Electoral Studies 38 (2015) 38–45

Contents lists available at ScienceDirect

Electoral Studies

journal homepage: www.elsevier.com/locate/electstud

Beauty contests and strategic voting

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A R T I C L E I N F O

Article history:
Received 20 May 2013
Received in revised form 28 September 2014
Accepted 5 January 2015
Available online 18 February 2015

Keywords:
Strategic voting
Experimentation
Individual differences
Political psychology

A B S T R A C T

Prevailing models of strategic voting demonstrate that individuals are less likely to vote strategically when their preferences for a third-place party increase or when the chances of their preferred party winning increase. Rather than both of these factors influencing all voters, we demonstrate that these two factors are used by different types of voters. Using a one-shot *p*-beauty contest, we separate subjects into those who display strategic inference and those who do not. We then show, using data from two different experiments, that those subjects who exhibit strategic inference rely on probabilistic information about their preferred party when deciding to cast a strategic vote, while those who do not display strategic inference rely on the strength of their preferences.

1. Introduction

An individual votes strategically when she abandons her preferred candidate or party for one that she prefers less but to whom she assigns greater chances of winning (Blais and Nadeau, 1996; Blais, 2002; Heath and Evans, 1994; Cain, 1978; Abramson et al., 1992; Blais et al., 2005). Strategic voting occurs in every voting system (Arrow, 1963; Cox, 1997; Abramson et al., 2010) and is particularly central to the operation of single-member district plurality systems (Duverger, 1963; Cox, 1997).[1] There is a substantial literature on strategic voting. This work identifies the contextual factors that are correlated with strategic voting – for example closeness between candidates (e.g. Blais and Nadeau, 1996; Abramson et al., 1992). This work likewise identifies individual-level political correlates, such as strength of preferences or party identification (e.g. Niemi et al., 1992). Despite this, we know surprisingly little about the non-political, non-socioeconomic individual-level differences that may predict strategic voting. Indeed, the only exception of which we know is the work of Dumitrescu and Blais (2011a), who examine the role of anxiety in casting a strategic vote. This is curious, not least because such differences between individuals are numerous; they underly many politically manifested differences (including voting, see Schoen and Schumann (2007)); and are deeply-set (e.g. Fowler et al., 2011; Mondak, 2010). The purpose of this paper is to explore the relationship between one such individual difference – which we label *strategic inference* – and strategic voting, an act central to elections.

We conceive of *strategic inference* as the ability to infer the behaviour of others and to change one's behaviour accordingly. We argue that this has a measurable influence on when individuals vote strategically. We set out to demonstrate within an experimental election paradigm that subjects who evince strategic inference in a separate task use different information when deciding to vote strategically. For those who exhibit strategic inference, the decision to vote strategically should be based on their perceptions of the chances of their preferred party winning

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[1] We gratefully acknowledge André Blais and Delia Dumistrescu for sharing their data and aiding in data collection for our first experiment. We received helpful comments at the 2011 ECPR Workshop in St. Gallen, Switzerland and the 2011 EPSA meetings in Dublin. We thank Brad LeVeck, David Hugh-Jones and David Gill for helpful comments.

http://dx.doi.org/10.1016/j.electstud.2015.01.001
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the election. In other words, they act on probabilistic information about the behaviour of others. By contrast, those who do not exhibit strategic inference in the separate task should make the decision to vote strategically based on the strength of their preferences.

Our paper proceeds as follows. First, we introduce the concept of strategic inference, as motivated by a measurement tool called a *p*-beauty contest. Second, we then describe two different experiments designed to test the relationship between strategic inference and strategic voting. In the first experiment described below (Experiment 1), we use a beauty contest to classify subjects, and then assess their behaviour in an experimental election designed and executed by Dumitrescu and Blais (2011b). This single-dimension election asks voters to cast real, consequential votes over three parties, each of which offers a distribution of some money between a charity and all subjects. The experimental protocol manipulates the distance between the parties, allowing us to observe which individuals abandon their preferred party for one with greater chances of winning. Reanalyzing their data, we find that the individual differences revealed in the beauty contest distinguish our subjects in an important way: the use of preference information. We find less conclusive information about the role of probabilistic information. However, in the replication study that follows (Experiment 2), we use an improved design and find clear differences between strategic and non-strategic subjects in the information they use in deciding to vote strategically. After presenting these results, we conclude with a discussion.

2. Measuring strategic inference

We posit that individuals will vary in their ability to make inferences about the behaviour of others. The task we use to uncover these individual differences in strategic inference is a one-shot, *p*-beauty contest (Nagel, 1995).[2] The idea of the beauty contest was first introduced by Moulin (1986) and formalized by Stahl and Wilson (1994). It is based on a story in Keynes' *General Theory of Employment, Interest and Money* about a newspaper contest in which people guess which face among many others readers will think is the most beautiful (Camerer, 2003, 209). To win the game, then, participants must anticipate the behaviour of others and make choices conditional upon this belief.

In practice, the basic beauty contest game takes a form as follow:

> A certain number of players choose simultaneously a number from an interval, perhaps, 0–100. The winner is the person whose number is closest to *p* times the mean of all chosen numbers, where *p* is predetermined and known. The winner receives a prize (Nagel, 1999, 106).

The Nash equilibrium of the beauty contest is zero. However, this is only the best response if others are also choosing it and only obtains in the experiment if all subjects make a very large number of iterations (Camerer, 2003, 225). In most subject pools, the average response will be between 20 and 40 (ibid). The main objective for a savvy player, then, is to determine "how far the average is reasoning" (Nagel, 1999, 106).

The beauty contest can be used to measure the steps of reasoning an individual undergoes in her thought process. Its principal advantage as a measurement tool is that it is not a mixed-motive game, as there are no other concerns beyond the individual's self-interest (Nagel, 1999, 207). However, and despite the prevalence of strategic, other-regarding reasoning in many common political tasks performed by both citizens and politicians, measures of strategic ability have so far scarcely been used to account for behavioural differences (Hafner-Burton et al., 2012b).

To measure individual differences in the steps of reasoning taken in beauty contest games, a "level-k" measure (Stahl and Wilson, 1995) is often used: a player that chooses a number at random without giving consideration to the actions of others is considered to have a level-0 strategic inference. Level-0 responses are therefore expected to average around 50. A level-1 player considers the behaviour of others in the game, but assumes she herself does not act similarly – namely, that they are all level-0 players. Level-1 players therefore ideally choose a number that is *p* times the average expected guess of level-0 players: if $p = .5$ then their choice is $0.5*50 = 25$. If $p = 1/3$, level-1 players will choose 16 or 17. Level-2 players are those who assume the other players come from a distribution of level-1 and level-0 – that is, they assume that at least some of the other players are strategic to a certain extent. Their response is therefore drawing closer to $p*p*50$ (i.e. 12.5 if $p = .5$).

Intuitively, individuals will differ in their ability to perform in the beauty contest. Iterations necessarily strain working memory, and there will be certain individuals who are better able to keep information in their working memory and as such, perform several iterations (Camerer, 2003, 11). How individuals differ in their performance in the beauty contest game, however, is a matter of empirical debate: Stahl and Wilson (1994) find no participants with level-0 reasoning, while 24% of the participants were found to belong to level-1, 49% were level-2, and 27% applied level-3 reasoning. Hafner-Burton et al. (2012a) tested a sample of undergraduate and graduate students, of which 54% were found to be level-0, 37.5% level-1, and 8.5% level-2. Camerer (2003) shows that professionals from different domains vary significantly in their average k-levels. Computer scientists and game theorists score on average close to level-4, portfolio managers have a level-k of 2.8 on average, economic PhDs score 2.8 and high school students have an average level-k of 1.6.

Overall, we expect some proportion of the participants to have level-0 reasoning, and that within this group, some participants will exhibit what we term "dominance violation" – providing a response that has a zero chance of winning (i.e. a guess greater than or equal to 50). These dominance violating participants are "extreme" level-0 – they expressly disregard the implied requirement to

[2] In 5.1 we validate this method using two other methods.