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PROJECT TITLE
IMPACT OF ELECTORAL REFORMS ON VOTER PARTICIPATION IN BULGARIA AND THE EU (2021-2024)

RESEARCH AREA
POLITICAL SCIENCES
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EVALUATING THE IMPACT OF MACHINE VOTING ON VOTER TURNOUT IN BULGARIA (2021-2023)

INTRODUCTION

Over the past decades, several countries have experimented with new voting technologies, from optical scanners to fully electronic systems to improve access, vote counting and enhance public trust in election results. Concurrently, debates on the intersection of technology and electoral behavior have grown significantly, motivated by controversies such as the 2000 U.S. presidential election recount in Florida, the introduction of e-voting in Estonia, and trials of electronic ballot interfaces in numerous jurisdictions around the world (Alvarez & Hall, 2008). Although the specifics vary by country, the underlying theoretical questions remain consistent: does introducing a new technology reduce or increase the incentives of voting for citizens, and do new technologies significantly modify the overall integrity and fidelity of elections?

From a rationalist perspective, technological innovations simplify the ballot casting process and speedup the waiting times at polling stations, thereby lowering costs, and thus are expected to increase turnout (Aldrich, 1993; Blais, 2006; Downs, 1957; Uhlaner, 1989). Moreover, supporters of e-voting or machine voting in many settings, have claimed that these technologies eliminate opportunities for certain types of manipulation, including ballot-box stuffing and miscounting or invalidation of ballots based on small technical errors in marking voter choices (Beaulieu, 2016; Benabdallah et al., 2022; Pratama & Salabi, 2020). However, the existence of a digital divide implies that introduction of technology in elections inflicts confusion and new forms of inconvenience for members of some affected communities and groups (Norris, 2001; van Dijk, 2019), raising the perceived costs of voting and reducing their willingness to participate. New voting technologies may exacerbate existing inequalities of marginalized minorities, elderly, or rural populations, while younger or urban voters adapt more quickly.

The introduction of these technologies is also frequently associated with compromised public trust in elections and the institutions charged with their administration (Norris, 2002). Doubts about the neutrality or technical competence of election management bodies along with perceived vulnerabilities in voting machines, ranging from hacking to software bugs, can erode confidence in the reported results, thereby reducing overall turnout incentives (Saltman, 2006, pp. 2–8). In a broader sense, these concerns merge with issues of trust in institutions and rule of law in general, which are inversely correlated with electoral participation, especially in transitional or newly consolidated democracies, where the net effect of technologies on electoral integrity is determined by the overall institutional environment and performance (Kostadinova, 2003, pp. 746–748; Rosenstone & Hansen, 1993, pp. 81–104).

In the contexts of post-communist countries in Eastern Europe, persistent clientelistic practices and generalized distrust in political parties and their elites contribute to lower turnout rates, compared to Western democracies. If machine voting systems do not address these root causes, their adoption is unlikely to exert a substantial mobilizing effect on the general voting populations. Therefore, the Bulgarian experience with machine voting presents an intriguing case for empirical examination. On the one hand, if machines are perceived to significantly reduce opportunities for fraud and manipulation of the results, the expected rise of confidence in elections would potentially reflect in higher turnout rates. On the other hand, if general distrust in institutions and structural issues of clientelism and vote-buying remain prevalent, we may observe little to no positive impact.

Our empirical analysis aims to bring more evidence on the effects of machine applications in voting on the public perceptions of accessibility and trust in elections in Bulgaria. Apart from the extent to which voters perceive the machines as technically reliable and secure, their adoption in the broader sociopolitical environment of turmoil, frequent early elections and ongoing allegations of political corruption and manipulation, contextualizes technological innovations in the more fundamental purpose of elections to translate in fair and reliable manner the public preference over policies in the formation of government. The next section briefly summarizes the development of electoral practice in Bulgaria and discusses how contextual factors culminated in the adoption of machine voting in 2021.

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DATA COLLECTION AND WEIGHTING PROCEDURE

The fieldwork of our study was conducted in collaboration with the Laboratory for Electoral Systems and Technologies (LEST) at the Sofia University for the designing and the administration of a face-to-face field survey between April 10 and April 30, 2024. The survey targeted eligible voters (Bulgarian citizens aged eighteen and older), in a national-level representative sample, employing a two-stage cluster random sampling procedure.

At the first stage, we randomly selected polling stations from the official maintained by the Central Electoral Commission to achieve geographic diversity across the thirty-one electoral districts in Bulgaria. We ensured that except for the three electoral districts covering the city of Sofia and the electoral district of the city of Plovdiv, at least two rural and two urban polling station areas were selected per district, stratifying by population density. At the second stage, within each selected polling station's coverage area, interviewers employed random-route procedures with a preset starting points and steps applied in expanding spiral movement to select households. They then used a Kish grid to randomly choose one adult respondent per household. If the selected respondent was unavailable or refused to participate, the interviewer moved on to the next randomly designated household by applying the step. Interviewers were trained to follow a research protocol, including a standardized questionnaire, guidelines, and instructions for reducing potential biases in recording responses.

The final consolidated dataset included 1,699 completed interviews out of approximately 2,780 contact attempts, yielding a response rate of about 61%. Demographic composition of the sample skewed slightly older and female respondents compared to the official population distribution patterns. We corrected these imbalances, which are rather common in field survey research, by performing a conventional post-stratification two-tier weighting procedure to enhance representativeness. Demographic weight: using official data from the National Statistical Institute (NSI), we calibrated the sample according to age (18–29, 30–44, 45–59, 60+), gender (male/female), and district of residence (28 administrative districts, grouped in 6 statistical regions). We then generated an initial set of weights so that weighted proportions of age-sex-region groups matched NSI figures for the voting-eligible population.

EMPIRICAL FINDINGS

To explore how the introduction of machine voting has affected voter perceptions and behavior at the individual level, our survey included questions on direct experience with and evaluation of the technology. The self-reported frequency of machine usage in elections since their large-scale adoption in 2021 shows that more than two-thirds of the voters have at least some familiarities with machines, with about 35% reporting they always or almost always take this opportunity, against 31.5% who have never use it. Regarding conviction in the integrity of machine voting, we registered reasonable ambivalence and skepticism in the opinions, divided between 39% relatively confident against 38.5% rather skeptical and 21% undecided. When asked about the potential advantages of machines (with multiple answers allowed), the most frequently outlined were faster processing of results (60.7%), reduced number of invalid ballots (29.5%) and decreased fraud potential (21%). Only 5.4% were certain there were no benefits at all, and 10.2% preferred not to answer. In terms of main concerns with the technology, risk of hacking or manipulation (41%), technical failures and problems (40.8%) and difficulties for some voters (37.7%) were predominantly shred.

Perceptions and usage of machine voting differ across demographic groups, highlighting potential digital divides and varying degrees of confidence in the electoral process after introduction of the machine voting. Younger respondents (under 30) report higher frequencies of machine usage (57%), but they are also more likely to worry about hacking (over 45% of the under thirty age group selected "Risk of hacking or manipulation" as a concern). A higher share of elderly respondents (60+) report never using a machine (64%) due to suspicions about the technology, difficulties of usage or fear of confusion and error. Respondents with higher education are more confident in machine voting (44%) and more likely to report consistent usage. Most respondents declaring ethnic identity other than Bulgarian either have no opinion or prefer not to answer the questions about confidence and usage in the machines.

STATISTICAL ANALYSIS

The statistical analysis of our survey data tries to provide fine-grained insights into how machine voting factored into electoral participation and voter behavior. We sought to differentiate between two potential influences:

- Direct usage effect: Whether those who used a machine in the previous election were more or less likely to vote in future elections, possibly due to better (or worse) experiences at the polling station.
- Trust effect: Whether those who regard machines as secure, reliable and generally beneficial are more likely to vote in the future, controlling for usage.

The identification of these two distinct channels would potentially move the analysis beyond simplistic dichotomous evaluations of machine voting as either "working" or "failing." We acknowledge that public trust in the institutions of government and the political parties, divergent socioeconomic conditions and personal political efficacy likely remain dominant factors determining turnout levels. Nevertheless, the novelty and potential significance of widespread machine voting in a relatively young democracy merits systematic scrutiny.

Future turnout intention is the dependent variable in our model, operationalized with a question of the likelihood of participation in the upcoming parliamentary election. The question answers are originally recorded on a five-point scale, but for the purpose of the logistic regression are dichotomized as 1 if a respondent answered "Very likely" or "Likely," and 0 for those who answered "Unlikely," "Definitely not," or "Cannot say." Previous machine usage is the first independent variable, operationalized with the question of how frequent the respondent has voted by a machine in the past (1 =(Almost) Alwayas and ,0 = Other). Confidence in machine voting is the second independent variable, registered on a five-point scale in the questionnaire and rescaled to binary for the statistical analysis. To control for omitted variables bias, we incorporated a range of additional predictors that have been identified as correlates of turnout in the literature (Aarts et al., 2005; Franklin, 2004; Wolfinger & Wolfinger, 2008).

Table 1 Likelihood Model of Voting in the Next Parliamentary Elections

Variable	Model 1	Model 2	Model 3
Age (continuous)	1.01 (0.002)***	1.01 (0.002)***	1.01 (0.002)***
Gender (1=Male, 0=Female)	0.93 (0.08)	0.91 (0.08)	0.91 (0.08)
Ethnic Minority (1=Yes, 0=No)	0.91(0.08)*	0.90(0.08)*	0.89 (0.08)*
Higher Education (1=Yes, 0=No)	1.48 (0.12)***	1.44 (0.11)***	1.41 (0.10)***
Urban (1=City, 0=Other)	0.96 (0.08)	0.95 (0.08)	0.95 (0.08)
Past Elections Participation (1=Yes, 0=No)	2.10 (0.19)***	1.95 (0.18)***	1.86 (0.17)***
Trust in Legislature (1=Yes, 0=No)	1.28 (0.04)***	1.27 (0.04)***	1.24 (0.05)***
Vote-Buying Experience (1=Yes, 0=No)	0.91 (0.09)	0.89 (0.09)	0.88 (0.09)
Previous Machine Usage (1=Yes, 0=No)	–	1.15 (0.09)*	1.09 (0.08)
Confidence in Machine Voting (1=Yes, 0=No)	–	–	1.34 (0.10)***
Constant	1.10 (0.25)	1.05 (0.24)	0.94 (0.23)
N	1,699	1,699	1,699
Pseudo R^2	0.19	0.20	0.23

*** Statistically significant at the 1 percent level (two-tailed test).
** Statistically significant at the 5 percent level (two-tailed test).
* Statistically significant at the 10 percent level (two-tailed test).

DISCUSSION

While some supporters of machine voting anticipated that mandatory adoption would automatically raise turnout by lowering the "cost" of voting, our data indicate otherwise. The direct effect of usage on future turnout is modest, a pattern consistent with the argument that simply having used a machine does not guarantee a positive experience or a sense of increased efficacy (Saltman, 2006, pp. 20–21).

By contrast, the strong and statistically robust effect of confidence suggests that positive perceptions of the machines' security and reliability correlate with higher willingness to vote. The effect is relatively large and comparable to the influence of overall political trust, which raises the question of whether confidence in the machines reflects or reinforce a general sense of trust in Bulgarian institutions, or do people who are predisposed to trust government and authority also appreciate the machines better? It is our suspicion that the relationship is partly endogenous. Over time, repeated positive experiences could raise trust, but our cross-sectional design cannot establish such a causal sequence. Future research might leverage panel data or track changes in personal trust in machines across multiple elections.

Lastly, the introduction of machine voting is not likely to solve the longstanding problem of electoral clientelism. Indeed, data from our survey indicate that approximately 28.9% of respondents either personally encountered or knew someone close who encountered attempts at vote-buying or coercion in some form in the last three years. Many of these attempts occur away from polling stations, rendering the technology in the booth moot. Unless pre-election factors are not adequately handled, new technologies could shift, but not eradicate, the operation of clientelistic networks of cooperation between parties, local leaders and marginalized communities. Machine voting might prevent certain forms of ballot tampering, but it is unlikely to deter the broader phenomenon of vote-buying if local patrons or political operatives can still distribute cash or in-kind rewards in exchange for promised support.

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