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The Influence of the President and Government Coalition on Roll-Call Voting in Brazil, 2003–2006

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Abstract

In Brazil's legislative process, political exchanges between the government and legislature is an essential feature. This article focuses on the role of the president and political parties in Brazil's national legislative process. Because nonideological factors influence voting, roll calls do not suffice for estimation of legislators' policy preferences. In this article, we derive a spatial model of voting in which voting behavior is induced by both ideological motivations and coalition dynamics and develop a multilevel ideal-point model implied by the spatial voting model. After the proposed model is applied to the analysis of roll-call votes in the Brazilian Chamber of Deputies between 2003 and 2006, coalition dynamics is found to influence the voting behavior of legislators. We also confirm the finding in previous studies that the ideological alignment of political parties in the legislature contrasts with the perceived positions.

Keywords

legislative politics, spatial model of voting, roll-call votes, Brazil, Bayesian inference, item response theory

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Introduction

The framework of spatial models has been widely applied to explain numerous aspects of the political process. Interpretations of the American Congress in the context of spatial models (e.g. Cox and McCubbins, 1993, 2005; Krehbiel, 1998) inspired theories of lawmaking, and those theories were then applied to cross-national studies (e.g. Carey, 2009). The empirical implications of these theories can be tested; one essential requirement for operationalization is the development of measurements of political actors' positions in policy space or ideological space. For instance, in the study of legislative politics,

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many analysts statistically analyze roll-call votes—the recorded votes in legislatures—to measure the policy preferences of legislators, which are called ideal points (e.g. Clinton et al., 2004; Poole and Rosenthal, 1997). Despite its merits, however, the principal problem of using roll-call data is that voting records are usually a consequence of political bargaining and, thus, they may not accurately reveal legislators' preferences (Clinton, 2012; Krehbiel, 2000).

In Brazil's Chamber of Deputies, typical legislative behavior can be as much a product of political negotiation as it is of ideological or policy concerns (Ames, 2002; Desposato and Scheiner, 2008). The legislative powers of the executive authorized by the 1988 constitution allow the president considerable control over the political resources on which legislators depend for their political survival. With these powers, the president can exchange political favors for legislative support by strategically forming coalitions (Alston and Mueller, 2006; Amorim Neto, 2006; Pereira and Mueller, 2004a). Although they hold different points of view, leading scholars of Brazilian politics agree that legislative behavior is structured by coalition dynamics (Ames, 2002; Amorim Neto, 2002a; Figueiredo and Limongi, 2000). When ideology is not the only factor, government–opposition dynamics drive voting behavior in the legislature; standard ideal point estimates do not distinguish the impact of coalition dynamics from individual policy preferences (Zucco, 2009; Zucco and Lauderdale, 2011).

In this article, we show how item response theory (IRT) can be used to set item-difficulty parameters in the framework of multilevel modeling; these calculations can recover estimates of the policy preferences of legislators and to test the government–opposition effect on legislative behavior. The logic underlying this modeling strategy is as follows: Assuming that the underlying political problem has one-dimensional ideological content, two legislators can make different voting decisions even if they hold the same policy position. The difference between voting decisions is systematically explained by the government–opposition status through changing the "difficulty" of roll calls confronted by legislators. The proposed model was applied to the analysis of roll-call votes in the Brazilian Chamber of Deputies between 2003 and 2006 to estimate policy positions of parties as well as to investigate the government–opposition effect. According to the results of the analysis, the dynamics of coalition formation indeed were influential for the voting behavior of legislators. Moreover, the results indicated that the ideological alignment of political parties in the legislature contrasts with the perceived positions.

Uncovering whether Brazilian presidents construct coalitions in the Congress and rule through them is important not only for the enhancement of our knowledge of executive–legislative relations but also from the perspective of democratic representation. This article illustrates party-based voting behavior and the role of the president in the legislative process and the representation of voters' preferences. Therefore, by explaining the role of parties in executive–legislative relations, this article contributes to several themes in this field, including party influence in legislatures (Aldrich, 1995; Cox and McCubbins, 1993; Krehbiel, 1999; McCarty et al., 2001), patterns of governance in presidential systems (Linz and Valenzuela, 1994; Shugart and Carey, 1992), and the role of parties as the primary vehicle of representation (Kitschelt, 2000; Sartori, 1976).

The remainder of this article proceeds as follows. Section "Presidential Powers and Legislative Behavior in Brazil" reviews the extant literature on legislative politics in Brazil. Section "Ideal-Point Model" presents a spatial model of voting in which voting is induced by both ideological motivations and coalition dynamics and develops a Bayesian random item-difficulty ideal-point model. Section "Roll-Call Data Analysis of Brazil" illustrates the data, model specification, and analysis of roll-call voting in Brazil. Section "Conclusion" concludes the article.

Presidential Powers and Legislative Behavior in Brazil

The scholarly literature on Brazilian political institutions has grown over the last two decades. Most articles have focused on executive–legislative relations and political parties and have investigated comparative aspects of how Brazilian parties differ from those across countries. Subsequently, we provide a discussion of the executive influence over legislators and government coalitions in Brazil.

Political Party and Government Coalition

Scholars have debated the role of political parties in structuring legislative behavior in the study of Brazilian politics.[1] One side of this debate focuses on the incentives structured by electoral rules and argues that an open-list proportional representation (OLPR) system, which is used to elect members of the Chamber of Deputies, leads to multiple, undisciplined parties in the legislature (Ames, 1995a, 2002; Mainwaring, 1991). Legislators who are elected under a system of OLPR in multimember districts face severe internal party competition and thus have strong incentives to seek personal votes (Carey and Shugart, 1995; Shugart et al., 2005). The constituent-centered nature of legislators' electoral bases weakens party leaders' control over their members in the legislature so that parties are less disciplined and cannot serve as the primary vehicle for executive–legislative cooperation (Mainwaring, 1993, 1999; Mainwaring and Shugart, 1997). Consequently, the nationally minded president must bargain with individualistic, pork-oriented deputies on a case-by-case basis to obtain support for legislative agendas (Ames, 1995b, 2001).

Scholars on the other side of this debate argue that Brazilian presidents have had success in enacting their legislative agendas supported by disciplined parties due to centralized decision-making processes within Congress (Cheibub et al., 2009; Figueiredo and Limongi, 2000). This argument emphasizes institutions within Congress that empower party leaders to influence the legislative agenda, thus shepherding legislative behavior to follow party leaders' indications (Lyne, 2008; Pereira and Mueller, 2004b). In other words, incentives from the electoral arena that push toward individualistic behavior are countered by incentives within Congress that induce party-based behavior. As a result, the president, who must engage with policies affecting national interests, can count on reliable support from the political parties included in the presidential coalition through bargaining with party leaders, who must be concerned with the policy reputations of their parties.

Coalition Dynamics and Legislative Voting

Although these two schools of thought draw attention to different political institutions that structure legislators' incentives, both agree that strong presidential powers are the key component to mold a coalition in the Brazilian Congress. The legislative powers of the executive authorized by the Constitution of 1988 result in a relatively powerful president in executive–legislative relations because the president controls the legislative agenda and resources upon which legislators depend for their political survival (Ames, 2002; Figueiredo and Limongi, 2000; Pereira and Mueller, 2004a). The president can successfully get proposals approved through control over the legislative agenda along with the strategic use of patronage for political support by allocating resources either directly to individual legislators or through political parties (Alston and Mueller, 2006). Alternatively, the existence of strong legislative powers of the president allows the executive to rule

through its prerogatives (such as decrees) without constructing a stable majority coalition (Amorim Neto, 2002a, 2006). Therefore, the Brazilian Congress can oscillate between "atomistic" (per Ames) and "parliamentary" (per Figueiredo and Limongi) modes, depending on the president's strategic choices (Amorim Neto et al., 2003).

One implication of these facts is that concerning their political survival, legislators who are in the government coalition have incentives to support the president in the legislature. This implication can be further illustrated from the aspect of political ambitions. In his research, for instance, David Samuels (2002, 2003) argues that Brazilian federal deputies are motivated by their political careerism to construct a coalition with the national-level and state-level executive branches. Although he focuses more on legislator-governor relations than on executive–legislative relations, his argument on the process of pork-barreling undoubtedly corresponds to the idea that, to some extent, legislators' political survival is dependent on the resources controlled by the president, and thus, they are motivated to cooperate with the president. In other words, due to the motivations of political careerism, or political survival in general, legislators belonging to the government coalition are willing to support for the proposals advocated by the president despite their policy preferences.

There is evidence of clear government–opposition cleavage in legislative voting on a partisan basis recently (Lyne, 2005; Zucco, 2009). The impact of the executive on legislative behavior masks the true preferences of legislators derived from roll-call votes (Clinton, 2012). Because legislative voting behavior reflects the government–opposition status besides policy concerns, methods of standard ideal point estimation such as the conventional IRT models cannot distinguish the impact of coalition from individual preferences (Zucco, 2009; Zucco and Lauderdale, 2011). The point is that legislative voting behavior is not only explained by individual preferences but also influenced by factors induced by coalition dynamics. This phenomenon corresponds to concerns for the inconsistency between behavior and preferences in general (Krehbiel, 1993, 2000) and in Brazil in particular (Ames, 2002; Saiegh, 2009; Zucco, 2009). Therefore, this suggests the need for an ideal model that can sort out the nonideological effect.

Ideal-Point Model

In this section, we derive an ideal-point model with a multilevel structure from a spatial model of voting. The government–opposition effect on legislative voting behavior is captured by the item-difficulty parameter under the multilevel modeling framework. The proposed model can be used to recover the estimates of the policy preferences of legislators and parties on a left–right ideological dimension and evaluate nonideological effects on legislative voting behavior.

Spatial Model of Legislative Voting

According to the literature on executive–legislative relations in Latin America in general, and in Brazil in particular, the executive can influence legislative voting through the provision of pork to individual legislators such as the appropriation of funds (Alston and Mueller, 2006; Ames, 1987) or through the allocation of resources (Lyne, 2008) and/or of control over government to parties such as the appointment of cabinet members (Amorim Neto, 2006; Amorim Neto et al., 2003). Following the research on party-based voting behavior of legislators (Lyne, 2005; Zucco, 2009), we focus on the latter allocation

strategy. It is worth noting that, although party leaders are one necessary actor in the resource distribution process, the government has the ultimate authority over the resources (Zucco, 2009). Therefore, in the following we focus on the effects of governing coalition on legislative voting through a partisan basis.

Suppose that, for each proposal $k = 1, \ldots, K$, legislator $i = 1, \ldots, N$ from party $j[i] = 1, \ldots, J$ makes a choice between a "Yea" decision and a "Nay" decision, where $j[i]$ denotes index variables for party affiliation of legislator i. To model the decisions made in a unidimensional Euclidean proposal space, we assume that each legislator's decision depends on the value of the policy positions of the status quo and of the alternative, and the value of the patronage and cost of voting with or against the government. In other words, it is assumed that a legislator is rational in the sense that the legislator will vote for the proposal if the utility the legislator attaches to the alternative is greater than the utility the legislator attaches to the status quo, regardless of the expected actions of the other legislators.

To derive the model of decision making, we start with random utility functions. Let $U_{i,k}^{(Y)}$ be the utility for legislator i of voting Yea on proposal k, and $U_{i,k}^{(N)}$ be the utility for legislator i of voting Nay on proposal k. Moreover, let $GovBill_k$ denote the indicator for the policy proposal k issued by the government for $k = 1, \ldots, K$. Similarly, let $GovMem_{j[i]}$ denote the indicator for the government for membership of party j to which legislator i belongs for $i = 1, \ldots, N$ and $j[i] = 1, \ldots, J$. Thus, the utility of legislator $i = 1, \ldots, N$ on proposal $k = 1, \ldots, K$ is assumed to be given by

$$\begin{cases} U_{i,k}^{(Y)} = -\left\|\theta_i - x_k^{(Y)}\right\|^2 + \delta \cdot GovMem_{j[i]} GovBill_k + \eta_{i,k} \\ U_{i,k}^{(N)} = -\left\|\theta_i - x_k^{(N)}\right\|^2 - \lambda \cdot GovMem_{j[i]} GovBill_k + \zeta_{i,k} \end{cases} \tag{1}$$

where $\|\cdot\|$ represents the Euclidean norm, $\theta_i \in \mathbb{R}$ the legislator i's ideal point, $x_k^{(Y)} \in \mathbb{R}$ the location of the proposal k under a Yea vote, $x_k^{(N)} \in \mathbb{R}$ the location of the proposal k under a Nay vote, $\delta > 0$ the value of the patronage, and $\lambda > 0$ the cost.[2] $\eta_{i,k}$ and $\zeta_{i,k}$ represent the stochastic elements of utility, which are assumed to be normally distributed with zero means and fixed variances.

It is conventionally assumed that legislator i will vote Yea on proposal k when $y_{i,k}^* = U_{i,k}^{(Y)} - U_{i,k}^{(N)} > 0$. We can write and simplify this utility difference as follows

$$\begin{aligned} y_{i,k}^* &= U_{i,k}^{(Y)} - U_{i,k}^{(N)} \\ &= -\left\|\theta_i - x_k^{(Y)}\right\|^2 + \delta \cdot GovMem_{j[i]} GovBill_k \\ &\quad + \lambda \cdot GovMem_{j[i]} OppBill_k + \eta_{i,k} - \left(-\left\|\theta_i - x_k^{(N)}\right\|^2 + \zeta_{i,k} \right) \\ &= -\left[\left(x_k^{(Y)}\right)^2 - \left(x_k^{(N)}\right)^2 - \delta \cdot GovMem_{j[i]} GovBill_k - \lambda \cdot GovMem_{j[i]} OppBill_k \right] \\ &\quad + 2\left(x_k^{(Y)} - x_k^{(N)}\right)\theta_i + \left(\eta_{i,k} - \zeta_{i,k}\right) \\ &= \beta_k \theta_i - \alpha_{j[i],k} + \varepsilon_{i,k} \end{aligned} \tag{2}$$

where $\alpha_{j[i],k} = (x_k^{(Y)})^2 - (x_k^{(N)})^2 - \delta \cdot GovMem_{j[i]}GovBill_k + \lambda \cdot GovMem_{j[i]}OppBill_k$, $\beta_k = 2(x_k^{(Y)} - x_k^{(N)})$, and $\varepsilon_{i,k} = (\eta_{i,k} - \zeta_{i,k})$. Suppose that two legislator *i* and *i′* belonging to party *j* and *j′*, respectively, and that $GovMem_{j[i]} = 1$ and $GovMem_{j'[i']} = 0$. The corresponding parameter α can be rewritten as follows

$$\begin{cases} -\alpha_{j[i],k} = -X_k + \delta \cdot GovBill_k - \lambda \cdot OppBill_k \ for\, GovMem_{j[i]} = 1 \\ -\alpha_{j'[i'],k} = -X_k \qquad\qquad\qquad\qquad for\ \ GovMem_{j'[i']} = 0 \end{cases} \tag{3}$$

where $X_k = (x_k^{(Y)})^2 - (x_k^{(N)})^2$. We can see that legislator *i* belonging to a governing party ($GovMem_{j[i]} = 1$) is rewarded (with an additional term δ) when supporting for a government proposal ($GovBill_k = 1$) and is punished (by subtracting an additional term λ) when supporting for the opposition ($OppBill_k = 1$), despite the policy positions of the status quo, the alternative, and legislators. In other words, this means that, for any two legislators with exactly the same ideal point on an ideological scale but from different camps in terms of government–opposition conflict, the legislator belonging to governing parties has incentives to vote with the government but the other one who is in the opposition has no incentives to support the proposals from the government.

Equation (3) and the previous discussion imply that

$$\begin{cases} \alpha_{j[i],k} < \alpha_{j'[i'],k} \ for\ GovBill_k = 1, and\ OppBill_k = 0 \\ \alpha_{j[i],k} > \alpha_{j'[i'],k} \ for\ GovBill_k = 0, and\ OppBill_k = 1 \end{cases} \tag{4}$$

From equations (3) and (4), we know that whether $\alpha_{j[i],k}$ is greater than $\alpha_{j'[i'],k}$ or vice versa depends on the status quo of proposals. Basically, it means that the effect of coalition dynamics influences a legislator's voting decisions through changing the value of the parameter $\alpha_{j,k}$.

Random Difficulty IRT Model

Let $y_{i,k} = 1$ if legislator *i* from party *j* votes Yea on the proposal *k* and $y_{i,k} = 0$ otherwise. The spatial model of voting can be translated into a statistical model by noting the relationship between the theoretical utility difference and observed votes. Typically, we can assume that

$$\begin{cases} y_{i,k} = 1 \quad if \quad y_{i,k}^* > 0 \\ y_{i,k} = 0 \quad if \quad y_{i,k}^* \le 0 \end{cases} \tag{5}$$

where

$$y_{i,k}^* = \beta_k (\theta_i - \alpha_k) + \varepsilon_{i,k}, \quad \varepsilon_{i,k} \overset{iid}{\sim} N(0,1) \tag{6}$$

This results in a standard two-parameter item response model. Therefore, we have a response function given by

$$\Pr(y_{i,k} = 1) = \Lambda\left[\beta_k (\theta_i - \alpha_k)\right] \tag{7}$$

where $\Lambda[\cdot]$ denotes the logistic function, and the slopes β_k and intercepts α_k are equivalent to item discrimination parameters and item difficultly parameters, respectively, in the item-response modeling literature (Embretson and Reise, 2000).

According to the spatial model of voting previously discussed, the values of item difficulty depend on the government or opposition status of proposals. Let $z_k = 1$ if $GovBill_k = 1$ and $z_k = 0$ otherwise. Then, equation (4) implies that

$$\alpha_{j[i],k} - \alpha_{j'[i'],k} < 0 \quad \text{for all} \quad j \text{ and } j' \tag{8}$$

This suggests that item difficulty parameters can be modeled through a framework of multilevel modeling (Gelman and Hill, 2007). Formally, the item difficulty parameters α_k can be modeled as a function of coalition dynamic as follows

$$\alpha_k = \gamma_0 + \gamma_1 z_k + v_k, \quad v_k \overset{iid}{\sim} N\left(0, \sigma_v^2\right) \tag{9}$$

where z_k contains the information on the government or opposition status of proposal *k,* γ_0 and γ_1 are coefficient parameters, and v_k is the error term assumed to be normally distributed with mean zero and variance σ_v^2.

We would expect that $\gamma_1 > 0$ if government–opposition conflict has an effect on legislative voting behavior. Substantively, this means that, for any two legislators with exactly the same ideal point on an ideological scale but from different camps in terms of government–opposition conflict, a legislator belonging to the governing coalition is more likely to vote with the government and an opposition legislator is more likely to support the proposals from the opposition. In other words, the proposed model is able to provide the same estimates of latent traits even when the voting records are different, which cannot be done by conventional item response models.

In typical item-response and ideal-point models, ideal points are assumed to be sampled from a single distribution. However, legislators from different parties may have distinct, or even opposing, preferences. To account for the between-party variation, a multilevel model is also applied to the ideal points clustered by parties (Bafumi et al., 2005; Fox, 2010). We assume that each legislator *i* is drawn from party-specific distributions, centered on the party means $\mu_{\theta_{j[i]}}$ for $j = 1, \ldots, J$ which is given by

$$\theta_i \sim N\left(\mu_{\theta_{j[i]}}, \sigma_\theta^2\right) \tag{10}$$

where σ_θ^2 is the variance. Although the specification of a prior distribution for ideal points follows Zucco and Lauderdale (2011), the key difference is that we assume hyper priors for these party means rather than fix them at certain values estimated from survey data as Zucco and Lauderdale do. We explain the specification of priors in the next section.

Let $\boldsymbol{\beta} = \left(\beta_1, \ldots, \beta_K\right)', \boldsymbol{\alpha} = \left(\alpha_1, \ldots, \alpha_K\right)', \boldsymbol{\gamma} = \left(\gamma_0, \gamma_1\right)', \boldsymbol{\theta} = \left(\theta_1, \ldots, \theta_N\right)'$, $\boldsymbol{\mu_\theta} = \left(\mu_{\theta 1}, \ldots, \mu_{\theta J}\right)'$, $\boldsymbol{Y}$ be a $N \times K$ matrix with the *k*th row $z_k = (1, z_k)$ The multilevel IRT model is estimated through a simulation-based Bayesian approach processed by Markov chain Monte Carlo (MCMC) methods (Gelfand and Smith, 1990), and thus, the influence is based on the joint posterior distribution.

The Bayesian multilevel ideal-point model proposed here has several advantages. First, this model allows us to detect whether legislators' voting behavior is influenced by

nonideological effects such as government–opposition conflict while estimating ideal points of legislators and parties. Second, because institution-structured behavior is differentiated from preference-induced behavior, we confirm that the estimated ideal points reflect the preference of legislators.

Prior Distribution and Identification

Item response models demonstrate two identification problems: *scale invariance* and *rotational invariance* (e.g. Albert, 1992; Johnson and Albert, 1999). The problem of scale invariance occurs because the metric (location and scale) of the latent traits is only known up to a linear transformation. Therefore, one must anchor the metric of the latent traits. Moreover, the problem of rotational invariance refers to the fact that for the unidimensional case, multiplying all of the model parameters by −1 would not change the value of the likelihood function. Substantively, the IRT model cannot determine which direction is left or right in terms of ideology.

In the Bayesian context, the use of informative prior distributions resolves these two identification problems (Johnson and Albert, 1999). We begin by identifying relative party positions on the left-right, ideological dimension. For the specification of prior distributions for party means $\boldsymbol{\mu}_\theta$, we can select (at least) two parties from the same camp in terms of government–opposition status—from the government, opposition, or both. Moreover, these parties must be considered to be confronting to each other in terms of ideological positions, say, the left-right cleavage.[3] In specific, these parties can be placed with an ordering restriction by assuming that

$$\mu_{\theta_j} \sim \text{Unif}\left(\mu_{\theta_{j-1}}, \mu_{\theta_{j+1}}\right), \text{for } j = 2,\ldots,J-1 \tag{11}$$

$$\mu_{\theta_1} \sim \text{Unif}\left(-3, \mu_{\theta_2}\right) \tag{12}$$

$$\mu_{\theta_J} \sim \text{Unif}\left(\mu_{\theta_{J-1}}, 3\right) \tag{13}$$

where μ_{θ_j} are ordered from the leftist to the rightist. Moreover, we can assume that some of the item discrimination parameters are negative, for example, proposals issued by leftist parties.[4] That is

$$\beta_k \sim N\left(-2,1\right)\boldsymbol{I}\left(\beta_k < 0\right), \text{for } k = 1,\ldots,M \tag{14}$$

$$\beta_k \sim N\left(0,1\right), \text{for } k = M+1,\ldots,K \tag{15}$$

where $\boldsymbol{I}(.)$ denotes an indicator function.

These specification strategies achieve two goals. First, the problem of rotational invariance is resolved by restricting the means of the preidentified leftist parties smaller than those of the preidentified rightist parties. As a result, leftist parties are on the left and rightist parties are on the right of the underlying scale. This form of constraint is

sometimes known as "anchoring" (Skrondal and Rabe-Hesketh, 2004: 66). Second, because the two selected parties are from the same camp in terms of government–opposition status, it ensures that assumed underlying ideological dimension and the government–opposition conflict do not completely overlap.

To deal with the problem of scale invariance, the metric of ideal points is rescaled through a linear transformation in each MCMC iteration (Bafumi et al., 2005; Fox, 2010). By imposing identification of normalization $\tilde{\theta}_i^{(t)} = (\theta_i^{(t)} - \bar{\theta}^{(t)}) / s_\theta{}^{(t)}$, where $\bar{\theta}^{(t)} = \frac{1}{N}\sum_{i=1}^{N}\theta_i^{(t)}, s_\theta{}^{(t)} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(\theta_i^{(t)} - \bar{\theta}^{(t)})^2}$, and t indexes MCMC iterations, we have ideal point $\tilde{\theta}_i^{(t)}$ with an identified metric. All the other parameters are transformed correspondingly.[5]

For parameters γ we assume that

$$\sigma_v^2 \sim IG\left(\frac{a_0}{2}, \frac{b_0}{2}\right) \tag{16}$$

$$\gamma_g \sim N\left(\gamma_o, \sigma_v^2\right), \quad \text{for} \quad g = 1, 2 \tag{17}$$

where a_0, b_0, and γ_0 are hyperparameters.

Roll-Call Data Analysis of Brazil

Roll-call data are widely used to estimate legislators' policy preferences, which are reflected by the so-called ideal points. The ideal point estimates in turn are used to test theories such as those of legislative politics in the United States (e.g. McCarty et al., 2006; Poole and Rosenthal, 1985) and Latin American countries (e.g. Morgenstern and Nacif, 2002). Although several approaches have been applied to the estimation of ideal points of legislators, a primary concern about ideal point estimates based on roll-call data is that these voting records do not differentiate voting behavior induced by preferences and nonideological effects such as party affiliation (Krehbiel, 1993, 2000).

Brazil's assembly is a typical legislature because the voting behavior of legislators is a consequence of political negotiation. As discussed in the previous section, legislative voting in the Brazilian Congress reflects the result of the president's distribution of resources combined with underlying preferences (Alston and Mueller, 2006; Pereira and Mueller, 2004a; Zucco, 2009). In particular, political exchanges between Brazil's government and Congress is an essential feature of Brazilian politics. Therefore, considering the impact of nonideological factors when ideal points are estimated based on the similarity of the legislators' voting records is crucial.

Data and Model Specification

In the study of Brazilian legislative politics, legislators' voting records have been widely used to evaluate party discipline, party strength, and, most broadly, party governance (Ames, 2002; Amorim Neto et al., 2003; Figueiredo and Limongi, 2000 just to name a few). Recently, Zucco (2009) showed that the voting behavior of Brazilian deputies does

not solely depend on their ideology. Instead, their voting behavior is strongly influenced by government–opposition conflict. Thus, ideal points estimated by standard unidimensional IRT models mostly reflect a government–opposition dimension of conflict rather than a left–right, ideological dimension. To distinguish between ideological motivations and political inducements from the executive, Zucco and Lauderdale (2011) employed a two-dimensional item response model and utilized survey of legislators to identify party positions on a left–right, ideological dimension and to explore the content of the second dimension. They argued that the second dimension corresponds to the government–opposition conflict and has become the dominant dimension of conflict in recent years.

The analysis of roll calls in this article follows Zucco and Lauderdale (2011) in the sense that we must first identify party positions on the left–right, ideological dimension. However, the procedure differs in three fundamental respects. First, we assume a unidimensional policy space underlying Brazilian legislative politics, which follows numerous studies of Brazilian politics (e.g. Figueiredo and Limongi, 2000; Pereira and Mueller, 2004b). Second, instead of using expert survey, we rely on information on the ideological ordering of parties to identify party positions through prior distributions. Specifically, we place parties from leftist to rightist on the underlying dimension with a constraint on the ideological ordering of political parties. In this context, party positions are still estimated in the same model. Finally, the effect of government–opposition conflict on legislative voting is evaluated by a regression model for item difficulty parameter in a framework of multilevel modeling.

We applied the Bayesian multilevel IRT model developed in section "Ideal-Point Model" to analyzing legislative behavior in the Brazilian Congress. We measured voting behavior using roll calls taken on the floor of the Câmara de Deputados between 2003 and 2006.[6] During this period, Lula, a member of the Partido dos Trabalhadores (PT, the Workers' Party), served his first term as the president. This period was selected because the cabinet in this period is considered as one with nonoverlapping between the ideological cleavage and government–opposition divide, and the results are comparable to those in previous studies (e.g. Zucco, 2009; Zucco and Lauderdale, 2011).

In the analysis, we excluded roll calls in which one side obtained less than 2.5% of the votes after excluding legislators who participated in less than 95% roll calls. This resulted in 286 of 421 roll calls and 703 legislators.[7] To evaluate the effect of government–opposition dynamics on legislative voting behavior, we included a dummy variable for government and opposition status of proposals as the covariate z_k in equation (9), that is, $z_k = 1$ if proposal k belongs to provisional measures (medidas provisórias, MP) and $z_k = 0$ otherwise.

It is well known that the ideological coherence of the Brazilian party system is weak and some of the parties have no clear ideological differences (Lucas and Samuels, 2010). Even so, we can place parties based on the widely perceived policy positions of the main parties in Brazil and the results from previous studies (e.g. Power and Zucco, 2009; Rosas, 2005; Zucco, 2009; Zucco and Lauderdale, 2011). Specifically, we placed the main parties in Brazil from left to right in the following ordering: Partido Comunista do Brasil (PCdoB, Communist Party of Brazil), PT, Partido Socialista Brasileiro (PSB, Brazilian Socialist Party), Partido Popular Socialista (PPS, Socialist People's Party), Partido da Social Democracia Brasileira (PSDB, Brazilian Social Democracy Party), Partido do Movimento democratico Brasileiro (PMDB, Brazilian Democratic Movement Party), Partido Democratico Trabalhista (PDT, Democratic Labor Party), Partido Trabalhista Brasileiro (PTB, Brazilian Labour Party), Partido Liberal (PL, the Liberal

Table 1. Effect of Government–Opposition Conflict, 2003–2006.

Parameter	Mean	Standard error	95% Lower CI	95% Upper CI
γ_0	−0.472	0.208	−0.885	−0.069
γ_1	1.003	0.273	0.482	1.544

CI: confidence interval.

Party), Pardito da Frente Liberal (PFL, the Liberal Front Party), and Partido Progressista (PP, Progressive Party). Among these parties, PCdoB, PT, PSB, PPS, PMDB, PTB, and PL are from the government coalition and PDT, PSDB, PFL, and PP are from the opposition.[8] The estimation was performed with three parallel chains of 50,000 iterations each. The first half of the iterations were discarded as a burn-in and 5 as thinning, and thus 15,000 samples were generated.

Empirical Results

Table 1 presents the results concerning the investigation of government–opposition conflict in legislative behavior. The estimate of γ_1 indicates how the effect of government–opposition conflict influences legislative behavior by changing item difficulty parameter α_k. Because the estimate of γ_1 is positive, the values of α would be larger when the proposals are issued by the government, compared to those issued by the opposition. That is, the item character curves (ICC) with negative slopes will shift to the right of the underlying scale, which increases the probability of voting Yea given the ideal points of legislators. Substantively, legislators with allies, particularly those in the government coalition, are more likely to support government proposals no matter whether they are leftist or rightist.

When the nonideological effect on legislative behavior is considered in the estimation of ideal points, we expect that the analysis of roll-call votes can reflect the true policy preferences of political actors, including parties and legislators. Figure 1 shows the estimates of $\mu_{\theta j}$, that is, the relative policy positions of the 11 parties. As can be seen, the estimated party positions reflect what the perceived ideological positions of Brazilian parties would have been between 2003 and 2006 because they were placed with an ordering restriction in priors. Thus, we focus on the differences between parties rather than on the positions. The ideological placement of the parties corresponds approximately to that in Zucco and Lauderdale (2011) in the sense that there are small differences between four pairs of parties: the PPS and PDT, the PSDB and PMDB, the PTB and PL, and the PFL and PP in terms of ideology.

It is worth noting that, first, Figure 1 shows the differences between legislators' individual positions and their party positions for parties such as the PCDOB, PT, PSDB, PL, PFL, and PP. Second, legislative voting is somewhat party-based because the majority of legislators within a party behave similarly even though legislators' individual positions deviate from their party positions. For example, the middle 50% of the legislators of the PP locates around the center of the underlying scale, which is far off from the estimated position of the PP. The reason the majority of legislators deviates from the party position is that these legislators supported the government before the PP joined the cabinet (see Zucco and Lauderdale, 2011). Since the legislators behaved like leftists, the analysis of legislative votes would not show that they are on the right-hand side of the spectrum even though the PP is restricted to the position of a rightist party. In other words, even though

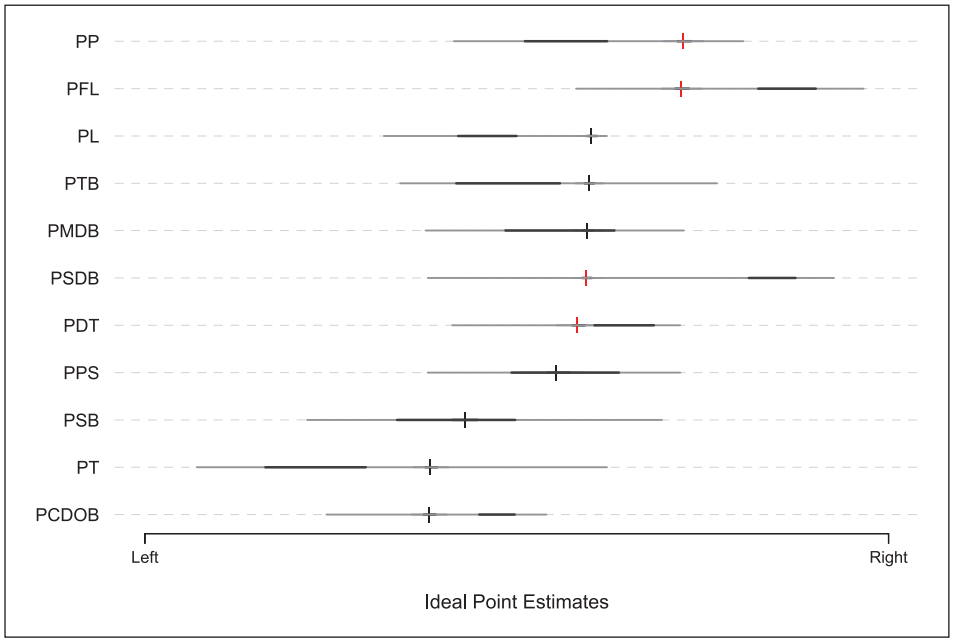

Figure 1. Estimates of Brazilian Party Positions.
Bold and thin lines represent 50% and 95% of the legislators, respectively; the check mark indicates the party mean, with which black and red colors denoting the cabinet and opposition, respectively.

we impose a restriction on party positions through prior distributions, there is an inconsistency between the estimated ideal points of legislators and the policy positions of parties for certain parties.

Furthermore, some of the parties behave differently from what they should have done according to their perceived policy positions. It has been shown that the ideological alignment of political parties in the legislature in Brazil (Zucco, 2009) and a number of other Latin American countries (Mayorga, 2006; Morgenstern, 2001) contrasts with the perceived positions due to the executive's distribution of resources such as cabinet positions, pork, and bribes. Although we investigate the effect of the resources distributed by the government on legislative voting behavior, it still shows the ideological incoherence of the Brazilian parties in both the electoral and legislative arenas. One possibility of this incoherence is that the competitors and the resources parties face and pursue in the legislature are different from those in the elections. Therefore, parties behave differently in electoral competition and in the legislature.

In sum, the results of analysis displayed here indicate that the government–opposition conflict indeed influences legislative voting behavior in the Brazilian Congress. Most importantly, legislative voting is somewhat party-based in the sense that political parties play a major role in the government–opposition conflict. These results suggest that the legislative behavior between 2003 and 2006 was operating in neither a purely atomistic nor a purely parliamentary mode. In other words, party membership in the cabinet indeed influences voting behavior of legislators but is not definitive. Moreover, the estimates of party positions show that party behavior is quite different in the electoral and legislative area. The result confirms the finding in previous studies, which is

the ideological incoherence of the Brazilian parties between the electoral and legislative arena. Last but not least, the proposed model can evaluate the effect of government–opposition conflict, compared to the standard IRT model.[9]

Conclusion

Legislative voting records are not always a good measure for legislators' ideology or preferences. This is particularly true when legislative voting behavior is a consequence of political negotiation such as the executive–legislative relation in Brazil. This article develops a random item-difficulty ideal-point model, in which item parameters differ across proposals and the differences can be systematically explained by the status of the proposals. In the process, we first derived a spatial model of voting in which voting behavior is induced by both ideological motivations and coalition dynamics. Next, we argued that the statistical model implied by the spatial voting model is a two-parameter item-response model with random difficulty parameters. This model can be employed to estimate ideal points of legislators and parties and detect the effect of government–opposition dynamics simultaneously.

By applying the Bayesian random item-difficulty ideal-point model proposed here to analyzing roll-call votes in the Brazilian Chamber of Deputies between 2003 and 2006, the evidence suggests that the government–opposition conflict matters for party-based legislative voting but that the conflict is not definitive all the time. Moreover, we confirmed the ideological incoherence of the Brazilian parties between the electoral and legislative arena, which has been found in previous studies. These results suggest that party membership in the cabinet indeed influences voting behavior of legislators. In other words, legislators with allies in the cabinet, especially those in the government coalition, are more likely to support government proposals.

This article makes the following contributions. Studies on legislative voting in the Brazilian Congress are increasingly stressing the role of the president and political parties. We derive a spatial model of voting to illustrate how legislative behavior is influenced by party membership in the cabinet. This work is relevant to the debate on the power of legislative parties (Krehbiel, 2000). Moreover, legislative behavior is a consequence of government–opposition conflict; thus, an ideal model that can sort the nonideological effect is needed. We applied a Bayesian random item-difficulty ideal-point model to differentiating between the ideological preferences and nonideological effects.

In this article, we aim to ideological positions of political parties with only the information of voting records and, thus, we assume that the underlying ideological dimension and the government–opposition conflict do not completely overlap. Without additional information, however, this approach limits the applicability to a condition with nonoverlapping between the ideological cleavage and government–opposition conflict. Moreover, we assume that party leaders are just intermediaries in the resource distribution process and leave the development of a model which relaxes this assumption for future research.

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Supplementary Information

Additional supplementary information may be found with the online version of this article.

Figure A1. Estimates of Brazilian Party Positions. The black and red colors denote the cabinet and opposition, respectively. The left panel shows the median legislator within parties and the right panel shows the mean of legislators within parties.

Notes

1. See Amorim Neto (2002b) for a brief review on the debate over the sources and patterns of party behavior in the Legislative in Brazil.
2. The inclusion of fixed terms along with the Euclidean norm in a utility function is often seen in studies of voters' voting behavior (e.g. the valence model in Schofield, 2008).
3. Basically, we assume that government coalitions are never purely ideological. This assumption excludes a complete collinearity between government–opposition cleavage and ideological conflict because they would be difficult to identify without further information (Zucco and Lauderdale, 2011).
4. In the psychometrics literature, the rotation invariance problem is typically solved by restricting item discrimination parameters to be positive (e.g. $\beta_\kappa \sim N(\mu_\beta, \sigma) I(\beta_\kappa > 0)$). This is because respondents are assumed to answer test items correctly if they have high ability. However, for roll-call voting, there is no correct "answer" to each roll call. In fact, rightest legislators are more likely to vote for rightist proposals and against leftist proposals.
5. $\tilde{\beta} = \beta \cdot s_\theta, \bar{\alpha} = \alpha - \beta \cdot \bar{\theta}, \bar{\gamma_0} = \gamma_0 - \beta \cdot \bar{\theta}$, $\tilde{\gamma_1} = \gamma_1$, and $\tilde{B_0} = (B_0 - \bar{\theta}) / s_\theta$.
6. The data set we used was collected by Zucco (2013) and can be found on his website: http://www.fgv.br/professor/cesar.zucco/.
7. Missingness is not considered a Nay vote.
8. During 2003–2006, some parties changed cabinet status. To simplify the analysis, we treat parties as governing parties as more than half of roll calls were proposed when they were in the government.
9. The ideal point estimates of parties by a standard item response theory (IRT) model are presented in Appendix A of the Supplementary Material, which shows that parties are distinguished by the government–opposition conflict rather than by ideology.

References

Albert JH (1992) Bayesian Estimation of Normal Ogive Item Response Curves Using Gibbs Sampling. *Journal of Educational and Behavioral Statistics* 17 (3): 251–269.

Aldrich JH (1995) *Why Parties? The Origin and Transformation of Political Parties in America*. Chicago, IL: University of Chicago Press.

Alston LJ and Mueller B (2006) Pork for Policy: Executive and Legislative Exchange in Brazil. *Journal of Law, Economics, and Organization* 22 (1): 87–114.

Ames B (1987) *Political Survival and Public Policy in Latin America*. Berkeley, CA: University of California Press.

Ames B (1995a) Electoral Rules, Constituency Pressures, and Pork Barrel: Bases of Voting in the Brazilian Congress. *Journal of Politics* 57 (2): 324–343.

Ames B (1995b) Electoral Strategy Under Open-List Proportional Representation. *American Journal of Political Science* 39 (2): 406–433.

Ames B (2001) *The Deadlock of Democracy in Brazil*. Ann Arbor, MI: University of Michigan Press.
Ames B (2002) Party Discipline in Brazil's Chamber of Deputies. In: Morgenstern S and Nacif B (eds) *Legislative Politics in Latin America*. New York: Cambridge University Press, pp.185–221.
Amorim Neto O (2002a) Presidential Cabinets, Electoral Cycles, and Coalition Discipline in Brazil. In: Morgenstern S and Nacif B (eds) *Legislative Politics in Latin America*. New York: Cambridge University Press, pp.48–78.
Amorim Neto O (2002b) The Puzzle of Party Discipline in Brazil. *Latin American Politics and Society* 44 (1): 127–144.
Amorim Neto O (2006) The Presidential Calculus: Executive Policy Making and Cabinet Formation in the Americas. *Comparative Political Studies* 39 (4): 415–440.
Amorim Neto O, Cox GW and McCubbins MD (2003) Agenda Power in Brazil's Camara Dos Deputados, 1989-98. *World Politics* 55 (4): 550–578.
Bafumi J, Gelman A, Park DK, et al. (2005) Practical Issues in Implementing and Understanding Bayesian Ideal Point Estimation. *Political Analysis* 13 (2): 171–187.
Carey JM (2009) *Legislative Voting and Accountability*. New York: Cambridge University Press.
Carey JM and Shugart MS (1995) Incentives to Cultivate a Personal Vote: A Rank Ordering of Electoral Formulas. *Electoral Studies* 14 (4): 417–439.
Cheibub JA, Figueiredo A and Limongi F (2009) Political Parties and Governors as Determinants of Legislative Behavior in Brazil's Chamber of Deputies, 1988–2006. *Latin American Politics and Society* 51 (1): 1–30.
Clinton JD (2012) Using Roll Call Estimates to Test Models of Politics. *American Review of Political Science* 15: 79–99.
Clinton JD, Jackman S and Rivers D (2004) The Statistical Analysis of Roll Call Data. *American Political Science Review* 98 (2): 355–370.
Cox GW and McCubbins MD (1993) *Legislative Leviathan: Party Government in the House*. Berkeley, CA: University of California Press.
Cox GW and McCubbins MD (2005) *Setting the Agenda: Responsible Party Government in the US House of Representatives*. New York: Cambridge University Press.
Desposato SW and Scheiner E (2008) Governmental Centralization and Party Affiliation: Legislator Strategies in Brazil and Japan. *American Political Science Review* 102 (4): 509–524.
Embretson SE and Reise SP (2000) *Item Response Theory for Psychologists*. Mahwah, NJ: Lawrence Erlbaum.
Figueiredo AC and Limongi F (2000) Presidential Power, Legislative Organization, and Party Behavior in Brazil. *Comparative Politics* 32 (2): 151–170.
Fox JP (2010) *Bayesian Item Response Modeling: Theory and Applications*. New York: Springer.
Gelfand AE and Smith AFM (1990) Sampling-Based Approaches to Calculating Marginal Densities. *Journal of the American Statistical Association* 85 (410): 398–409.
Gelman A and Hill J (2007) *Data Analysis Using Regression and Multilevel/hierarchical Models*. New York: Cambridge University Press.
Johnson VE and Albert JH (1999) *Ordinal Data Modeling*. New York: Springer-Verlag.
Kitschelt H (2000) Linkages between Citizens and Politicians in Democratic Polities. *Comparative Political Studies* 33 (6–7): 845–879.
Krehbiel K (1993) Where's the Party? *British Journal of Political Science* 23 (2): 235–266.
Krehbiel K (1998) *Pivotal Politics: A Theory of US Lawmaking*. Chicago, IL: University of Chicago Press.
Krehbiel K (1999) Paradoxes of Parties in Congress. *Legislative Studies Quarterly* 24 (1): 31–64.
Krehbiel K (2000) Party Discipline and Measures of Partisanship. *American Journal of Political Science* 44 (2): 206–221.
Linz JJ and Valenzuela A (1994) *The Failure of Presidential Democracy: Comparative Perspectives*. Baltimore, MD: Johns Hopkins University Press.
Lucas K and Samuels D (2010) The Ideological "Coherence" of the Brazilian Party System, 1990–2009. *Journal of Politics in Latin America* 2 (3): 39–69.
Lyne MM (2005) Parties as Programmatic Agents: A Test of Institutional Theory in Brazil. *Party Politics* 11 (2): 193–216.
Lyne MM (2008) Proffering Pork: How Party Leaders Build Party Reputations in Brazil. *American Journal of Political Science* 52 (2): 290–303.
McCarty NM, Poole KT and Rosenthal H (2001) The Hunt for Party Discipline in Congress. *American Political Science Review* 95 (3): 673–688.
McCarty NM, Poole KT and Rosenthal H (2006) *Polarized America: The Dance of Ideology and Unequal Riches*. Cambridge, MA: MIT Press.

Mainwaring S (1991) Politicians, Parties, and Electoral Systems: Brazil in Comparative Perspective. *Comparative Politics* 24 (1): 21–43.
Mainwaring S (1993) Presidentialism, Multiparty Systems, and Democracy: The Difficult Equation. *Comparative Political Studies* 26 (2): 198–228.
Mainwaring S (1999) *Rethinking Party Systems in the Third Wave of Democratization: The Case of Brazil*. Stanford, CA: Stanford University Press.
Mainwaring S and Shugart MS (1997) *Presidentialism and Democracy in Latin America*. New York: Cambridge University Press.
Mayorga R (2006) Bolivia's Democracy at the Crossroads. In: Hagopian F and Mainwaring S (eds) *The Third Wave of Democratization in Latin America: Advances and Setbacks*. New York: Cambridge University Press, pp.149–178.
Morgenstern S (2001) Organized Factions and Disorganized Parties: Electoral Incentives in Uruguay. *Party Politics* 7 (2): 235–256.
Morgenstern S and Nacif B (eds) (2002) *Legislative Politics in Latin America*. New York: Cambridge University Press.
Pereira C and Mueller B (2004a) The Cost of Governing Strategic Behavior of the President and Legislators in Brazil's Budgetary Process. *Comparative Political Studies* 37 (7): 781–815.
Pereira C and Mueller B (2004b) A Theory of Executive Dominance of Congressional Politics: The Committee System in the Brazilian Chamber of Deputies. *The Journal of Legislative Studies* 10 (1): 9–49.
Poole KT and Rosenthal H (1985) A Spatial Model for Legislative Roll Call Analysis. *American Journal of Political Science* 29 (2): 357–384.
Poole KT and Rosenthal H (1997) *Congress: A Political-Economic History of Roll Call Voting*. New York: Oxford University Press.
Power TJ and Zucco C (2009) Estimating Ideology of Brazilian Legislative Parties, 1990–2005. *Latin American Research Review* 44 (1): 218–246.
Rosas G (2005) The Ideological Organization of Latin American Legislative Parties: An Empirical Analysis of Elite Policy Preferences. *Comparative Political Studies* 38 (7): 824–849.
Saiegh SM (2009) Recovering a Basic Space from Elite Surveys: Evidence from Latin America. *Legislative Studies Quarterly* 34 (1): 117–145.
Samuels D (2002) Progressive Ambition, Federalism, and Pork-Barreling in Brazil. In: Morgenstern S and Nacif B (eds) *Legislative Politics in Latin America*. New York: Cambridge University Press, pp.315–340.
Samuels D (2003) *Ambition, Federalism, and Legislative Politics in Brazil*. New York: Cambridge University Press.
Sartori G (1976) *Parties and Party Systems: A Framework for Analysis*. New York: Cambridge University Press.
Schofield NJ (2008) *The Spatial Model of Politics*. New York: Routledge.
Shugart MS and Carey JM (1992) *Presidents and Assemblies: Constitutional Design and Electoral Dynamics*. New York: Cambridge University Press.
Shugart MS, Valdini ME and Suominen K (2005) Looking for Locals: Voter Information Demands and Personal Vote-Earning Attributes of Legislators Under Proportional Representation. *American Journal of Political Science* 49 (2): 437–449.
Skrondal A and Rabe-Hesketh S (2004) *Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models*. Boca Raton, FL: Chapman & Hall/CRC.
Zucco C (2009) Ideology or What? Legislative Behavior in Multiparty Presidential Settings. *Journal of Politics* 71 (3): 1076–1092.
Zucco C (2013) Roll Call Votes from the Câmara De Deputados. Cesar Zucco Dataverse. Available at: http://hdl.handle.net/1902.1/20270 (accessed 21 December 2012).
Zucco C and Lauderdale BE (2011) Distinguishing between Influences on Brazilian Legislative Behavior. *Legislative Studies Quarterly* 36 (3): 363–396.

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