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ALTRUISM, STRATEGIC VOTING, AND COLLECTIVE DECISION-MAKING: EXPERIMENTAL EVIDENCE FROM PUBLIC CHOICE GAMES

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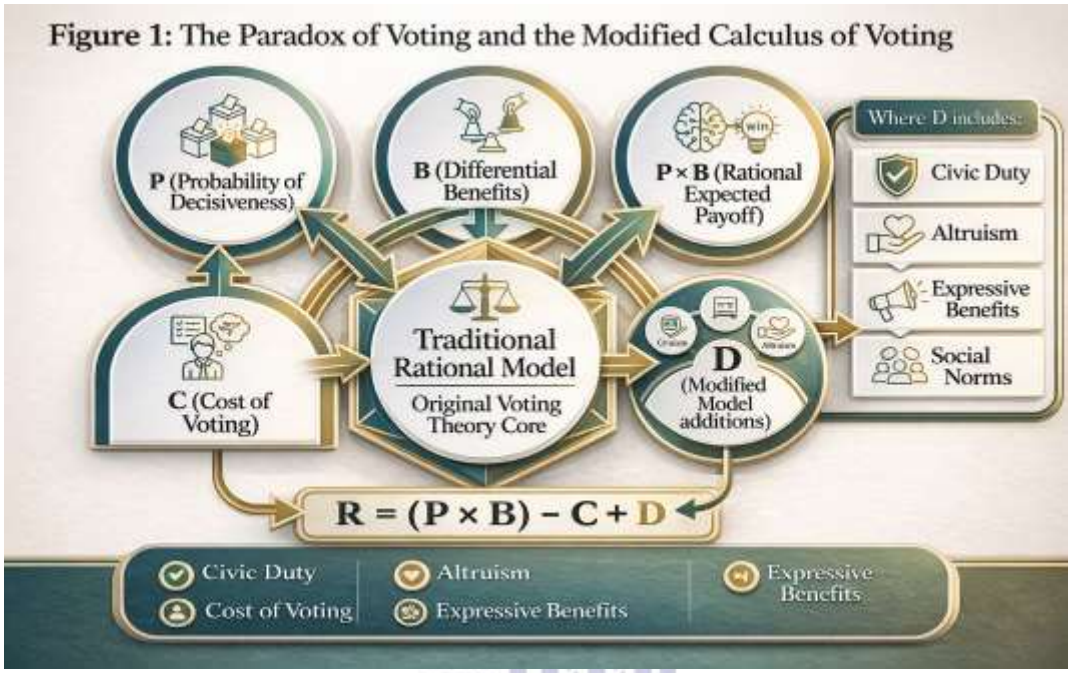
Abstract

The paradox of voting where rational-choice theory predicts near-zero turnout in large elections due to negligible pivotality, yet millions consistently participate has prompted extensive research into the roles of altruism, strategic considerations, and institutional design in collective decision-making. This review synthesizes experimental evidence from laboratory public goods games, voter turnout experiments, and field studies of elections and referenda, alongside insights from neuroeconomics and agent-based modeling. Key findings demonstrate that other-regarding preferences (altruism, inequity aversion, warm-glow giving) significantly elevate turnout even when instrumental benefits are vanishingly small, with dictator-game variants and modified calculus-of-voting models showing altruism accounts for 30–60% of observed participation. Strategic voting sincere vs. tactical behavior, leader-follower dynamics, and coordination under incomplete information further modulates outcomes, particularly in multi-candidate or two-round systems. Institutional features (compulsory voting, expressive benefits, social norms, information provision via networks) interact with intrinsic motives to stabilize cooperative equilibria. Neuroeconomic studies reveal activation in reward and empathy-related brain regions during prosocial voting decisions, while computational simulations highlight how heterogeneous altruism and learning dynamics sustain turnout in large electorates. The synthesis reconciles apparent irrationality with persistent cooperation, underscoring that effective democratic design must harness both self-interest and other-regarding motivations to ensure robust civic engagement.

INTRODUCTION

The foundational inquiry of modern public choice theory centers on the tension between individual rationality and collective welfare. In the classic rational-actor paradigm, citizens are characterized as self-interested utility maximizers who assess the costs and benefits of every action, including participation in political processes (Medema et al., 2013). This framework, however, leads to the well-known "paradox of voting": because the probability of an individual's vote being pivotal in a large-scale election is infinitesimal, the personal cost of voting and information acquisition typically outweighs any expected instrumental benef it (popa et al., 2015). This conflict between theory and reality where millions of citizens consistently participate in elections has catalyzed a robust body of research integrating altruism, strategic behavior, and institutional design into the study of collective decision-making (Gorton et al., 2016) By synthesizing laboratory and field experiments with advancements in neuroeconomics and

computational simulation, researchers have begun to reconcile the apparent irrationality of political participation with the persistent stability of cooperative social structures (Murthy et al., 2022). While classical rational-choice theory predicts minimal turnout in large elections, empirical participation remains substantial. Figure 1 illustrates the paradox of voting and the theoretical modification that incorporates expressive and altruistic motivations.



Theoretical Foundations and the Turnout Paradox

The calculus of voting, originally proposed by Anthony Downs (1957) and later refined by William H. Riker and Peter C. Ordeshook (1968), suggests that a rational citizen will vote only when the expected benefits of voting exceed the associated costs. In the standard decision-theoretic model, the reward from voting (R) is expressed as:

$$R = (P \times B) - C + D$$

In this equation, P represents the probability that a single vote will be decisive (pivotal), B denotes the benefit received if the preferred candidate wins, C represents the costs associated with voting (such as time, effort, or obtaining information), and D refers to non-instrumental motivations such as civic duty, moral satisfaction, or the expressive value of participating in an election (Poupko, 2015).

In large electorates, however, the probability P becomes extremely small, making the term P × B almost negligible. For example, in a close election with approximately 100,000,000 voters, the probability that a single vote will determine the outcome is estimated to be around 0.00008. In less competitive elections, this probability becomes even smaller (Evren, 2012). According to the model, unless the value of D is sufficiently large, most individuals would rationally decide not to vote. This prediction contradicts the relatively high voter turnout observed in many democratic societies, creating what scholars describe as the turnout paradox (Goldberg & Sciarini, 2023).

To address this paradox, more recent theoretical approaches modify the traditional framework by incorporating altruistic motivations into the benefit component. Instead of considering only personal benefits (B_s), voters may also take into account the benefits that their preferred candidate's victory could bring to other individuals (B_o) across the entire society (N)

(Mata López, 2013). Under this social preference model, the benefit term can be expressed as:

$B = B_s + (N \times B_o)$

When the size of the population (N) is very large, even a small level of altruism (B_o) can generate a significant collective benefit that may outweigh the personal cost of voting (C), despite the extremely small value of P (Jankowski, 2019). This modification shifts the interpretation of voting from a purely self-interested decision to a form of socially motivated participation that contributes to collective welfare (Stevens, 2018).

Population Uncertainty and Bayes–Nash Equilibria

The shift from decision-theoretic to game-theoretic approaches has substantially refined the theoretical understanding of voter turnout. Early pivotal-voter models grounded in strict self-interest predict that, under population uncertainty, equilibrium turnout in large electorates should be very low because the probability of being decisive approaches zero (Myerson et al., 1998; Becker et al., 2002). However, subsequent models incorporate weak altruism and incomplete information about the composition of the electorate, generating symmetric Bayesian equilibria in which turnout can remain substantial. In these frameworks, individuals compare their private voting cost with the expected social welfare gain from influencing the collective outcome (Feddersen et al., 2006; Coate et al., 2004).

A central insight of these models concerns uncertainty about the proportion of altruistically motivated voters. When the share of such voters is common knowledge, equilibrium turnout in large elections typically converges toward zero (Sigdyal, 2020). By contrast, when individuals are uncertain about how many others are motivated by civic duty or social preferences, positive turnout levels can persist even in arbitrarily large electorates (Evren, 2012).

Taxonomy of Altruistic Motivations

Experimental evidence highlights a distinction between different forms of altruism, each of which interacts uniquely with collective decision-making processes. The primary categorization divides motivations into pure altruism and impure altruism, the latter of which includes the "warm glow" effect (Van Dijk et al., 2021).

Pure versus Impure Altruism and the Crowd-Out Effect

Pure altruism assumes that individuals derive utility exclusively from the total provision of a public good or from the welfare of its beneficiaries, regardless of who finances it. In this framework, an individual's own contribution and the contributions made by others are perfect substitutes; what matters is the final level of the public good, not personal involvement in producing it (Bergstrom et al., 1986). A central implication of this model is the prediction of "complete crowd-out": if the government or another third party increases its contribution by one unit, a purely altruistic individual will reduce their private contribution by exactly the same amount, leaving total provision unchanged (Warr et al., 1982; Roberts et al., 1984).

Impure altruism, first formalized by Andreoni et al. (1990), challenges this strict substitution logic by proposing that individuals are motivated not only by the total level of the public good but also by a private "warm-glow" benefit derived from the act of giving itself. In this setting, personal contributions and those of others are imperfect substitutes because individuals gain utility from their own participation in addition to the collective outcome. As a result, increases in external funding lead to only partial reductions in private giving producing "incomplete crowd-out" (Andreoni et al., 1990; Andreoni et al., 2006). Experimental evidence from charity settings in which participants were matched with identifiable beneficiaries, such as specific disaster victims, further demonstrates that the magnitude of crowd-out depends on the level of total provision already achieved, reinforcing the empirical relevance of impure altruism models (Eckel et al., 2003; Ribar et al., 2004).

Table 1. Comparison of Pure and Impure Altruism Frameworks: Theoretical Predictions and Experimental Crowd-Out Evidence

Measure	Pure Altruism Framework	Impure Altruism (Warm Glow)
Primary Utility Driver	Total societal output/benefit (Faias & Moreno-García, 2025)	Act of personal contribution + total output (Andreoni, 1989)
Substitute Status	Perfect substitutes (Ottoni-Wilhelm et al., 2017)	Imperfect substitutes (Ottoni-Wilhelm et al., 2017)
Crowd-out Level (Theoretical)	Complete (1.00) (Ottoni-Wilhelm et al., 2017)	Incomplete (<1.00) (Ottoni-Wilhelm et al., 2017)
Experimental Crowd-out (Low Output)	97% (Near Complete) (Ottoni-Wilhelm et al., 2017)	97% (Near Complete) (Ottoni-Wilhelm et al., 2017)
Experimental Crowd-out (High Output)	97% (Near Complete) (Ottoni-Wilhelm et al., 2017)	82% (Significant Drop) (Ottoni-Wilhelm et al., 2017)

The observation that crowd-out decreases as giving-by-others increases provides a direct test of impure altruism. At low levels of provision, donors behave like pure altruists because the social need is acute; however, as the public good becomes more satisfied, the marginal motive shifts toward the private satisfaction of the warm glow, reducing the substitutability of their gift (Ottoni-Wilhelm et al., 2017).

Attitude-Dependent Altruism and Vicarious Utility

A distinct branch of research examines how altruistic behavior is shaped by social identity and shared beliefs. develop a framework in which individuals derive utility not only from material outcomes but also from alignment with others who share their ideological positions (Rueda, 2018). Two core psychological mechanisms underpin this approach: first, individuals exhibit stronger altruistic concern toward those who agree with them; second, personal well-being increases when one's views are socially validated. Within this setting, voting generates "vicarious utility" by affirming the preferences of one's in-group and reinforcing collective identity (Bénabou et al., 2016).

This perspective helps explain why turnout can remain substantial even when the probability of casting a pivotal vote is negligible, and why some individuals support third-party or non-viable candidates. In such cases, the act of voting functions less as an instrument of policy change and more as an expressive or identity-affirming action that signals solidarity with like-minded individuals (Hillman et al., 2010; Grossman et al., 2021).

Recent experimental research further supports this account by demonstrating that altruistic behavior systematically increases toward individuals perceived as similar in beliefs, identity, or group membership (Chen et al., 2022). Controlled laboratory and field experiments show that perceived ideological similarity enhances cooperation, generosity, and prosocial responses. These findings reinforce the idea that turnout and political participation are embedded in broader patterns of identity-based altruism and social affiliation (Curry et al., 2018)

Strategic Voting and Institutional Mechanisms

Strategic voting occurs when a voter casts a ballot for a candidate other than their most preferred one to avoid a worse outcome; this behavior is a cornerstone of multi-person strategic games where the aggregation of preferences is governed by specific institutional rules (Aldrich et al., 2018).

Sincerity, Sophistication, and Voting Rules

Experimental evidence suggests that strategic behavior varies significantly across different voting systems, including plurality rule, approval voting, and the Borda count (Meir et al., 2020). In laboratory settings, plurality rule tends to elicit relatively sophisticated and often sincere responses from voters, whereas experimental subjects under Borda count rules depart from

sincere rankings more frequently indicating higher levels of insincere manipulation; approval voting typically falls between these extremes in its influence on strategic behavior (Forsythe et al., 1996)

Table 2. Comparison of Voting Systems: Sincerity, Strategic Sophistication, and Incidence of Manipulation (Experimental Evidence from Bassi, 2015)

Voting System	Sincerity Levels	Strategic Sophistication	Incidence of Manipulation
Plurality Rule	High (Bassi, 2015)	Very High (Best Response) (Bassi, 2015)	Lowest (Bassi, 2015)
Approval Voting	Intermediate (Bassi, 2015)	Intermediate (Bassi, 2015)	Mild (Bassi, 2015)
Borda Count	Low (Bassi, 2015)	Low (High Error) (Bassi, 2015)	Highest (Bassi, 2015)

Strategic voting is often rationalized using the Quantal Response Equilibrium (QRE) framework, which accounts for the possibility that voters make probabilistically "better" decisions as the stakes the utility differences between candidates increase (Kawai et al., 2009). Experimental evidence further confirms that "Rank-3rd" voters (those whose favorite candidate is trailing in the polls) are the most likely to vote strategically, shifting their support to a more viable second-best option to secure a compromise outcome (Kawai & Watanabe, 2014)

Information and Coordination Dynamics

The availability of information, such as opinion polls or results from previous voting rounds, acts as a powerful coordination device, increasing the likelihood of strategic voting and improving electoral efficiency (Cooperman, 2024). In experimental settings where voters are uninformed, strategic voting occurs at a low rate (approximately 0.05); however, when preference distributions are revealed, this rate rises substantially (to roughly 0.17), and the probability that the plurality-preferred candidate wins increases from about 80 % to over 95 % (Plutowski et al., 2021). In the context of jury voting, the Condorcet Jury Theorem suggests that majority rule can produce highly accurate collective decisions if individual signals are independent (Grofman et al., 1983). However, strategic considerations can undermine this efficiency: if a juror believes their vote is pivotal only when others have received conflicting signals, they may have an incentive to vote against their private information (Arias et al., 2019). Experimental comparisons of simultaneous and sequential jury voting show that although sequential voting theoretically risks "information cascades," where early votes overwhelm later private signals, subjects in sequential settings are generally more likely to reach correct verdicts because early public votes help mitigate the "swing voter's curse" (Feddersen et al., 2009).

Experimental Evidence from Public Choice Games

Public choice research relies heavily on laboratory experiments, particularly Public Goods Games (PGG), to simulate social dilemmas where individual and collective interests diverge (Elsenbroich et al., 2020).

- **Cooperation in Public Goods Games (PGG)**

In a typical PGG, subjects (usually in groups of 4–5) are given tokens to invest in a private or public account. While the public account yields a higher total payoff for the group, the individual return is lower than the private account, creating a dominant strategy of free-riding (Schram, 2002; Ledyard, 1995).

Key experimental findings in PGG include:

- **Initial Altruism:** Contributions start at relatively high levels, typically 40–60% of endowments, suggesting that many participants are not purely self-interested at the outset (Fischbacher, Gächter, & Fehr, 2001).

- **Decay and Reciprocity:** Contributions generally decrease over repeated rounds as participants observe free-riding behavior in others, though they rarely drop to zero (Fehr & Gächter, 2000).
- **Group Size and Scaling:** Contrary to some theoretical predictions that larger groups would suffer from more free-riding, experiments with up to 1,000 players show that cooperation levels are qualitatively similar to those in small groups (Bonroy et al., 2019).
- **Individual Heterogeneity:** Participants can be classified into behavioral types, such as "Trustful," "Optimist," or "Pessimist," which remain stable across different scales of interaction (Fischbacher et al., 2001).

Table 3. Key Factors Affecting Cooperation in Public Goods Games: Experimental Evidence on Repetition, Group Size, Communication, Information, and Punishment

Factor	Effect on Cooperation in PGG	Source
Repetition	Decreases contributions (Decay)	(Lozano et al., 2019; Schram, 2002)
Group Size (N=4 to N=1000)	Qualitatively similar outcomes	(Lozano et al., 2019)
Communication	Increases participation/contributions	(Schram, 2002)
Distributional Info	Stronger impact than simple averages	(Lozano et al., 2019)
Punishment Options	Significantly increases/stabilizes cooperation	(Schram, 2002)

Recent evidence from large-scale digital experiments suggests that the difficulty in large groups lies not in the size itself, but in the efficiency of conveying information. When provided with the *distribution* of others' choices rather than just a group average, participants adjust their behavior more effectively, highlighting information feedback as a primary driver of collective outcomes (Lozano et al., 2019).

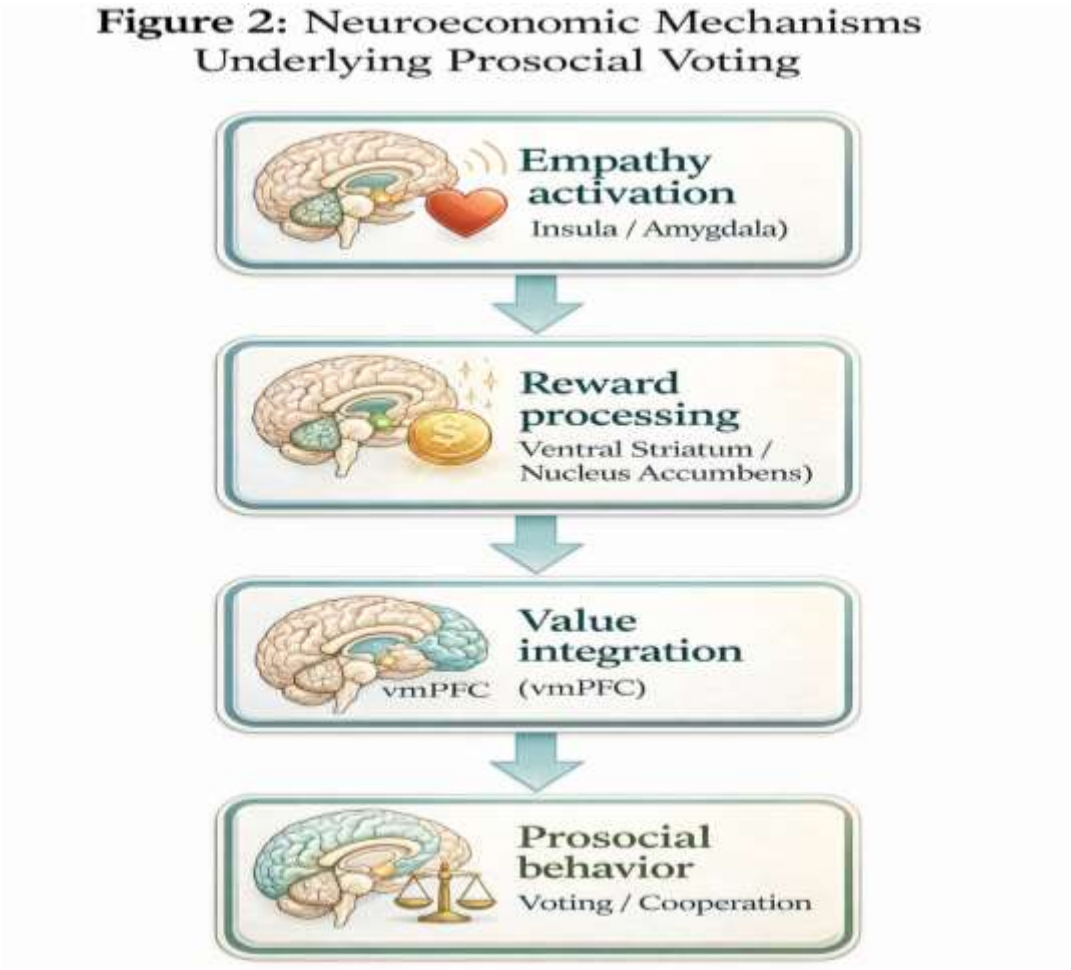
Rule-Choice Stages and Procedural Altruism

An emerging area of study is the "rule-choice" stage, where agents decide on the voting rules before entering a second stage of collective decision-making (Aghion, Alesina, & Trebbi, 2004). This mirrors real-world constitutional processes. Experiments show that if players are not entirely selfish, introducing a rule-choice stage can significantly increase total social welfare (Feld & Tyran, 2002; Tyran & Feld, 2006).

Voters often display "procedural altruism," choosing symmetric, efficient rules even when they could personally benefit from a biased rule. In asymmetric valuation settings, a substantial share of voters is willing to adopt supermajority rules to protect the interests of minorities (Messick & Sentis, 1983). This suggests that individuals value fairness and legitimacy in the decision-making process, not just the outcome, and that collective decision-making is more than a simple aggregate of selfish preferences (Buchanan & Tullock, 1962; Engelmann & Strobel, 2004).

Neuroeconomics: The Biological Substrates of Choice

Neuroeconomics seeks to identify the neural processes underlying decision variables such as value, uncertainty, and social interaction. This field provides a biological foundation for the social preferences observed in public choice experiments (Glimcher & Fehr, 2013; Camerer, Loewenstein, & Prelec, 2005). Recent advances in neuroeconomics provide biological evidence supporting prosocial motivations in collective decision-making. Figure 2 illustrates the neural pathways associated with empathy, reward processing, and voting behavior.



The Role of Empathy and Oxytocin

Collective action often requires costly helping behavior, which is frequently driven by empathy. Empathic concern the emotional response congruent with the welfare of another person is considered a proximate mechanism for altruism (Batson, 1991; Decety & Jackson, 2004). Research has identified the neuropeptide oxytocin as a key physiological driver of this process; increased oxytocin levels are correlated with higher trust and a greater willingness to engage in costly collective action (Kosfeld et al., 2005; Zak, Stanton, & Ahmadi, 2007).

The "arousal: cost-reward" model suggests that awareness of another's need elicits emotional contagion (aversive arousal), which then motivates a cognitive weighing of the costs and benefits of helping (Piliavin, Dovidio, Gaertner,

& Clark, 1981). Altruistic acts provide a "warm glow" utility flow that rewards the individual, potentially processed through the same reward pathways as material gains (Harbaugh, Mayr, & Burghart, 2007).

Neural Correlates of Valuation and Risk

The brain's reward system, particularly the dopaminergic pathways, plays a central role in assigning value to potential outcomes (Arias-Carrión et al., 2010).

Table 4. Key Brain Regions in Value-Based Decision Making and Their Implications for Public Choice and Political Behavior

Brain Region	Functional Role	Implications for Public Choice
Ventromedial Prefrontal Cortex (vmPFC)	Tracks subjective value of rewards/options	Central for comparing political candidates/policies
Ventral Striatum (VS)	Processes reward prediction errors (RPE)	Reinforces voting for successful/popular candidates
Nucleus Accumbens	Alters salience of incentives	Drives motivated behavior in collective goals
Amygdala	Processes risk and emotional responses to uncertainty	Influences behavior in uncertain/close elections
Posterior Parietal Cortex	Linked to trait-like risk behavior	Accounts for individual differences in strategic risk

Dopaminergic neurons in the ventral tegmental area (VTA) project to the nucleus accumbens and are active during the calculation of reward prediction errors the difference between expected and actual rewards. This mechanism allows voters to update their models of future candidate performance or the reliability of their peers' cooperation (Vitay & Hamker, 2014).

Methodological Debates and External Validity

The reliance on laboratory experiments to draw conclusions about societal-scale political behavior has led to a vigorous debate regarding external validity the extent to which results generalized to the real world (Capstick et al., 2015).

The Lab versus Field Controversy

Laboratory experiments offer high internal validity through strict control over variables and random assignment; however, they often rely on "artificial" settings with low stakes and anonymous participants. Critics argue that the "free money" provided in labs does not replicate the lifelong consequences, social stigma, or physical risks associated with field-level political action, such as corruption or revolutionary protest (Dasgupta et al., 2012).

Field experiments, conducted in natural settings, possess higher external validity but suffer from a lack of control. For instance, researchers may be unable to implement random assignment or may face high attrition rates that bias results (Kool et al., 2020). Contemporary perspectives increasingly view the two methodologies as complementary rather than competitive: labs are used to identify general principles and underlying mechanisms the "science view" while field experiments are used to forecast behavior in specific target settings, the "policy view" (Aguinis & Lawal, 2012)

The WEIRD Population Problem

A significant portion of experimental data is derived from "WEIRD" (Western, Educated, Industrialized, Rich, and Democratic) populations, particularly college students. This limits the cultural generalizability of findings, as norms of altruism and fairness can vary drastically across societies (Henrich, Heine, & Norenzayan, 2010).

Research into "lab-sophistication" suggests that experienced subjects may behave differently than unsophisticated ones, often showing less generosity in allocation games (List et al., 2015). However, some institutional studies find that although demographic differences between student pools at different universities are significant, their responses to experimental treatments in crisis bargaining or voting scenarios are remarkably consistent (Boggs et al., 2018).

Future Directions: Digital Simulations and Humanomics

As the field of public choice evolves toward 2026 and beyond, it is increasingly incorporating computational modeling and large-scale

simulation to address the limits of traditional human-subject experiments (Jin et al., 2026).

LLM-Driven Social Simulations

The emergence of simulators like "AgentSociety" allows for the generation of social lives for over 10,000 agents driven by Large Language Models (LLMs) (Piao al., 2025). These simulations can capture intricate dynamics such as the spread of inflammatory messages, polarization, or the effects of universal basic income that are logistically impossible to study in a laboratory (Kapur et al., 2007). By leveraging bottom-up simulations, researchers can observe how large-scale interactions lead to the emergence of social norms and collectives, providing a scalable and replicable framework for studying complex social systems (Lippe et al., 2019).

The Humanomics and Historical Perspectives

The future of public choice also points toward "Humanomics" the integration of economic reasoning with the humanities to understand how ideas and ethics shape institutions (Boettke, 2018). This approach emphasizes that politics is not just about the technical aggregation of preferences but about "politics as exchange," where the institutional environment itself is a product of social contractarianism and historical evolution (McCloskey, 2016).

Table 5. Emerging Research Frontiers in Political Economy and Public Choice (2025–2026): Key Themes and Representative Works

Emerging Research Focus (2025-2026)	Description	Source
Historical Political Economy	Study of how past institutions/events shape current preferences	(Boettke, 2023)
Agent-Based Simulations	Use of AI agents to study emergent collective behavior	(AgentSociety, 2025)
Humanomics	Integrating ethics/ideas into public choice models	(Boettke, 2023)
Digital Transparency	Effects of open data on institutional trust/legitimacy	(Christensen & Lægreid, 2025)
Crisis Management	Political economy of responses to transboundary shocks	(Christensen & Lægreid, 2025)

Conclusion

The persistent gap between rational-choice predictions of mass abstention and the empirical reality of widespread electoral participation is largely resolved by integrating altruism and strategic sophistication into models of collective choice. Experimental evidence consistently shows that other-regarding preferences whether pure altruism, warm-glow motives, or inequity aversion provide a powerful intrinsic incentive to vote, often outweighing the negligible instrumental benefit in large electorates. Strategic considerations, including tactical voting, leader bias, and network-driven coordination, further shape behavior, especially in multi-option or high-stakes settings. Institutional levers such as compulsory rules, expressive voting benefits, social-norm enforcement, and targeted information campaigns can amplify these motives, stabilizing turnout and enhancing accountability. Neuroeconomic and computational approaches reinforce that voting is rarely a purely calculative act; it frequently engages empathy, reward circuitry, and heuristic learning that sustain cooperation even under unfavorable cost-benefit ratios. For democratic theory and practice, the implication is clear: effective electoral systems should not assume purely self-interested actors but should actively cultivate and channel prosocial predispositions through design features that lower participation

costs, reinforce norms, and signal collective efficacy. Future research should prioritize longitudinal field experiments, cross-cultural comparisons, and hybrid models that jointly capture heterogeneity in altruism, strategic depth, and contextual moderators to refine predictions and inform policies aimed at strengthening civic engagement in an era of declining trust and rising polarization.

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