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Spatial Model of U.S. Presidential Election in 2012

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Abstract

Using a survey from a nationally representative sample in the U.S., this paper applies a spatial model of election to 2012 U.S. Presidential election. Studying 2012 Presidential election allows us to examine the role of activists in U.S. elections, since this election is the first presidential election after the historical *Citizens United* decision by the U.S. Supreme Court, which resulted in the removal of the limits on campaign contribution. By estimating a set of multinomial logit models, we find that ideological distance between candidate and voters still plays a significant role in determining vote choice in the U.S. elections. However, the valence of a candidate in the 2012 election turns out to be not a statically significant predictor of vote choice. The finding suggests that the exogenous increase in campaign contribution has emphasized the role of ideological distance in voting behavior, while reducing the effect of valence.

JEL classifications: H11, C1

Keywords: stochastic electoral models, multinomial logit, valence, U.S. presidential elections

1. Introduction

In this research paper, we explore a following set of research questions. First, what are the relative roles of ideological position and valence in determining vote choices in the 2012 U.S. presidential election? Second, is there a Nash equilibrium for the position of candidates in 2012 election? Third, is the effect of ideological position robust to the inclusion of demographic characteristics of voters?

This study is not the first attempt applying spatial model to the study of U.S. presidential elections. For instance, using the 2008 American National Election Study (ANES), Schofield and Gallego (2011) show that there exists a local Nash equilibrium for candidates' policy positions (see also Schofield, Claassen, Ozdemir, & Zakharov, 2011, Schofield and Miller, 2007, Schofield, Classen, Gallego, & Ozdemir, 2011, Turner, Schofield & Gallego, 2015). However, studying the 2012 election itself is academically interesting for many reasons. In particular, it helps us better understand the role of activists in U.S. elections. In January 2010, there was a historical ruling, the U.S. Supreme Court's *Citizens United v. Federal Elections Commission*. This Supreme Court decision resulted in the removal of the limits on campaign contribution in the U.S. elections.

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President Barack Obama criticized the *Citizens United* decision for "opening the floodgates for special interests to spend without limit in our elections." In addition to an unprecedented increase in political spending, the *Citizens United* decision also led to the creation of "Super PACs," that can accept unlimited amounts of political funds from contributors (Hansen, Rocca, & Ortiz, 2015). The 2012 election is the first presidential election that was held after this significant event. Thus, analyzing the 2012 election and comparing the results with those of previous elections will allow us to test the exogenous effect of campaign contribution and activist influence on electoral outcomes. In this regard, this research examines how did an increase in campaign contribution as prompted by the Supreme Court's decision affect vote choice and the policy positions of candidates.

2. The Electoral Effect of Campaign Contribution

In American politics, there is a large literature examining the impact of candidate spending on electoral outcomes (see Abramowitz 1991; Gerber 1998; Jacobson, 1990; Krasno & Green, 1988). Yet, only a few studies have investigated the electoral effect of the campaign contribution law. Among them, La Raja and Schaffner (2014) find that there is only a minimal effect of the campaign spending bans on electoral outcomes such as partisan control of government and incumbency re-election rates. Their study suggests that the *Citizen United* decision may not have significant electoral consequences. On the other hand, Klumpp, Mialon and Williams (2012) demonstrate that the *Citizens United* decision has increased the electoral prospects of Republican candidates in state elections. Although these recent studies address whether a change in campaign contribution law has electoral consequences, their findings are mainly from state elections. The question of whether and how campaign contribution affects election outcomes at the federal level remains unexamined.

3. Applying Spatial Model of Elections to 2012 U.S. Presidential Election

3.1. Spatial Model of Elections

In order to examine the role of ideological position in determining vote decisions in 2012 election, we start the analysis with a pure spatial model, M(λ, β). The data of the spatial model is a distribution, $\{x_i \in X\}_{i \in N}$, of voter ideal points for the members of the electorate, N, of size n. And, each of the candidates in the set P = {1, . . ., j, . . . , p} chooses a policy, $z_j \in X$, to declare prior to the specific election to be modeled. In this model, the utility that voter i ,with position x_i ,gets from voting for candidate j with position z_j is:

$$\mu_{ij}(x_i, z_j, \lambda_j) = \lambda_j - \beta \parallel x_i - z_j \parallel^2 + \epsilon_j \quad (1)$$

where λ_j, denotes to the intrinsic or exogenous valence of candidate j, the term β is the spatial parameter, giving the importance of policy difference defined in terms of a metric induced from the Euclidean norm, and the vector $\epsilon = (\epsilon_1, \cdots, \epsilon_j, \cdots \epsilon_p)$ is the stochastic error, whose mutivariate cumulative distribution is the Type 1 extreme value distribution.

3.2. Data: The American Panel Survey (TAPS)

In this research, we examine the role of policy positions and valence in determining vote choices and estimate Local Nash equilibrium of candidate positions by utilizing The American Panel Survey (TAPS) data. TAPS is a monthly online survey of a nationally representative sample from a panel of about 2,000 adults in the U.S., starting November 2011. The data include responses about vote choice at the 2012 presidential election as well policy positions and demographic characteristics of respondents.

Miller and Schofield (2003) have argued that American politics has a stable two-dimensional nature that consists of economic and social issues. Following this, we begin by conducting a factor analysis based on a set of questions asking about respondents' positions on economic and social policies in TAPS data. The set of questions used and the factor loadings of each item are presented in an appendix.

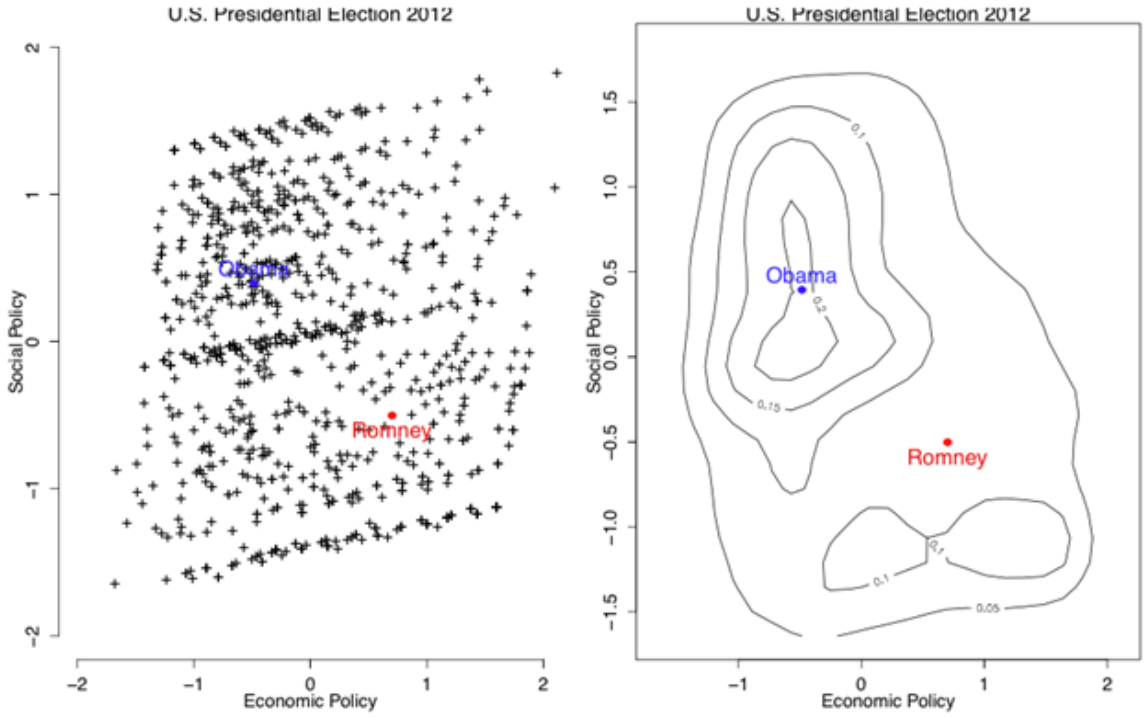

Figure 1. Voter distribution and candidate Positions in 2012 U.S. presidential election

Figure 1 illustrates the position of voters with the x-axis corresponding to the economic dimension and the y-axis corresponding to the social dimension. A movement from left to right on the *x*-axis indicates favoring less government regulation on economic activities while a movement from south to north on the *y*-axis means more liberal attitudes on social issues.

The variances on both axes are very similar to each other; the variance on x-axis is 0.722, while the variance on y-axis is 0.751. The covariance between the two dimensions is -0.128. The voter variance-covariance matrix, ∇, can be presented as follows:

$$\nabla = \begin{bmatrix} 0.722 & -0.128 \\ -0.128 & 0.751 \end{bmatrix} \quad (2)$$

with trace(∇) = 1.47. The negative sign of covariance between the two dimensions seems plausible since an increase in the *x*-axis refers to a movement towards economic conservatism, while an increase in *y*-axis indicates a move to social liberalism. However, the magnitude of the covariance between the two dimensions is not very high.

The positions of the major presidential candidates, Romney and Obama, in 2012 are estimated by taking the means of policy positions of respondents who voted for each candidate. These positions are denoted (z^*_{Obama}, z^*_{Romney}), and the candidate position matrix is given by:

$$z^* = \begin{bmatrix} Candidate & \text{Obama} & Romney \\ \text{x: Economic} & -0.48 & 0.71 \\ y: Social & 0.39 & -0.50 \end{bmatrix} \quad (3)$$

From the matrix, we see that Obama's estimated position is more liberal than Romney's position in terms of both social and economic policy area, as expected.

Table 1. Spatial model of the 2012 U.S. presidential election

Variable	(1) Pure Spatial	(2) Spatial + Traits	(3) Spatial + Traits + Socios
Romney Valence	-0.044	-0.422*	-2.899
	(0.117)	(0.192)	(5.757)
Spatial β	1.117***	0.575***	-0.721***
	(0.075)	(0.116)	(0.156)
Obama trait		-3.237***	-3.640***
		(0.354)	(0.481)
Romney trait		2.844***	3.070***
		(0.321)	(0.413)
Ethnicity (Black)			-2.503
			(5.809)
Ethnicity (Hispanic)			0.878
			(5.669)
Ethnicity (White)			3.287
			(5.641)
Ethnicity (Other)			2.623
			(5.699)
Education (Less than High School)			4.939***
			(1.451)
Education (High School)			0.689
			(0.702)
Education (College)			0.555
			(0.572)
Age			-0.013
			(0.014)
Gender (Female)			0.606
			(0.466)
N	834	819	692
Log Likelihood	-244.65	-106.59	-73.606
McFadden R^2	0.57	0.81	0.85

Note: Baseline category is *Vote for Obama,* Standard error in parentheses; *: $p < 0.005$, **: $p < 0.01$, ***: $p < 0.001$

Next, we estimate a multinomial logit model (MNL) to examine the effect of ideological position and valence of candidates on vote choice. Table 1 summarizes the results. From the first column in Table 1, we see that the spatial coefficient is 1.117 and statistically significant. Here, the reference category is Vote for Obama. The relative valence of Romney is -0.044. Compared to the 2008 presidential election (Schofield & Gallego, 2011), the magnitude of the spatial coefficient is greater in the 2012 election. However, unlike 2008 election, the valence term in the 2012 election is not statistically significant. The spatial coefficient remains statistically significant when we condition on demographic variables, such as ethnicity, education, age, and gender in the model. From the second column in Table 1, we see that African American respondents are less likely to vote for Romney, and respondents with a college education are more likely to vote for Romney than Obama.

Also, from the results, we can calculate the probability that a voter chooses each candidate, when all candidates are located at the electoral mean of the voter policy positions. First, the probability that a voter chooses Obama is

$$\rho_{Obama} = \frac{\exp(0)}{\exp(0)+\exp(-0.044)} = 0.511 \tag{4}$$

Using the same calculation, the probability that a voter chooses Romney is

$$\rho_{Romney} = \frac{\exp(-0.044)}{1+\exp(-0.044)} = 0.489 \tag{5}$$

The results of calculation are close to the actual result from the sample. While 56% percent of the respondents answered they voted for Barack Obama, 44% of them answered that they voted for Mitt Romney at the 2012 presidential election.

In order to check whether the joint origin, $z_0 = (0,0)$ is a Local Nash Equilibrium (LNE), we examine the Hessians of the vote share utility functions. The Hessian, or the characteristic matrix of Romney's vote share function at z_0 is given by:

$$\begin{aligned} c_{Romney} &= 2\beta(1-2\rho_{Romney})\nabla - \mathbf{I} \qquad (6)\\ &= 2\times 1.117\times(1-2\times 0.489)\begin{bmatrix} 0.752 & -0.128 \\ -0.128 & 0.751 \end{bmatrix} - \mathbf{I} \\ &= \begin{bmatrix} -0.963 & -0.006 \\ -0.006 & -0.964 \end{bmatrix} \end{aligned}$$

The eigenvalues of the characteristic matrix are -0.957 with the eigenvector (-0.747, 0.665), and -0.970 with the eigenvector (0.665, 0.747). According to Schofield (2007), negative eigenvalues of the characteristic matrix is a necessary condition for the electoral mean to be SLNE (or strict local Nash equilibrium).

The convergence coefficient,c, can be calculated by using the following formula:

$$\begin{aligned} c &= 2\beta(1-2\rho_{Romney})Tr[\nabla] \qquad (7)\\ &= 2\times 1.117\times(1-2\times 0.489)\times 1.473 = 0.073 \end{aligned}$$

Schofield (2007) shows that c < 1 is a sufficient condition for convergence to , z_0 in the pure spatial model. Using simulations, we find a SLNE with the following candidate positions:

$$z_1 = \begin{bmatrix} Candidate & Obama & Romney \\ Economic: & 0.032 & 0.032 \\ Social: & 0.004 & 0.004 \end{bmatrix} \quad (8)$$

As we see, the candidate positions in this SLNE are very close to the joint electoral origin,(0,0).

We extend the spatial model by including perceptions of candidate traits. Using the respondents' evaluations of candidates, we constructed a trait index by factor analysis (see the appendix for factor loadings). From Table 1, we find that the spatial coefficient is still significant in models with candidate trait variables.

4. Discussion

From the analysis of voter perceptions in the 2012 U.S. presidential election, we can draw the following preliminary findings. First, as in the case of previous presidential elections, ideological distance between candidate and voters plays a significant role in determining vote choice in the 2012 election. The magnitude of the spatial coefficient turns out to be even greater than in the previous election. Second, the valences of the candidates in the 2012 election are not a statically significant predictor of vote choice. These findings provide implications about the influence of increased campaign contribution, resulting from Supreme Court decision in 2011. That is, the exogenous increase in campaign contribution has emphasized the role of ideological distance in voting behavior, and decreased the effect of valence.

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Appendix 1. Questions for the 2012 TAPS

1. Indicate your level of agreement with this statement: Federal personal income taxes for individuals with incomes higher than $250,000 should be raised.
2. Which actions are you in favor of and which are you against: less government regulation of business?
3. Indicate your level of agreement: Incomes should be more equal because everyone's contribution to society is equally important.
4. Do you consider your view of the federal government recognizing same-sex marriages liberal, moderate, or conservative?
5. Do you consider your view of federal funding for abortion liberal, moderate, or conservative?
6. Do you consider your view of the banning possession of handguns liberal, moderate, or conservative?
7. Do you consider your view of programs designed to help minorities get better jobs and education liberal, moderate, or conservative?

Appendix 2. Factor Loadings for Economic And Social Policy

Table 2. Factor loadings for economic and social policy

Question	Economic Policy	Social Policy
Personal income tax	0.78	0.27
Government regulation of business	0.65	0.30
Income inequality	0.57	0.15
Gay marriage	0.20	0.77
Abortion	0.19	0.79
Gun control	0.26	0.57
Helping minorities	0.27	0.62

Table 3. Factor loadings for candidate traits

		Obama trait	Romney trait
Obama	Optimistic	0.724	-0.192
	Fair	0.893	-0.294
	Strong	0.833	-0.320
	Honest	0.873	-0.291
	Trustworthy	0.882	-0.295
	Experienced	0.835	-0.315
	Knowledgeable	0.823	-0.277
	Inspiring	0.796	-0.301
	Decisive	0.763	-0.208
	Moral	0.842	-0.262
Romney	Optimistic	-0.177	0.708
	Fair	-0.320	0.802
	Strong	-0.358	0.790
	Honest	-0.280	0.830
	Trustworthy	-0.304	0.864
	Experienced	-0.286	0.747
	Knowledgeable	-0.242	0.774
	Inspiring	-0.337	0.751
	Decisive	-0.304	0.675
	Moral	-0.196	0.774

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