

ASK, 2008, nr 17, strony 101–113
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DECOMPOSITION OF LONG-TERM CHANGES IN POLITICAL OPINIONS ACCORDING TO GROUP-SPECIFIC MARKOV PROCESSES*

In this paper I use longitudinal data for Poland to test the assumption that political opinion change through time is not entirely due to some universal and time-constant processes; rather, it depends on the initial conditions in a person's state. Information on Poles' evaluations of the past socialist regime available for repeated intervals, and over a sufficiently long time period—ten years—allows me to decompose long-term changes in assessment of socialism into short-term change, and the reliability of responses according to group-specific Markov processes. I obtain three types of stochastic matrices: $M_{t, t+10}$, $M_{t, t+1}$, $M_{rel} = R$, where M refers to a matrix of opinions in time t by opinions in subsequent time, t refers to specific years, and R is the reliability matrix from the measurement of opinions in one-month period. To assess the fit of the observed transition matrix for the 10-year period as a linear combination of matrices $M_{t, t+1}$ and M_{rel} , I apply the random effect maximum likelihood function in STATA, with the bootstrap option for obtaining the standard errors of the coefficients. Results demonstrate that Markov-type processes do not have significant explanatory power for long-term change in opinions about socialism. Substantively, this means that the 'subjective' legacy of the past, namely peoples' views of the former regime, matters.

Key words: long-term, short-term change in public opinion; group-specific Markov processes, stochastic matrices, evaluation of socialist, POLPAN, POLTEST

* Work on this paper was supported by the Graduate Interdisciplinary Specialization in Survey Research and the Department of Sociology at the Ohio State University, and the Institute of Philosophy and Sociology of the Polish Academy of Sciences. I wish to thank Elizabeth Stasny, Herb Weisberg, Gerald Kosicki, and Kazimierz M. Slomczynski for their useful comments. Address for correspondence: Irina Tomescu-Dubrow, Institute Philosophy and Sociology, Polish Academy of Science, Nowy Swiat 72 - Palac Staszica, 00-330 Warszawa, e-mail: idubrow@ifispan.waw.pl.

Introduction

In social-psychology, research on functions of beliefs (Eagly and Chaiken 1998) and cognitive dissonance (Festinger 1957, Harmon-Jones 1999) provide important insights into the mechanism underlying attitude change. Correspondingly, one of the main achievements in sociology is to explain attitude change through variables describing position of individuals in the social structure (see Rose et al. 1998, Slomczynski and Marquart-Pyatt 2007). In all these theoretical approaches it is particularly important to establish to what extent opinion change depends on the initial condition in a person's state, and to what extent it is governed by internally self-sufficient means. This paper deals with this issue focusing on Poles' change in opinion about the past socialist regime.

In Central and Eastern Europe, two observations call for a specific investigation of political opinion formation and its change. First, even journalistic accounts show that in the countries of the former Soviet bloc people remember the historical experience of communism differently. For Poland, research on the 1988-2003 period shows that, essentially, one third of the adult population evaluates the pre-1989 socialist system positively, one third has neutral views, and one third of people have negative opinions (Slomczynski and Wilk 2002, Tomescu-Dubrow and Slomczynski 2006). We can add to this first observation the second one: within less than two decades people repeatedly change their opinion about socialism. In the years following systemic change in Poland, one fifth of respondents switch from a negative to a positive assessment of socialism. Reverse switching, from positive to negative, also occurs, but after 1993 it remains constantly lesser than changes to the positive. Moreover, the proportion of people who initially held a neutral view on socialism but then switch to a positive one increases with the passage of time (Tomescu-Dubrow and Slomczynski 2006).

The crucial issue, given these observations, is to determine whether political opinion change through time is due to some universal and time-constant processes, and/or the extent to which it actually reflects structural transformations. One way to tackle this issue is to examine individuals' opinion change by means of statistical analysis of two components of long-term change: (1) short-term change, and (2) the reliability of responses. Both these components can be represented in terms of Markov-type processes. Defined briefly, a Markov process is a random process whose future probabilities are determined by its most recent values, and the values of the past "do not count" (Dobson and Meeter 1974). Sometimes it is a mathematical model for the random evolution of a *memoryless*

system. Thus, one can ask: Is the observed transition matrix for long-term change in opinion of socialism decomposable into two types of matrices, the first of Markov Equilibrium Matrix M, and the second the Markov Reliability Matrix R?

Panel data available for post-1989 Poland allow me to estimate these matrices using respondents' evaluations of the past. I conceptualize evaluations of the past in terms of attitudes towards the socialist system in Poland, that is, in terms of the degree of positive/negative assessment of socialism. This specific reference point is essential for this research problem since "socialist system" represents an abandoned regime. Thus, change in opinion about socialism is not caused by the change in its object; it might be caused only by the change in the subject - a person and his or her conditions.

Markov Process

A problem can be considered a (first-order) Markov process if it has the following properties:

- a. For each time period, every object/person in the system is in exactly one of the defined states. At the end of each time period, each object either moves to a new state or stays in that same state for another period.
- b. The objects move from one state to the next according to the transition probabilities which depend only on the current state (they do not take any previous history into account). The total probability of movement from a state A to B must equal one (movement from a state to the same state does count as movement).
- c. The transition probabilities do not change over time (the probability of going from state A to state B today is the same as it will be at any time in the future). This is not a requirement of Markov chains in general, but for a homogeneous Markov chain.

Hence, the transition matrix used to model the Markov chain will have the following properties: (i) each element of the transition matrix is a probability; therefore, each is a number between 0 and 1, inclusive; (ii) the elements of each row of the transition matrix sum to 1; and (iii) the transition matrix must be square because it has a row and a column for each state.

In sociology, attempts to use Markov processes date back to the middle of 1950s (for review see Thomlinson 1970; Hannan and Tuma 1979). Usually applications relate to studies of social mobility and labor force dynamics (Horan 1976, Singer 1981). Less frequent are studies of opinion change and response errors

in multi-wave pane data (Bye and Schechter 1986; Dobson and Meeter 1974). For a review of application of Markov models for repeated measurements of one categorical variable at several consecutive points in time see Langeheine and Van de Pol (1990); see also Carette (1999) on the compatibility of multi-wave panel data and the continuous-time homogeneous Markov chain.

To represent political opinion change in terms of Markov-type processes, longitudinal survey data are needed. Specifically, we should be able to capture peoples' opinion about a certain political event at repeated intervals, and also over a sufficiently long time period. For Poland, the panel data sets POLPAN and POLTEST offer this opportunity.

Data and Measurement

Data

The data for this paper come from two sources. The first is the Polish Panel Survey, POLPAN 1988-2003. In this survey a representative sample of Poles was interviewed in 1988 and re-interviewed in 1993, 1998, and 2003. The 1988 random sample consisted of 5,817 men and women ages twenty-one to sixty-five. The 1993 wave was based on a random sample of 2,500 respondents from the 1988 wave. In 1998, the sample consisted of 1,752 men and women ages thirty-one to sixty-five who had been interviewed in both previous waves, and a renewal sample of people aged twenty-one to thirty ($n = 383$). In 2003, the sample consisted of those who took part in the previous waves ($n = 1,474$) as well as those from the younger cohort, age twenty-one to twenty-five in the year of the study. For this paper, analyses are conducted on the POLPAN panel sample, consisting of people who evaluated socialism in 1993 and 2003.

The second data set is the POLTEST survey, a three-wave panel survey on a national representative sample of adults in Poland. It involves one one-month inter-interview interval and one one-year inter-interview interval and was recently executed by the Polish Center for Public Opinion Research as a part of a larger a project (for details, see Simkus, Ringdal, Slomczynski, Zagorski, and Mach 2002). All waves of POLTEST were conducted through personal interviews in March 2004 (N=1458), April 2004 (N=767) and again in March 2005 (N = 850). Altogether, 665 people took part in all three waves (Wenzel and Zagorski, 2005).

Measurement

The POLPAN and the POLTEST surveys contain the same central questions about assessment of the experienced socialist regime. This is essential for examining whether Markov-type processes have significant explanatory power for long-term change in political opinions. The questionnaire item asks: “Do you think that the socialist system brought to the majority of people in Poland: (1) gains only, (2) more gains than losses, (3) as many gains as losses, (4) more losses than gains, or, (5) losses only?” Since I am interested in a clear-cut distinction between outlooks on the past, I regroup the five-choice answer into three categories: *positive assessment* of socialism, comprised of ‘gains only’, and ‘more gains than losses’; *neutral assessment*, corresponding to ‘as many gains as losses’; and *negative assessment*, which includes ‘more losses than gains,’ and ‘losses only.’

Mode of Analysis

I provide detailed analyses for assessing the fit of the observed transition matrix for the 10-year period 1993-2003 as a linear combination of matrices $M_{t, t+1}$ and $M_{rel} = R$, expressed in the equation:

$$M_{t, t+10} = a + \beta_1(M_{t, t+1})^{10} + \beta_2(R) + E, \text{ where } E \text{ is a matrix of residuals}$$

The reason for focusing on Poland 1993-2003 is twofold. Methodologically, having a longer time span is better because it allows the transition matrix to achieve stability and it is easier to see whether we deal with a Markov-type process or not. Substantively, to assume that the process could be potentially of Markov type, it is better to start in the post-communist period already, as the 1988-1993 interval was characterized by radical socio-economic and political transformations.

Information from the POLPAN and POLTEST surveys allows me to obtain three types of stochastic matrices: $M_{t, t+10}$, $M_{t, t+1}$, $M_{rel} = R$, where M refers to a matrix of opinions in time t by opinions in subsequent time, t refers to specific years, and R is the reliability matrix from the measurement of opinions in one-month period. More specifically, I use POLPAN to create the *observed* transition matrix for long-term change. The one-year inter-interview interval in the POLTEST survey allows for assessing the short-term changes and constructing the corresponding *equilibrium* matrix $(M_{t, t+1})^{10}$, while the one-month inter-interview interval in POLTEST captures reliability of answers. Reliability means

to what extent the measurement is reproducible. Assuming that people do not change their opinion within one month, the transition matrix for one month would be the *reliability* matrix.

Results

Observed Matrix

Table 1 displays the observed matrix for 10-year change ($M_{t, t+10}$) for 1993-2003, N_{ij} , calculated on the POLPAN panel sample of people who in 1993 belonged to the categories of Winners, Neutrals or Losers ($N = 833$). For each element N_{ij} , i represents the starting location, and j the ending location for that move (i.e. the row is the beginning location, and the column is the ending location after one move). I denote with 'A' positive assessment of socialism, with 'B' neutral assessment of socialism and with 'C' negative assessment of socialism.

Table 1. Transition matrix for observed 10-year change in assessment of socialism ($M_{t, t+10}$), 1993-2003

$$\begin{array}{c}
 A \\
 B \\
 C
 \end{array}
 \begin{array}{ccc}
 A & B & C \\
 \left[\begin{array}{ccc}
 0.60 & 0.25 & 0.15 \\
 0.35 & 0.42 & 0.23 \\
 0.29 & 0.28 & 0.43
 \end{array} \right] & = & N_{ij}
 \end{array}$$

Answers to the assessment of socialism question for the 1993-2003 period confirm previous research showing a considerable degree of stability but also substantial change in peoples' evaluations of the past, dependent on the initial state. The proportion of switches from negative evaluations to positive ones are higher than in the reverse direction, and for people who held a neutral opinion of socialism, more switch to a positive appraisal than a negative one.

Homogeneous Equilibrium Matrix

I construct the transition matrix of the type $M_{v_{t+1}}$, denoted S_{ij} , which captures the observed one-year change in assessment of socialism among all respondents based on panel data from the POLTEST data set ($N = 296$). Raising S_{ij} to the 10th power gives the homogeneous equilibrium matrix $(S_{ij})^{10} = S_{ij}^A$, which corresponds to *computed* 10-year change.¹ Both matrices S_{ij} and $(S_{ij})^{10} = S_{ij}^A$ are given in Table 2.

Table 2. Transition matrix of change in assessment of socialism ($M_{v_{t+1}}$), 2004-2005

$$\begin{array}{c}
 A \\
 B \\
 C
 \end{array}
 \begin{array}{c}
 A \quad B \quad C \\
 \left[\begin{array}{ccc}
 0.48 & 0.40 & 0.12 \\
 0.16 & 0.60 & 0.24 \\
 0.07 & 0.24 & 0.69
 \end{array} \right]
 \end{array}
 = S_{ij}$$

$$\begin{array}{c}
 A \\
 B \\
 C
 \end{array}
 \begin{array}{c}
 A \quad B \quad C \\
 \left[\begin{array}{ccc}
 0.18 & 0.42 & 0.40 \\
 0.18 & 0.42 & 0.40 \\
 0.18 & 0.42 & 0.40
 \end{array} \right]
 \end{array}
 = (S_{ij})^{10} = S_{ij}^A$$

Clearly, S_{ij}^A is very different from N_{ij} , the transition matrix for observed 10-year change. This indicates that a *homogeneous transition process does not capture the process of long-term change in opinion of socialism well*, and raises the question of whether a heterogeneous transition process would be a better fit.

Group-Dependent Equilibrium Matrix

Studies of the consequences of the 1989 systemic change in Central and Eastern Europe, Poland included, demonstrate that the costs and benefits of the socio-economic

¹ The transition matrices in this chapter were computed using the Matrix Algebra Tool available through the Department of Mathematics, Hofstra University, http://people.hofstra.edu/faculty/stefan_waner/RealWorld/Summary8.html

conomic and political restructuring have been distributed differently across social groups, justifying the distinction between ‘winners’ and ‘losers’ of the transition. Generally, managers, experts and the new class of employers have taken advantage of the business opportunities the post-1989 environment opened. In contrast, manual workers and farmers have been strongly hit by the downsides of privatization, such as down-closing and/or downsizing of state-run enterprises, inflation and withdrawal of state subsidies. They make up a disproportionate share of the ‘losers’ category (Slomczynski and Shabad 1997; Slomczynski 2002; 2007).

With this distinction in mind, the next step is to examine whether a heterogeneous transition process would be a better fit for long-term change in opinion of socialism. By heterogeneous process I understand the group-dependent process—that is, that the equilibrium matrices for specific groups differ. Table 3 shows change in evaluations of socialism from 2004 to 2005 for Winners, Neutrals, and Losers, respectively, obtained from the POLTEST panel data. Only respondents whose social status has not changed over the examined period are considered.

Table 3. Observed one-year change in assessment of socialism for different social groups, 2004-2005

Observed One-year Change in Assessment of Socialism among ‘Winners’(SW)				
March 2004 From	March 2005 To			N (100%)
	Positive	Neutral	Negative	
Positive	58.3%	16.7%	25.0%	12
Neutral	14.8%	59.3%	25.9%	27
Negative	0.0%	8.3%	91.7%	24
Observed One-year Change in Assessment of Socialism among ‘Neutrals’(SN)				
March 2004 From	March 2005 To			
	Positive	Neutral	Negative	
Positive	52.4%	28.6%	19.0%	21
Neutral	10.5%	76.3%	13.2%	38
Negative	2.9%	26.5%	70.6%	34
Observed One-year Change in Assessment of Socialism among ‘Losers’(SL)				
March 2004 From	March 2005 To			
	Positive	Neutral	Negative	
Positive	44.8%	48.3%	6.9%	58
Neutral	19.6%	50.0%	30.4%	56
Negative	19.2%	34.6%	46.2%	26

Calculated from POLTEST panel sample.

Based on Table 3 I obtain the observed one-year transition matrices for each of these social groups. The transition matrices raised to the 10th power give the equilibrium matrices for Winners, for Neutrals, and for Losers respectively. Table 4 shows three equilibrium matrices that are very different from each other. Hence, the assumption that the propensity of changing opinion about socialism is the same across social groups does not hold.

Table 4. Equilibrium matrices for winners, for neutrals and for losers

$$\begin{matrix} & \text{A} & \text{B} & \text{C} \\ \text{A} & \left[\begin{array}{ccc} 0.07 & 0.18 & 0.74 \\ 0.07 & 0.18 & 0.74 \\ 0.07 & 0.18 & 0.74 \end{array} \right] \\ \text{B} & \\ \text{C} & \end{matrix} = S_{Winners}^{10}$$

$$\begin{matrix} & \text{A} & \text{B} & \text{C} \\ \text{A} & \left[\begin{array}{ccc} 0.14 & 0.53 & 0.33 \\ 0.14 & 0.53 & 0.33 \\ 0.14 & 0.53 & 0.33 \end{array} \right] \\ \text{B} & \\ \text{C} & \end{matrix} = S_{Neutrals}^{10}$$

$$\begin{matrix} & \text{A} & \text{B} & \text{C} \\ \text{A} & \left[\begin{array}{ccc} 0.26 & 0.45 & 0.29 \\ 0.26 & 0.45 & 0.29 \\ 0.26 & 0.45 & 0.29 \end{array} \right] \\ \text{B} & \\ \text{C} & \end{matrix} = S_{Losers}^{10}$$

The following equation provides the group-dependent equilibrium matrix:

$$S_{ij}^B = a^* (S_w)^{10} + b^* (S_N)^{10} + c^* (S_L)^{10}, \text{ where}$$

- a, b, and c are the proportions of Winners, Neutrals and Losers in 1993 in POLPAN,² and

- (S_w)¹⁰, (S_N)¹⁰, (S_L)¹⁰ are the equilibrium matrices for Winners, Neutrals and Losers respectively, presented in Table 4. However, when I calculate the transi-

² Proportion of Winners = 0.156 (N = 133); proportion of Neutrals = 0.322 (N = 274); proportion of Losers = 0.522 (N = 444).

tion matrix in which the group-specific equilibrium matrices are components with appropriate weights, I receive a group-dependent equilibrium matrix that is very similar to the homogeneous one (S_{ij}^A).

Table 5. Group-dependent equilibrium matrix

$$\begin{array}{c} A \\ B \\ C \end{array} \begin{array}{c|cc} A & B & C \\ \hline 0.19 & 0.44 & 0.37 \\ 0.19 & 0.44 & 0.37 \\ 0.19 & 0.44 & 0.37 \end{array} = S_{ij}^B$$

Reliability Matrix

An equilibrium matrix R for the one-month change in assessment of socialism (March 2004-April 2004, POLTEST), expressed by transition matrix T, is considered to be a reliability matrix. Equilibrium was reached by raising T to the 12 power. Both matrices, T and R, are presented in Table 6.

Table 6. Transition matrix T and the equilibrium reliability matrix R

$$\begin{array}{c} A \\ B \\ C \end{array} \begin{array}{c|cc} A & B & C \\ \hline 0.59 & 0.28 & 0.13 \\ 0.21 & 0.64 & 0.15 \\ 0.16 & 0.24 & 0.60 \end{array} = T$$

$$\begin{array}{c} A \\ B \\ C \end{array} \begin{array}{c|cc} A & B & C \\ \hline 0.32 & 0.42 & 0.26 \\ 0.32 & 0.42 & 0.26 \\ 0.32 & 0.42 & 0.26 \end{array} = R$$

Basic Equation

Considering the group-dependent equilibrium matrix $(M_{v_{t+10}})^{10}$ and the reliability matrix R together allows us to test the hypothesis about the explanatory power of Markov-type process. I estimated the basic equation,

$$M_{v_{t+10}} = a + \beta_1(M_{v_{t+1}})^{10} + \beta_2(R) + E$$

using the random effects maximum likelihood function in STATA, with the option of bootstrapping for obtaining the standard errors of the coefficients. Bootstrapping is a method for estimating the sampling distribution of parameters by re-sampling from the original sample. Since it does not require the normality assumption to be met, and can be effectively utilized with smaller sample sizes ($N < 20$) it is an optimal tool for this analysis. The coefficients for $\beta_1 = -0.610$, and for $\beta_2 = 0.559$, with constant $a = 0.350$. The bootstrap standard error for β_1 is 0.452, and for β_2 is 0.656, with 50 replications.³

The coefficients for both matrices are far from being statistically significant. The residuals are also very large. Moreover, the probability $\chi^2 = 0.386$, and the Wald $\chi^2 = 1.90$ ($df = 2$) show that the model fits the data very poorly. Overall, these findings demonstrate that Markov-type processes do not have significant explanatory power for long-term change in public opinion about socialism. It would be easy to explain long-term public opinion changes in socialism, if for these changes only the previous state would matter. This, however, would mean that history is irrelevant. Therefore, from a substantial point of view the findings discussed in this paper are good news, because they show that the legacy of the past cannot be ignored.

Conclusion

Empirical analyses performed in this paper demonstrate that a major premise for studies of political opinions -that the values of the past matter -is justified. Using longitudinal survey data for Poland, I have applied Markov-type processes to model opinion change about the pre-1989 socialist regime by means of statistical analysis of two components of long-term change: (1) short-term change, and (2) the reliability of responses. Results show that Markov-type processes do not have significant explanatory power for long-term change in public opinion

³ Estimating the basic equation using the homogenous equilibrium matrix $(S_{ij})^{10} = S_{ij}^A$ and the reliability matrix R yields similar results: The coefficients for $\beta_1 = -0.553$ and for $\beta_2 = 0.361$, with constant $a = 0.39$. The bootstrap standard error for β_1 is 0.484 and for β_2 is 0.581.

about socialism. The non-significant coefficients for the heterogeneous equilibrium matrix corresponding to *computed* 10-year change, and for the reliability matrix (R), the very large residuals, and the fit statistics showing a poor fit of the model to the data demonstrate that long-term changes in assessment of socialism do not depend only on its most recent state. Substantively, this means that the 'subjective' legacy of the past, namely peoples' views of the former socialist regime, matters. Further research should consider how evaluations of the past may affect peoples' adjustment to the post-communist environment.

Methodologically, in this paper I have chosen over-reduced matrices. I intend to repeat these analyses on full transition matrices, to address the question: How do various parameters of social structure (such as formal education, occupational status, and job income) and demographic characteristics (such as gender and age) influence opinion change. Opinion change should be represented by stochastic matrices $M_{v, t-5}$, $M_{v, t-1}$ and M_{error} , where subscript t refers to time. I expect that the discrepancy between the real opinion change and the ideal Markov-type processes is far from uniform across various segments of the social structure. It is likely that the analyzed processes are not time-homogeneous, and the rate of change in opinions varies across time, related to specific historical events.

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