A Brief Survey on Rational Choice Models of Polling

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Abstract

This paper reviews some of the recent growing literature on rational choice models of polling. We focus on research branches that address: (i) the strategic incentives of polled citizens to report honestly, when citizens internalize how candidates will use that information to formulate policy, (ii) the possibly adverse welfare effects of public polling, when voting is costly and (iii) strategic platform location, when candidates are asymmetrically-informed about the preferences of voters due to their private polling of voters.

1   Introduction

The last years has seen new contributions to rational choice theory exploring the implications of polling in elections and policy choice of office holders. These papers are motivated by the observation that both electoral candidates and office holders devote substantial resources to gathering information about voters through private polling. Eisinger (2003) finds that since the Roosevelt administration, private polls have been an integral part of the White House modus operandi. Nixon had polls routinely conducted, but did not disclose results even to the Republican National

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Committee; and F.D. Roosevelt described private polling as his "secret weapon" (Eisinger, 2003). President Kennedy famously kept his polling numbers locked away in a safe in his brother's house rather than admit to using them. President Reagan, who is often famously viewed as making policy based mainly on his ideology, polled obsessively, taking polls "prior to his inauguration, while he was being inaugurated, and the day after he was inaugurated"(Green, 2002, 4). The close relationship between President Clinton and his chief pollster, Richard Morris, is an acknowledgement of the importance of polls in determining policy outcomes in that administration. Indeed, Medvic (2001) finds that fully 46 percent of all spending on U.S. Congressional campaigns in 1990 and 1992 was devoted to the hiring of political consultants, primarily political pollsters. In addition, the major parties provide polling services to their candidates. While polls conducted by office-holders and candidates are often kept secret, there is also a vast amount of information gathered by public polls prior to elections or while an office holder is in power.

Recent rational choice models of polling largely consider three distinct lines of research: (i) the strategic behavior of polled citizens, (ii) the adverse effects of public polling, and (iii) strategic platform choice when candidates are privately informed due to their polling.

Strategic behavior of polled citizens. There is a growing literature on the strategic incentives of polled citizens in delivering their responses to pollsters. Morgan and Stocken (2007) study a simple model of information transmission via polling, based on the classic work by Crawford and Sobel (1982) on strategic information transmission. Before choosing a policy that affects all constituents, a policy maker polls a subset of her constituents to obtain information about a payoff relevant state variable. Constituents receive private signals about the state variable, but may choose to misreport their information because in order to influence the policy choice. A tradeoff between truthful revelation in the polls and precision of the polls is uncovered: full revelation can be an equilibrium when relatively few constituents are polled, but as the poll size grows large, full revelation becomes impossible. The paper then investigates whether full information aggregation can arise even when truthful revelation becomes impossible. The paper considers the most informative

equilibria, and finds that full information aggregation can arise in an equilibrium if constituents and the policy maker have similar ideologies. In these equilibria, constituents endogenously sort themselves: moderates answer truthfully while extremists bias their responses to the pollster. If, instead, the policy maker is ideologically isolated, full information aggregation is impossible.

In contrast to Morgan and Stocken (2007), who consider the policy choice of an office-holder, Meirowitz (2005) embeds his analysis of strategic information transmission via polling in a full-fledged model of electoral competition. In addition, he considers the possibility that pollsters report only a summary statistic from polls that ask respondents their preferences. The analysis focuses on settings with a unidimensional policy space, single peaked preferences and two office-seeking candidates. Meirowitz (2005) supposes that all the information received via polling is common knowledge among the candidates. Hence, following Calvert (1985), candidate platforms converge to the median of the distribution of the median policy in the electorate. Meirowitz (2005) confirms Morgan and Stocken's (2007) finding that truthful revelation of information via polling cannot generically occur in equilibrium. However, simple partially-revealing equilibria exist when the poll only asks respondents which party or candidate they prefer. Such equilibria evidently persist when the candidates learn the sample average, or see all the data but ignore all information received beyond the basic ranking of voters between the two parties.

Adverse effects of public polling. The literature on the adverse effects of public polling emerged in an attempt to motivate the bans on release of public polling found in many countries. Goeree and Grosser (2007) and Taylor and Yildirim (2005) study models of costly voting that predict that elections are more likely to be close and voter turnout is more likely to be high when public polling information is released to citizens prior to an election. The models suppose that there are two alternatives, one minoritarian and the other one supported by the majority. When the distribution of preferences is common knowledge among citizens, it is known from Palfrey and Rosenthal (1983, 1985) that costly voting leads to equilibria where the probability that either alternative wins the election is exactly one half. In fact, each voter chooses to participate to the election if and only if

her probability of being pivotal is strictly positive. Thus, equilibrium requires that members of the minority vote with higher frequency in order to compensate exactly for their smaller group size.

Goeree and Grosser (2007) and Taylor and Yildirim (2005) consider a setting where, by contrast, voters' preferences are private information and, ex-ante, each alternative is majoritarian with *equal* probability. They identify two types of inefficiencies that may obtain. First, candidates and/or issues may win elections even though they were preferred by only a minority of the citizens. Second, aggregate voter turnout may be excessive in the sense that too many citizens expend resources in casting votes. They find that in this symmetric setting, each voter votes with the same probability in equilibrium. As a result, the majority is more likely to win the election and expected voter turnout is lower. In fact, when the population is large and voting costs are small, the majority wins with probability arbitrarily close to one in equilibrium. Welfare is, therefore, unambiguously higher when public polls results are not released prior to elections.

Private Polling by Parties. A third line of research explores the strategic platform location of parties that are privately informed about voters' preferences through polling. Bernhardt Duggan and Squintani (2007) formulate and analyze a general model of elections in which candidates receive private signals about voters' preferences prior to committing to political platforms. They fully characterize the unique pure-strategy equilibrium when it exists: After receiving her signal, each candidate locates at the median of the distribution of the median voter's location, conditional on the other candidate receiving the *same* signal. Sufficient conditions for the existence of pure strategy equilibrium are provided. Though the electoral game exhibits discontinuous payoffs for the candidates, Bernhardt Duggan and Squintani (2007) prove that mixed strategy equilibria exist generally, that equilibrium expected payoffs are continuous in the parameters of the model, and that mixed strategy equilibria are upper hemicontinuous. This allows them to study the robustness of the median voter theorem to private information: Pure strategy equilibria may fail to exist in models "close" to the Downsian model, but mixed strategy equilibria must, and they will be "close" to the Downsian equilibrium.

Bernhardt, Duggan and Squintani (2008a) specialize the model of Bernhardt, Duggan and Squintani (2007), to obtain explicit closed form calculations of mixed strategy equilibria, which permits comparative static and welfare analyses. In the essentially unique equilibrium, candidates who receive moderate signals adopt more extreme platforms than their information suggests, but candidates with more extreme signals may moderate their platforms. Policy convergence does not maximize voters' welfare. Although candidates' platforms diverge in equilibrium, they do not do so as much as voters would like. Bernhardt, Duggan and Squintani (2008a) find that the electorate always prefers less correlation in candidate signals, and thus private over public polling. They further find that some noise in the polling technology always raises voters' welfare, which highlights another possible adverse welfare effects of public polling, and the welfare benefits of spending limits.

2 Strategic Information Transmission via Polling

2.1 Morgan and Stocken (2007)

This paper studies how strategic motives affect the information content of polls and, ultimately, policy outcomes. The model is a straightforward modification of the classic piece by Crawford and Sobel (1982) on strategic information transmission. A polity consists of a continuum of individuals, who differ in ideologies. It is commonly known that the policy maker has the median ideology. While the constituents are uninformed about the realized state, each constituent receives a conditionally independent private binary signal that is correlated with the state. The policy maker does not observe the state nor receive a signal about it. However, the policy maker can obtain information about the state by polling voters. Unfortunately, for the policy maker, voters internalize how their responses may influence policy and choose whether to report honestly. In particular, before choosing a policy, the policy maker conducts a poll consisting of a commonly known (finite) sample of the constituents. Each polled constituent simultaneously sends a binary message— the message is pure cheap talk. After learning the results of the poll, the policy maker selects a policy, and payoffs are realized. All agents' utilities satisfy the regularity conditions of Crawford and Sobel (1982):

they are concave in the policy, and single-crossing across policy and state. Agents with different ideologies may be upward-biased or downward biased relative to the median of the constituency, and hence relative to the policy maker.

The main results of the paper are as follows. First, Morgan and Stocken (2007) find that truthful information revelation is an equilibrium if and only if the number of constituents polled is relatively small and the ideology of citizens is relatively homogeneous. Since the size of the poll is relatively small, however, the amount of information the policy maker obtains is limited. As the size of the poll sample grows large, truthful communication ceases to be an equilibrium. Indeed, they show that there is a finite upper bound on the size of a poll for which truthful information revelation is an equilibrium. These results are intuitive: due to the concavity of preferences, a single citizen may find it optimal to truthfully reveal her signal if the information of the policy maker is imprecise, so that her report moves the policy maker's action significantly; and at the same time, prefer to pool her signals according to her ideology bias when the information of the policy maker is very precise, so thather report moves the policy maker's action only by a slight amount. In the first case, in fact, misreporting a signal may move the action beyond the bliss point of the citizen, but this cannot happen when the effect of the report on the action is sufficiently small. In sum, there is a tradeoff between polling precision and truthful revelation: precisely as the sample becomes more informative, truthful revelation ceases to be an equilibrium.

Second, Morgan and Stocken (2007) determine whether polls aggregate information under non truth-telling strategies. They find that it depends on the distribution of ideologies in the polity. When the policy maker is moderate, in the sense that there are sufficiently many upwardly-biased citizens and sufficiently many downwardly-biased citizens, they show that full information aggregation can arise in equilibrium. The citizens polled endogenously sort themselves into centrists, who answer truthfully, and extremists, who pool their answers according to their ideology. As the size of the poll grows large, the fraction of centrists among those polled becomes vanishingly small, because the ideological bounds on centrism converge to the median ideology. However, the number

of centrists grows without bound, so that full information aggregation occurs in the limit.

Third, Morgan and Stocken (2007) show that ignoring strategic motives and using classical statistical inference leads to biased estimators of the state variable as well as a mischaracterization of confidence intervals for the value of the state variable. The authors propose estimators that correct for strategic effects in polls. Finally, the authors show that policy outcomes arising from a poll differ from those obtained when policies are determined by voting, as in a referendum. Suppose that the policy space is constrained to be binary so that meaningful comparisons between the two mechanisms can be undertaken. The authors show that citizens will convey some information when voting in a referendum. In contrast, when policies are determined following a poll it may be impossible for constituents to credibly convey information in any equilibrium.

2.2   Meirowitz (2005)

In contrast to Morgan and Stocken (2007), this paper studies of polling in a complete electoral competition set-up. Candidate positions are strategic variables chosen by candidates after observe polling data. In the model, there is an initial polling stage in which a sample of voters announce their ideal points to a polling service, followed by an electoral stage in which the two candidates learn polling statistics and take policy stances, and finally by a voting stage in which the electorate chooses between the candidates. After learning the polling outcomes, each candidate takes a position on a closed interval of the real line. Voters' preferences are single-peaked and symmetric: hence they vote for the candidate whose platform is closer to their ideal point. The distribution of voter preferences is parametrized in an unknown random variable that represents the distribution's realized median. A randomly chosen finite subset of voters is simultaneously polled. This subset is gathered by an odd number of independent draws from the uniform distribution of voter preferences. Poll respondents simultaneously announce a message. The candidates observe the messages and update their beliefs about the unknown random parameter, and then choose their policy platforms.

Following Calvert (1985), in the equilibrium of the electoral game, the candidates choose the platform that corresponds to the median of the median of the distribution of voter's preferences

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conditional on the polling results. The key general result of this paper is that truthful communication occurs only for non-generic parametrizations of the polling game. The logic of the result is similar to that uncovered by Morgan and Stocken (2007), and relies on single-peakedness and concavity of the citizens' policy preferences. In fact, given that candidate platforms converge to the median of the median of the distribution of voter's preferences conditional on the polling results, the strategic choice in the electoral game can be subsumed into the choice of a single decision-maker (the receiver in the parlance of cheap-talk games). This result is robust to specifications where the candidates only receive a summary statistic of polling results, such as the median of the polled voters' bliss-points.

Meirowitz then proceeds to consider a setting where polls have small message spaces: specifically, poll respondents are asked only which party or candidate they prefer. Evidently, this message space is too small to support truthful equilibria, but Meirowitz finds that partially-revealing perfect Bayesian equilibria exist. One interesting implication of partially revealing equilibria is that the set of people who say they would vote for a particular candidate may not correspond to the set of people who would really vote for the candidate at the election stage. That is, some respondents may misrepresent themselves to try to influence candidate platforms: Specifically, respondents who expect to be unsatisfied with the policy outcome (say a right of center respondent) can manipulate the inferences and policy selections of candidates by lying about their preferences (e.g., claiming to be even more right of center). Hence, as in Morgan and Stocken (2007), naive interpretations of polling statistics is problematic. Finally, Meirowitz (2005) shows that equilibria in this binary message game can be reinterpreted as partially revealing equilibria of games where the polled respondents report their bliss-points and candidates observe either the whole polling data or the sample average. Because the content of information transmission in these equilibria mimics the model where the polled respondents are only asked which party or candidate they favor, these equilibria exhibit stark polarization as all respondents claim to be maximally extreme.

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3   The Perverse Effects of Public Polling

3.1   Goeree and Grosser (2007) and Taylor and Yildirim (2005)

These papers independently highlight possible unpleasant implications of public polling in settings with costly voting. Specifically, they show that the release of public polls can give rise to two types of inefficiency. First, candidates and/or issues may win elections even though they were preferred by only a minority of the citizens. Second, aggregate voter turnout may be excessive in the sense that too many citizens expend resources in casting votes.

In the models by Goeree and Grosser (2007) and Taylor and Yildirim (2005), there are two fixed electoral alternatives, which could represent a referendum or a two-party election with differentiated parties. Citizens possess private valuations over electoral outcomes and voting is costly. These papers contrast two polar informational scenarios. In the first scenario, the distribution of political preferences is common knowledge. In the second scenario, a citizens only knows her own private valuation, and ex-ante each alternative is majoritarian with equal probability. These two polar cases are related to the issue of public polling release: when public polls are released to citizens, their information about each others' preferences is enhanced. In each regime the authors characterize the unique symmetric Bayesian Nash Equilibrium (BNE) in which all citizens randomize between voting for their preferred alternative and abstaining. This equilibrium can be derived also as a pure-strategy equilibrium where voters differ in their voting costs or their intensity of preferences.

If citizens are informed about each others' preferences, then following Palfrey and Rosenthal (1983, 1985), the probability that either alternative wins the election under the mixed-strategy BNE is one-half regardless of the distribution of political preferences or the cost of voting. In fact, each voter chooses to participate to the election if and only if her probability of being pivotal exceeds zero. Thus, equilibrium requires that the members of the minority voting with higher frequency in order to compensate exactly for their smaller group size. The unpleasant implication is that the minoritarian alternative can be adopted with probability one half, resulting in an aggregate utilitarian inefficiency.

If, instead voters do not know each other' preferences, then they cannot base their voting decisions on the distribution of political preferences, since they know only their own types. Because of the common prior over the parameter governing the distribution of tastes is symmetric, all citizens believe their type to be in the majority, and vote with the same probability regardless of type. Because each citizen believes he/she is in the majority, expected equilibrium voter turnout is lower than when citizens know each others' preferences.[1] Furthermore, because each citizen votes with the same probability, the majority group, therefore, wins the election with probability strictly exceeds one-half.

Since many (if not most) important elections involve a large number of potential voters, it is important to understand whether the uninformed-voter setting continues to yield higher welfare in the limit as the number of citizens tends to infinity. In this context, Taylor and Yildirim (2005) show that the equilibrium number of votes for each alternative correspond to independent random variables following Poisson distributions with endogenously determined means. As a result, in the limit as the number of citizens tends to infinity and the relative cost of voting approaches zero, the alternative favored by the majority wins the election with probability arbitrarily close to one when citizens are uninformed of each others' preferences, but only with probability one-half when citizens know the size of the majority and minority supports.

4 Strategic Electoral Platform Choices by Privately Informed Candidates

4.1 Bernhardt, Duggan and Squintani (2007)

Bernhardt, Duggan and Squintani (2007) develop a general model of elections in which candidates receive private polling signals. Each candidate receives a signal drawn from an arbitrary finite set of possible signals about the location of the median voter's ideal policy; each candidate updates about both the location of the median voter and her opponent's platform before choosing a platform from

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[1]This result obviously hinges on the ex-ante symmetric distribution over which outcome is likely to be preferred; it would be worthwhile to investigate the robustness of voter turnout in the generic asymmetric settings, where one outcome is ex-ante more likely to be favored by a majority of voters than another.

the real line; and the candidate whose platform is closest to the median voter wins. Bernhardt, Duggan and Squintani (2007) consider a very general setting, in which there can be arbitrary correlations in the polling signal structure and arbitrary (finite) numbers of signal realizations. The authors consider any family of conditional distributions of the random median policy such that the conditional distributions are continuous with connected supports. While results are given for a baseline model in which candidates have identical polling technologies, the most general results allow candidates to have different polling technologies, as might be expected when an incumbent runs against a challenger. Within this framework, the authors derive the existence and continuity properties of electoral equilibria, and determine the ways in which the classical median voter theorem is and is not robust to the introduction of small amounts of asymmetric information.

The introduction of private polling to the model generates subtle informational incentives for candidates, and logic of the median voter theorem does not extend to the general private-information environment in the expected way. In particular, a candidate does not target the median voter conditional on his own signal. In the symmetric model, there is at most one pure strategy equilibrium: After receiving a signal, a candidate updates the prior distribution of the median voter, *conditioning on both candidates receiving that same signal,* and locates at the median of *that* posterior distribution. In the probabilistic voting model, where candidates have symmetric information, conditioning on one candidate receiving a signal is the same as conditioning on both receiving it, so the traditional probabilistic version of the median voter theorem is obtained as a special case. With private information, however, this paper's result shows that strategic competition leads candidates to take positions that are more extreme than their own estimates of the median voter's ideal policy: Asymmetric information obviously leads to policy divergence, and the strategic effect magnifies the policy divergence already inherent in private information.

The paper gives sufficient conditions for existence of the pure strategy equilibrium, the key being that conditional on a candidate receiving a signal, the probability that the opponent receives a signal weakly to the "left" should exceed the probability that the opponent receives a signal

strictly to the "right," and vice versa. This limits the incentive for a candidate to move away from the equilibrium platform after any signal, and together with other background conditions, it ensures the existence of the pure strategy equilibrium. This key condition is actually necessary for existence in some environments. It becomes quite restrictive, however, when the number of possible signals is large, and it is concluded that the pure strategy equilibrium typically fails to exist in elections with fine polling information. In fact, it is shown that adding arbitrarily small amounts of asymmetric information to the Downsian model can cause the pure strategy equilibrium to cease to exist, highlighting the issue of robustness of the median voter theorem with respect to even small amounts of private information.

These considerations lead one to analyze mixed strategy equilibria. Despite discontinuities inherent in candidate payoffs, it is proved that mixed strategy equilibria exist. Bernhardt, Duggan and Squintani (2007) show that the (unique) mixed strategy equilibrium payoffs vary continuously in the model parameters, and this result implies upper hemicontinuity of equilibrium mixed strategies. Imposing only minimal functional form restrictions, the paper obtains characterization results for mixed-strategy equilibria. The supports of mixed strategy equilibria lie in the interval defined by the smallest and largest conditional medians; this implies the corollary that the equilibrium of the traditional probabilistic voting model is unique within the class of all *mixed* strategy equilibria. Furthermore, it is shown that the only possible atoms of equilibrium mixed strategies are at conditional medians. As a consequence, if there is a positive probability that the candidates converge on the same policy platform in equilibrium, then that platform must belong to the finite set of conditional medians.

Finally, the paper returns to the issue of robustness of the median voter theorem. The paper's continuity results apply to the traditional probabilistic voting model and immediately yield robustness of the probabilistic version of the median voter theorem: When candidate beliefs about the median voter's location are "close" to some common distribution, mixed strategy equilibria must be "close" to the median of that distribution. Furthermore, even though the Downsian model

is marked by fundamental discontinuities, the robustness result extends. Thus, in the Downsian model, the median voter theorem is fragile in terms of pure strategies, but robust in terms of mixed strategies: Mixed strategy equilibria exist and must be close to the median when small amounts of asymmetric information are added to the model. Lastly, the paper gives examples showing the robustness result for the Downsian model relies critically on complete information: It does not extend to general models with discontinuous conditional distributions.

4.2 Bernhardt, Duggan and Squintani (2008a)

This paper specializes the general model of elections in which candidates receive private polling information about voters' preferences developed in Bernhardt, Duggan and Squintani (2007). In Bernhardt, Duggan and Squintani (2008), the median policy is given by $\mu = \alpha + \beta$, where α is independently and uniformly distributed, and candidates receive signals about β, which is symmetrically distributed around the ex-ante median. One interpretation of this median policy decomposition is that voters are unwilling or unable to provide pollsters accurate summaries about all of their views, as is suggested by the empirical work of Gelman and King (1993). Another interpretation is that candidates learn about the position β initially preferred by the median voter, after which electoral preferences may shift by α during the electoral campaign.

The observation in Bernhardt, Duggan and Squintani (2007) that the necessary and sufficient conditions for pure-strategy equilibrium existence are implausible unless there are few possible signals, or unless signals are so precise that the probability that the opponent receives the same signal (rather than just a near-by signal) exceeds one half, lead the authors to prove that, even when a pure strategy equilibrium does not exist, there always exists a unique mixed-strategy equilibrium in which the locations of the candidates follow a strong order with respect to their signals. The authors derive the closed-form solution of this equilibrium and generate several empirical predictions. First, they show that candidates with sufficiently moderate signals adopt their pure strategy equilibrium platforms, locating more extremely than their information suggests, while candidates who receive more and more extreme signals mix over policy positions, tempering their positions

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by more and more toward the ex-ante median policy. This result reflects that a politician whose pollster predicts greater shifts in the median anticipates that she is more likely to compete against an opponent with a more moderate signal, who will take a more moderate platform. The result is broadly consistent with the empirical evidence that candidates' platforms significantly diverge from the median voter's preferred policy, and yet are not too extreme.

The paper then turns to the effect of the statistical properties of the polling technology on equilibrium platforms. It is shown that an increase in the precision of the candidates' signals leads candidates to locate more extremely, in the sense of first order stochastic dominance. This finding is consistent with the concurrent trends of platform polarization (see the NES data as reported in Budge et al., 2001) and technological improvement in polling. The effect of increased signal correlation across candidates (which can be induced by public polling, for example) is ambiguous for candidates with extreme signals, but it unambiguously moderates their locations following moderate signals.

The paper then provides a thorough analysis of the welfare properties of private polling and equilibrium outcomes. The analysis builds on the observation that in a model with office-motivated candidates who share symmetric information on the unknown median policy à la Wittman (1983) or Calvert (1985), candidates' platforms converge to the median of the median policy distribution and do not offer voters enough choice (see Bernhardt, Duggan and Squintani (2008b)). If one were to introduce exogenously a small amount of dispersion in candidate platforms, then each candidate's individual platform would target the median less accurately. Collectively, however, the platform closest to the realized median would generally be more accurate than the median of the median policy distribution. Because candidates care only about winning, they do not internalize this externality. As a result, candidates do not provide enough platform dispersion from the standpoint of the electorate. This paper identifies conditions under which this insight extends endogenously to the asymmetric information setting considered in this paper: Candidates' platforms diverge in equilibrium due to private polling, but not by as much as voters would like.

The welfare analysis then proceeds to show that greater signal correlation makes voters worse off: Correlation reduces both the degree by which candidates "extremize" their platforms given their signals, as well as the probability that candidates receive different signals, choose distinct platforms, and thus provide more variety to the electorate. In contrast, the effect of signal precision on welfare is non-monotonic. Increased polling accuracy raises the probability that candidates correctly identify the median voter's preferred policy, raising the welfare from any one candidate's platform. However, increased polling accuracy also raises the probability that the candidates adopt similar platforms, reducing the choice that candidates give voters. The net effect is that up to some point, raising precision raises welfare, but too much precision has the opposite effect.

These final two results have implications for public policy. First, the electorate prefers private to public polling, because sharing information raises the correlation between candidates' information and adversely reduces platform diversity. This finding provides support for public polling bans that does not rest on claims that public polling may distort elections because of bandwagon effects or effects on voter participation. Second, because greater precision eventually reduces voter welfare, campaign spending caps that limit resources devoted to polling may raise voter welfare, even when campaign advertising is truly informative and beneficial to the electorate.

5 Conclusion

This paper reviews recent contributions to rational choice models of polling in three areas: (i) the strategic incentives of polled citizens to report honestly, when citizens internalize how candidates will use that information to formulate policy, (ii) the possibly adverse welfare effects of public polling, when voting is costly and (iii) strategic platform location, when candidates are asymmetrically-informed about the preferences of voters due to their private polling of voters.

A common theme of this literature is that polling can interact with strategic behavior of agents to confound selection of optimal policies in equilibrium. We saw how polls that convey information to voters can lead to under- or over-participation by voters in elections, participation rates that

are influenced by voter perceptions of the popularity of their positions, and hence to the "wrong" policy sometimes being adopted. We also saw how polls that convey information to candidates can be manipulated by voter responses, again sometimes leading to the wrong policy being adopted; while public public polling can reduce heterogeneity in candidate information sets, which can give rise to too little variety in candidate platforms, and hence implementation of a platform far from the preferred platforms of most voters.

By omission, this literature also highlights exciting and important open issues for future researchers. Two features that these rational choice models of polling have in common are that (i) they are largely static in nature — candidates simultaneously choose policy positions, and (ii) the issue space has a single dimension. One important direction into which to take this research is to investigate how political polling affects the dynamics of political campaigns. How does political polling influence the timing of when incumbent and challenger candidates take positions? And, in both static and dynamic environments with many (perhaps binary) issues, how does polling influence *which* issues candidates choose to take positions on, and which issues do candidates choose to ignore? *what* those positions are? and how do these choices depend on the information that voters start out with about the policy preferences of candidates? We hope soon to uncover the answers to some of these fundamental questions.

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