

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

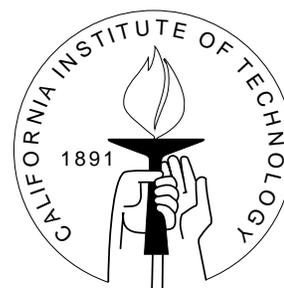
CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA 91125

A BAYESIAN MULTINOMIAL PROBIT ANALYSIS OF VOTER CHOICE IN CHILE'S 2005 PRESIDENTIAL ELECTION

R. Michael Alvarez

Gabriel Katz



SOCIAL SCIENCE WORKING PAPER 1287R

December 2007
Revised April 2008

A Bayesian multinomial probit analysis of voter choice in Chile's 2005 Presidential election

R. Michael Alvarez

Gabriel Katz

Abstract

The profound transformations in Chile's party structure since 1989 has led several authors to examine the main cleavages shaping partisan divide and the impact of different factors on citizens' party preferences. No study, however, has examined the influence of these factors on actual vote choice. We implement a Bayesian multinomial probit model to analyze voter choice in Chile's 2005 election. We show that the authoritarian-democratic cleavage dominated voter choice, with socio-demographic variables playing a less important role. We also find that the presence of a second conservative candidate significantly affected citizens' electoral behavior, increasing the support for the right and influencing the electoral outcome in a way that cannot be accounted for by analyses focused exclusively on citizens' party identification.

JEL classification numbers: J222, F88

Key words: Bayesian multinomial probit, Chile; multi-candidate elections

1. Introduction

Chile's post-authoritarian party structure, dominated by two stable and solid multiparty coalitions, contrasts with the highly fragmented system existing prior to the 1973 military coup (Valenzuela and Scully, 1997; Tironi and Agüero, 1999; Alemán and Saiegh, 2007). Since the re-establishment of democracy, the center-left *Concertación* coalition, comprising the Socialist Party (PS), the Party for Democracy (PD), the Christian Democrats (CD) and the Radical Social-Democratic Party (PRSD), has been in control of the presidency and held the majority of the legislative seats. The other major coalition, the conservative *Alianza por Chile*, is made up of the Independent Democratic Union (UDI), the National Renewal Party (RN) and the Centrist Union (UCC). Although other minor parties exist outside these blocks, the two coalitions have dominated contemporary politics in Chile.

There has been considerable debate among scholars about the reshaping of the Chilean political system and about the relative influence of different factors on voters' behavior in this new setting (Valenzuela and Scully, 1997; Tironi and Agüero, 1999; Torcal and Mainwaring, 2003). Some authors argue that the social and cultural cleavages (in particular, class and religious divisions) that originally structured the Chilean political system still play a predominant role in defining political identities, and that the division between supporters and opponents of the authoritarian regime that marked the democratic transition was the result of a particular historical background and is likely to fade away as democracy is consolidated (Scully, 1995; Valenzuela, 1999; Bonilla, 2002). Other researchers, however, maintain that the new authoritarian-democratic cleavage has come to dominate party competition, integrating and reorganizing traditional sources of

partisan divide and reflecting intense discrepancies about regime preferences and conceptions of democracy in the Chilean society that are likely to subsist (Tironi and Agüero, 1999; Torcal and Mainwaring, 2003).

The 2005 Presidential election offers an especially interesting opportunity to test these alternative explanations in an electoral setting, while at the same time exhibiting distinctive characteristics that bring about substantive and methodological implications that have received little attention in the literature on voter behavior in Chile. It was the fourth Presidential election since Chile's return to democracy, held at a time of continuing economic growth and high popularity of the incumbent *Concertación* government, and with Pinochet relegated to a marginal role in the national political scene (Bonilla, 2002; Angell and Reig, 2006). Also, for the first time in its history, the two main partners of the *Alianza por Chile*, UDI and RN, presented independent candidates who adopted relatively different electoral strategies: while Lavín (UDI) adopted an aggressive campaigning style aimed at consolidating the vote among his right-wing supporters, the candidate of the National Renewal Party, Sebastián Piñera, took a more moderate stance, distancing himself from the traditional right and the legacy of the military regime in order to capture the support of centre in view of the almost certain second-round runoff between the candidate of the *Concertación* and one of the two conservative candidates (Angell and Reig, 2006; Gamboa and Segovia, 2006). Together with the formation of the left-wing alliance *Juntos Podemos Más*, this resulted in relatively clear leftist (*Juntos Podemos Más*), center-left (*Concertación*), center-right (RN) and rightist (UDI) electoral options available for Chilean voters.

In order to analyze the relative influence of socio-demographic, ideological and political variables on voter choice at the individual level, we specify and estimate a Bayesian multinomial probit model that explicitly accounts for the multi-party character of the election by letting voters evaluate all competing candidates simultaneously and to ‘group’ alternatives they consider similar when choosing for which candidate to vote. Our model allows testing the relative validity of the competing theories in explaining voters’ electoral behavior. In addition, it enables us to examine other factors that might have had substantial influence in this particular election, such as the presence of a second conservative contestant and its effect on voters’ behavior in the view of the second-round runoff.

Therefore, the paper offers two important contributions with respect to prior studies of the Chilean case. First, while past research analyzed citizens’ party identification or vote intention (Frei, 2003; Torcal and Mainwaring, 2003), no study has so far examined actual vote choice at the individual level. Theoretical and empirical arguments indicate that party identification and vote intention are dynamic concepts influenced by election-specific circumstances and campaign effects, and that there is no linear relationship between party preferences and actual vote (Franklin and Jackson, 1983; Alvarez, 1998; Hillygus and Jackman, 2003). In the case of Chile’s 2005 election, held in a context of declining party identification among the electorate and increasing number of respondents not expressing any vote intention in opinion polls (Frei, 2003), short-term factors such as candidates’ campaigning style and the impressive economic record of President Lagos’ administration might have played a considerable influence on voters’ decisions (Angell and Reig, 2006; Navia, 2006).

Second, all previous individual-level studies of candidate choice in Chile (Frei, 2003; Torcal and Mainwaring, 2003) employed binary choice models, restricting comparisons to pairs of parties and imposing the independence of irrelevant alternatives (IIA) property on voters. The IIA condition is a very restrictive assumption to make about voters' electoral behavior, in that it implies that the probability of a voter choosing an electoral alternative is independent of the other alternatives available and of the characteristics of these other alternatives (Alvarez, Nagler and Bowler, 2000; Train, 2003); in particular, the presence or absence of the candidate of the RN in the election would not change the relative probabilities of choosing any of the other candidates. Thus, imposing the IIA condition neglects the possibility that centrist voters who were disenchanted with the *Concertación* but were not willing to vote for a clear right-wing candidate might find a moderate conservative candidate attractive. Also, it implies that an *Alianza* supporter could not see the candidates of the UDI and the RN as substitutes, an assumption that is at odds with the view that coalition labels are meaningful for Chilean voters (Huneus, 2006; Alemán and Saiegh, 2007) and that might have been particularly inappropriate in the context of the 2005 election, when the declining popularity of Lavín and the better prospects of Piñera in a second-round runoff against Bachelet (Gamboa and Segovia, 2006) might have driven UDI sympathizers to vote for the RN candidate for tactical reasons. The potential for strategic voting in the 2005 election was substantially increased due to the fact that opinion polls close to the election date indicated that a *ballotage* between Bachelet and one of the conservative candidates was almost certain, and that the contest between Lavín and Piñera for the second place in the first round was very tight (Angell and Reig, 2006).

Even if relaxing the IIA condition might not necessarily improve the model fit or lead to substantially different results regarding the determinants of voter choice (Horowitz, 1980; Quinn and Martin, 1998), it allows addressing central substantive questions for the analysis of Chile's 2005 election, namely whether Piñera's entry into the race was determinant in bolstering *Alianza*'s vote support, and how it affected voters' electoral behavior. While, prior to the election, *Alianza* leaders expressed concerns that the divisions between the two conservative candidates could weaken the right-wing coalition (Gamboa and Segovia, 2006), Piñera's candidacy might in fact have contributed to its relative success in the presidential election, in which the right did considerably better than in the simultaneous legislative election and obtained more votes than the *Concertación* for the first time since Chile's return to democracy (Navia, 2006). The impact of Piñera's candidature on the election cannot be directly quantified using vote choice models that rely on the independence of irrelevant alternatives property such as the multinomial logit (Dow and Endersby, 2004). Therefore, these relevant questions have not been addressed in previous analyses of the 2005 election.

In view of the computational complexity of fitting the multinomial probit model (Train, 2003), there have been relatively few applications of this model in the political science literature (e.g., Alvarez and Nagler, 1995; Alvarez, Nagler and Bowler, 2000; Dow and Endersby, 2004). Most applications have used maximum likelihood estimation, relying on asymptotic normality in making inferences about the error variance and covariance parameters. As shown by McCulloch and Rossi (1994), however, asymptotic approximations are quite problematic in the context of the multinomial probit model. The main advantage of the Bayesian approach based on Gibbs sampling is that it allows

obtaining arbitrarily precise approximations to the posterior densities, without relying on large-sample theory (McCulloch and Rossi, 1993; Jackman, 2004). In addition, it avoids direct evaluation of the likelihood function and the resulting convergence problems exhibited by maximum likelihood optimization, and is computationally more efficient than simulation-based methods of classical estimation (Kim, Kim and Heo, 2003). Hence, the Bayesian approach overcomes some of the main criticisms that have been leveled against the use of multinomial probit in electoral studies (Dow and Endersby, 2004). Furthermore, since the Bayesian framework allows for straightforward comparisons of models that can be used to operationalize alternative sets of hypothesis (Quinn and Martin, 1998), it is particularly well suited to examine the relative validity of the different explanations proposed to account for voters' behavior in Chile.

The remainder of the paper is organized as follows. Section 2 presents an initial look at voting behavior in the 2005 Presidential election using survey data. Section 3 presents a multinomial probit model to analyze voter-choice in multi-party elections and describes the data and methodology used to fit the model to the Chilean case. Section 4 presents the most salient results, and Section 5 concludes.

2. A first look at Chile's 2005 presidential election

Using data from the Comparative Study of Electoral Systems post-election survey (CSES, 2007), we provide preliminary evidence regarding the impact of different sets of variables on the support for each of the candidates running for office in the 2005 election: Michelle Bachelet, of the governing *Concertación*; Tomás Hirsch, of the left-wing coalition *Juntos Podemos Más* (JPM); and the two *Alianza* candidates, Joaquín Lavín

(UDI) and Sebastián Piñera (RN). Table 1 presents the percentage of voters in the sample supporting each of the four candidates, based upon respondents' relevant socio-demographic traits, party identification, opinions regarding democracy and evaluation of the incumbent government.

[Table 1 here]

In accord with the assumption that an authoritarian/democratic cleavage is prevalent in the restructured Chilean party system, a strong division between voters regarding their attitudes towards democracy and their regime preferences can be seen in Table 1. Sixty-five percent of the respondents who stated they were unsatisfied with democracy and 79% of those stating that democracy is not always the best form of government supported the RN and UDI candidates. Interestingly, those expressing more critical views towards democracy tended to support the more moderate Piñera, although dissatisfaction with democracy, however, was higher for Lavín supporters.

Socio-demographic variables also factor into the choice between the competing candidates, as seen in Table 1. The high support for Bachelet among women marked a clear difference with respect to previous *Concertación* candidates (Angell and Reig, 2006; Huneeus, 2006). Hirsch did twice as well among younger, better-educated voters than among the older and less educated respondents. The electoral support-base of the two conservative candidates was also quite different, with Piñera having higher support than Lavín among better educated and wealthier voters. Religion seems to have strongly affected the choice for Hirsch: agnostic, atheists and respondents with no religious affiliation were much more likely to vote for Hirsch, while those belonging to a religious

denomination (Catholics and Christians, essentially) were more likely to choose one of the other three candidates.

As for the effect of short-term factors, citizens' assessments of the incumbent *Concertación* government clearly influenced the choice between Bachelet and the three candidates of the opposition. Eighty percent of the respondents expressing dissatisfaction with the performance of the incumbent administration voted for the two conservative parties UDI and RN. The vote-share of *Juntos Podemos Más* was also disproportionately high among government critics, suggesting that Hirsch's vocal disapproval of the government's economic policies might have attracted the far-left voters disenchanted with the *Concertación's* espousal of market economy and neo-liberal policies (Valenzuela and Scully, 1997; Navia, 2006). In contrast, 61% of those with favorable opinions of the government supported Bachelet. However, a majority of voters had positive evaluations of the government's performance, reflecting the unusually high popularity of President Lagos among the electorate (Angell and Reig, 2006; Navia, 2006).

Finally, another remarkable fact emerging from Table 1 is the relationship between partisanship and vote choice, particularly for respondents identified with the *Concertación* and UDI in the sample: 8% of the former and more than 43% of the latter voted for Piñera in the election. As mentioned in the introduction, the fact that opinion polls indicated that Bachelet would easily defeat Lavín in a two-candidate runoff while Piñera would pose a more serious challenge to the *Concertación* (Gamboa and Segovia, 2006) suggests that tactical voting might be the reason underlying the high electoral

support of the RN candidate among UDI sympathizers.¹ This interpretation, however, does not account for the moderate support of Piñera among *Concertación* identifiers. Rather, the explanation in this case seems to be related to Piñera’s moderate positioning and his appeal to Christian Democrats during the electoral campaign. Figure 1 explores this issue further by plotting the distribution of votes among *Concertación* partisans, discriminated between Christian Democrats (CD) and other *Concertación* identifiers. As shown in the figure, almost 20% of respondents in the sample expressing identification with the CD voted for the RN, a percentage 6 times higher than for other partisans of the center-left coalition.

[Figure 1 here]

Hence, this preliminary analysis suggests that, in line with the hypothesis underscoring the prevalence of an authoritarian/democratic cleavage in Chilean politics, voters’ views and attitudes towards democracy played a key role on their decision of whether to vote for the *Concertación* or the *Alianza* candidates. In contrast, while socio-demographic variables also influenced voter behavior, they did not clearly determine a division between supporters of the two main political coalitions. In addition, the evidence presented above reveals that election-specific factors such as the emergence of a moderate conservative candidate and voters’ strategic considerations also had a considerable influence on electoral behavior. This points to the fact that the different hypothesis proposed to account for voter behavior in Chile must be considered in the

¹ Party identification is defined based on respondents’ answer to the question “Which party do you feel closer to?” in the CSES survey.

light of the particular political and institutional context of the 2005 election, and that previous analyses based entirely on citizens' party identification would probably fail to provide a complete account of voting patterns in the presidential race.

These bivariate relationships, however, do not allow us to assess the relative influence of the different variables on voter choice in a controlled way. In to assess which factors were more relevant in the 2005 election and to test alternative hypothesis about the determinants of voter behavior in Chile, we specify and estimate a model of multi-candidate vote choice.

3. A multi-candidate model of vote choice for the 2005 election

In order to test the competing explanations and to account for possible substitution patterns between electoral choices, we specify and estimate a multinomial probit model that allows us to examine the effect of different individual characteristics on voter choice after controlling for other confounding factors, as well as to assess how changes in candidates' spatial positions affect their expected vote-share. Unlike previous models applied in individual-level analysis of Chilean elections, the multinomial probit specification assumes that the voter simultaneously considers all the electoral options when making her choice, allowing us to test for the violation of the IIA assumption and to assess whether the relative probabilities of a voter choosing between any two candidates depends on the presence of other electoral options.²

² The IIA assumption underlying logistic models can be tested on subsets of alternatives (Hausman and McFadden, 1984) and cross-alternative variables (McFadden, 1987). However,

Our model specification is grounded in the spatial voting and random utility maximization literature, and draws on Alvarez and Nagler (1995) and Alvarez, Bowler and Nagler (2000). We assume that the voter's utility for each candidate is composed of a systemic component, specified as function of characteristics of the individuals and the candidates, and a stochastic component that represents the influence of unobserved factors on voters' choice. Following Alvarez and Nagler (1995), voter i 's utility for candidate j , denoted by $U_{i,j}$, is given by:

$$U_{i,j} = z_i' \alpha_j + x_{i,j}' \delta + \varepsilon_{i,j}, \quad j = \text{Bachelet, Hirsch, Lavín, Piñera} \quad (1)$$

where z_i is a vector of characteristics of the i^{th} voter (including a constant term), $x_{i,j}$ is a vector of characteristics of the j^{th} candidate relative to the voter, α_j and δ are vectors of parameters to be estimated, and $\varepsilon_{i,j}$ is a disturbance term. We assume that the four error terms $(\varepsilon_{i,\text{Bachelet}}, \varepsilon_{i,\text{Hirsch}}, \varepsilon_{i,\text{Lavín}}, \varepsilon_{i,\text{Piñera}})$ follow a multivariate normal distribution with mean vector 0 and variance-covariance matrix Σ , allowing the random components of utility to be correlated across parties. In line with random utility models, each voter is assumed to vote for the candidate that provides her with the highest utility; that is,

$$Y_i = j \quad \text{if} \quad U_{i,j} = \max(U_i) \quad (2)$$

rejection of IIA using these tests does not provide much guidance on the correct specification to use (Train, 2003).

where Y_i is the observed voter choice, Given that only differences in utility matter and thus any location shift will not change the observed vote, we can solve the identification problem by taking one party as the base alternative and expressing i 's utility for the other candidates relative to her utility for the base alternative. Assuming, without loss of generality, that we take Piñera (RN) as the base alternative, and defining $\tilde{U}_{i,k} = U_{i,k} - U_{i,\text{Piñera}}$, $k = \text{Bachelet, Hirsch, Lavín}$, we can express the random utility model as:

$$\tilde{U}_i = W_i \tilde{\beta} + \tilde{\varepsilon}_i \quad (3)$$

with

$$W_i = [z_i \otimes I_3, X_i^*], \quad X_i^* = \begin{bmatrix} x'_{i,\text{Bachelet}} - x'_{i,\text{Piñera}} \\ x'_{i,\text{Hirsch}} - x'_{i,\text{Piñera}} \\ x'_{i,\text{Lavín}} - x'_{i,\text{Piñera}} \end{bmatrix}, \quad \text{and}$$

$$\tilde{\varepsilon}_i = (\varepsilon_{i,\text{Bachelet}} - \varepsilon_{i,\text{Piñera}}, \varepsilon_{i,\text{Hirsch}} - \varepsilon_{i,\text{Piñera}}, \varepsilon_{i,\text{Lavín}} - \varepsilon_{i,\text{Piñera}}) \sim N_3(0, \tilde{\Sigma}).$$

The parameters $\theta = (\tilde{\beta}, \tilde{\Sigma})$ are still not identified, because a scale shift will not change the observed choices.³ We follow McCulloch and Rossi (1994) and achieve identification by normalizing the parameters with respect to $\tilde{\sigma}_{1,1}$: $\theta' = (\tilde{\beta}', \tilde{\Sigma}') = (\tilde{\beta}' / \sqrt{\tilde{\sigma}_{1,1}}, \tilde{\Sigma}' / \tilde{\sigma}_{1,1})$.

The likelihood for the multinomial probit model is then given by

³ That is, $Y_i(\tilde{U}_i) = Y_i(\alpha \tilde{U}_i) \quad \forall \alpha > 0$.

$$f\left(Y|W, \tilde{\beta}', \tilde{\Sigma}'\right) = \prod_{i=1}^n \Pr\left(Y_i | W_i, \tilde{\beta}', \tilde{\Sigma}'\right) \quad (4)$$

$$P\left(Y_i | W_i, \tilde{\beta}', \tilde{\Sigma}'\right) = \int_{A_j} \phi_3\left(\tilde{U}_i | W_i, \tilde{\beta}', \tilde{\Sigma}'\right) d\tilde{U}_i \quad (5)$$

where ϕ_3 is the trivariate normal probability density function, and

$$A_j = \begin{cases} \tilde{U}_i : \tilde{U}_{i,k} > \max(\tilde{U}_{i,-k}, 0) & \text{if } Y_i = k, k = \text{Bachelet, Hirsch, Lavín} \\ \tilde{U}_i : \tilde{U}_i < 0 & \text{if } Y_i = \text{Piñera} \end{cases}$$

The posterior density of the parameters is given by Bayes theorem as

$$\pi\left(\tilde{\beta}', \tilde{\Sigma}' | W\right) \propto f\left(Y | W, \tilde{\beta}', \tilde{\Sigma}'\right) \pi\left(\tilde{\beta}'\right) \pi\left(\tilde{\Sigma}'\right) \quad (6)$$

where $\pi\left(\tilde{\beta}'\right)$ and $\pi\left(\tilde{\Sigma}'\right)$ denote the prior densities of $\tilde{\beta}'$ and $\tilde{\Sigma}'$, respectively.

Our source of data is the Comparative Study of Electoral Systems post-election survey (CSES, 2007). In line with the competing theories about the determinants of electoral behavior in Chile, we examine the effect of respondents' socio-demographic characteristics, attitudes towards democracy and assessment of the incumbent Lagos' government on their vote choice. The socio-demographic variables included in the model: *Age*; *Education*, recorded on an four point-scale ranging from no education to university degree; a dummy variable for *Female*; *Income*, by household quintile; and *Religion*, coded 1 for respondents belonging to a religious denomination (Catholicism and other

Christian faiths, essentially), 0 otherwise. We also include *Regime preference*, recording respondents' agreement with the statement "Democracy is better than any other form of government"; *Satisfaction with democracy*, a variable reflecting how satisfied respondents are with the way democracy works in Chile; and *Government evaluation*, measures respondents' assessment of the performance of Lagos' government; the three variables are scored on four-point scales in ascending order. As an alternative, all variables coded on an ordered scale were discretized, with the lower category taken as baseline and dummy variables specified for the remaining categories; the main substantive findings reported in Section 4, based on the default parametrization, remain unchanged under this alternative specification.⁴

In addition, in line with the prevalent spatial model of voting (Hinich and Munger, 1994; Merrill and Grofman, 1999), we include *Ideological distance*, a measure of respondents' spatial perceived ideological distance from each of the candidates in the model, defined as the squared difference between the respondent's self-reported placement on an 11-point left-right scale and her placement of each of the parties on the same scale (Merrill and Grofman, 1999). The left-right ideological dimension plays a key role in terms of popular perceptions of party differences in Chile (Valenzuela and Scully, 1997; Tironi and Agüero, 1999), where there are relatively minor differences between the main political forces regarding fundamental political and economic issues (Scully, 1995; Fuentes, 1999; Angell and Reig, 2006). Although the CSES survey asks Chilean respondents only about parties' positions, we compared the ideological locations obtained

⁴ A complete set of results using the alternative coding scheme is available from the authors upon request.

from the CSES survey with candidates' perceived positions from the October-November 2005 Centro de Estudios Públicos (CEP, 2005) national survey; the ordering of the candidates on the left-right scale is the same in both surveys, and differences in the mean of respondents' placements of the candidates between the surveys are quite small.⁵ While the results reported below are based on the distance measure computed from parties' perceived location in the CSES survey in order to avoid statistical complexities brought about by combining information from different sources (Lohr, 2005; Raghuanathan et al., 2006), using the candidates' placements obtained from the CEP survey yields similar results.⁶

The model was fit through Markov chain Monte Carlo simulations, using McCulloch and Rossi's (1994) Gibbs sampling algorithm.^{7,8} As mentioned in the introduction, Bayesian procedures based on Gibbs sampling allow making exact finite sample inferences without relying on large-sample theory (McCulloch and Rossi, 1994; Kim, Kim and Heo, 2003). Because of the discrete nature of the dependent variable, a considerable sample size may be required for accurate asymptotic approximations (McCulloch and Rossi, 1994). Hence, the Bayesian approach is particularly appropriate

⁵ Less than 0.9 points on an eleven-point scale for each of the candidates.

⁶ Ibidem, footnote 4.

⁷ See McCulloch and Rossi (1994), McCulloch, Polson and Rossi (2000) and Imai and van Dyk (2005) for a detailed presentation of the sampling algorithm. A general discussion of Gibbs sampling can be found in Gelfand and Smith (1990) and Casella and George (1992).

⁸ The Gibbs sampler was implemented using the 'bayesm' package in R (Rossi, Allenby and McCulloch, 2005).

given the relatively small dataset available to analyze the 2005 election.⁹ The Bayesian approach is also better suited to deal with a large number of alternatives than the simulation-based methods of classical estimation, which require deriving the likelihood function with respect to each element of the variance-covariance matrix, thus resulting in substantial increases in computational time (Train, 2003; Kim et al., 2003).

In addition, the Bayesian model-fitting strategy allows for comparison of competing models and explanations of voter behavior in a straightforward and computationally practical way using Bayes factors (Kass and Raftery, 1995). The Bayes factor for model M_j relative to model M_k is given by

$$B_{j,k} = \frac{p(y|M_j)}{p(y|M_k)} = \frac{\int p(y|M_j, \theta_j) p(\theta_j|M_j) d\theta_j}{\int p(y|M_k, \theta_k) p(\theta_k|M_k) d\theta_k} \quad (7)$$

where, in the application of Section 4, we used the harmonic mean of the likelihood values evaluated at the posterior draws (Newton and Raftery, 1994) as an estimate for $p(y|M_x)$, $x = j, k$:

$$\hat{p}(y|M_x) = \left(\frac{1}{R} \sum_{r=1}^R p(y|\theta_x^{(r)})^{-1} \right)^{-1} \quad (8).$$

⁹ McCulloch and Rossi (1994) show that non-normality of finite sampling distributions of the error variance-covariance parameters can arise with even 1,000 observations per parameter, indicating that “asymptotic theory may be of little use for the MNP model” (p. 219).

Diffuse proper priors were assumed for the parameters in the model, $\tilde{\beta} \sim N(\bar{\beta}, B^{-1})$ and $\tilde{\Sigma} \sim \text{Inverse Wishart}(v, V)$, with $\bar{\beta} = 0$, $B^{-1} = 0.0001I$, $v = 6$, $V = vI$ (McCulloch, Polson and Rossi, 2000); routine sensitivity analyses were performed to assess the robustness of the results with respect to different priors and starting values for the sampling algorithm, yielding similar results. A single Markov chain was run for 3,000,000 cycles, with the first 50,000 discarded as burn-in; while McCulloch and Rossi's (1994) sampler is quite easy to implement, high correlation between the parameters and the latent variables introduced by the data augmentation algorithm used to form the Gibbs sampler (Tanner and Wong, 1987; McCulloch and Rossi, 1994; Imai and van Dyk, 2005), coupled with a high-dimensional parameter space, determined that the Markov chain was extremely slow in navigating the state space, and some parameters required more than 2,000,000 draws to converge.¹⁰ The results presented in Section 4 are based on the last 50,000 Gibbs sample draws of the parameters.

4. Empirical results

4.1 Multinomial probit estimates

Table 2 reports the posterior means and 95% Bayesian Credible Intervals of the parameters of the multinomial probit model. The model correctly predicts voter choice in 59.6% of the cases, while a “null model” predicting that voter choice for each respondent will take the value of the most common outcome in the sample (*Concertación*) correctly

¹⁰ Convergence was assessed using Geweke's (1992) and diagnostic based on a test for equality of the means of the first 10% and last 50% of the Markov chain.

classifies 51.4% of the vote. Such a model, however, would provide no information about the effect of the predictors on the relative probability of voting for the different parties.

[Table 2 here]

The summaries of the posterior densities shed substantial light on the relative the relative influence of respondent's socio-demographic characteristics, attitudes towards democracy and evaluation of government performance on their electoral behavior. First, regarding the effect of socio-demographic variables, wealthier voters were more likely to vote for the Renewal Party (RN) than for *Concertación* or UDI, and younger voters were also more likely to choose Piñera over Lavín. None of these variables significantly affected the choice between the RN candidate and Hirsch. In contrast, and in line with the data presented in Table 1, more educated voters and those not belonging to any religious denomination were more likely to vote for JPM than for RN, but these variables did not affect the choice between Piñera and the other two candidates at the 95% level. Although these estimates indicate that socio-demographic factors did influence voters' electoral behavior, they did not necessarily affect the choice between *Concertación* and *Alianza*. Rather, the evidence indicates that some of the socio-economic variables that had a positive effect on the probability of choosing Bachelet over Piñera – e.g., *Income* - also increased the probability of voting for Lavín over the candidate of the Renewal Party.

On the other hand, respondents' regime preferences and their evaluation of the incumbent government significantly affected the choice between Bachelet and the two candidates of the *Alianza*. Respondents who stated that democracy is always the best

form of government and those expressing favorable views of Lagos' administration were more likely to vote for Bachelet than for Piñera, but this variable did not affect vote choice between the UDI and the RN candidates. Voters satisfied with the way in which democracy works in Chile were more likely to vote for Bachelet and for Lavín than for Piñera, but they were less likely to choose Hirsch over the RN candidate.

A remarkable result emerging from Table 2 is that, although the coefficient of *Ideological distance* has the expected negative sign, in line with the spatial voting literature, it is not statistically significant at the usual confidence levels. This finding is robust to alternative definitions of the ideological distance measure, such as using the absolute value rather than the square of the difference between the respondents' and the parties' locations on the left-right scale or approximating parties' location using the mean of respondents' placements (Rabinowitz and MacDonald, 1989; Alvarez and Nagler, 1995). Nonetheless, it must be mentioned that 24% of the respondents in the sample who placed themselves in the far-left end of the ideological scale stated that they had voted for one of the two *Alianza* candidates. This suggests that this result might stem from the methodological difficulties inherent in collecting perceptual data (Aldrich and McKelvey, 1977; King, Murray, Salomon and Tandon, 2004) or from flaws in the CSES questionnaire. In order to address this problem, we re-estimated the model using estimates of respondents' self-placement and parties' locations obtained through Aldrich and McKelvey's (1977) method of scaling, with virtually identical outcomes. Hence, although we cannot discard the hypothesis that this result is mainly driven by problems in the CSES questionnaire and well-known difficulties associated to the use of ordinal scales (King et al., 2004), a possible explanation lies in the absence of important policy

differences between the three main candidates and in the fact that the first round of the election was presented as a choice between candidates' personal traits, rather than between parties or ideological positions (Gamboa and Segovia, 2006).

A different interpretation has to do with the extent of tactical voting among the Chilean electorate. Given the high probability of a *ballotage* and the highly disputed contest between Piñera and Lavín for the second place in the election, voters - in particular, *Concertación* sympathizers - might have had an incentive to cast a ballot for a candidate other than their most preferred one in order to affect the race between the two candidates of the *Alianza* and to influence who would face Bachelet in the second-round runoff (Cox, 1997). The relationship between partisanship and vote-choice reported in Table 1 and the high percentage of split-ticket voting between the presidential and legislative races (Navia, 2006) suggests that tactical voting might have been relatively important in the 2005 election; we explore this argument in Section 4.3 below.

Finally, as seen at the bottom of Table 2, we find a positive correlation between *Concertación* and UDI and a negative correlation between JPM and UDI. Although the positive correlation between *Concertación* and UDI is at odds with received knowledge about citizens' partisan identities in Chile, it is in line with Angell and Reig's (2006) observation that the RN candidate was disliked by a significant proportion of Lavín's supporters, and might help account for the fact that a considerable percentage of them voted for Bachelet in the second-round runoff against Piñera (Gamboa and Segovia, 2006; Huneeus, 2006). These results indicate that the IIA assumption is violated and that models that impose such condition might produce incorrect inferences about voter choice in Chile's 2005 election (Alvarez, Bowler and Nagler, 2000). More importantly, such

models would neglect the fact that Piñera’s entry into the election significantly affected citizens’ probabilities of voting for the other competing candidates.

4.2 The effect of individual characteristics on vote choice

The coefficients reported in Table 2 are difficult to interpret directly due to the nonlinear functional form of the multinomial probit model and the fact that the voters’ utilities are expressed with respect to a baseline alternative (Piñera). In order to assess the relative impact of the different factors proposed to account for voter behavior in Chile and to be able to make pairwise comparisons between candidates, we estimate the marginal effect of the individual-specific variables on the probability of voting for each candidate using “first differences” (King, Tomz and Wittenberg, 2000). For each respondent in the sample, we compute vectors of choice probabilities $[P_i(\text{Bachelet}), P_i(\text{Hirsch}), P_i(\text{Lavín}), P_i(\text{Piñera})]$ based on the value of the regressors and the Gibbs sample draws of the models’ parameters using the GHK algorithm (Hajivassiliou, McFadden and Ruud, 1996). Then we alter one independent variable at a time and recompute the predicted probabilities for each respondent, holding all other variables constant. Finally, we average the differences between these probabilities over all simulations and respondents, obtaining the mean value and 95% Credible Intervals for the causal effect of the variable under analysis. Table 3 summarizes the average impact on the probability of support for each party of changing the values of the predictors from one end of the scale to the other.¹¹

¹¹ In the case of the binary variables, *Female* and *Religion*, we measure the impact of a change from 0 to 1.

[Table 3 here]

In line with the results presented in Table 2, the estimated first differences do not support the hypothesis that socioeconomic or religious cleavages played a key role in the choice between leftist and conservative candidates. While, *ceteris paribus*, higher education levels increased the probability of voting for the left-wing *Juntos Podemos Más* by 11 percentage points, it reduced the likelihood of voting for *Concertación* by 0.21. Respondents belonging to households in the wealthiest income quintile were 0.18 more likely to vote for Piñera than those in households at the bottom quintile, but they were also 0.04 more likely to vote for Hirsch. Also, respondents belonging a religious denomination were 0.18 less likely to cast a ballot for Hirsch than atheist or agnostic voters, but this variable had no statistically significant effect on the probability of voting for Bachelet or for either of the two candidates of the *Alianza*.

In contrast, opinions about regime preference and government performance did have substantive and opposite effects on the probability of voting for the two leftist and the two conservative candidates. Respondents would be on average 0.33 more likely to vote for Bachelet and 0.02 more likely to vote for Hirsch if they felt that democracy is always the best form of government, but they would be 0.26 less likely to vote for Piñera. Also, moving from a very negative to a very positive evaluation of the incumbent government increased the likelihood of voting for Bachelet and Hirsch by 0.66 and 0.09, respectively, while reducing the average probability of supporting Lavín and Piñera by 54 and 22 percentage points. Given the success of the President Lagos's economic and social

policies and the fact that neither of the UDI nor the RN candidates proposed substantial transformations in this regard, it seems reasonable to assume that the strong positive effect of a negative evaluation of the government on the probability of supporting the *Alianza* is not necessarily reflecting retrospective voting. Rather, it might be related to a series of important democratizing reforms implemented during Lagos' term in office, such as the elimination of designated senators and the restoration of the presidential power to designate and remove the heads of the different branches of the military, as well as to the adoption of divisive "symbolic" measures like the reparations to victims of human rights violations (Angell and Reig, 2006; Navia, 2006).

On the other hand, although *Satisfaction with democracy* also had a significant influence on voter choice, the effect of this variable does not reveal a clear left-right division. On average, moving from a very negative to a very positive opinion of the way in which democracy works in Chile increased the likelihood of voting for Bachelet by 0.42, but decreased the probability of voting for either Hirsch or Piñera by 0.19. Notice, however, that the causal effect of this variable on the probability of choosing Lavín is not statistically significant at the 0.05 level. The positive relationship between dissatisfaction with the functioning of democracy and the likelihood of voting for Hirsch and Piñera might reflect a demand for alternative electoral options among voters disenchanted with the two major blocs dominating electoral competition, rather than respondents' anti-democratic values. While Hirsch adopted a critical position towards both the *Concertación* and the conservative opposition during the campaign, Piñera emphasized the need to build a broad center-right "New Coalition" based on "Christian Humanist"

principles to replace the *Concertación/Alianza* dichotomy (Angell and Reig, 2006; Gamboa and Segovia, 2006).

In order to better illustrate the relative validity of the hypotheses emphasizing the role of socio-economic and authoritarian-democratic cleavages, Figure 2 summarizes the effect on the choice probabilities of a hypothetical voter of shifting all the predictors used to operationalize each approach from the lower to the upper end of the scale.¹² The upper panel of Figure 2 plots the probabilities of voting for each candidate as a function of the voter's views on democracy and government performance, while holding the socio-demographic variables at the mean sample values. The lower panel reproduces the analysis, varying the voter's education and income levels and fixing the remaining predictors at their average values.

[Figure 2 here]

The comparison of the upper and lower panels in Figure 2 suggests that differences in the attitudes towards democracy and the evaluation of the government are the main source of divide between *Alianza* and *Concertación* supporters. Going from the lower to the upper end of the scale on *Regime Preference*, *Satisfaction with democracy* and

¹² Our hypothetical voter is male, of mean age, education and income, and belongs to a religious denomination; his opinions on democracy and the government and his ideological distance from each party are set at the mean sample values. Although the values of the independent variables used to construct this hypothetical voter influence the baseline probability estimates, they do not substantively influence the marginal effect of the predictors on the choice probabilities.

Government evaluation increases the probability of voting for Bachelet from 0 to 87 percent, while decreasing the likelihood of voting for Lavín and Piñera from 0.25 and 0.65 to 0 and 0.01, respectively. Simultaneous increases in *Education* and *Income* also have a substantial effect on the likelihood of choosing Bachelet, lowering it by as much as 50 percentage points, from 0.77 to 0.27. However, the effect of such increases on the likelihood of supporting the candidates of the Alianza is much smaller, raising it from 0.11 to 0.27 in the case of Piñera, while having virtually no effect on the vote for Lavín. Hence, our findings support the arguments underscoring the role of the authoritarian-democratic in the choice between *Concertación* and *Alianza* (Tironi and Agüero, 1999; Torcal and Mainwaring, 2003). In contrast, the evidence presented above shows that socio-economic and cultural factors are the main determinants of the support for Hirsch.

It is worth mentioning, however, that the comparison of a model including only socio-economic variables *vis a vis* a model including only respondents' views on democracy and the government does not favor any of the two specifications: the Bayes factor between the second and the first model is 1.09, and remains essentially unchanged (1.11) when including the spatial distance measure in both specifications. Hence, neither the hypothesis emphasizing the role of social and cultural cleavages nor the theory underscoring the authoritarian-democratic divide provides a single best explanation of voter choice in Chile's 2005 election.

4.3 The role of the electoral context: candidate competition and voter calculus

The salience of the authoritarian-democratic cleavage in structuring the competition between the two main political blocs in the 2005 election suggests that Chile is still, in

the words of Constable and Valenzuela (1991), a ‘nation of enemies’. In this context, it is particularly relevant to examine whether Piñera’s candidacy and his campaign strategy aimed at distancing himself from the far right and the military dictatorship, contributed not only to his victory over Lavín in the contest for the second place in the election, but also to increase the support for the *Alianza*.

In order to do so, we exploit the fact that the multinomial probit model allows us to estimate the effect of the entry of Piñera in the presidential race and determine where the RN votes had gone in his absence. For each respondent in the sample, we calculate his expected utility difference for Bachelet, Hirsch and Lavín with respect to Piñera using the Gibbs sampling draws of the coefficients. Based on these differential utilities and on the draws of elements of the variance-covariance matrix, we can simulate vectors of choice probabilities for Bachelet, Hirsch and Lavín in a three-candidate race and estimate their expected vote-shares. In order to compare the results with those obtained under a scenario in which Piñera had been the only candidate of the *Alianza*, we also computed the probability of each voter choosing between Bachelet, Hirsch and Piñera in a three-candidate race with Lavín omitted. Table 4 reports the simulated vote-shares of the candidates in these two hypothetical three-candidate races and contrast them with the model’s predictions for the four-candidate election.

[Table 4 here]

As seen in the table, in a four-candidate election, our model predicts an expected vote-share of 50.9% for Bachelet, 8.2% for Hirsch, 26.4% for Piñera and 14.5% for Lavín,

close to the actual proportion of votes for each candidate in the sample (Table 1).¹³ While the expected vote-share for the two candidates of the *Alianza* would add to almost 41% in the four-candidate election, none of the two conservative candidates running alone would have obtained more than 34% of the vote in a three-candidate race against Bachelet and Hirsch. This indicates that Piñera's candidacy was an important determinant of *Alianza's* relative success in the 2005 election, increasing the support for the center-right in the sample by more than 10 percentage points with respect to the hypothetical case in which Lavín had been the only candidate of the coalition, as originally expected. Moreover, the support for Hirsch among the respondents in the sample would more than double under this scenario when compared to the four-candidate race, suggesting that the RN candidate was backed by a segment of voters who were not willing to cast a ballot for either Bachelet or Lavín. This interpretation is in line with the results in Tables 2 and 3 showing that Hirsch and Piñera had a strong support among voters disenchanted with the workings of democracy in Chile and who might have been looking for alternatives to the two "traditional" electoral options.

Figure 3 explores this issue further, plotting the distribution of the candidates' vote-share among different groups of respondents in both hypothetical three-candidate elections. The upper panel of Figure 3 summarizes the model's predictions for a three-candidate race between Bachelet, Hirsch and Lavín, plotting the distribution of the support for the candidates among those respondents who voted for Piñera in the actual election, among Christian Democrats (DC), and among the rest of the respondents in the

¹³ In the CSES sub-sample of 751 respondents we use, there is a positive bias for Bachelet and Hirsch and a negative bias for Lavín, which our multinomial probit model reproduces.

sample. Analogously, the bottom panel of Figure 3 presents the results for a three-candidate election with Lavín omitted, plotting the distribution of the support for Bachelet, Hirsch and Piñera among those who voted for Lavín in the presidential election, among DC partisans and among the remaining respondents.

[Figure 3 here]

The upper panel shows that, in a three-candidate race between Bachelet, Hirsch and Lavín, respondents who voted for Piñera in the actual election were more likely to vote for *Juntos Podemos Más* than the rest of the respondents in the sample. Also, comparing the two hypothetical three-candidate races between Bachelet, Hirsch and a single *Alianza* contender, the support for JPM among respondents who voted for Piñera in the presidential election would have been twice as large as among respondents who voted for Lavín. Hence, far from weakening the *Alianza*'s electoral prospects, the division between the UDI and the RN candidates seems to have actually increased the coalition's vote-share. While the *Alianza* retained its customary right-wing vote, Piñera's candidacy allowed the coalition to expand its electoral appeal to some citizens dissatisfied with the workings of democracy in Chile and demanding alternative electoral options; Lavín, *Alianza*'s "natural" candidate, would not have offered an attractive choice for this group of voters.

Nonetheless, the evidence reported in Table 4 and Figure 3 also point out that Piñera's success was, to a large extent, due to the specific circumstances surrounding the 2005 election and, in particular, to the uncertainty about which of the two *Alianza* candidates

would join Bachelet in the almost certain second-round runoff (Angell and Reig, 2006; Gamboa and Segovia, 2006). Three main results back up this claim. First, as seen in the upper panel of Figure 3, Piñera voters were more likely to vote for Lavín than for the other contestants if the RN candidate had not entered the race, and the expected vote-share of the UDI among them is much higher than among the other respondents in the sample. Hence, Piñera seems to have attracted many conservative voters who would have otherwise voted for Lavín and who might have seen the RN candidate as a more viable option in a second-round runoff against Bachelet. Second, as seen in the third column of Table 4, even though the *Alianza* would have done slightly better in a three-candidate race in which Piñera, rather than Lavín, had been the coalition's only nominee, Bachelet's expected vote-share among respondents in the sample would have peaked at more than 57% under this scenario. Moreover, Hirsch's support in this case would remain essentially unchanged in comparison to the actual four-candidate race. Hence, some voters that would support the minority candidate in an election with Bachelet and Lavín as real contenders for the presidential office would choose to cast a 'useful' vote for the *Concertación* in a less polarized election in which Piñera was the only nominee of the *Alianza*. Finally, although Christian Democrats were twice as likely to vote for Piñera than for Lavín in the actual election (Figure 1), Figure 3 shows that their propensity to vote for Piñera and for Lavín in the two hypothetical three-candidate races would not be significantly different. This result indicates that some respondents who voted for the National Renewal Party in order to prevent Lavín from advancing to the second round would have had no incentive to do so in a three-candidate election with Bachelet and Piñera as the main aspirants for office.

Therefore, our findings underscore the fact that the political and institutional context played a key role in explaining Piñera success and *Alianza*'s unprecedented support in the 2005 election. In particular, tactical voting seems to have been an important determinant of the support for the RN candidate. Interestingly, however, the strategic calculus of Chilean voters corresponds only in part to the predictions of received models of strategic vote under top-two runoff (Myerson and Weber, 1993; Cox, 1997). In line with the theoretical literature, Piñera's support among UDI sympathizers might reflect the desire of conservative voters to coordinate on the candidate of the *Alianza* that, according to public opinion polls, stood the best chance in a two-candidate runoff against Bachelet. In contrast, his support among *Concertación* partisans and potential Hirsch voters indicates that strategic voting among center-left and left-wing respondents stemmed from their desire to exclude Lavín from the *ballotage*, rather than to improve the probability of victory for their most-favored candidate (Cox, 1997).

Again, this calls attention to the persistence of the authoritarian/democratic cleavage and its influence on the election results. The prevalence of this division in the society, together with the broad consensus over economic and social issues and strong party and coalition labels, impose powerful limitations to party leaders and political elites intending to alter their long-established electoral coalitions (Valenzuela and Scully, 1997). Their success in doing so might depend on their ability to shift their bases of electoral competition by politicizing new dimensions of conflict that cross coalitions and partisan lines, such as the ones underlying the growing "demand for rights" among the electorate and the increased debate over moral and social issues (Torcal and Mainwaring, 2003; Angell and Reig, 2006).

5. Final remarks

The 2005 election in Chile had several unusual characteristics. Among them, the presence of two viable conservative candidates marked a clear difference with previous elections. In this paper, we specify and fit a Bayesian multinomial probit model to study the presidential race, accounting for the multi-party character of the election and allowing estimation of substitution patterns among the candidates that enable us to assess how their expected vote-shares would change under alternative electoral scenarios. The Bayesian approach is particularly well suited for analyzing this election, given its advantages over classical estimation techniques for dealing with a relatively large number of alternatives and small sample sizes, as well as for providing a practical way of testing competing hypothesis and statistical models.

Our results shed light on the debate about the transformation of the political system in Chile and the redefinition of voters' preferences since the re-establishment of democracy. In line with Tironi and Agüero (1999), we find that voters' regime preferences and their attitudes towards democracy played a substantial role in the choice between the candidates of the *Concertación* and the *Alianza*. Earlier works suggested that the authoritarian-democratic cleavage would probably lose its influence over time as the memories of the dictatorship receded, as democracy was consolidated and as parties found new political issues to mobilize their supporters (Valenzuela and Scully, 1997). However, our findings for the 2005 election show that, sixteen years after the plebiscite that marked the end of Pinochet's rule, voters' electoral behavior still reflects the durability of the division between supporters and critics of the military regime.

In addition, our analysis underscores the considerable impact of the particular electoral context of the 2005 presidential race on voter choice, an aspect that has received relatively little attention in previous analyses of Chilean elections. Specifically, we show that the entry of a second conservative candidate into the presidential race increased the vote of the right, gathering the support of some Christian Democrats and, especially, of voters who were not inclined to favor either Bachelet or Lavín. We also find that much of Piñera's support was due to strategic calculus on the part of voters in view of the almost certain second-round runoff and the tight contest between Lavín and Piñera for the second place in the first round of the election. An in-depth analysis of this argument, however, requires developing a statistical model to estimate the amount of strategic voting in multiparty elections under top-two runoff, an extension that we leave for further research.

References

- Aldrich, J.H., McKelvey, R.D., 1977. A Method of Scaling with Applications to the 1968 and 1972 Presidential Elections. *Am. Pol. Sci. Rev.* 71(1), 111-130.
- Alemán, E., Sebastián S., 2007. Legislative Preferences, Political Parties and Coalition Unity in Chile. *Comp. Pol.* 39(3), 253-272.
- Alvarez, R.M., 1998. *Information and Elections*. University of Michigan Press, Ann Arbor.
- Alvarez, R.M., Nagler, J., 1995. Economic, Issues and the Perot Candidacy: Voter Choice in the 1992 Presidential Election. *Am. J. Pol. Sci.* 30(3), 714-744.
- Alvarez, R.M., Nagler, J., Bowler, S., 2000. Issues, Economics, and the Dynamics of Multiparty Elections: The British 1987 General Election. *Am. Pol. Sci. Rev.* 94(1), 131-149.
- Angell, A., Reig, R., 2006. Change or Continuity? The Chilean Elections of 2005/2006. *Bulletin of Latin American Research* 25(4), 481-502.
- Bonilla, C., 2002. A Micro Application of the Spatial Theory of Voting. *Revista de Ciencia Política* 21(2), 3-16.
- Casella, G., George, E.L., 1992. Explaining the Gibbs Sampler. *Am. Statist.* 46(3), 167-174.
- Centro de Estudios Públicos (CEP), 2005. *Estudio Nacional de Opinión Pública N° 23 – Tercera Serie. Octubre – Noviembre 2005.*
- Comparative Study of Electoral Systems (CSES). 2007. CSES Module 2 Election Study Archive.
- Constable, P., Valenzuela, A., 1991. *A Nation of Enemies: Chile under Pinochet.*

Norton, New York.

Cox, G., 1997. *Making Votes Count*. Cambridge University Press, Cambridge.

Dow, J.K., Endersby, J.W., 2004. Multinomial probit and multinomial logit: a comparison of choice models of voting research. *E. Studies* 23, 107-122.

Franklin, C.H., Jackson, J.E., 1983. The Dynamics of Party Identification. *Am. Pol. Sci. Rev.* 77(4), 957-973.

Frei, E.O., 2003. Los Partidos Políticos Chilenos Cambio y Estabilidad en el Comportamiento Electoral, 1990 -2000. *Revista de Ciencia Política* 23(2), 109-147.

Gamboa, R., Segovia, C., 2006. Las Elecciones Presidenciales y Parlamentarias en Chile, Diciembre 2005 – Enero 2006. *Revista de Ciencia Política* 26(1), 84-113.

Gelfland, A.E., Smith, A.F., 1990. Sampling-Based Approaches to Calculating Marginal Densities. *J. Am. Statist. Assoc.* 85(410), 398 – 409.

Geweke, J., 1992 Evaluating the accuracy of sampling-based approaches to calculating posterior moments. In *Bayesian Statistics 4*, J. Bernardo, J. Berger, A. Dawid and A. Smith (eds.). Clarendon Press, Oxford.

Hajivassiliou, V., McFadden, D., Ruud, P., 1996. Simulation estimation methods for limited dependent variable models. In Maddala, G.S., Rao, C.R., Vinod, H.D. (Eds.), *Handbook of Statistics*. North Holland, Amsterdam, pp. 519-543.

Hausman, J., McFadden, D. 1984. Specification tests for the multinomial logit Model. *Econometrica* 52(5), 1219–1240.

Hillygus, D.S., Jackman, S., 2003. Voter Decision Making in Election 2000: Effects, Partisan Activation and the Clinton Legacy. *Am. J. Pol. Sci.* 47(4), 583-596.

Hinich, M., Munger, M., 1994. *Ideology and the Theory of Political Choice*. The University of Michigan Press, Ann Arbor.

Horowitz, J. 1980. The accuracy of the multinomial logit model as an approximation to the multinomial probit model of travel demand. *Transportation Research B*, 14, 331-341.

Huneus, C., 2006. *Las elecciones presidenciales y parlamentarias del 2005 en Chile*. Publicaciones de Coyuntura, Centro de Estudios de la Realidad Contemporanea.

Imai, K., van Dyk, D.A., 2005. A Bayesian analysis for the multinomial probit model using marginal data augmentation. *J. Econometrics* 124, 311-334.

Jackman, S., 2004. Bayesian Analysis for Political Research. *Ann. Rev. Pol. Sci.* 7, 483-505.

Kass, R.E., Raftery, A.E., 1995. Bayes Factors. *J. Am. Statist. Assoc.* 90, 773-795.

Kim, Y., Kim, T., Heo, E., 2003. Bayesian estimation of multinomial probit models of work trip choice. *Transportation* 30, 51-365.

King, G., Murray, C.J., Salomon, J.A., Tandon, A., 2004. Enhancing the Validity and Cross-Cultural Comparability of Measurement in Survey Research. *Am. Pol. Sci. Rev.* 98(1), 191-207.

King, G., Tomz, M., Wittenberg, J., 2000. Making the Most of Statistical Analyses: Improving Interpretation and Presentation. *Am. J. Pol. Sci.* 44, 341-355.

Lohr, S., 2005. *Inference from Multiple Frame Surveys*. Statistics and Biostatistics Colloquium Series, Department of Statistics, The Ohio State University.

McCulloch, R., Polson, N.G., Rossi, P.E., 2000. A Bayesian analysis of the multinomial probit model with fully identified parameters. *J. Econometrics* 99, 173-193.

- McCulloch, R., Rossi, P.E., 1994. An exact likelihood analysis of the multinomial probit model. *J. Econometrics* 99, 173-193.
- McFadden, D., 1987, Regression-based specification tests for the multinomial logit model. *J. Econometrics* 34, 63–82.
- Merrill, S., Grofman, B., 1999. *A Unified Theory of Voting – Directional and Proximity Spatial Models*. Cambridge University Press, Cambridge.
- Myerson, R.B., Weber, R.J., 1993. A Theory of Voting Equilibria. *Am. Pol. Sci. Rev.* 87(1), 102-114.
- Navia, P., 2006. La elección presidencial de 2005 en Chile. *El Debate Político. Revista Iberoamericana de Análisis Político* 3(4/5), 215-228.
- Newton, M.A., Raftery, A.E., 1994. Approximate Bayesian Inference by the Weighted Likelihood Bootstrap. *J. Roy. Stat. Soc., Ser. B*, 56, 3-48.
- Quinn, K.M., Martin, A.D., 1998. Operationalizing and Testing Spatial Theories of Voting. Paper presented at the meeting of the Midwest Political Science Association, Chicago, IL.
- Raghunathan, T., Xie, D., Schenker, N., Parsons, V., Davis, W., Dodd, K., Feuer, E., 2006. Combining Information from Two Surveys to Estimate County-Level Prevalence Rates of Cancer Risk Factors and Screening. The University of Michigan Department of Biostatistics Working Paper Series, Working Paper 58.
- Rabinowitz, G., MacDonald, S.E, 1989. A Directional Theory of Issue Voting. *American Political Science Review* 83(1), 93-121.
- Rossi, P.E., Allenby, G., and McCulloch, R., 2005. *Bayesian Statistics and Marketing*. John Wiley and Sons, West Sussex.

Scully, T.R., 1992. Rethinking the Center. Party Politics in Nineteenth and Twentieth Century Chile. Stanford University Press, Stanford.

Scully, T.R., 1995. Reconstituting Party Politics in Chile. In Mainwaring, S., Scully, T.R. (Eds.), Building Democratic Institutions. Party Systems in Latin America. Stanford University Press, Stanford, pp. 100-137.

Tanner, M.A. and Wong, W.H. 1987. "The calculation of posterior distributions by data augmentation." J. Am. Statist. Assoc. 83, 528-540.

Tironi, E., Agüero, F., 1999. ¿Sobrevivirá el Actual Paisaje Político Chileno? Estudios Públicos 74, 151-168.

Torcal, M., Mainwaring, S., 2003. The Political Recrafting of Social Bases of Party Competition: Chile, 1973–95. Brit. J. Pol. Sci. 33, 55-84.

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.

Valenzuela, J.S., 1995. Orígenes y Transformaciones del Sistema de Partidos en Chile. Estudios Públicos 58, 6-77.

Valenzuela, J.S., 1999. Respuesta a Eugenio Tironi y Felipe Agüero: Reflexiones sobre el presente y el futuro del paisaje político chileno a la luz de su pasado. Estudios Públicos 75, 273-290.

Valenzuela, J.S., Scully, T.R., 1997. Review: Electoral Choices and the Party System in Chile: Continuity and Changes at the Recovery of Democracy. Comp. Pol. 29(4), 511-527.

Figures and tables

Table 1

Vote Choice by Respondents' Views and Characteristics*

		Bachelet (Concertación)	Hirsch (JPM)	Lavín (UDI)	Piñera (RN)	N
		%	%	%	%	
<i>Age</i>	18 -29	45.05	12.87	8.91	33.17	202
	30-44	53.23	11.03	15.97	19.77	263
	45-64	53.36	5.83	15.25	25.56	223
	65+	55.56	6.35	23.81	14.28	63
<i>Education</i>	None	37.50	0.00	37.50	25.00	8
	Primary	66.41	5.47	11.72	16.41	128
	Secondary	50.00	8.55	14.74	26.70	468
	University	42.86	17.01	14.97	25.17	147
<i>Gender</i>	Female	56.56	8.20	13.66	21.58	366
	Male	46.23	10.91	15.32	27.53	385
<i>Household Income</i>	1 st quintile	57.89	6.58	22.37	13.16	76
	2 nd quintile	55.66	8.49	13.52	22.33	318
	3 rd quintile	47.89	11.05	13.16	27.89	190
	4 th quintile	43.38	11.76	12.50	32.35	136
	5 th quintile	45.16	9.68	22.58	22.58	31
<i>Religious Denomination</i>	Yes	52.38	6.35	15.56	25.71	630
	No	45.45	26.45	9.09	19.01	121
<i>Democracy is the best Form of government</i>	Disagree strongly	12.50	25.00	0.00	62.50	8
	Disagree	14.55	3.64	32.73	49.09	55
	Agree	46.82	9.92	16.79	26.46	393
	Agree strongly	65.08	9.83	8.47	16.61	295
<i>Satisfaction with democracy in Chile</i>	Unsatisfied	13.51	29.73	16.21	40.54	37
	Not very satisfied	24.78	8.84	26.99	39.38	226
	Fairly satisfied	61.46	9.43	9.97	19.14	371
	Very satisfied	82.05	5.13	4.27	8.55	117
<i>Government Evaluation</i>	Very bad	0.00	16.67	16.67	66.67	12
	Bad	7.32	13.01	41.46	38.21	123
	Good	55.04	8.40	11.34	25.21	476
	Very good	81.43	10.00	1.43	7.14	140
<i>Party identification</i>	Concertación	83.33	5.56	3.33	7.78	90
	JPM	33.33	66.67	0.00	0.00	15
	UDI	0.00	0.00	57.14	42.86	22

	RN	0.00	0.00	20.69	79.31	29
	Others	25.00	12.50	37.50	25.00	8
	Independents	51.79	9.37	14.48	24.36	587
<i>Sample</i>		51.44	9.58	14.70	24.49	751

* Table entries are the percentage of each row-variable voting for the designated candidate.

Percentages sum to 100 across rows.

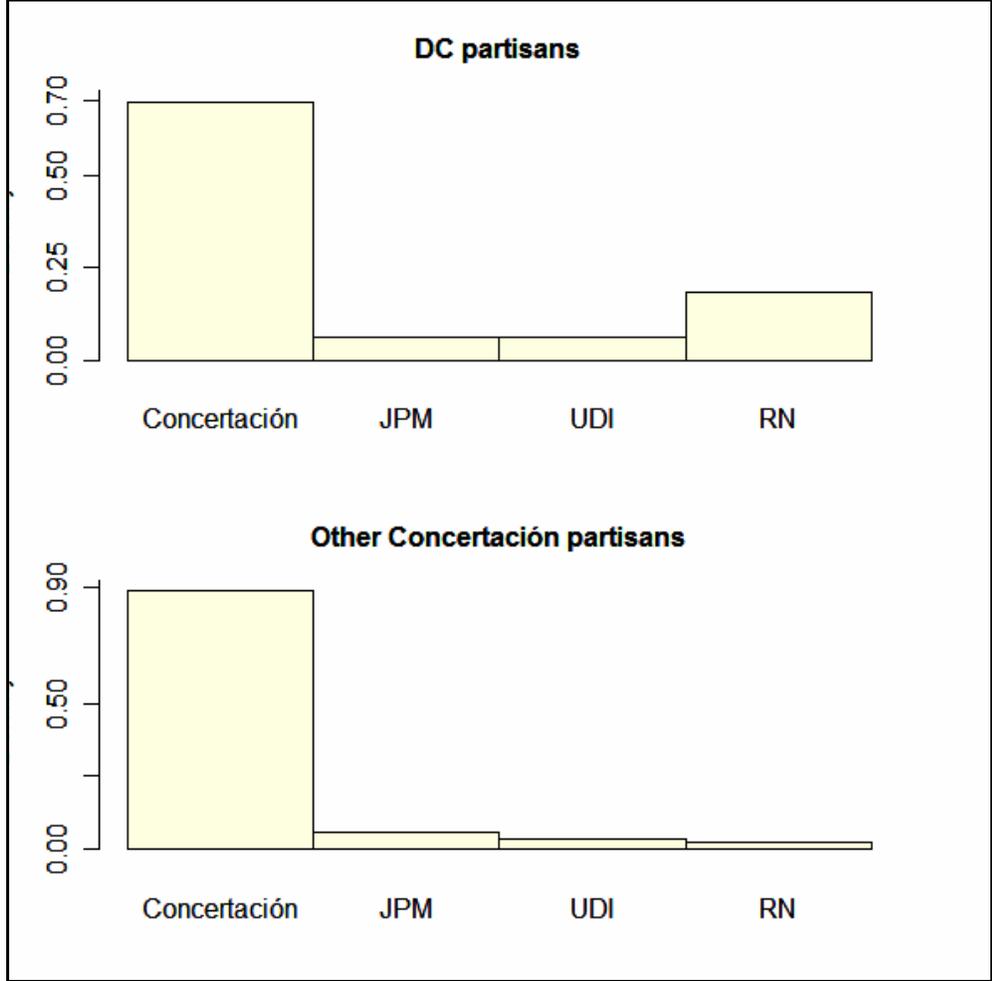


Figure 1: Distribution of votes among Concertación identifiers. The figure shows the percentage of electoral support for each of the competing parties among respondents identified with the Concertación in the 2005 election.

Table 2
Posterior means and 95% Bayesian Credible Intervals (in parenthesis)
for the parameters of the multinomial probit model

Coefficients	Bachelet/Piñera	Hirsch/Piñera	Lavín/Piñera
Intercept	-1.88 (-3.83, -0.73)	-0.11 (-0.57, 0.31)	-1.02 (-2.03, -0.06)
Age	0.11 (-0.00, 0.23)	0.00 (-0.06, 0.07)	0.20 (0.04, 0.38)
Education	-0.17 (-0.36, 0.02)	0.13 (0.02, 0.24)	-0.07 (-0.31, 0.17)
Female	0.11 (-0.09, 0.30)	-0.01 (-0.11, 0.13)	0.10 (-0.13, 0.35)
Income	-0.17 (-0.27, -0.06)	-0.01 (-0.08, 0.06)	-0.17 (-0.34, -0.04)
Religion	0.09 (-0.15, 0.34)	-0.34 (-0.52, -0.17)	0.21 (-0.10, 0.60)
Regime preference	0.19 (0.02, 0.36)	0.02 (-0.07, 0.11)	0.08 (-0.15, 0.28)
Satisfaction with democracy	0.33 (0.13, 0.51)	-0.13 (-0.24, -0.04)	0.26 (0.06, 0.48)
Government evaluation	0.31 (0.07, 0.66)	0.07 (-0.02, 0.17)	-0.13 (-0.46, 0.18)
Ideological distance	-0.01 (-0.01, 0.01)		

Correlations	
$\rho_{Concertación,JPM}$	-0.78 (-1.00, 0.27)
$\rho_{Concertación,UDI}$	0.92 (0.55, 1.00)
$\rho_{JPM,UDI}$	-0.93 (-1.00, -0.63)
% Correctly predicted (vs. Null Model*): 59.6% (51.44%)	
Number of observations: 751	

*The null model predicts that voter choice for each respondent will take the value of the most common outcome in the sample.

Table 3**Marginal effect of individual-specific variables on voter choice**

Variable	Bachelet (Concertación)	Hirsch (JPM)	Lavín (UDI)	Piñera (RN)
Age	0.00 (-0.02, 0.01)	-0.07 (-0.18, -0.01)	0.07 (0.01, 0.18)	0.00 (-0.01, 0.01)
Education	-0.21 (-0.31, -0.01)	0.11 (0.04, 0.23)	0.04 (-0.10, 0.10)	0.07 (-0.03, 0.15)
Female	0.02 (0.00, 0.03)	0.00 (-0.01, 0.01)	0.02 (0.00, 0.04)	-0.03 (-0.04, -0.01)
Income	-0.21 (-0.27, -0.01)	0.04 (0.01, 0.12)	-0.01 (-0.17, 0.00)	0.18 (0.03, 0.24)
Religion	0.04 (-0.04, 0.10)	-0.17 (-0.28, -0.06)	0.02 (0.00, 0.07)	0.11 (0.00, 0.25)
Regime preference	0.33 (0.03, 0.47)	0.02 (0.01, 0.05)	-0.10 (-0.20, 0.10)	-0.26 (-0.33, -0.14)
Satisfaction with democracy	0.42 (0.18, 0.52)	-0.19 (-0.38, -0.08)	-0.04 (-0.11, 0.13)	-0.01 (-0.31, -0.01)
Government evaluation	0.66 (0.33, 0.85)	0.09 (0.02, 0.23)	-0.54 (-0.73, -0.29)	-0.22 (-0.35, -0.11)

95% Credible Intervals reported in parenthesis.

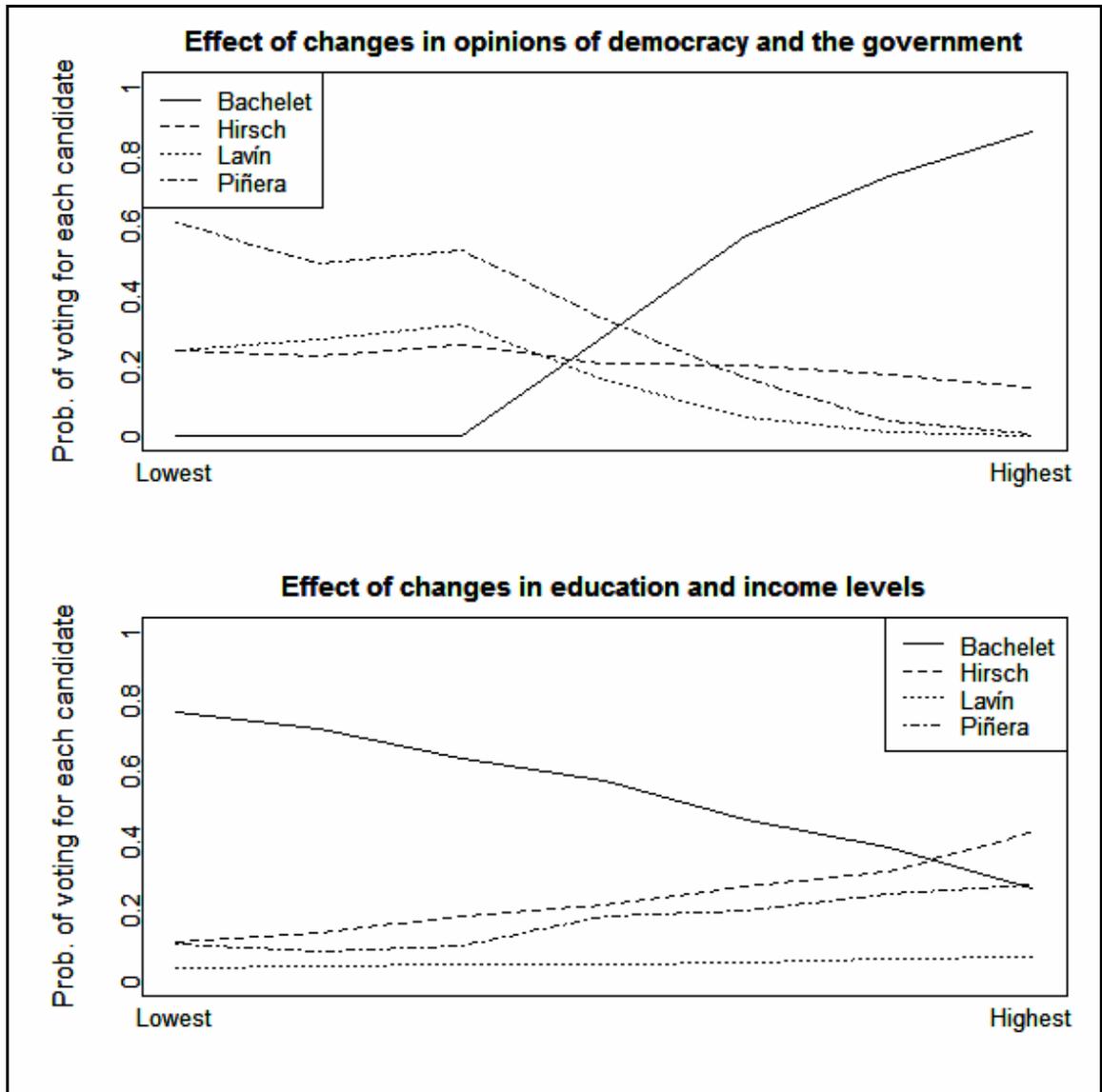


Figure 2: Effect of views on democracy and the government and of socio-economic variables on choice probabilities. The upper panel plots the probabilities of voting for each candidate as a function *Regime preference*, *Satisfaction with democracy* and *Government evaluation*. The lower panels plots the choice probabilities as functions of *Education* and *Income*.

Table 4
Expected vote-shares of the candidates under alternative electoral scenarios
(in percentage points)

Candidate	Four-candidate race	Three-candidate races	
		without Piñera	without Lavín
Bachelet (Concertación)	50.87 (48.34, 53.31)	51.64 (49.04, 54.27)	57.10 (54.83, 59.56)
Hirsch (JPM)	8.19 (6.83, 9.79)	17.52 (15.31, 19.90)	9.57 (8.03, 11.23)
Lavín (UDI)	14.53 (12.74, 16.72)	30.84 (23.38, 33.81)	-
Piñera (RN)	26.41 (23.81, 28.17)	-	33.33 (31.60, 35.12)

95% Credible Intervals reported in parenthesis.

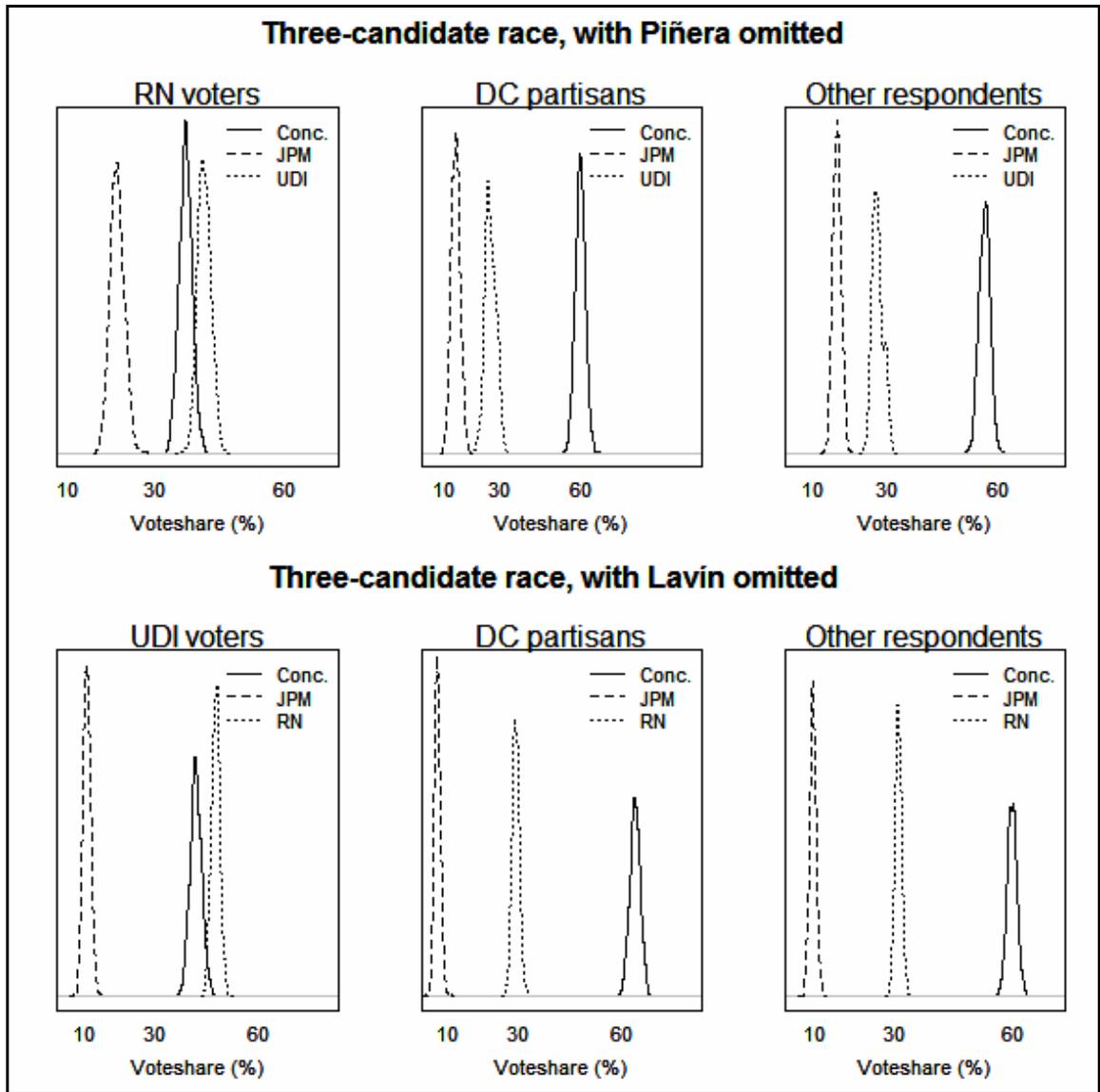


Figure 3: Predicted vote-shares in the two hypothetical three-candidate races.

The upper panel plots the distribution of support for Bachelet, Hirsch and Lavín among different groups of respondents in a three-candidate race with Piñera omitted. Analogously, the lower panel plots the expected-vote share of Bachelet, Hirsch and Piñera in a three-candidate race with Lavín omitted.