Public Choice Models of Electoral Turnout: An Experimental Study[1]

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Abstract: *In this paper we present the results of a laboratory experiment which seeks to test four of the most salient economic models of voting behavior: the calculus of voting model, the expressive model, and two models of altruistic voting – pure and warm-glow altruism. While the experimental design is embedded in the rapidly developing literature concerning experiments on electoral behavior, it also displays a number of original elements, being the first design that seeks to simultaneously test predictions derived from the four accounts of voter turnout. The main findings suggest that turnout is mainly driven by the cost of voting and the probability of being decisive. Abstention increases when the cost increases and decreases as the probability of being decisive increases. These results yield slightly higher support for the calculus of voting model, followed by expressive voting, while both models of altruistic voting was found to be the least supported.*

Keywords: turnout, calculus of voting, expressive voting, altruistic voting, warm-glow altruism.

Introduction

Ever since Downs (1957) hypothesized that selfish instrumental utility maximizers (*homo oeconomicus*) should not vote - a result at clear odds with the observables of democratic elections - Neoclassical Economics imperialistic (Stigler, 1984) claims have been under attack. It was argued that given this obvious anomaly, mainstream economics is not suited to address voting behavior (Green and Shapiro, 1994) and that explaining turnout in mass elections is *the ”Achilles heel of public choice theory*” (Udéhn, 1992: p.249). In response to such critiques, public choice scholars (e.g. Brennan, 2008a) argued that regardless of the failed export of the homo *oe*conomicus behavioral model, the neoclassical endeavor of explaining voting behavior is legitimate. Instead of abandoning its assumptions, what was needed was a better specification of its methodological core, confining it to what were the essential elements (methodological individualism, deductivity, the utility maximization principle). As a result, explaining high levels of voting and other types of political participation in the neoclassical framework should operate a trade-off between rationality and selfishness or instrumental behavior. This position was the most influential public choice answer to the voting paradox and provided two main ways of circumventing it: the non-instrumental models of voting behavior and the altruistic voting models. These models operationalized the formal definition of rationality (utility maximization) either as altruism or as non-instrumental behavior and apparently solved the paradox of voting. This paper seeks to simultaneously test the implications of these models.

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The results reveal higher support for the calculus of voting model and less (in this order) for expressive and altruistic voting. The reminder of this paper proceeds as follows: in the first section we offer a review of the most salient theoretical and empirical literature. In the second section we present the research design. The third section details the results. We conclude with a discussion of the results in the fourth section.

1. *Theoretical background and previous empirical research*

Researchers working within Public Choice Theory tradition started modelling voting behavior in the '50s and '60s with a focus on electoral turnout. Using the neoclassical expected utility framework, Downs (1957) and Tullock (1967), had built what now is known as the calculus of voting model. Its core could be depicted in the simple formula: $R = pB - C_v$ [2]. Here, voters are all instrumental (they act to get the result *R*), selfish (there are no considerations for others' welfare in the utility function), utility maximizers, they all know the probability (*p*) of being decisive in mass elections and they are all able to accurately estimate the costs (C_v) and the benefits (*B*) of voting. This simple model implied the prediction that almost nobody will vote – a result clearly at odds with observed behavior. Neoclassical economics methodology seemed to have failed, and its imperialistic claims[3] seemed to have been unjustified. As mentioned in the introductory section, public choice scholars' answer to this problematic result was either to give up instrumental behavior or to drop the selfishness assumption.

In the first class, Riker and Ordeshook (1968) introduced the *D* term into the voting equation. They described it as embodying (Riker and Ordeshook, 1968: p.28) non-instrumental reasons of voting such as performing ones duty or complying with the ethics of voting, enjoying voting in itself or expressing political partisanship. With some notable exceptions[4] the literature treated these reasons as analytically and empirically homogenous under the umbrella of expressive voting. Later Kan and Yang, (2001: p.297) and Mueller, (2003: p.321) argued that expressive voting comprise at least two main views: voting as expressing partisan preferences (Fiorina, 1976; Brennan and Buchanan, 1984; Brennan and Hamlin, 1998; Kan and Yang, 2001; Brennan, 2008b) and voting as expressing moral sentiments (Buchanan, 1954; Tullock, 1971; Brennan and Lomasky, 1985, 1987). On the first account, voters might be seen as analogous to booing and cheering spectators at a sports event. They are not supporting their teams/candidates because they will affect the outcome of the game/election – they are not instrumental

[2] This is (with slightly modified notations) what Riker and Ordeshook (1968) labeled as the original "calculus of voting formula" (Riker and Ordeshook, 1968: p.25). See also Fiorina (1976: p.391)

[3] At least the claim of having better tools of explaining the political phenomena.

[4] For instance, Aldrich (1997) and Jones and Hudson (2000) argued for the difference between voting for duty and voting as as having intrinsic value.

supporters/voters yet they are rational. On the second account, by voting people could express moral views that otherwise would be costly to express[5]

This later view on expressiveness is, as Hamlin and Jennings (2011: p.654) argued, equivalent to Andreoni's warm-glow altruism[6]. As Andreoni (1990) argues, this is actually a form of (non-instrumental) selfish behavior. The agent derives utility independent of the efficacy of the donation and dependent on the identity of the donor[7], as opposed to a pure (instrumental) form of altruism in which voters' utility function comprise the utility of other people as well (independent of the donor's' identity and dependent of the efficacy of donation). This type of altruism was mentioned by Buchanan (1954: p.337), Tullock (1967: p.111) and formalized by Brennan and Buchanan (1984) which included both non-instrumental components (the V term) and instrumental altruistic parts (the X_j term - the consumption of private goods by other individuals) in the utility functions of voters [$U_i = U_i(X_i; G; X_j; V; ...)$]. Since Brennan and Buchanan (1984) explored only the non-instrumental expressive part of the equation, this does not qualify as a fully developed model of altruistic voting. Later, building on Andreoni's research, Jankowski (2002, 2007) proposed a new formula of voting: $U_i = \left(p\left[B_1 + B_2\right]\right)/2 - C + D + W$. Here B_1 is the selfish benefit, B_2 is the purely altruistic benefit from voting a transfer and W is the private benefit that a voter receives when he votes for a transfer – this having the effect of producing a warm glow, as mentioned above[8]. Something similar to the way Jankowski split the B term was later proposed by Edlin et al (2007). In their view $B = B_{ego} + \alpha B_{soc}$, where B_{ego} is the self-interested benefit, B_{soc} is the altruistic benefit and α is a discount factor which reflects the intuition that the altruistic benefit is a fraction of the self-interested benefit[9]. If $\alpha = 0$ then the voter is purely self-interested; if $\alpha > 0$ then the voter has social preferences.

Both non-instrumental and altruistic voting models had the ability to solve[10] the paradox of voting. The 'original sin' of the calculus of voting – *i.e.* its inconsistency with observed facts of voting – seemed to be waived. Of course, a positive theory should be tested against facts, and the empirical literature on voting behavior is rich enough. For instance Kan and Young

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[5] This is what Tullock (1971) labeled as the charity of the uncharitable hypothesis: since talking and voting about charity are cheaper than actually giving something to the poor, transfers are more likely as the probability of being decisive decreases.

[6] So the charity of uncharitable hypothesis is equivalent to the warm glow hypothesis.

[7] If I am a warm glow altruist I don't care about the receiver's utility. I care only about my giving by means of voting.

[8] The other notations (*i.e. p, C, D)* have the same meaning as in the original calculus of voting formula.

[9] Note that Jankowski (2007: pp.9-10) used a similar discounting parameter to designate the weight we attach to the happiness of others.

[10] By making the implication of the model consistent with the observed facts of voting.

(2001), Greene and Nelson (2002), Drinkwater and Jennings (2007), Laband et al. (2009) found strong support for the cheering and booing hypothesis while Carter and Guerette (1992), Fischer (1996), Sobel and Wagner (2004), Tyran (2004), Crumpler and Grossman (2008), Federsen et al. (2009), Kamenica and Brad (2014) tested the warm glow hypothesis with mixed support. Furthermore, Fischer (1996), Sobel and Wagner (2004), Tyran (2004), Crumpler and Grossman (2008), Federsen et al. (2009) gathered enough evidence to support the hypothesis. Carter and Guerette (1992) found only a weak support for the warm glow hypothesis and Fowler (2006) and Kamenica and Brad (2014) found no support whatsoever.

2 Experimental design

Our experimental design draws to an important extent on Blais et al (2014). In their experiment, Blais et al (2014) test a number of predictions generated by the calculus of voting model with participants who faced the decision of whether to vote or to abstain in a number of first past-the-post (FPTP) and proportional representation elections (PR). Each session of the experiment involved 21 participants, with each of them being randomly allocated to a different position on a 21-point scale. The two parties for whom participants could vote for (if they chose not to abstain) were labelled A and B, with A located at the 5th position on the scale and B at the 15th position. Participants were informed about their own position on the axis, but did not have information about the positions of other individuals. They were also forbidden to communicate with each other. The payoff for each participant was computed as the difference between 16 points and the distance between the winning position and the position of the participant. The cost of voting was fixed at 1 point. After each vote, participants were informed about the outcome of the election and about their personal gain.

Similar to Blais et al (2014), our experimental design also makes use of spatial positioning in order to build individual preference hierarchies. This procedure consists in placing both participants and candidates on an ideological continuum and using a proximity model[11] to map these locations onto an individual utility function, which is operationalized through the use of monetary incentives. In contrast to Blais et al (2014), we do not use a 21-point scale, but a 100-point scale for our continuum, and consequently, a participant's gain following an electoral round is $U_i(v_j) = 100 - |w_i - v_j| - C_v$, where U_i represents the number of points gained by the individual at the *i*-th electoral round, w_i is the position of the winning candidate in electoral round *i*, v_j is the position of the participant and C_v is the cost of voting. In total, each participant

[11] See Downs (1957), Davis and Hinich (1966) and Davis et al (1970) for basic versions of the proximity model.

played 48 rounds[12], receiving a lump sum payment at the end of the experimental session, on a single randomly selected round[13]. The sum of money received could range between 10 RON[14] for gaining between 0 and 25 points, 20 RON for gaining between 26 and 50 points, 30 RON for gaining between 51 and 75 points and 40 RON for gaining between 76 and 100 points. To each of these amounts, 10 RON were also added as a participation fee. Introducing the C_v variable in our equation is the second common feature shared with the design of Blais et al (2014), and its purpose is to simulate the costs associated with actual electoral participation[15]. Unlike Blais et al (2014) however, the costs of participation in our experiment are not fixed, but are varied from one electoral round to the other, taking the values of 10 for 24 rounds and 30 for the other 24 rounds[16].

The electoral setting designed offered a choice between two parties, *A* and *B* positioned at A={25} and B={75}. The positions of the parties were fixed throughout the electoral rounds. Furthermore, participants were informed that if party *A* would win in most electoral rounds, a sum of money will be distributed to students in the university coming from a disadvantaged socio-economic background, thereby making A the "ethical alternative"[17] (Feddersen et al: 2009, p.176). As opposed to the experiment conducted by Blais et al (2014), where participants were randomly allocated to a position on the continuum in each electoral round, in our experiment the positions of participants in half of the rounds were randomly assigned, while in half of the rounds they were fixed at locations that tracked their responses to a pre-experimental questionnaire[18]. This procedure was used in order to test the expressive voting behavior hypothesis, since it requires that a partisan preference could, in principle, exist.

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[12] Excluding 3 trial rounds at the beginning of each experimental session which were used in order to test the software and to accommodate participants with the game.

[13] We used https://www.random.org/randomness/ in order to select the round which entailed actual monetary payoffs. Since the game was played for a considerably high number of rounds, this procedure has the advantage of eliciting the attention of the participant throughout the experimental session, as there is an equiprobable chance that any of the rounds would be the one that generates a significant amount of monetary incentives. We thank Jan Palguta for suggesting that we take this approach rather than using very small (perhaps even negligible) monetary incentives for each round of the game.

[14] At the time when the experiment was conducted 1 euro equalled approximately 4.5 RONs. For comparative purposes, the hourly rate for a minimum-wage earner at the respective time was less than 6 RONs.

[15] Which in normal circumstances refer to the time spent on the road to the polling booth, transportation costs, costs associated with travel in case of bad weather etc.

[16] The information regarding participation costs was made available to participants at the beginning of each round.

[17] Using charitable donations in order to construct an ethical alternative in experiments involving voting behaviour has been used, *inter alia*, by Carter and Guerette (1992) and Tyran (2004). In our case, the subjects of the charitable donation were identified as being the recipients of social scholarships, a form of scholarship designed to cover some of the living expenses of students coming from families whose *per capita* income does not exceed the minimum wage.

[18] In which participants were asked to place themselves on a number of policy issues traditionally captured within the left-right divide.

A final departure from the setting of Blais et al (2014) consisted in varying the probability that an individual is decisive in an electoral round. While Blais et al (2014) do not attempt to simulate the conditions innate to regular, large-scale elections, and a participant's probability to be decisive is much higher than that of a regular voter in actual elections, we follow Dumitrescu and Blais (2011) in simulating such conditions by embedding the participant into an electorate amounting to 1001 (fictional) voters. Specifically, at the beginning of each electoral round, the participant is informed that 900 other people have already voted and that she will vote (or abstain) simultaneously with the other 100 people remaining. She is also provided with information pertaining to the actual distribution of the 900 votes, which can take 2 different forms: (1) 399 for *A* and 501 for *B* or (2) 425 for *A* and 475 for *B*. Aside from these distributions a third one was also used, whereby the participant is informed that 1000 votes were already cast in the following manner: (3) 500 for *A* and 500 for *B*. Each of the three distributions renders a different probability of decisiveness for the participant, with *p* equaling 0% in distribution (1) and *p* equaling 100% in distribution (3). Each distribution was played a total number of 8 times with 10 points as the participation costs, and 8 times with 30 points as the participation costs, to a total of 48 rounds. In each round, the participant had to make two choices, namely if she was going to cast her vote or abstain and if she was going to cast her vote, would she vote for party *A* or party *B*?

As previously mentioned, the experiment was designed to test four models of electoral behavior: (1) the calculus of voting model, (2) the expressive voting model, (3) the pure altruistic voting model and (4) the warm-glow altruistic voting model. In order to test the compatibility of these theories (operationalized under the form of particular models) with empirical evidence, we first need to see what predictions each of the models would supply for each voting position and under each distribution. These predictions are summarized in Table 1.

Table 1. Model predictions regarding voting behaviour patterns

Models	Distributions	*Voters 1-49*	*Voter 50*	*Voters 51-100*
Calculus of voting	D1	Abstain	Abstain	Abstain
	D2	Abstain	Abstain	Abstain
	D3	A	A/B	B
Expressive voting	D1	A	A/B	B
	D2	A	A/B	B
	D3	A	A/B	B
	D1	A	A	A

Pure altruistic voting	D2	A	A	A
	D3	A	A	A
Warm-glow altruistic voting	D1	A	A	A
	D2	A	A	A
	D3	A	A/B	B

We begin with the calculus of voting model. The calculus of voting model predicts that since the probability that the participant is decisive is 100% under D3, she will vote with the party closest to her own position, in order to maximize the economic gains received. Under any of the other distributions, the probability of being decisive is sufficiently low to make voting irrational. This is most clear under D1, where even if all the remaining votes go to the same party, B would still win the contest. D2 also points in the same direction, although in this case some small chance of decisively influencing the result remains, just as in the case of mass elections. While different formulas to compute the probability of being decisive may be used (see Dhilon and Peralta: 2002, pp.335-338), they all point to the idea that the probability of being decisive under these conditions is sufficiently small to be outweighed by the cost of voting, under the calculus of voting model. By contrast, the predictions formulated via an expressive voting model differ substantially. The operationalization which we employ in the experiment for the expressive account is that of partisan preferences (Riker and Ordeshook, 1968: p.28), since this interpretation is both one of the most salient in the literature and the most susceptible to being captured in an experimental framework. In order to determine the partisan preferences of participants, we asked them to fill in a pre-experimental questionnaire which contained a series of policy-related questions. Subsequently, in half of the electoral rounds they were allocated to a position on the ideological continuum based on the average values of their responses to these questions. Therefore, their position on the scale matched their actually held political beliefs for these rounds. As can be seen from Table 1, the predictions in this case would point toward an invariance of the probability of being decisive and a vote for parties closest to the participant's position under all distributions, since these parties mirror the partisan preferences of participants. The pure altruistic voting model also predicts that participants will vote in all cases, but gives different predictions in regard to the choice of party alternatives. Since in the pure altruistic voting model, participants maximize a function composed both of selfish elements and altruistic elements, we expect that all positions would vote for A in all distributions, since this is the ethical alternative. Finally, the warm-glow altruistic voting model yields predictions which should resemble the pure altruistic models for distributions of voters where the individuals have a low probability of being decisive, but would follow the calculus of voting model predictions in cases where the probability of being decisive is significant (i.e. in D3). This prediction is mainly based on Tullock's (1971) account of altruistic behavior. Tullock claims that displaying a charitable behavior in large-scale elections is bound to occur because of the low-cost nature of the situation. However, when individuals take private decisions concerning their finances, or similarly, when there is a very high probability of being decisive in a situation of collective decision-making (as is the case here), voters will not engage in altruistic behavior.

3. Results

We first analyse the extent to which participants' behavior is compliant with the predictions of the four models, as described above in Table 1. Table 2 and 3 below depict the situation by cost level and distribution. When the cost is low, the expressive voting model seems to be doing a slightly better job of explaining voting behaviour. Overall, 48.48% of the cases are consistent with the predictions of the expressive voting model, while 44.18% of the cases are compliant with the calculus of voting model, 36.66% with the warm-glow altruistic voting and only 29.09% with the pure altruistic one. The compliance rate also seems to be varying by distribution, with higher compliance rates for all models as participants become pivotal[19].

Tabel 2. Compliance percentage by model and distribution (cost=10)

Model	Distribution			Total
	D1	D2	D3	
Calculus of voting	37.20	33.20	55.42	44.18
Expressive voting	40.91	48.16	55.42	48.48
Pure altruistic voting	21.69	24.90	37.62	29.09
Warm-glow altruistic voting	21.69	24.90	55.42	36.66

Increasing the cost alters the compliance rates for all models. As the cost goes up so does abstention, especially when participants are not pivotal (D1 and D2). Thus, the calculus of voting becomes the model with the highest compliance rate, followed by the expressive voting model, then by warm-glow and finally by pure altruistic voting. Compliance rates seem to vary

[19] Proportion tests have been run to test whether both the differences between models and between distributions within models are significant. The results have been significant at the 95% level in all cases.

by distribution again. When moving from the first towards the third distribution the compliance rate goes up for all models except the calculus of voting, for which the opposite is true.

Tabel 3. Compliance percentage by model and distribution (cost=30)

Model	Distribution			Total
	D1	D2	D3	
Calculus of voting	57.65	55.29	42.86	53.49
Expressive voting	27.81	30.55	42.86	32.20
Pure altruistic voting	13.69	17.07	28.71	18.37
Warm-glow altruistic voting	13.69	17.07	42.86	21.32

The figures in tables 2 and 3 above seem to indicate that mainly the cost and the probability of being decisive are the key factors driving the choice of voting for one of the parties and abstaining. To further test this hypothesis we run three separate conditional logit/fixed effects logistic regressions, where the depended variable is in turn a dummy indicating whether the voter has abstained as opposed to voting for A or B, or has voted for A or has voted for B. We have opted for a conditional logit/fixed effects model in order to account for the fact that our data comes from an intra-subject experimental design and thus observations coming from the same person might be correlated. The fixed effects model accounts for this correlation and allows us to model the within-subject variation (Allison: 2009, pp.11-12).

Table 4. Vote choice predictors. Odds ratios from three fixed effects logistic regressions

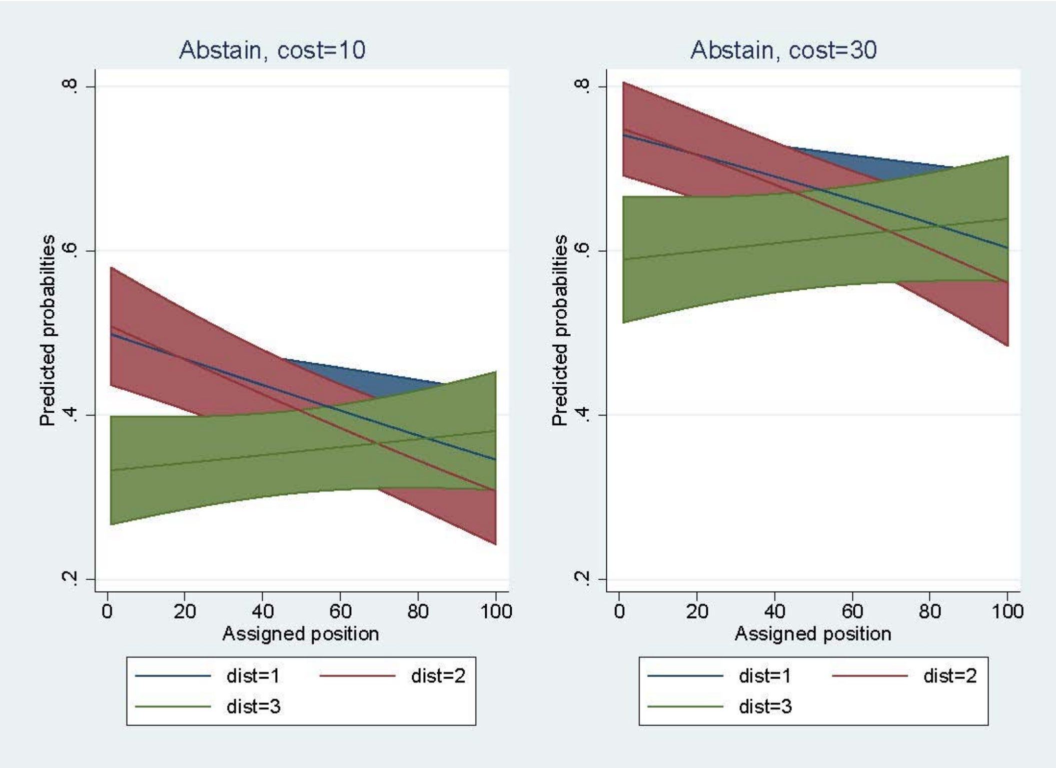
Predictors	Abstain		Vote for A		Vote for B	
	OR	S.E	OR	S.E	OR	S.E
Cost	2.88	0.15***	0.54	0.03***	0.49	0.03***
Assigned position	0.99	0.01***	0.98	0.002***	1.02	0.001***
D2 (425-275)	1.04	0.15	1.47	0.24.	0.63	0.10**
D3 (500-500)	0.49	0.07***	5.90	0.99***	0.19	0.03***
D2*Assigned Position	0.98	0.003	0.99	0.003	1.01	0.003.
D3*Assigned Position	1.01	0.003**	0.98	0.003***	1.02	0.003***

Sig: “***”=0.001; “**”=0.01; “*”=0.05; “ .”=0.1

The independent variables are cost, the assigned position and the distribution. While the assigned position is a continuous variable ranging from 1 to 100, cost and distribution are dummy variables. Cost takes a value of 1 when the cost of voting was 30 points and 0 otherwise.

Distribution was converted into two separate dummy variables: D2 which takes a value of 1 when the distribution was 425-475 and D3, which takes a value of 1 for 500-500. D1, which stands for the 399-501 distribution, is the reference category. Interaction terms between the assigned position and the distribution dummies have also been included in the model. Table 4 above depicts the results in odds ratios (the probability of success over the probability of failure). In order to ease interpretation, we have also generated the predicted probabilities for each dependent variable by cost, distribution and assigned position. Figures 1, 2 and 3 below illustrate these results.

Figure 1. Predicted probability of abstaining as opposed to voting for A or B, by cost and distribution



The first thing to notice about figure 1 is that the probability of abstaining is lower for the third distribution in comparison to the other two. However, the effect is only significant for the far left. As we move from left to right the effect of the distributions becomes insignificant, as the probability tend to decrease for the first two distributions, causing the confidence intervals to overlap. Moreover, when the cost increases, the probability of abstaining increases in all three distributions.

Figure 2. Predicted probability of voting for A as opposed to abstaining of voting for B, by cost and distribution

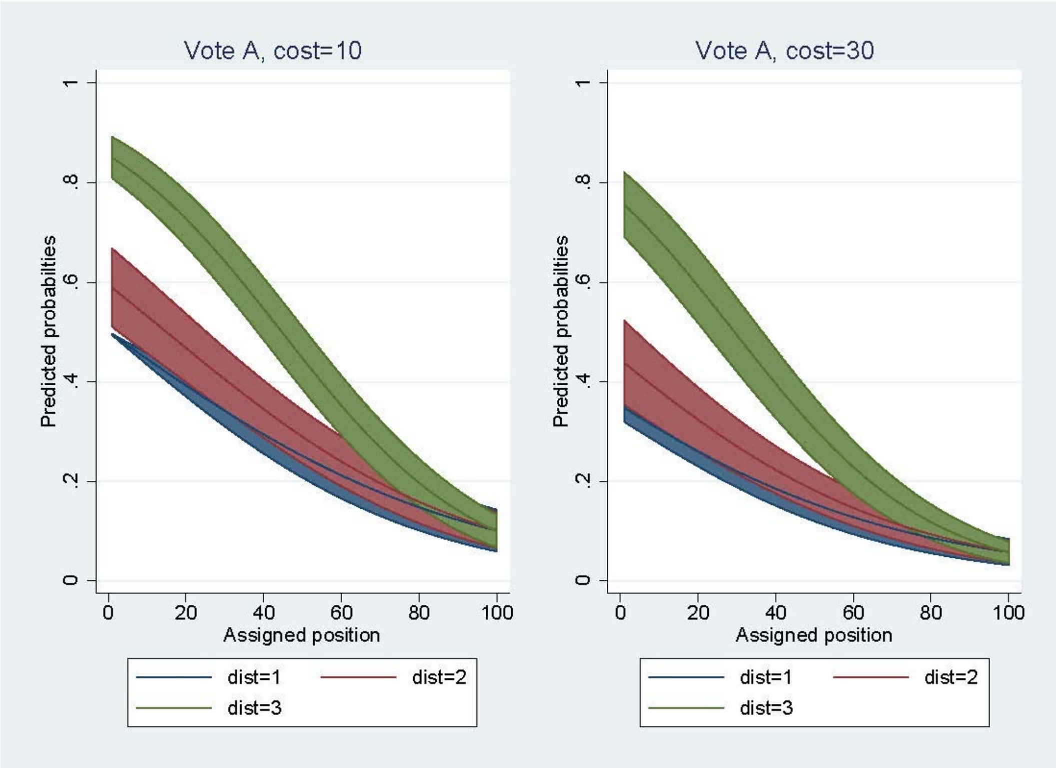
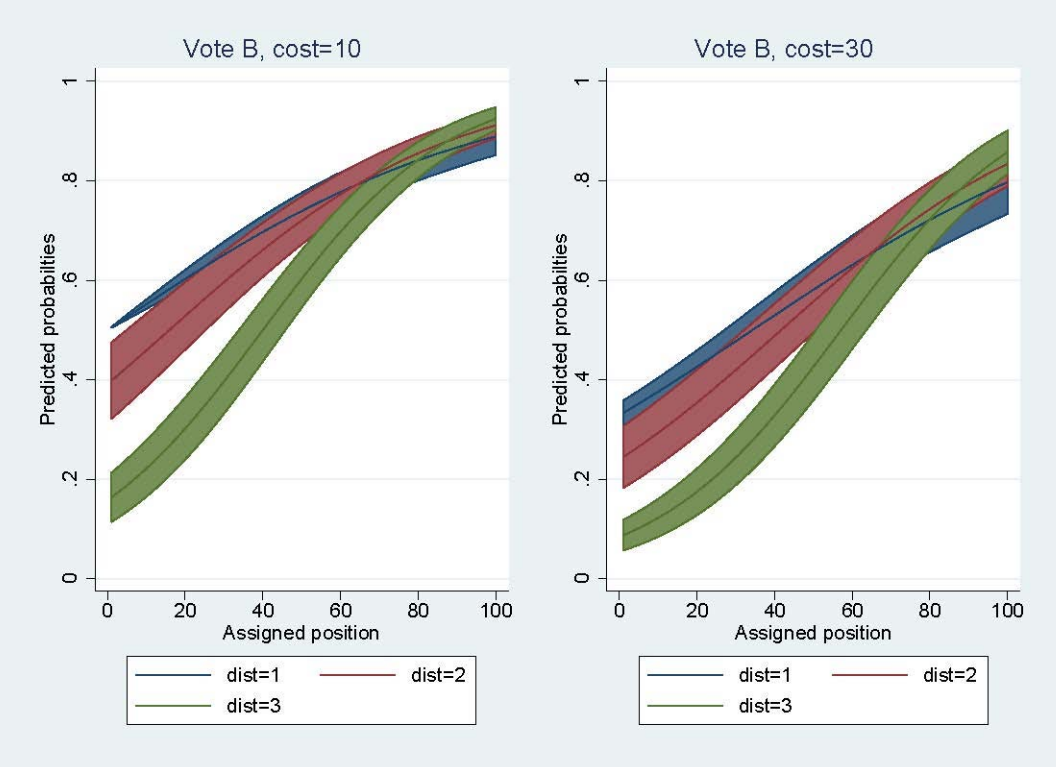


Figure 2 reveals that the probability of voting for A is significantly higher for the third distribution, when having a leftist position. However, as we move to the right, the probability of voting for A decreases on all three distributions. Thus, someone who has been assigned a rightist position has a lower probability of voting for A, regardless of the distribution, even though it is still about 10% for the far right. Increasing the cost significantly decreases the overall probability of voting for A with about 10%.

Finally, Figure 3 indicates that the probability of voting for B increases as we move from left to right on all distributions. On the third distribution, the probability of voting for B when having been assigned a leftist position is significantly lower than on the other two distributions. However, it is still about 20% on the third distribution and about 40-50% on the other two. Being assigned a rightist position determines a high probability of voting for B, which varies from 70% to 90%. The probability is slightly higher on the third distribution, but the effect is not significant.

Figure 3. Predicted probability of voting for B as opposed to abstaining or voting for A, by cost and distribution



4. Discussion

The analysis above has yielded mixed results. It is clear that the three most important factors driving vote choice are cost, the assigned position and the distribution. An increase in cost increases the probability of abstention, regardless of the distribution. The position slightly affects the probability of abstention, with more abstention on the left than on the right. Also, leftist positions increase the probability of voting for A and decrease the probability of voting for B, while rightist positions have the opposite effect. Finally, being pivotal, as on the third distribution also has an impact. It slightly decreases the probability of abstention, but only for leftist positions. Also, when coupled with a leftist position it also increases the probability of voting for A and it decreases the probability of voting for B more than the other distributions. When coupled with a rightist position however, it has no significant effect in comparison to the other two distributions.

Therefore, the results seem to be more consistent with the predictions of calculus of voting model when being assigned a leftist position than when being assigned a rightist position. It might be the case that, since by design party B wins most of the time[20], participants that are assigned rightist positions might be inclined to vote for the winner, even when B would win with or without their vote. In any case, the results of the analysis on rightist positions are consistent with voting for the closest party regardless of the distribution and thus support expressive voting. Although slim, there is also some support for altruistic voting, as the probability of voting for A is at least 10% when being assigned a rightist position. However, the insignificant effect of distribution on rightist positions is in contradiction with the predictions of warm-glow altruistic voting, according to which we would expect altruistic voting when the participant is not decisive.

Furthermore, the probability of voting for A is lower on the first two distributions than the third, although both altruistic voting models predict that participants with leftist positions should always vote A regardless of the distribution. Choosing to abstain when the individual is not decisive is more consistent with the calculus of voting than with the rest of the models.

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[20] B might lose if the participant decides to abstain on the third distribution and the winner is decided at random. In theory, A should win in 50% of these cases.

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