$$

Whereby X_{ijk} represents a vote share for party i in a particular type of election j (state or federal) and aggregated to level k (state or federal). The dissimilarity index varies from a minimum of 0 per cent – completely similar or full congruence– to 100 per cent –completely dissimilar or full incongruence (note that there is an inverse relationship between the dissimilarity index and the degree of congruence).

Our measures of state nationalization (congruence) vary on the type of vote shares which are plugged into the dissimilarity index. There are four types of vote shares: federal election results at the federal level (FF) and at the state level (FS) and state election results at the federal (SF) and state level (SS). Our indicators are based on comparisons between different types of vote shares. In a box below we give an example of how four congruence scores can be calculated for state W.

Box: example calculation congruence measures for state W (S_W)

Party system congruence (FF-SS)	**Electorate congruence federal elections (FF-FS)**
½ * [P_A|FF-SS| + P_B|FF-SS| + P_C|FF-SS| + P_D|FF-SS|]	½ * [P_A|FF-FS| + P_B|FF-FS| + P_C|FF-FS| + P_D|FF-FS|]
½ * [|25-0| + |25-0| + |25-0| + |25-100|]	½ * [|25-25| + |25-0| + |25-0| + |25-75|]
½ * [25 + 25 + 25 + 75] = 75	½ * [0 + 25 + 25 + 50] = 50
Election congruence (FS-SS)	**Electorate congruence state elections (SF-SS)**
½ * [P_A|FS-SS| + P_B|FS-SS| + P_C|FS-SS| + P_D|FS-SS|]	½ * [P_A|SF-SS| + P_B|SF-SS| + P_C|SF-SS| + P_D|SF-SS|]
½ * [|25-0| + |0-0| + |0-0| + |75-100|]	½ * [|18.8-0| + |18.8-0| + |25-0| + |31.3-100|]
½ * [25 + 0 + 0 + 25] = 25	½ * [18.8 + 18.8 + 25 + 68.8] = 68.8

Party system congruence seeks to measure the extent to which state party systems are different from the federal party system (a comparison between FF and SS). This indicator informs us about the extent to which state party systems are nationalized (or integrated). Two sources of variation underlie party system congruence since we are comparing, at the same time, different types of elections (j) and different levels of aggregation (k). To tease out the two sources of variation we differentiate between electorate and election congruence.

Electorate congruence keeps the type of election constant but varies the level of aggregation and seeks to measure to what extent a particular state electorate is different from the federal electorate. Hence, this indicator gauges the degree to which state electorates are nationalized. Since we have two types of elections we may derive electorate congruence for federal elections (a comparison between FF and FS) and for state elections (a comparison between SF and SS).

Election congruence keeps the level of aggregation constant but varies the type of election. This indicator assesses the extent to which an electorate votes similarly in state and federal elections (i.e. dual voting). This measure can be interpreted as the degree to which a state electorate is to a similar extent nationalized for federal and state elections. There are two levels of aggregation and vote switching can be explored in a particular state (a comparison between FS and SS) as well as at the federal level (a comparison between FF and SF). However, federal level election congruence is not very informative with regard to the territorial heterogeneity of the vote since it does not vary at the state level.

Congruence scores can be derived for individual states which can be subsequently averaged (weighted by state size; in our example each state contains 25 per cent of the total electorate) in order to obtain a score for the whole party system ($\bar{X}$). The average dissimilarity score for party

system congruence ($\bar{X}$ FF-SS) equals to 43.8 per cent which means that almost half of the vote is different between federal and state party systems.

Party system nationalization in multilevel electoral systems
Most studies on nationalization use indicators with parties as a unit of analysis. A state-level perspective leads one to broaden one's analytical lens and induces one to ask new and unexplored questions with regard to the causes of nationalization. We obtain a holistic view on party system nationalization in multilevel electoral systems when we consider both measures of party and state nationalization.

Indicators for party nationalization inform us about the extent to which parties are able to win equal vote shares across the territory. A multilevel electoral system perspective invites us to apply indicators to state (PNSS-S) as well as federal elections (PNSS-F). From the example displayed in Figure A1 one may observe that party vote shares are more unequally distributed across the territory for state ($\bar{X}$ PNSS-S = 0.30) than for federal elections ($\bar{X}$ PNSS-F = 0.43). Hence, an exclusive focus on federal elections would overestimate the extent of nationalization.

A closer look at individual parties reveals that only P_A and P_D are confronted with lower nationalization scores in state elections whereas P_B and P_C obtain equal vote shares in federal and state elections. This result may direct the attention of the researcher to the question why P_A and P_D are confronted with different voter support bases.

The indicators for state nationalization generate different kinds of insight. From the example in Figure A1 we may observe that party system congruence ($\bar{X}$ FF-SS = 43.8) can be broken down into election congruence ($\bar{X}$ FS-SS = 6.3) and electorate congruence for federal elections ($\bar{X}$ FF-FS = 37.5). In other words, we gain insight into the causes underlying denationalization of the vote. Denationalization (increasing party system congruence FF-SS) can be triggered by voters switching votes between federal and state elections (dual voting; decreasing election congruence FS-SS) or by wider inter-state variations in voting patterns for federal elections (decreasing electorate congruence FF-FS).

Electorate congruence for federal (FF-FS) and state elections (SF-SS) informs us about the extent to which the vote differs across the states. These two indicators closely resemble the party nationalization measurements (respectively PNSS-F and PNSS-S) with one important exception. The unit of analysis is the state for the congruence measures whereas it is the party for party nationalization scores. The congruence measures provide insights into the question which state electorates tend to vote differently whereas party nationalization scores inform us about which parties are differently favoured across the territory.

Comparing federal to state elections
In many federal countries –including India– state elections are held at a different date than federal and other state elections. Apart from electorate congruence for federal elections (FF-FS) and party nationalization scores applied to federal elections (PNSS-F), our indicators of party and state nationalization contrast federal to state election outcomes. Hence, the question arises which elections should be compared to each other?

There was vertical and horizontal simultaneity for the federal elections of 1952, 1957, 1962, and 1967 which poses no problem in comparing the federal vote to the state vote. For elections post 1967 we take a federal election and we match it to state elections held closest in time either before or after the federal election. The federal elections of 1971 and 2014 are exceptions to this rule. State and general elections were de-coupled in 1971 and we compare the federal election of 1971 to state elections which are held later. Our analysis stops with the federal election of 2014 and we compare these results with previously or simultaneously held state elections. The table below shows which elections are compared when calculating scores on our indicators of party and state nationalization.

Table: Comparisons of federal and state elections in India underlying the congruence measures

FEDERAL	10/1971	03/1977	06/1980	12/1984	11/1989	05/1991	05/1996	03/1998	10/1999	05/2004	05/2009	04/2014
Andhra Pradesh	03/1972	02/1978	02/1978	05/1985	11/1989	11/1989	12/1994	09/1999	09/1999	04/2004	04/2009	04/2014
Arunachal Pradesh	—	02/1978	03/1980	12/1984	02/1990	02/1990	03/1995	10/1999	10/1999	10/2004	10/2009	04/2014
Assam	03/1972	02/1978	02/1978	12/1985	05/1991	05/1991	04/1996	04/1996	05/2001	04/2006	04/2011	04/2011
Bihar	03/1972	10/1977	05/1980	05/1985	02/1990	02/1990	03/1995	02/2000	02/2000	02/2005	11/2010	11/2010
Chhattisgarh	—	—	—	—	—	—	—	—	—	12/2003	11/2008	11/2013
Delhi	03/1972	10/1977	10/1977	05/1983	06/1993	06/1993	11/1998	11/1998	11/1998	12/2003	11/2008	12/2013
Goa	03/1972	01/1977	03/1980	12/1984	11/1989	11/1989	11/1994	06/1999	06/1999	05/2002	06/2007	03/2012
Gujarat	03/1972	05/1975	05/1980	05/1985	02/1990	02/1990	02/1995	02/1998	02/1998	12/2002	12/2007	12/2012
Haryana	03/1972	10/1977	05/1982	06/1987	06/1987	05/1991	05/1996	05/1996	02/2000	02/2005	10/2009	10/2009
Himachal Pradesh;	03/1972	10/1977	05/1982	05/1985	02/1990	09/1993	02/1998	02/1998	02/1998	02/2003	12/2007	11/2012
Jammu and Kashmir	03/1972	06/1977	06/1977	05/1983	03/1987	—	09/1996	09/1996	10/2002	10/2002	12/2008	12/2008
Jharkhand	—	—	—	—	—	—	—	—	—	02/2005	12/2009	12/2009
Karnataka	03/1972	02/1978	02/1978	05/1985	11/1989	11/1989	11/1994	09/1999	09/1999	03/2004	05/2008	05/2013
Kerala	09/1970	03/1977	01/1980	03/1987	06/1991	06/1991	06/1996	06/1996	05/2001	05/2006	04/2011	04/2011
Madhya Pradesh	03/1972	10/1977	05/1980	02/1985	02/1990	02/1990	11/1993	11/1998	11/1998	12/2003	11/2008	11/2013

Maharashtra	03/1972	02/1978	05/1980	05/1985	02/1990	02/1990	02/1995	09/1999	09/1999	10/2004	10/2009	10/2009
Manipur	02/1972	02/1974	06/1980	05/1985	12/1990	12/1990	02/1995	02/2000	02/2000	02/2002	02/2007	01/2012
Meghalaya	03/1972	02/1978	02/1978	02/1983	02/1988	02/1993	02/1998	02/1998	02/1998	02/2003	03/2008	02/2013
Mizoram	04/1972	05/1978	04/1979	04/1984	11/1989	11/1989	11/1993	11/1998	11/1998	11/2003	12/2008	11/2013
Nagaland	02/1974	11/1977	11/1982	11/1982	11/1989	02/1993	02/1998	02/1998	02/1998	02/2003	03/2008	02/2013
Odisha	03/1971	10/1977	05/1980	05/1985	02/1990	02/1990	03/1995	02/2000	02/2000	04/2004	04/2009	04/2014
Pondicherry	02/1974	10/1977	03/1980	05/1985	02/1990	06/1991	04/1996	04/1996	05/2001	05/2006	04/2011	04/2011
Punjab	03/1972	10/1977	05/1980	09/1985	02/1992	02/1992	02/1997	02/1997	02/2002	02/2002	02/2007	01/2012
Rajasthan	03/1972	10/1977	05/1980	05/1985	02/1990	11/1993	11/1993	11/1998	11/1998	12/2003	12/2008	12/2013
Sikkim	—	12/1979	12/1979	05/1985	11/1989	11/1989	11/1994	10/1999	10/1999	05/2004	04/2009	04/2014
Tamil Nadu	03/1971	10/1977	05/1980	12/1984	01/1989	06/1991	02/1996	02/1996	05/2001	05/2006	04/2011	04/2011
Tripura	03/1972	12/1977	12/1977	05/1983	02/1988	02/1993	02/1998	02/1998	02/1998	02/2003	02/2008	02/2013
Uttarakhand	—	—	—	—	—	—	—	—	—	02/2002	02/2002	01/2012
Uttar Pradesh	02/1974	10/1977	05/1980	05/1985	11/1989	05/1991	09/1996	09/1996	02/2002	02/2002	05/2007	03/2012
West Bengal	03/1972	10/1977	05/1982	05/1987	06/1991	06/1991	07/1996	07/1996	05/2001	05/2006	05/2011	05/2011