Preference Heterogeneities in Models of Electoral Behavior*

Walter R. Mebane, Jr.[†] John E. Jackson[‡] Jonathan Wall[§]

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[†]Professor, Department of Political Science and Department of Statistics, University of Michigan, Haven Hall, Ann Arbor, MI 48109-1045 (E-mail: wmebane@umich.edu).

[‡]Professor, Department of Political Science, University of Michigan, Haven Hall, Ann Arbor, MI 48109-1045 (E-mail: jjacksn@umich.edu).

[§]Department of Political Science, University of Michigan, Haven Hall, Ann Arbor, MI 48109-1045 (E-mail: jonwall@umich.edu).

Abstract

Preference heterogeneities should be included in political behavior models. We demonstrate this using spatial policy distance measures. Different voters weight policy issues differently—perhaps because they are variously well informed, are differently situated or are more or less unthinkingly partisan. If the weights that apply to preferences are heterogeneous, a question is whether they vary more or less continuously across the public or whether there are different sets of individuals where all individuals in the same group use the same weights even though there is variation among groups. The latter configuration has many of the features of Converse's idea of "issue publics." Using survey data from Poland we use mixed logit models to implement such preference heterogeneities. A latent class mixed logit model outperforms both a continuous mixed logit model and a model that lacks preference weight heterogeneities. Not only the weights placed on policy issues but other aspects of tastes vary across latent classes, in particular the weights placed on economic evaluations. The latent class structure varies significantly over time, which suggests it is more a function of political context than of personal characteristics. Modeling randomly varying coefficients reveals important aspects of political behavior that are otherwise difficult to observe or understand.

Introduction

The seminal work by McFadden (1973) using conditional or multinomial logit models (MNL) to analyze choice behavior is well suited to models of electoral choice in multi-party elections. It incorporates variables describing the choices, in this case attributes of the parties or candidates as well as variables describing the choosers, such as occupation, education, or income.[1] This model is restrictive in that it assumes that individuals are homogeneous in that everyone weights each attribute identically. As such, this model is well suited to the early spatial models of voting, which assume identical utility functions except for the individual ideal points (Davis and Hinich 1966).

An important advance beyond the MNL models was the mixed logit model (McFadden and Train 2000; Train 2009). This is a random coefficients model in which the weights given to each attribute by each individual follow a random distribution, such as a normal or log-normal, rather than being fixed values. Glasgow (2001) has been a proponent of these models in political science. This introduces the possibility of heterogeneity among individuals in their choice behavior. This model nicely matches the second Davis and Hinich (1968) model that assumes random individual weights that were distributed independently of preferences.

Neither of these models is consistent with the classic description of issue publics (Converse 1964). By issue publics he meant groups of voters who vote on the basis of a single or small set of issues and that this issue or set varied among individuals or groups. The proposition of issue publics implies different fixed or mean values for the weights for different groups of voters. The MXL advance in choice models introduces heterogeneity in the weights given to different attributes of the options.

Latent class mixed logit models introduce an alternative to continuous mixed logit models that more closely matches the idea of issue publics (Greene and Hensher 2003; Hess, Ben-Akiva, Gopinath and Walker 2011). The latent classes are homogeneous (though

[1] In McFadden's analysis of transportation choice the attributes were price, convenience, etc.

this condition can be relaxed) in the weights they give to various attributes but there is heterogeneity between classes. We suggest that issue publics may be associated with latent classes.

This paper uses data from surveys following two Polish national elections (Jackson, Mach and Markowski 2010) to explore and compare these models of heterogeneity. The next section describes the two heterogeneous choice models. This is followed by a brief description of the two Polish elections and the data used to compare the models. The 1997 data are used for a detailed comparison of the continuous mixed logit and latent class mixed logit models. The 2001 election data are used to examine the question of whether the latent classes are relatively fixed over time or change with electoral context. We conclude with some observations about the importance of heterogeneity in voter choice models and ways to model that heterogeneity.

Models of Heterogeneity

In our case the choice-model specifications are based on two kinds of variables. First are choice-specific "spatial distance" policy covariates. Let X_{ik} represent survey respondent i's position on an issue k and let P_{jk} represent party j's position, with each variable being measured on a scale from one to ten. Let $w_{ik} = 1$ if repondent i has a position on issue k, otherwise $w_{ik} = 0$. The policy "distance" variables are $D_{ijk} = w_{ik}|X_{ik} - P_{jk}|$ for policy issues indexed by $k = 1, \ldots, K$, where $i = 1, \ldots, n$ indexes respondents and $j = 1, \ldots, J$ indexes parties. For each respondent let all these variables be collected in the vector $\mathbf{D}_i = (D_{ijk} : j = 1, \ldots, J; k = 1, \ldots, K)^\top$. The second set of variables, denoted Z_{ih}, $h = 1, \ldots, H$, concerns various behaviors, opinions or attributes of each respondent i. Let all these variables be collected in the vector $\mathbf{Z}_i = (Z_{ih} : h = 1, \ldots, H)^\top$.

Using coefficients β_{cjh} and α_{ck}, the choice models use the (nearly) linear predictors

$$\nu_{icj} = \beta_{cj0} + \sum_{h=1}^{H} \beta_{cjh} Z_{ih} - \sum_{k \in \mathcal{K}_c} \alpha_{ck} D_{ijk}^{\gamma} \tag{1}$$

where the exponent $\gamma > 0$ is to be estimated, $\mathcal{K}_c$ indicates which subset of the full set of issues is included in the particular linear predictor and, in order to identify the parameters, $\beta_{c10} = 1$ and $\beta_{c1h} = 0$, $h = 1, \ldots, H$. The index $c = 1, \ldots, C$ becomes meaningful in the model forms that feature multiple latent classes, in which case c indicates the latent class and $\mathcal{K}_c$ may vary across latent classes. In model forms that do not feature latent classes we suppress the index c to reduce notational clutter. Let $\boldsymbol{\alpha} = (\alpha_{ck} : c = 1, \ldots, C; k \in \mathcal{K}_c)^\top$ and $\boldsymbol{\beta} = (\beta_{cjh} : c = 1, \ldots, C; j = 1, \ldots, J; h = 0, \ldots, H)^\top$.

One model form is the basic MNL model in which there are no latent classes and the coefficients β_{jh} and α_k are constant. This is the kind of specification used in Jackson, Mach and Markowski (2010). To define the MNL model for a choice among parties in $\mathcal{J} = \{1, \ldots, J\}$, let $\mathcal{K} = \{1, \ldots, K\}$ and define the probability that respondent i chooses party j by

$$P_{\text{MNL}}(j|\mathbf{D}_i, \mathbf{Z}_i; \boldsymbol{\alpha}, \boldsymbol{\beta}, \gamma) = \frac{\exp\{\nu_{ij}\}}{\sum_{j \in \mathcal{J}} \exp\{\nu_{ij}\}} \,. \tag{2}$$

Another model form is the mixed logit (MXL) form in which there are no latent classes and the coefficients β_{jh} are constant but the α_k parameters are random. Because a more positive value of D_{ijk}^γ should imply a lower probability of choosing party j, other things equal, the α_k parameters must be nonnegative. To produce this effect, each α_k is log-normal: $\alpha_k = \exp\{\tilde{\alpha}_k\}$ and $\tilde{\boldsymbol{\alpha}} \sim N(\check{\boldsymbol{\alpha}}, \boldsymbol{\Sigma})$ where $\check{\boldsymbol{\alpha}}$ and $\boldsymbol{\Sigma}$, the Normal mean and covariance matrix, are constant. Define a mixed logit model with log-normal random coefficients by

$$P_{\text{MXL}}(j|\mathbf{D}_i, \mathbf{Z}_i; \check{\boldsymbol{\alpha}}, \boldsymbol{\beta}, \gamma, \boldsymbol{\Sigma}) = \int \frac{\exp\{\nu_{ij}\}}{\sum_{j \in \mathcal{J}} \exp\{\nu_{ij}\}} G(d\boldsymbol{\alpha}; \check{\boldsymbol{\alpha}}, \boldsymbol{\Sigma}) \tag{3}$$

where $G(\cdot)$ denotes the joint log-normal density. The mean of each effect α_k is $\exp\{\check{\alpha}_k + \frac{1}{2}\sigma_{kk}\}$, where σ_{kk} is the variance of $\tilde{\alpha}_k$.

Define a mixed logit model with C latent classes (MXLLC) by

$$P_{\text{MXLLC}}(j|\mathbf{D}_i, \mathbf{Z}_i, \mathbf{Y}_i; \boldsymbol{\alpha}, \boldsymbol{\beta}, \gamma, \boldsymbol{\delta}) = \sum_{c=1}^{C} \pi_{ic} \frac{\exp\{\nu_{icj}\}}{\sum_{j \in \mathcal{J}} \exp\{\nu_{icj}\}} \tag{4}$$

where the β_{cjh} and α_{ck} parameters are constants and π_{ic} is the probability that respondent i is in latent class c. In general, π_{ic} is a function of variables $\mathbf{Y}_i$ and constant coefficients gathered in $\boldsymbol{\delta}$. We use a logistic functional form for π_{ic}:

$$\pi_{ic} = \frac{\exp\{\mathbf{Y}_i^\top \boldsymbol{\delta}_c\}}{\sum_{c=1}^{C} \exp\{\mathbf{Y}_i^\top \boldsymbol{\delta}_c\}} \tag{5}$$

where $\boldsymbol{\delta}_C = \mathbf{0}$ in order to identify the parameters.

Polish elections

Data from surveys following two Polish parliamentary elections to its lower chamber, the Sejm, provide the empirical basis for comparing these choice models. Members of the Sejm are elected in multi-member districts of varying magnitude with the parties' number of seats in each district determined by a PR formula. This section briefly describes the context during which these elections were held and the major competing parties.

1997

The 1997 elections were held after a period of substantial economic growth and declining unemployment following the severe contraction in 1992 resulting from the "shock therapy" policies of the early transition period. GDP growth had been close to 8% for several years, the highest in Europe, and unemployment had fallen from 18% in 1993 to 10% in 1997. Contrary to retrospective models Polish voters replaced the incumbent left of center, secular coalition of post-Communist parties (SLD and PSL) with a coalition led by leaders

from the Solidarity trade unions and the Catholic Church (AWS).[2] The two components in the AWS coalition shared views opposing participation by former members of the Communist party (meaning the leaders of the SLD and the PSL), promoting greater adherence to Catholic ideology and participation in government, and favoring government subsidies to assist the large enterprises just beginning the process of privatization. The AWS did not hold a majority of the seats, however, and had to partner with the more centrist Union of Freedom (UW) to form a governing coalition. The UW's positions were more secular on the church influence issue and more moderate on the issues of the role for former Communists.[3] The AWS and the UW differed substantially on economic policy, however, with the UW leaders favoring rapid privatization without government subsidies. The major opposition party, the SLD, was composed of former Communist party leaders from the 1980s and was far more secular than either the AWS or the even the UW, supporting liberalized abortion rules for example. Their economic policies were close to those of the UW and more liberal than those of the AWS. Grzyma1a-Busse (2002) provides an excellent description of the transition of the SLD leadership from a Communist party to one that strongly supported liberal economic and political reforms. The AWS leaders, however, continued to campaign against any participation by former Communists.

The one important issue on which there was little debate was Poland's anticipated entry into NATO and eventually the EU. In 1997 the primary concern was NATO, which Poland entered in 1999. There was broad agreement at both the mass and elite levels that this would be beneficial for Poland as it would be a large security blanket against any actions Russia might take to reclaim influence in the region. EU entry was still a distant possibility though most elite leaders took it as a given and were preparing Poland's administrative apparatus for its eventual occurrence. Grzyma1a-Busse and Innes (2003)

[2]In previous elections the trade unions and the Church had separate candidate lists, dividing the vote of the supporters of these two pillars of the Solidarity Movement that ousted the Communists in 1989.

[3]In fact their leader, Leszek Balcerowicz, had been a member of the Communist party in the 1970s. He subsequently joined the Solidarity Movement and the UW's predecessor party and became prominent in implementing the shock therapy policies of the early transition.

provide an excellent discussion of the lack of public debate on EU entry among elites in Eastern Europe, and its ultimate implications for accession referenda.

2001

The divisions related to the roles for the Catholic church and former Communists remained but the 2001 elections were held in a substantially different economic environment. GDP growth had slowed to under 1% and unemployment was back to 18%, and was substantially higher in some regions. The decline was partly a consequence of recession in Western Europe on which Poland's economy was increasingly dependent. It was also attributable to domestic economic policies associated with the government's implementation of the privatization mandated by the 1996 legislation on mass privatization. As promised the government provided large subsidies to some of the largest enterprises being privatized so they could "modernize." Simultaneously, or possibly as a consequence, new firm creation that had been the almost the only source of job creation in the 1990s fell substantially (Jackson, Klich and Poznańska 2005).

The economic circumstance along with the inevitable allegations of inside deals and corruption associated with all privatization programs in the transition countries led to almost complete discrediting of the incumbent government. Not surprisingly both the AWS and the UW splintered with various leaders forming new parties. The SLD merged with a small economically left party, the Union of Work (UP) and was the main challenger in the 2001 election, taking about forty percent of the vote and forty-seven percent of the seats. The second place finisher was the Civic Platform (PO), formed by leaders formerly associated with the UW plus an independent who finished second in the 2000 Presidential elections. In terms of policies it was a clear replacement for the UW.

The 2001 election saw the emergence of several right-wing parties espousing pro-church and nationalistic platforms. The dominant of these, though only fourth in vote share, was the new Law and Justice party (PiS) led by the Kaczyński twins. This party maintained or

raised the level of pro-church and anti-Communist rhetoric of the AWS and combined that with a strong anti-European integration stance. This was the first open opposition to EU accession and built its case on opposition to the terms of Poland's entry, which were then being debated. It also campaigned on an anti-corruption platform, hoping to take advantage of the discredited reputation of the incumbent government even though PiS was the closest party to being an ideological successor to the AWS.

Data

Extensive data are available on both elections from the Polish National Elections Studies (PGSW) (Markowski 1997, 2001).[4] See Jackson, Mach and Markowski (2010) for analysis of these two elections using these data. Their data and model specifications using the conditional logit form the point of departure for the analysis here.

As mentioned previously, we use two kinds of variables.[5] The $K = 6$ policy issue distance variables, D_{ijk}, $k = 1, \ldots, K$, are as follows: privatization ($k = 1$); Catholic church's role in government ($k = 2$); participation of former communist officials in government ($k = 3$); unemployment policy ($k = 4$); agricultural subsidies ($k = 5$); and NATO and EU entry ($k = 6$, EU only in 2001). We use $H = 4$ respondent attribute variables Z_{ih}, $h = 1, \ldots, H$: a variable to measure the frequency of church attendance ($h = 1$); variables to measure economic evaluations for "Poland" ($h = 2$) or personal ("household") economic evaluations ($h = 3$);[6] and a binary variable that indicates whether the respondent is a farmer ($h = 4$).

[4] See `http://isppan.waw.pl/pgsw/`.

[5] See the Data Appendix for detailed descriptions of all variables.

[6] For the economic evaluation variables, a code of -1 means "very good" and a code of 1 means "very poor" or "very bad."

Model Estimates

To estimate all three model forms—MNL, MXL and MXLLC—we use `BIOGEME` (Bierlaire 2003)[7] with survey data from 1997 and from 2001. In each year we study choices among six parties. In 1997 the parties are SLD, UW, AWS, PSL, UP and ROP.[8] In 2001 the parties are SLD/UP, PO, PiS, PSL, LPR and SRP.[9] We associate these parties with the numbers $j = 1, \ldots, 6$.

Estimation is by maximum likelihood or maximum simulated likelihood.[10] Table 1 summarizes the performance of the models with the 1997 data in terms of the log-likelihood evaluated at the optimum solution. Clearly the MXLLC model[11] is superior to the other two models.[12] The MXL model is better than the MNL model, although with the particular formulation shown in the table the increase in the loglikelihood is not sufficient to compensate for the increase in the number of parameters.[13]

*** Table 1 about here ***

[7]We use Bison Biogeme for the MNL and MXL models and Python Biogeme for the MXLLC models. See `http://biogeme.epfl.ch/`.

[8]The parties with their numbering in $j \in \{1, \ldots, 6\}$ are: 1, SLD, Democratic Left Alliance; 2, UW, Freedom Union/Democratic Union; 3, AWS, Solidarity Electoral Action; 4, PSL, Polish People's Party; 5, UP, Labour United; and 6, ROP, Movement for the Reconstruction of Poland.

[9]The parties with their numbering in $j \in \{1, \ldots, 6\}$ are: 1, SLD/UP, Democratic Left Alliance/Labour United; 2, PO, Civic Platform; 3, PiS, Law and Justice; 4, PSL, Polish People's Party; 5, LPR, League of Polish Families; and 6, SRP, Self-Defense of the Republic of Poland.

[10]To estimate the MXL model we use 1000 pseudorandom draws to simulate the likelihood.

[11]In conducting the specification search to choose the form of the MXLLC model, we started with a model in which most of the coefficient parameters were the same across all three latent classes. We informally imposed the restriction that the standard errors found by inverting the Hessian not be substantially different from the "robust" standard errors found using the sandwich matrix. Also, the covariance matrix cannot be singular. These restrictions explain why several coefficient parameters are constrained to be equal to zero or equal to one another. A model with four latent classes performs poorly by these criteria. The best model we found with two latent classes has 43 parameters and a loglikelihood of -1180.573.

[12]The MXLLC model does not strictly speaking nest either the MNL or MXL models. The MNL and MXL specifications include an interaction between `Farmer` and the Agriculture Subsidies issue variable (following Jackson, Mach and Markowski (2010)) that does not appear in the MXLLC model. Such an interaction never appeared with significant coefficients when included in the MXLLC model. In a version of the MXLLC model that allows the coefficients α_{ck} to have log-normal distributions—that is, a model with both latent classes and log-normally distributed random effects—the lognormal random effects are not significant.

[13]The MXL model includes a full covariance matrix $\mathbf{\Sigma}$, but the log-likelihood does not decrease significantly if all but a couple of the off-diagonal covariance terms are constrained to zero. Indeed, if $\mathbf{\Sigma}$ is diagonal, there are 37 parameters and the loglikelihood is approximately -1196, which constitutes a borderline improvement over the MNL model.

The taste parameters $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ of the MXLLC model for 1997 are reported in Table 2, and the parameters $\boldsymbol{\delta}$ of the class-membership probability model for the same year are reported in Table 3 (the exponent γ is also reported in Table 3). The latent classes are distinguished by the particular issues that appear in each—distinctly the Privatization issue in the first, the EU+NATO issue in the second and the Unemployment issue in the third—and by the signs and magnitudes of the economic evaluations variables.[14] The Privatization issue has the largest weight among the four issues with nonzero weight in latent class one, and the EU+NATO issue has the largest weight in latent class two, but the Unemployment issue does not have the largest weight among the issues with nonzero weight in latent class three.

*** Tables 2 and 3 about here ***

Economic evaluations have a variety of effects across latent classes and for different parties. Personal economic evaluations have a similar positive effect on the choice between SLD and UW: the relevant coefficient is the same in all three latent classes ($\hat{\beta}_{123} = \hat{\beta}_{223} = \hat{\beta}_{323} = 1.44$); a better personal economic evaluation goes with a higher probability of voting for SLD instead of UW. But in latent class one the $\hat{\beta}_{1j3}$ value is zero for all parties besides UW. In latent class two the coefficients of the personal economic evaluation variable for all other parties except PSL are similar to the coefficient for UW. In latent class three all parties have positive coefficients for the personal economic evaluation variable, and the coefficients for AWS and for PSL are especially large. Evaluations of the Polish economy have similar and positive coefficients for all parties in all three latent classes except for PSL. For PSL evaluations of the Polish economy have a negative coefficient in the first and second latent classes but a positive coefficient in the third latent class.

Church attendance has effects that for most parties are homogeneous across all three latent classes. The exception is AWS, for which the coefficient of church attendance is especially positive in the third latent class. For all parties except UP, higher church

[14] A model that included a class from which all six issue variables were excluded performed very poorly.

attendance goes with a higher probability of voting for the referent party instead of SLD. For UP the coefficient of the church attendance variable is insignificant.

The class-membership part of the model suggests that voters who know less tend not to be in latent class one, those who work in private businesses tend to be in class two, and business owners tend to be in class three. In light of the estimated coefficients for the economic evaluation variables, private workers tend to be more sensitive to their personal economic situation than are others, except for business owners who are even more sensitive. In light of the estimated coefficients for the issue distance variables, respondents who are better informed and who are not private workers and not business owners place heavy weight on the Privatization issue, while private workers place heavy weight on the EU+NATO issue and business owners place some weight on the Unemployment issue.

Figure 1 shows the distribution of the probabilities of choosing each party when those probabilities are simulated for each respondent. Latent class one clearly describes the decisions that tend to be most favorable for SLD, while latent class two and to a lesser extent latent class three tend to be more favorable for AWS. The strongest support for UW tends to come from latent class three and to some extent latent class one. The strongest support for UP and ROP comes from latent class one, although ROP also gains a bit from latent class two. The strongest support for PSL comes from latent class two (with the spiky distribution pointing to strong dependence on the `Farmer` variable).

*** Figure 1 about here ***

The taste parameters of the MXLLC model for 2001 are reported in Table 4, and the parameters of the class-membership probability model for the same year are reported in Table 5 (the exponent γ is also reported in Table 5). In contrast to 1997, in the specification for 2001 there are only two latent classes.[15] The class-membership part of the model now includes none of the covariates that figured in 1997: none have significant

[15]The best-fitting model with three latent classes that we were able to find for 2001 actually had a worse log-likelihood (-1212.9) while using more parameters (36): there is a singularity.

coefficients when included. Now latent class two includes all six of the issue distance variables while latent class one excludes Privatization and Unemployment. The personal economic evaluations variables have a negative coefficient that is the same in both latent classes for PO, significant negative coefficients in latent class one for PiS and PSL but insignificantly positive coefficients for the same parties in latent class two, and coefficients of zero in both latent classes for LPR and SRP. The coefficients of aggregate economic evaluations are negative but not significant in both latent classes for all parties except PSL. For PSL the coefficient of the aggregate economic evaluations variable is significantly negative in latent class two and insignificantly positive in latent class one. The coefficients of the church attendance and farmer variables are the same for each party in both latent classes. The coefficients of the church attendance variables are positive, and they are significant for all parties except SRP. The coefficients of `Farmer` are positive for all parties except PO, for which they are zero, and they are significant only for PSL and SRP.

*** Table 4 and 5 about here ***

Figure 2 shows the distribution of the probabilities of choosing each party when those probabilities are simulated for each respondent. Latent class one clearly describes the decisions that tend to be most favorable for SLD/UP while latent class two tends to describe decisions that are unfavorable to the coalition. PO, SRP and LPR have slightly stronger support in latent class one than in latent class two, while PiS and PSL have stronger support from latent class two than from latent class one.

*** Figure 2 about here ***

Discussion

An important question is how stable the classes are across time. One possibility is that sorting into one of the latent classes is an individual and possibly psychological process that may relate to person-specific attributes, such as occupation, knowledge and so forth.

This would imply that the same latent classes exist in both elections and that latent class membership is stable across the elections. A second possibility is that the number and composition of latent classes is contextual and at least partially influenced by the characteristics of the election, such as the social and economic circumstances at the time and the number and structure of the competing parties. This would imply that the latent class structure is likely to differ between 1997 and 2001. As the previous discussion outlined, economic conditions, the party coalitions, and Poland's relationship with NATO had all changed between 1997 and 2001.

The latent class model specification clearly differs between 1997 and 2001. A specification with two latent classes does not work all that well in 1997: the specification with three latent classes is dramatically better. A specification with three latent classes works poorly in 2001: the best specification we were able to find with three latent classes suffers from some kind of singularity problem.[16] As with any mixed logit model, the model specification describes only an approximation to the choice rules the respondents may actually be using (McFadden and Train 2000). The nonparametric discrete mixture used in the latent class specification fits the data much better than the best continuous mixed logit model we have been able to find.[17] We relate the new structure to the changes in the issue and choice space. This is speculation but a good opportunity to explore the substantive implications of the latent class mixed logit model.

The changes in the Issue space include the following. In 2001 EU membership was being debated in ways that NATO and the EU were not in 1997. Much of the privatization process was underway by 2001, and in 2001 unemployment was not much higher than in 1997, and possibly rising.

[16]Regarding the model described in note 15, Python Biogeme terminates with the message, "The iterations are stucked," and throws warnings about parameters having nonzero Lagrange multipliers, which are symptoms of singularity. Oddly, the Hessian seems to be invertible so that standard errors derived from the inverse Hessian exist and are all positive, and only a few of the robust standard errors are very different from their nonrobust counterparts.

[17]We also tried a lognormal mixed logit specification that includes all the crossproducts between pairs of issues, including both fixed and random effects. Using 1000 pseudorandom draws to simulate the likelihood, that model has 112 parameters and a loglikelihood of -1172.021.

The changes in the choice space include the following. Because of the economic collapse and allegations of cronyism, by 2001 the governing AWS and UW were both fracturing as leaders tried to distance themselves from the current parties through formation of new parties—PiS and PO respectively. The SLD and UP had formed a coalition, consolidating the economic left.

We surmise that these changes motivate the differences in the structure of the choice model between the two elections.

Conclusions

Regardless of the model used to represent heterogeneity, it is important to allow heterogeneity to become manifest in models of electoral choice. Members of the voting public are diverse not only in the composition of their tastes—in their policy preferences, their evaluations of economic performance and other aspects of the status quo, and their not-obviously political habits such as church attendance—but also in the ways they bring those tastes to bear when voting. Given a set of variables to measure the relevant tastes, choice models use coefficients to represent how those tastes relate to actions such as voting. An effective way to represent heterogeneity is to allow the coefficients to have random distributions.

We find that discrete distributions are more effective than continuous ones in capturing the heterogeneity present in Polish national elections. Converse's "issue publics" idea comes close to what we find, although our estimates suggest more of a contextual and political origin for the structure of "publics" than any purely psychological foundation for them, and we fail to identify a subset of voters that match a description of having "no issue content" to their voting decisions (Converse 1964, 218).[18] The structure and composition of the latent classes seems to be related to the electoral context more than to individual characteristics.

[18]Of course our analysis does not address the concept of "constraint" that Converse (1964) discusses.

Data Appendix

Raw data, survey interview schedules and codebooks may be found at `http://isppan.waw.pl/pgsw/`. Following are descriptions of variables used in the current study, along with the numerical codes used to measure the responses.

Policy position variables

Six different measures of individual policy preferences and party locations are used. All items are measures on a zero to ten scale.

1. Privatization:
   Zero – State enterprises should be privatized quickly; the inefficient should be liquidated.
   Ten – Enterprises should remain state property and their modernization financed from the state budget.
2. Church Role:
   Zero – Church should be completely separated from the state and should not interfere with politics.
   Ten – Church should exert influence over politics and state policies.
3. Nomenklatura:
   Zero – Individuals occupying high positions under communism ("nomenklatura") should now be forbidden to perform responsible state functions.
   Ten – These individuals ("nomenklatura") should have the same rights as all others in competing for public offices and state positions.
4. Agriculture Subsidies:
   Zero – Agriculture should receive state subsidies, even if it leads to agricultural reform slowdown.
   Ten – Agriculture should not receive state subsidies, even if it leads to farmers bankruptcies.
5. European Union:
   Zero – Our foreign policy should pursue joining NATO and EU as soon as possible.
   Ten – Polish foreign policy should not pursue joining NATO and EU, instead should protect our political and economic sovereignty.
   Note: The 2001 version refers only to the EU as Poland joined NATO in 1999.
6. Unemployment:
   Zero – Fighting unemployment should be an absolute policy priority of the government, even if it leads to higher spending and inflation.
   Ten – Many other, more important than unemployment, issues should be governmental priority, i.e balanced budget, fighting inflation, etc.

Measurement of party positions

1. Based on mean respondent placements.
   a. 1997 – Privatization, Church Role, Nomenklatura.
   b. 2001 – Privatization, Church Role, EU
2. Others based on mean placements of each party by a sample of parliament members that is part of the PGSW data collection.

Other Variables in 1997

Church Attendance

M45. How frequently do you attend church?: never (0); less frequently than once a year (1/104); more or less once a year (1/52); several times a year (4/52); once a month (12/52); two to three times a month (36/52); once a week (52/52); several times a week (64/52); DK, refusal (NA).

Personal Economic Evaluation

61. How do you, generally, evaluate the financial situation of your household: In your opinion, is it: very good (-1); good (-.5); fair (0); poor (.5); very poor (1).

Aggregate Economic Situation

37. What do you think about the state of the economy these days in Poland? Would you say that the state of the economy is very good, good, neither good nor bad, bad, very bad?: very good (-1); good (-.5); neither good nor bad (0); bad (.5) very bad (1).

Farmer

M24. What was the profile of the company/enterprise you worked for? What did it produce, create?: farmer (1); other (0).

Private Worker

M12. What is (was) the ownership status of the institution/firm you work(ed) for? self-employment, private company/enterprise, but not self-employment, communal (local) owned company/enterprise, cooperative, individual (private) (1); state office or institution financed by the state budget, state owned company/enterprise, company/enterprise partly owned by the state treasury (0).

Own Business

M13. Are you (were you) the owner of this company (enterprise, farm) or hired employee? owner or co-owner (1); hired employee, other status (0).

Political Knowledge (variable value is the number incorrect, range 0–5).

96. Now we would like to ask you a few questions about Polish political life. Of course, many people are not interested in politics. Thus, it is natural that many will decline from answering these sort of questions. Please name persons occupying the following positions: Sejm's speaker; President of the Supreme Court; Minister of Foreign Affairs.

97. July this year Poland was invited to join an important international organization. What organization is it?

98. Please name political parties that formed the governmental coalition in 1993-97 period.

Other Variables in 2001

Private Worker

M11. What is (was) the ownership status of the institution/firm you work(ed) for? self-employment, private company/enterprise, but not self-employment, communal (local) owned company/enterprise, cooperative, individual (private) farm (1); state office or institution financed by the state budget, state owned company/enterprise, company/enterprise partly owned by the state treasury (0).

Own Business

M12. Are you (were you) the owner of this company (enterprise, farm) or hired employee? owner or co-owner (1); hired employee, other status (0).

Church Attendance

M49. How frequently do you attend church never (0); less frequently than once a year (1/104); more or less once a year (1/52); several times a year (4/52); once a month (12/52); two to three times a month (36/52); once a week (52/52); several times a week (64/52); DK, refusal (NA).

Aggregate Economic Evaluation, Personal Economic Evaluation

E 79. What do you think about current _____ [read the item from the list]: A. political situation in Poland; B. economic situation in Poland; C. financial situation in your household. Do you think it is: very good (-1); good (-.5); neither good nor bad (0); bad (.5) very bad (1).

Political Knowledge (variable value is the number incorrect, range 0–3).

C144. Who is the head/leader of Sojusz Lewicy Demokratycznej (SLD)?

C145. Who is the President of Russia?

C146. Which military alliance is Poland a member of?

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Table 1: Log-Likelihood Statistics for Various Models, Poland 1997

Description	Class 1 log-likelihood	Class 1 number of parameters
multinomial logit (MNL)	−1201.633	31
mixed logit, lognormal random effects (MXL)	−1190.729	52
mixed logit, latent class effects (MXLLC)	−1162.698	40

Note: $n = 1026$. The MNL and MXL models are nested, but the MXLLC model is not nested relative to the other two models.

Table 2: Latent Class Choice Model Taste Coefficients, Poland 1997

	Class 1		Class 2		Class 3	
Description	est.	SE	est.	SE	est.	SE
Issue Losses						
Privatization	.127	.0463	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$
Church Role	.0768^{a}	.0243	.0768^{a}	.0243	.0768^{a}	.0243
Nomenklatura	.105^{b}	.0306	.105^{b}	.0306	.105^{b}	.0306
Agr. Subsidies	.0409^{c}	.0130	.0409^{c}	.0130	.0409^{c}	.0130
EU+NATO	—$^{\emptyset}$	—$^{\emptyset}$	.163	.0640	—$^{\emptyset}$	—$^{\emptyset}$
Unemployment	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	.0532	.0287
Church Attendance						
UW	1.94^{d}	.479	1.94^{d}	.479	1.94^{d}	.479
AWS	2.03^{e}	.505	2.03^{e}	.505	4.03	.928
PSL	2.51^{f}	.667	2.51^{f}	.667	2.51^{f}	.667
UP	−.495^{g}	.429	−.495^{g}	.429	−.495^{g}	.429
ROP	.882^{h}	.441	.882^{h}	.441	.882^{h}	.441
Aggregate Economic Evaluation						
UW	1.14^{i}	.427	1.14^{i}	.427	1.14^{i}	.427
AWS	1.40^{j}	.478	1.40^{j}	.478	1.40^{j}	.478
PSL	−1.66^{k}	.772	−1.66^{k}	.772	2.88	.990
UP	.572^{l}	.584	.572^{l}	.584	.572^{l}	.584
ROP	1.14^{m}	.520	1.14^{m}	.520	1.14^{m}	.520
Personal Economic Evaluation						
UW	1.44^{n}	.464	1.44^{n}	.464	1.44^{n}	.464
AWS	—$^{\emptyset}$	—$^{\emptyset}$	1.27^{o}	1.11	5.05	1.46
UP	—$^{\emptyset}$	—$^{\emptyset}$	1.27^{o}	1.11	1.27^{o}	1.11
ROP	—$^{\emptyset}$	—$^{\emptyset}$	1.27^{o}	1.11	1.27^{o}	1.11
PSL	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	4.23	1.27
Farmer^{z}						
UW	−3.00^{p}	1.10	−3.00^{p}	1.10	−3.00^{p}	1.10
PSL	2.47^{r}	.539	2.47^{r}	.539	—$^{\emptyset}$	—$^{\emptyset}$
Constant Terms						
UW	−2.53^{s}	.532	−2.53^{s}	.532	1.84	.870
AWS	−1.93	.520	6.45	1.24	1.71	.851
PSL	−4.58^{t}	.956	−4.58^{t}	.956	.125	.945
UP	−2.05^{u}	.291	−2.05^{u}	.291	−2.05^{u}	.291
ROP	−2.37^{v}	.398	4.12	1.64	−2.37^{v}	.398

Note: $^{\emptyset}$ Parameter constrained to equal zero. $^{a-v}$ Estimates shown with the same superscript are constrained to be equal to one another. ^{z} Estimates not shown for the coefficients of `Farmer` are constrained to equal zero. $n = 1026$. 40 estimated parameters. Loglikelihood = −1162.698.

Table 3: Latent Class Choice Class Coefficients and Model Exponent, Poland 1997

	Class 1		Class 2	
Description	est.	SE	est.	SE
Constant	1.19	.351	−1.00	.433
Political Knowledge	−.243	.0770	—^{ø}	—^{ø}
Own Business	−.830^{a}	.407	−.830^{a}	.407
Private Worker	—^{ø}	—^{ø}	1.03	.401

Description	Symbol	est.	SE
exponent	γ	1.71	.137

Note: ^{ø} Parameter constrained to equal zero. ^{a} Estimates shown with the same superscript are constrained to be equal to one another.

Table 4: Latent Class Choice Model Taste Coefficients, Poland 2001

	Class 1		Class 2	
Description	est.	SE	est.	SE
Issue Losses				
Privatization	—$^{\emptyset}$	—$^{\emptyset}$	.0663	.0309
Church Role	.0214^{a}	.00942	.0214^{a}	.00942
Nomenklatura	.0154^{b}	.00756	.0154^{b}	.00756
Agr. Subsidies	.00806^{c}	.00525	.00806^{c}	.00525
EU	.0144^{d}	.00664	.0144^{d}	.00664
Unemployment	—$^{\emptyset}$	—$^{\emptyset}$	.0501	.0327
Church Attendance				
PO	.717^{e}	.270	.717^{e}	.270
PiS	1.13^{f}	.454	1.13^{f}	.454
PSL	.907^{g}	.472	.907^{g}	.472
LPR	1.44^{h}	.488	1.44^{h}	.488
SRP	.208^{i}	.273	.208^{i}	.273
Aggregate Economic Evaluation				
PO	−.501^{j}	.292	−.501^{j}	.292
PiS	−.573^{k}	.483	−.573^{k}	.483
PSL	.527	.904	−2.16	.640
LPR	−.641^{l}	.403	−.641^{l}	.403
SRP	−.0759^{m}	.321	−.0759^{m}	.321
Personal Economic Evaluation				
PO	−.691^{n}	.299	−.691^{n}	.299
PiS	−2.01	.930	1.27	.966
PSL	−2.76	.928	1.02	.796
LPR	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$
SRP	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$	—$^{\emptyset}$
Farmer^{z}				
PiS	.750^{o}	.487	.750^{o}	.487
PSL	2.66^{p}	.779	2.66^{p}	.779
LPR	.654^{q}	.392	.654^{q}	.392
SRP	1.34^{r}	.281	1.34^{r}	.281
Constant Terms				
PO	−1.32	.286	.482	.752
PiS	−2.41	.872	.0777	.905
PSL	−4.22	1.01	.150	.817
LPR	−2.26^{s}	.525	−2.26^{s}	.525
SRP	−1.64^{t}	.309	−1.64^{t}	.309

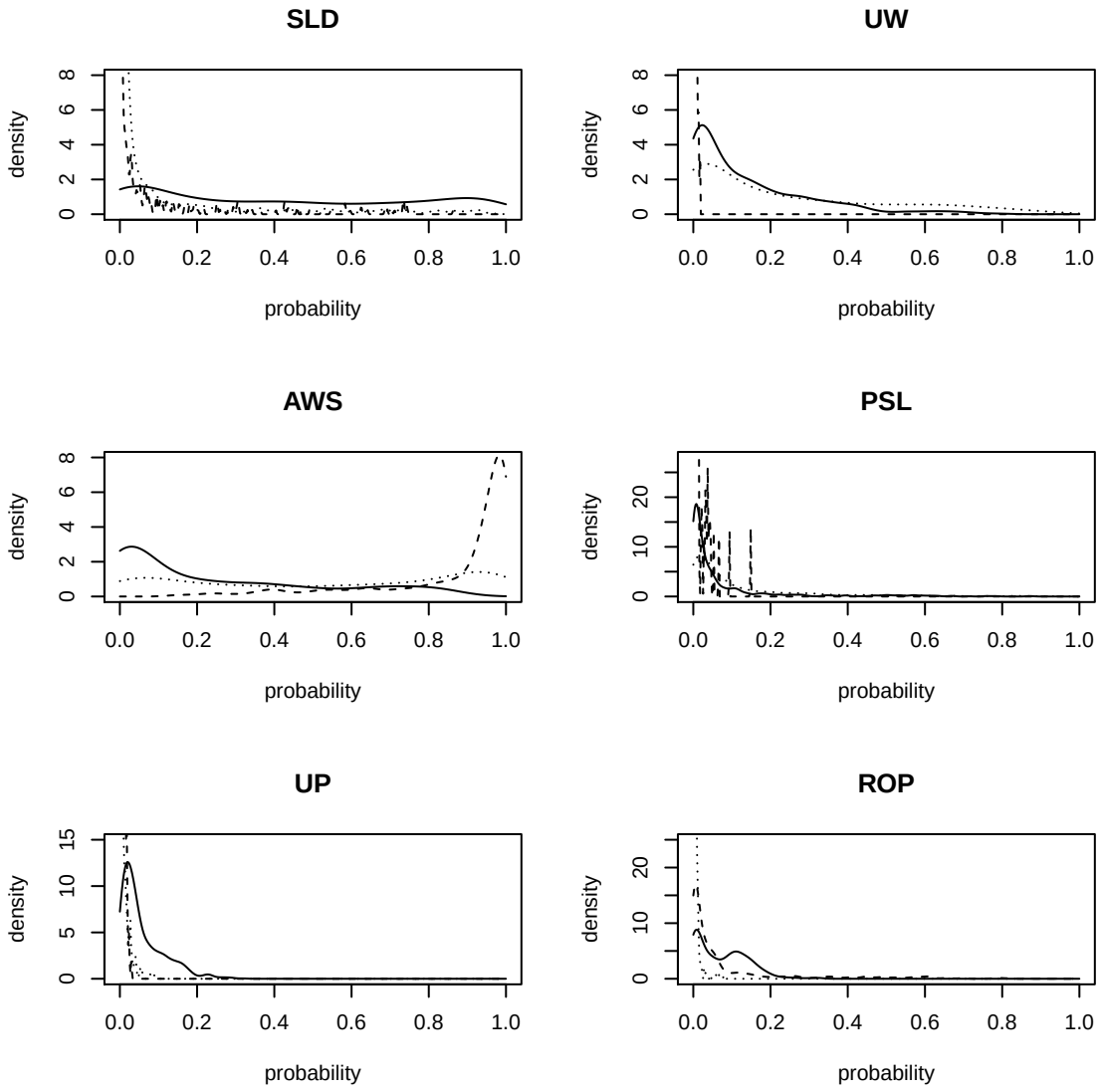
Note: $^{\emptyset}$ Parameter constrained to equal zero. $^{a-t}$ Estimates shown with the same superscript are constrained to be equal to one another. ^{z} Estimates not shown for the coefficients of `Farmer` are constrained to equal zero. $n = 912$. 36 estimated parameters. Loglikelihood = −1205.450.

Table 5: Latent Class Choice Class Coefficients and Model Exponent, Poland 2001

	Class 1	
Description	est.	SE
Constant	1.14	.421

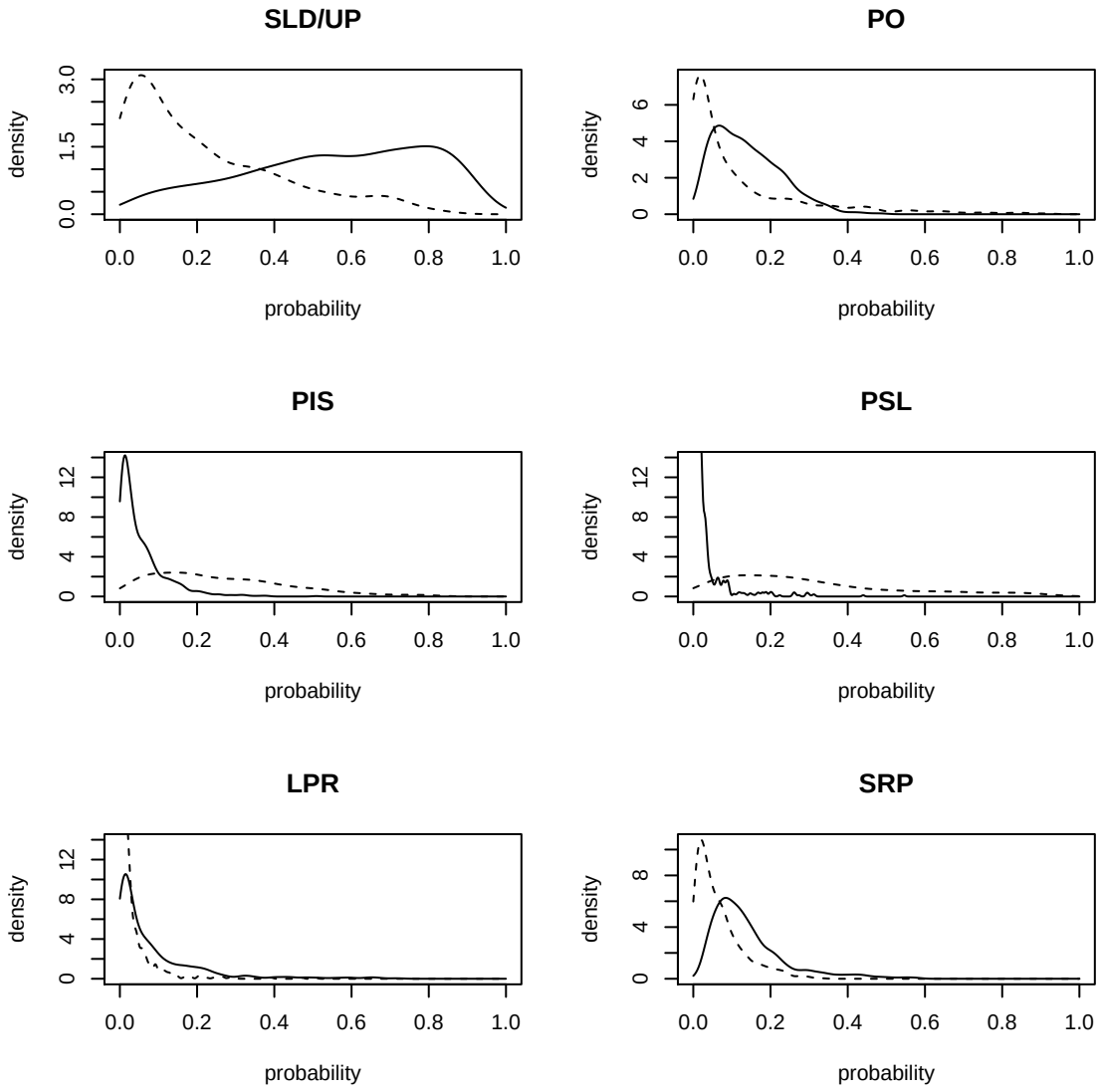
Description	Symbol	est.	SE
exponent	γ	2.13	.224

Figure 1: Latent Class Choice Model Simulated Choice Probabilities, Poland 1997



Note: distribution of probabilities of choosing each party by latent class simulated for each respondent. Solid line shows the probability for class one. Dashed line shows the probability for class two. Dotted line shows the probability for class three.

Figure 2: Latent Class Choice Model Simulated Choice Probabilities, Poland 2001



Note: distribution of probabilities of choosing each party by latent class simulated for each respondent. Solid line shows the probability for class one. Dashed line shows the probability for class two.