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A NEW SOLUTION TO THE RATIONAL VOTER PARADOX

ABSTRACT
The rational voter paradox suggests that there is no incentive for a rational individual to vote if the expected benefits are outweighed by the costs. However, the probability of an individual vote deciding the outcome of an election is typically small, making the expected benefits negligible. In response to the paradox, this paper proposes a novel solution based on Goldman's causal responsibility approach, which asserts that voters make a partial causal contribution to the electoral outcome even if their vote is not decisive. The paper integrates the logic of Condorcet's jury theorem into the causal responsibility approach, arguing that this leads to solving the rational voter paradox.

KEYWORDS
rationality, causal responsibility, democratic decision-making, Condorcet's jury theorem, normative reasons for voting

Introduction

The rational voter paradox suggests that there is no incentive for a rational individual to vote if the expected benefits are outweighed by the costs. However, the probability of an individual vote deciding the outcome of an election is typically small, making the expected benefits negligible. In response to the paradox, this paper proposes a novel solution based on Goldman's causal responsibility approach, which asserts that voters make a partial causal contribution to the electoral outcome even if their vote is not decisive. The paper integrates the logic of Condorcet's jury theorem into the causal responsibility approach, arguing that this leads to solving the rational voter paradox.

The introduction is followed by four parts. In the first part of the paper, we examine the rational voter paradox and some traditional solutions to it. Despite their differences, those solutions share the common feature of adding some morally relevant factors as a reason to vote. In contrast to this superficial inclusion of moral reasons, we turn to Goldman's theory, which distinguishes

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between moral and prudential reasons to vote. The second part of the paper focuses on Condorcet's jury theorem and its relationship to democratic theory. We present the original conditions and results of the theorem and then relax those conditions to better reflect democratic decision-making. In the third part of the paper, we demonstrate the compatibility of Condorcet's jury theorem with the causal responsibility approach. We explain why the theorem is the most suitable logical foundation for the causal responsibility approach and, finally, provide a solution to the rational voter paradox by combining the two. In the final part, we explore several objections to both the causal responsibility approach and the jury theorem that could challenge our findings and we conclude that they do not undermine our main results.

The Rational Voter Paradox and Some Escape Routes

The origin of the rational voter paradox can be traced back to Downs's economic theory of democracy (Downs 1957). The basic assumptions of the economic theory of democracy are that all voters are rational, and that they are rational in the sense of advancing their self-interest. Actually, Downs presupposes the conception of instrumental rationality in which persons will use the least of scarce resources as a means to further their aims. So, on this view, an integral part of instrumental rationality is cost/benefit analysis. To avoid further discussion on the nature of aims, it is simply presupposed within the economic theory of democracy that persons will further their self-interest. On Downs's view, the benefits of voting (B) can be given numerical value by calculating the utility that someone derives if the preferred party wins the election (i.e., by calculating the party differential, which assigns some measure of utility to each party or option). However, instrumentally rational voters will also have to take into account the costs of voting (C), which are mainly seen as opportunity costs (related to time spent on voting and becoming informed about the elections). Finally, in conditions of uncertainty, voters will also have to take into account the probability (p) that their vote will be decisive, that is, they will have to calculate the expected utility of voting. According to the economic theory of democracy, a rational voter will vote if and only if:

(1) $pB > C$

Downs also assumes that "any citizen is rational in regard to elections if his actions enable him to play his part in selecting a government efficiently" (Downs 1957: 24). But, according to Downs, when numerical values are added to the expected utility calculus, the prospect of a citizen playing this role becomes quite bleak. If it is expected that the number of voters will be large (as in most elections), this greatly diminishes the probability p that someone's vote will be pivotal, which in turn diminishes the benefit side of the calculus of voting. Since the benefits of voting in that case are very small, the costs of voting that are not that minuscule might outweigh the benefits. If voters are

instrumentally rational and base their voting decisions on the calculus of voting that maximizes expected utility, they will decide not to vote at all. As we have seen, it is presupposed that citizens ought to vote due to playing a part "in selecting a government efficiently". But the expected utility calculus tells the very same citizens that they ought not to vote because voting will contribute nothing to furthering their self-interest. Hence, we arrive at the rational voter paradox.

From the same line of reasoning, Downs derived the further conclusion that it will not be instrumentally rational for citizens to be well-informed about how to vote correctly. If a single vote doesn't add much to the result of the election, why bother to gather information on how to vote? A very small probability that someone's vote will be decisive thus influences the motivation not to be well-informed. On the basis of the previous analysis, Downs concluded that "rational ignorance" will prevail in a society of rational voters (Downs 1957: 244–245).

Some of the main routes to solve the rational voter paradox are to realize that the informational basis of the calculus of voting is not rich enough and, consequently, to add further assumptions. Riker and Ordeshook were the first to propose that adding the assumption of citizens' duty to vote (D) might dissolve the rational voter paradox since the satisfaction of fulfilling this duty might outweigh the costs of voting (Riker and Ordeshook 1968). On their proposal, the expected utility calculus should be modified in the following way:

(2) $pB + D > C$

Another way to solve the paradox is to take into account benefits that might accrue to all other citizens. In the spirit of this proposal, Edlin, Gelman, and Kaplan refined the calculus of voting to include benefit to other people or society as a whole (Edlin, Gelman, and Kaplan 2007: 296):

(3) $p(B_{ind} + \alpha NB_{soc}) > C$

In this version of the calculus of voting, αNB_{soc} includes the utility of all other citizens (represented by N), reduced by the factor α which indicates the relative importance of B_{ind} for each voter.

On yet another rendering of the calculus of voting, expressive returns are added rather than duty or altruistic motivation. On this view, a difference is drawn between instrumental rationality that is relevant in the context of the market and expressive rationality that is relevant in the context of democracy (Brennan and Lomasky 1993). In contrast to the market context, where each consumer is decisive, no voter is decisive in the context of democracy. However, for precisely that reason, voters can derive utility simply from enjoying supporting candidates or parties they prefer. In other words, while the value of the B term remains very small, the benefit side of the voting calculus can increase dramatically with expressive returns (satisfaction that someone derives from supporting their preferred political option), which in turn contributes to

solving the rational voter paradox. When expressive returns (*E*) are added, the calculus of voting has the following form:

(4) $pB + E > C$

Obviously, there are differences between proposals (2), (3), and (4) in solving the rational voter paradox. Nevertheless, each of the proposals can be criticized for assuming that some morally relevant considerations should be included in the calculus of voting that maximizes expected utility. For that reason, a generalized objection to (2), (3), and (4) can be made, namely, if morally relevant features are doing most of the work in solving the rational voter paradox, why not divorce them from the calculus of voting that maximizes expected utility? It looks like they are exogenously added to the economic theory of democracy simply to solve the paradox. But once their importance is realized, it seems reasonable to presuppose that the logic of voting need not be necessarily based on the calculus of voting that maximizes expected utility and its related logic of decisiveness. On this view, another logic might be more appropriate for solving the rational voter paradox.

For that reason, we now turn to Goldman's account of the duty to vote, which is based on moral considerations that are independent of the calculus of voting and its logic of decisiveness (Goldman 2002). The view that he calls "the causal responsibility approach" is mainly focused on *moral reasons* why someone should vote. Goldman draws a difference between the *prudential sense* and the *moral (or quasi-moral) sense* of why one should vote (Goldman 2002: 267). One of the main characteristics of the moral (or quasi-moral) reasons for voting is that, unlike prudential reasons, they are not based on self-interest. Although, on Goldman's view, moral and prudential considerations are not mutually exclusive, it is obvious that these two considerations are independent of each other. Since moral considerations are divorced from prudential considerations from the outset, this also means that they need not be necessarily included in the calculus of voting that is tied to the logic of decisiveness.[1]

1 Goldman introduces two main characteristics of the causal responsibility approach in the following way: "The first claim of the causal responsibility approach is that a voter can make a partial causal contribution toward the election of a given candidate even if he is not a swing or decisive voter. Even a non-swing voter can *help* elect a winner. Second, voting in favor of the actual winner counts as a greater causal contribution to her election than merely abstaining. Thus, if the election of a given candidate would be a (socially) *good* outcome, a person can earn more "credit" by helping to produce that outcome than by sitting on the sidelines. Conversely, if an election might result in a *bad* candidate being chosen, potential voters who sit on the sidelines may not escape partial blame for that possible outcome, should it occur. They could contribute (more) toward the defeat of that candidate by voting for a rival; and their failure to do so may carry with it some culpability or blameworthiness. They do not avert such blameworthiness or culpability simply because their vote would not have been a decisive, or swing, vote. So potential voters should vote either to help produce a good outcome or to avoid a bad one." (Goldman 2002: 269)

In the rest of this section, we will explain the *causal* and *moral* (or *quasi-moral*) components of the causal responsibility approach. But first we need an explanation of the difference between moral and quasi-moral credit or blame. Goldman explains this difference in the following way. If one of the candidates is morally better, those who voted for the candidate can earn moral credit (or alternatively moral blame if they abstained, and a bad candidate wins). If neither candidate is morally better, but one of them is more competent, then credit or blame can be ascribed to voters in a quasi-moral sense. In the third section, we will turn to epistemic considerations that are relevant to the logic of voting that is, on our view, most appropriate for the causal responsibility approach.

In the prudential sense of why a person should vote, causal influence is exerted only if someone's vote is decisive. However, this need not be the case with the causal responsibility approach. When some candidate or party wins the election, it can be said that each of those who voted for the winning party or candidate had at least some causal influence (however small that influence might be). So, Goldman is mainly interested in causality that he calls "*partial* causation, or *contributory* causation, or causal *influence*", which need not be full causality (Goldman 2002: 271). He gives the following example in order to illustrate the main point. Imagine that ten friends help someone to free a car out of a snowbank. Let's suppose also that three are sufficient to push it out of the snowbank. On the logic of decisiveness, no more than three pushes that are both necessary and sufficient can count as causal influences on the outcome. Quite the contrary, on the causal responsibility approach, each of the pushes "exerts *some* causal influence, and each deserves some degree of credit and thanks, which are presumably predicated on [...] partial causal responsibility" (Goldman 2002: 271). And the same goes for voting because voters can exert causal influence even when they are not pivotal.

However, not just any kind of voting that contributes to the winning party or option gives moral reasons for voting on the causal responsibility approach. Voters can earn some moral credit not just due to their causal influence, but also because they voted for the morally better option or candidate. For the same reason, they can be blamed for staying at home rather than voting when a bad candidate is elected. In a nutshell, the duty to vote is based on the possibility of both causal influence and moral credit if the better candidate wins and moral blame if someone abstains, and the bad candidate wins. According to the causal responsibility approach, this creates a moral reason for why someone should vote.[2]

2 One important question is where this moral credit or blame comes from. As we understand his position, Goldman thinks that such moral credit or blame can be both *non-relational* and *relational*. It can be non-relational in the sense that "the voter attains a certain (quasi-) moral status, whether or not anybody else knows about this status or does anything about it" (Goldman 2002: 278–279). However, it can also be relational if moral credit or blame comes from other people. Of course, in that case, other people must be aware of someone's voting (or non-voting) behavior. Although on Goldman's view relational moral credit or blame is not necessary for the moral duty to vote, it can

Goldman maintains that the causal responsibility approach has both a *normative* and an *explanatory* dimension. To be sure, the causal responsibility approach mostly addresses the normative dimension of the duty to vote. Goldman emphasizes that he wants to "offer normatively sound reasons for voting, however successful or unsuccessful these reasons might be in motivational terms" (Goldman 2002: 279). Nevertheless, he also says that he is "tempted to speculate that the reason so many people *do* vote, as a matter of fact, is precisely because of their grasp of the rationale offered here, including their grasp of the 'contributing cause' role that their voting occupies within the system" (Goldman 2002: 281). So, according to Goldman, the causal responsibility approach can explain why people both *should* and *do* vote. For that reason, it can be considered a better alternative to the economic theory of democracy, which leads to the rational voter paradox and subsequently runs into the problem of explaining why people do in fact vote.

To summarize our analysis so far. We proposed that divorcing moral considerations from the voting calculus that maximizes expected utility and looking for a more appropriate logical foundation might be a better strategy to solve the rational voter paradox. In the light of this proposal, we examined Goldman's causal responsibility approach, which focuses on moral reasons for the duty to vote that are independent of the calculus of voting and prudential reasons. However, since the main purpose of the causal responsibility approach is to explain why someone should vote, it doesn't by itself offer a solution to the rational voter paradox and the related problem of rational ignorance. In the rest of the paper, we argue that it is possible to offer an adequate solution to the rational voter paradox (and the rational ignorance problem) by building on the foundations of the causal responsibility approach.

While we accept the causal responsibility approach as the conceptual framework for our solution, we identify here one shortcoming of this approach that our proposal will try to remedy. On our view, it does not suffice for a solution to the rational voter paradox to argue that the calculus of voting that maximizes expected utility is inadequate; a more adequate logic of voting must also be offered. Although Goldman offers a formal analysis that illustrates how various views on causation are related to the causal responsibility approach, he doesn't formulate its logic. He even claims that the causal responsibility approach, which initially works as divorced from the calculus of voting, might be compatible with it. We think that the better route to solve the rational voter paradox is to search for a logic that supports the causal responsibility approach that is independent of the calculus of voting tied to maximizing expected utility.

Our main argument in this paper is that the logic of Condorcet's Jury Theorem (CJT) is the most promising candidate for both formally grounding the causal responsibility approach and offering a solution to the rational voter

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figure in explaining why someone votes. So, by understanding what causal responsibility implies, someone might not only have a moral reason for voting, but also acquire motivation to vote.

paradox on the premises of said approach.[3] Since there is widespread skepticism concerning the application of the CJT to democratic decision-making, our main aim in the next section will be to show why the CJT might be a useful formal tool in the context of democracy.

Condorcet's Jury Theorem and Democratic Decision-Making

In this part of the paper, we introduce Condorcet's Jury Theorem and its connections to democratic theory. However, the original form of the CJT rests on some quite restrictive assumptions, and it is uncertain whether they are ever satisfied in reality. Even though many authors claim that the CJT can be applied to model democratic decision-making, some reject the theorem precisely for its strong initial assumptions. This is why much of the literature on the CJT focuses on various means of weakening the conditions present in its original form.

Formally, the theorem may be stated in the following way (Miller 1986; Owen et al. 1989; Goodin and Spiekermann 2018). There are n voters,[4] each with a probability p of voting correctly on a given matter, where p is a number between 0 and 1. This probability is called *individual competence*. Let m be a majority of n voters (defined as $(n+1)/2$). Then the *group competence* (i.e., the probability that a group of n voters who make their decision by majority rule would choose the correct outcome) can be calculated in this way:

$$(5)\quad P_n = \sum_{i=m}^{n} \binom{n}{i} p^i (1-p)^{n-i}$$

From here, two results follow.[5] A non-asymptotic result of the CJT states that a majority of a larger group of voters is more likely to be correct than a majority of a smaller group of voters, provided that individual voters are more likely to vote for the correct option rather than the incorrect one (Goodin and Spiekermann 2018: 19):

(6) For every n and p such that : $0.5 < p < 1 : P_{n+2} > P_n$

The asymptotic result is that the probability that a majority of voters is correct converges to 1 when the number of voters tends to infinity (Goodin and Spiekermann 2018: 20):

(7) For every n and p such that : $0.5 < p < 1 : \lim_{n\to\infty} P_n \to 1$

3 It is noteworthy that Goldman considers the role of the CJT in social epistemology in some of his works. While in Goldman (1999) he is more skeptical about its role, in Goldman (2014) he sees it as the major support for social process reliabilism. However, he doesn't consider the CJT in the context of the causal responsibility approach to voting.

4 For simplicity, n is usually taken to be an odd number.

5 A straightforward proof of the CJT can be found in Estlund (1994: 134–137).

Even if individual competence is *barely* larger than 0.5, a large enough number of voters will make a group competence (almost) completely infallible.[6] Thus, the "law of large numbers" lies at the core of the CJT. Many authors have suggested that the CJT can be applied to political decision-making and that it provides an epistemic argument for democracy (e.g., Cohen 1986; Landemore 2013; Goodin and Spiekermann 2018). Nevertheless, the promising result of the CJT rests on some fairly demanding assumptions. We opt to present them in the following way:

1) *Competence condition: the probability that a single voter would choose the correct option is larger than 0.5.* This condition ensures the optimistic result of the CJT. If it fails to be satisfied, group competence decreases when more voters are added. This is because the theorem works in reverse, too. In cases where individual competence is lower than 0.5, group competence rapidly converges to 0 as the number of voters increases (Owen et al. 1989: 2).

2) *Homogeneity condition: the competence of all voters is identical to one another.* The classic form of the CJT assumes homogeneous groups of voters. Interestingly enough, Condorcet may not have introduced this condition solely for reasons of simplicity. He held the view that when a country has progressed through enlightenment, there appears "a great equality between minds" in terms of their ability to judge the truth (Condorcet 1976: 51). Thus, according to some interpretations (see: Goodin and Spiekermann 2018: 24), he believed this condition could be met in reality, but most later commenters doubted it.

3) *Binary choice condition: the decision is made between the two options.* In Condorcet's original example, there were only two options: the correct one and the false one. Since Condorcet was primarily interested in the jury problem (i.e., what is the ideal size of the jury and does its decision require unanimity; Condorcet 1976: 36), he went with the view that the jury usually has to reach one of two verdicts. However, his subsequent theory of elections was, at least ostensibly, an attempt to apply the same findings to multiple-choice situations (Black 1998: 196).

4) Independence condition: voters make their choice independently of one another. The theorem assumes that the chance that two voters are both correct is calculated as the probability that the first voter is correct *times* the probability that the second voter is correct. This presupposes that these two events are mutually independent. If, however, some voters choose the same option as one particular voter (an "opinion leader"), their votes are no longer independent (Estlund 1994). For example, if we conceive a group composed entirely of voters who follow a single opinion leader, then the competence of such a group will be *equal* to that of an opinion leader, regardless of its size.

6 For example, a group whose members have an individual competence of 0.6 needs only 250 voters to reach correct decisions with near certainty. And if we conceive a group where every voter has a competence of only 0.505, a million of such voters would still tend to make correct decisions at an almost certain rate (see Miller 1986: 176 and Grofman 1978: 50 for tables of selected values of n and p).

These assumptions are either quite demanding or fairly unrealistic. Some of them are rarely (if ever) met in real-world political decision-making, let alone all of them simultaneously. For this reason, each of these assumptions is used to express general skepticism about the prospects of applying the CJT to democratic decisions. David Estlund argues that citizens can easily be "dumber than a coin flip" due to many systematically wrong views they hold (Estlund 2008: 16). Interestingly enough, Condorcet himself believed that large assemblies of citizens fail to satisfy the competence condition, as they tend to combine ignorance with prejudices (Condorcet 1976: 50). Elizabeth Anderson, in turn, rejects the CJT for its assumptions of homogeneity and independence. She claims that, due to these conditions, the CJT fails to capture two constituent features of democracy: diversity and discussion. Anderson argues that the epistemic argument for democracy rests on the epistemic diversity of voters and that Condorcet's original assumption of homogeneity goes directly against such an argument. Democracy is expected to solve complex problems, and thus democratic decisions can variously affect persons who differ in their age, gender, education, occupation, economic status, etc. Since voters are most likely to recognize the effects that democratic decisions would have on those groups to which they belong, the idea of homogenous voters is not only unrealistic but potentially harmful to democracy. The same goes for the assumption of independence which, according to Anderson, puts the two democratic ways of information pooling, voting and talking, against one another (Anderson 2006: 11).

Lastly, the binary choice condition is the obvious drawback in applying the CJT to democratic decisions. Even though sometimes, like in the cases of run-off rounds of elections or in referenda, citizens are indeed facing only two options, it is much more common for real-world political decisions to involve more than two options (Goodin and Spiekermann 2018: 26). And even when the political choice is actually presented as binary, it is usually preceded by some political mechanism which narrowed the possible options/solutions/candidates to a single pair. A binary choice is thus only a final stage of a much more complex process (Estlund 2008: 226–227), which makes the applicability of the CJT to real-world democracy exceedingly limited (Farrelly 2012: 14–15).

Although the prospects of applying the CJT to democratic decision-making may seem bleak, there are various extensions and adjustments of the theorem that manage to modify or relax these conditions, while still keeping the theorem's rationale intact. Three of them are particularly important for the democratic interpretation of the CJT.

1. *Average competence*. Even though the original form of the CJT presupposes the homogenous groups of voters, the general results hold if we abandon the assumption of identical voters' competence and instead introduce their average competence as a substitute in a formula.[7] This modification affects two conditions present in the classical form of the CJT. The modified theorem permits the heterogeneous group of voters, but it also allows that some voters may

7 This result is proven by Grofman et al. (1982).

individually fail to satisfy the competence condition – as long as the average competence is above the threshold line. The interesting result of this modification is that two of Condorcet's original three statements are no longer necessarily true (Nitzan and Paroush 2017: 496–497). In his *Essay on the Application of Mathematics to the Theory of Decision-Making* (1976 [1785]), Condorcet made the following tripartite statement (Nitzan and Paroush 2017: 495): 1) The probability that a group of voters would collectively make the correct decision is higher than the probability that any single voter makes that decision, 2) The advantage of the group over the single voter's performance increases with the number of voters in the group, and 3) The probability that a group makes a correct decision tends to one when the number of voters tends to infinity; i.e., with an infinite number of voters, there is a complete certainty that the group decision is correct. In certain cases, when the number of voters is relatively small, the group competence may be lower than the competence of its most capable members. It is also possible that the addition of some less competent members can lower the group competence, despite the average competence still being larger than 0.5. (Nitzan and Paroush 2017: 497). Nevertheless, it is Condorcet's third statement that remains intact. Even though certain small heterogeneous groups can yield some peculiar results, if we keep adding new voters to the group, the group competence would start converging to 1, provided that the average competence is kept above the threshold of 0.5. As the group grows, even the most competent members would be eventually surpassed by the judgment of a group as a whole. Thus, under this modification of the theorem, both non-asymptotic and asymptotic results still hold with *large enough numbers* (Goodin and Spiekermann 2018: 24–25). However, this is all that is needed for a democratic interpretation of the CJT, since such an interpretation usually assumes large groups of voters anyway. Therefore, an extension of the CJT which allows heterogeneous voters, who on average satisfy the competence condition, can simultaneously bring the CJT assumptions closer to real-world conditions *and* make it more apt for modeling democratic decision-making.

2. *Multiple options extension.* To successfully link the CJT to democracy, it is crucial to relax the binary choice condition as well. There are two relatively well-known ways of doing so. The first one is proposed by Condorcet himself, as he was aware that choosing between only two options is not always feasible. He suggested that, whenever it is possible, a more complex choice should be broken down into simple propositions, such that it is possible to judge them two by two. For situations in which this is not an option, Condorcet proposed his method of pairwise comparison (Condorcet 1976: 52–53). However, in cases with a large number of options, this method can be rather cumbersome and impractical for real-world decision-making (not to mention that it led Condorcet to discover the paradox named after him). In more modest settings, however, it can be a viable way of extending the CJT to three or more options. Another solution is famously advanced by Christian List and Robert Goodin (2001).[8]

8 The general idea is introduced by Grofman (1978: 51).

They claim that nothing in the theorem itself actually presupposes a binary choice. The CJT result can be naturally extended to a number of k options if the majority rule is replaced by the plurality rule. Moreover, the average competence of above 0.5 is also no longer a necessity, since it is the competence of above $1/k$ which is required for the optimistic result of the CJT. An advantageous feature of the plurality rule is that it avoids voting cycles that plague Condorcet's method of pairwise comparison (Goodin and Spiekermann 2018: 27). The apparent drawback of this extension is that when there is a large number of options, the group competence does not rise *as quickly as* in cases with two options. But it nevertheless reaches near certainty when the group becomes sufficiently large. We do not wish to claim that one way of extending the CJT to more than two options is superior to the other, as both have distinct advantages and disadvantages;[9] our aim was to point out that *there are* ways of applying the CJT to multiple-options situations, which makes the theorem applicable to various forms of democratic decision-making.

3. *Reexamining independence.* If we accept the proposed revisions of the CJT, an important question remains: how can we be sure that the average competence of citizens is large enough? Condorcet's answer was that we cannot be sure, and must therefore severely limit the questions that are put before a popular vote. On the other hand, some authors believe that a healthy dose of discussion among citizens prior to voting can enhance their individual capabilities and make them sufficiently competent (Goodin and Spiekermann 2018). Although such a proposal seems to directly clash with the CJT's independence condition, this is not necessarily the case.

It is wrong to assume that independence simply means a lack of interaction. Such an interpretation is wrong for two reasons (Goodin and Spiekermann 2018: 68). First, it would treat any group of voters who do not interact directly as statistically independent, even if all those voters follow the same opinion leader who does not participate in the voting process. Second, it would treat beneficial forms of interaction as a violation of an independence condition. However, discussion among citizens can enhance voters' competence without undermining the said condition (Estlund 2008). If the average competence in a group is lower than the required threshold, the group will likely include some individuals whose competence is significantly higher. Those individuals may be positioned to persuade those who are less competent to see the error of their ways and abandon their prejudices. The only sort of interaction that violates the independence condition is the one where citizen A votes for a certain option *just because* citizen B does so. But interactions that go along the lines of "Don't just vote the way I do, make up your own mind" (Goodin and Spiekermann 2018: 68) do not make the votes dependent on one another. Therefore, nothing in the CJT presupposes the lack of discussion; on the contrary, discussion can be understood as an inherently beneficial process in the CJT framework.

9 See Estlund (2008: 227–230) for a critique of List and Goodin's proposal.

How to Solve the Rational Voter Paradox

After establishing the relevance of the CJT to democratic decision-making, in this section, we demonstrate how integrating the logic of the CJT into the causal responsibility approach leads to solving the rational voter paradox. Our argument is in three steps. First, we show how the CJT can be integrated into the causal responsibility approach. Second, we argue that the CJT can be understood as the most appropriate logical foundation of the causal responsibility approach. We show that the compatibility of the CJT with the causal responsibility approach applies to both its basic version and its various extensions. This also includes compatibility with asymptotic and non-asymptotic results of the CJT. Finally, we offer a solution to the rational voter paradox based on the synergy between the causal responsibility approach and the CJT. In the next section, we will also examine several objections to the causal responsibility approach and the CJT that might affect our solutions. We conclude that none of them undermines our basic results.

Recall that one of the main characteristics of the causal responsibility approach is that the rationale for the duty to vote lies in the prospects of choosing a good candidate or policy. In the first section, we analyzed how this might create moral reasons for voting. However, we think that it would be more appropriate to say that this characteristic of the causal responsibility approach relies on the *interdependence* of moral and epistemic reasons. Although it is true that someone might earn moral credit due to voting for the better candidate or policy, it is necessary to first realize which of the candidates or policies is the better one. And this epistemic dimension is crucially important for the causal responsibility approach. When taking this dimension into account, it becomes obvious that not just any kind of voting is recommended by the causal responsibility approach. In other words, the duty to vote is conditional on epistemic reasons as well.

To show this, Goldman asks whether it follows from the causal responsibility approach that someone should vote even without being informed or knowing anything about the candidates or policies. He gives the following answer:

> On the approach I favor, citizens should not be encouraged to *vote, full stop.* Instead they should be encouraged first to gather enough information and then to vote. The point of becoming informed, of course, is to increase the probability of making a good choice, that is, of choosing the objectively best candidate. The upshot is that voting is not necessarily and without qualification a desirable or dutiful act... I am unconvinced that a person ought to vote, or has a duty to vote, even when he is both uninformed and no longer has time to become informed. (Goldman 2002: 274)

We think that this epistemic feature of the causal responsibility approach points in the direction of the CJT. Since the duty to vote is conditional on "the probability of making a good choice", it seems appropriate to understand this in terms of the competence condition (or some of its revisions, as we will later

argue). So, one natural way to understand epistemic reasons for voting is that the causal responsibility approach says that someone should vote if the competence condition is satisfied. On our construal, this is how the point about being well informed before voting is best understood. But is the causal responsibility approach also compatible with relaxed conditions of competence and homogeneity? It seems quite obvious that relaxed conditions in the form of heterogeneous voters and average competence are also compatible with the causal responsibility approach, which allows that someone might be wrong so long as their voting decision is based on as much evidence as is needed to form a justified belief (Goldman 2002: 275).

So far, we have presented reasons why we think that the CJT might be integrated into the causal responsibility approach. Now we will show that the CJT is indeed the most appropriate logic for said approach. We start by showing that the causal responsibility approach fits nicely with both the asymptotic and non-asymptotic results of the CJT. Then we will show that its properties are also compatible with extensions discussed in the previous section. According to the causal responsibility approach, each contribution (however small) might have a partial causal influence in choosing the correct option. It is important to notice that a *small* contribution doesn't imply *low* competence. Quite the contrary, we already saw that the competence condition and its relaxed version of average competence are among the main characteristics of this approach. On our view, partial causal influence for which someone can earn moral credit implies that one aspect of the rationale for voting is that the more voters there are, the greater the chance that the correct option will be chosen by the majority. In that regard, the asymptotic result of the CJT provides formal support for this claim, since it shows that, as a group grows larger, the probability that the majority will vote for the correct option approaches 1, as the group tends to infinity.

But the non-asymptotic result of the CJT is even more important for the causal responsibility approach. This result can be understood to confirm what Dietrich and Spiekerman call *the growing-reliability thesis*, which says that larger groups are "more likely to select the correct alternative (by majority) than smaller groups or single individuals" (Dietrich and Spiekermann 2020: 386). However, they show that, when relaxing the independence condition to conditionalize on the common causes (CI condition), this might conflict with the conditionalization of the competence condition (CC), since required competence cannot be sustained across all domains over which conditionalization works. Their proposal is to revise conditional competence to be understood as the *tendency to competence* (TC), which may vary across domains, while tending to exceed 0.5. Under this revision, *the growing-reliability thesis*, which is characteristic of the non-asymptotic result, is bolstered (while the asymptotic result no longer holds). Here is their revision of the jury theorem, which gives further support to *the growing-reliability thesis* (Dietrich and Spiekermann 2020: 390):

(8) Assume CI and TC. As the group size increases, the probability of a correct majority (i) increases (growing reliability), and (ii) tends to a value which is below 1 (no infallibility) unless CC holds.

Just as in the previous cases with the competence condition and average competence, the causal responsibility approach is flexible enough to include various interpretations of competence so long as the level of competence is sufficient for the results of the CJT to obtain, i.e., that it increases the probability that the majority will choose the correct option. Because of this flexibility, the causal responsibility approach is compatible with both the asymptotic and non-asymptotic results of the CJT. For the very same reason, it is compatible with revision to the tendency to competence so long as it contributes to the growing reliability that the majority will select the correct option. Although the partial causal contribution is less obvious in the non-asymptotic than in the asymptotic result of the CJT, it is still of great importance since larger groups increase the probability that the majority will select the correct option, making them more reliable in that way.

Now we turn to the compatibility of the causal responsibility approach with extensions and revisions of the CJT discussed in the previous section. We already established this compatibility regarding relaxing conditions of competence and homogeneity to include average competence and heterogeneous voters (and further revising the competence condition to be understood as the tendency to competence). We first examine whether the causal responsibility approach is compatible with relaxing the binary choice condition. As we noticed in the previous section, List and Goodin generalized the CJT to include plurality voting over k options. They proved that both asymptotic and non-asymptotic results of the CJT hold with extension to more than two options. Interestingly enough, they show that, in k-options cases, the probability that the majority will choose the correct option might sometimes increase more quickly than in two-options cases. To use their example, if there are 51 voters and 0.51 probability in the two-options case that each voter will choose the right option, the probability that the correct option is the plurality winner is 0.557, while in the three-options case ($k = 3$), with slightly lower individual probability (0.5), the probability of the correct option being the plurality winner increases to 0.937 (List and Goodin 2001: 287).[10] The implications

10 As an anonymous reviewer points out, it may be unrealistic to expect that individual competence would stay roughly the same in $k > 2$ cases, since in multiple-option situations there are more ways to be wrong. However, it is unclear that epistemic demands necessarily increase with more options. Suppose we conceive that in a two-option case the incorrect option takes the form of a disjunction between two incorrect sub-options; presenting these sub-options as separate choices alongside the correct option might not reduce individual competence. A similar matter is pointed out by Estlund (2008: 229). However, even if we assume individual competence decreases slightly with more options, this does not undermine the CJT's results. As long as voters still have a better-than-random chance of identifying the correct option, even with up to 20

for the causal responsibility approach of extending the CJT to more than two options are the following. First, since the moral credit that someone can earn for voting (their partial causal contribution) is conditional on increasing the probability that the correct option will be selected, when extending the CJT to more than two options (and plurality voting), each partial causal contribution increases the probability more quickly in some cases that the correct option will be chosen than in the standard two-option case. Second, when individual probabilities are below 0.5 in *k*-options cases, every partial causal contribution becomes even more important since the probability that the majority will choose the correct option obtains only if there is a large number of voters. So, each of the partial causal contributions might be important for the *k* options in some cases to either ensure or (sharply) increase the probability that the majority will select the correct option. And someone might earn moral credit for voting in each of those cases.

We pointed out in the previous section that discussion need not be excluded by the independence condition, that is, communication may have positive effects on satisfying the competence condition (and its various relaxed versions). In a similar vein, Dietrich and Spiekermann emphasize that one of the main advantages of their revised version of the jury theorem is that it is sensitive to inputs from discussion and communication in order for the tendency to competence condition to be satisfied (Dietrich and Spiekermann 2020: 390). However, while including discussion is also significant for the causal responsibility approach, the implication of extending the CJT to include discussion cannot be demonstrated in a direct way. We think that this connection is indirect in the sense that it doesn't relate directly to the duty to vote but indirectly via epistemic reasons. The causal responsibility approach is compatible with including communication so long as it affects epistemic reasons for voting (by increasing competence), which in turn contributes to the duty to vote by being interrelated with moral reasons.[11]

We are now in a position to offer our solution to the rational voter paradox, which is based on integrating the logic of the CJT into the causal responsibility approach:

(9) Assume that the CJT conditions are satisfied. Then, on the causal responsibility approach and the CJT, it is rational to vote due to epistemic reasons, *and* someone has the duty to vote due to the interdependence of moral and epistemic reasons (i.e., someone can earn moral credit due to voting for the good option or candidate).

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choices, a group the size of a small town would likely select the correct option using the plurality rule (Goodin and Spiekermann 2018: 31).

11 It is noteworthy in this context that even Downs believed that, when acquiring information is costly, one of the main routes to becoming informed is via communication with other people (Downs 1957).

To explain. First, notice that our solution to the rational voter paradox depends in large part on the implicit prior solution to the rational ignorance problem given by the CJT, namely, since normative justification of the duty to vote is conditional on being well informed, satisfaction of the competence condition leads to the solution to the rational ignorance problem.[12] What drives the solution to the rational voter paradox is that voters have epistemic reasons for being well informed given by the competence condition and the logic of the CJT. So, the solution to the rational voter paradox works in reverse from Downs's economic theory of democracy.[13] Solving the rational ignorance problem first leads to the solution to the rational voter paradox. The solution to the rational ignorance problem is provided by integrating the logic of the CJT into the causal responsibility approach.

Second, it is important to notice that our solution is based on epistemic reasons and epistemic rationality, not prudential reasons and rationality understood as advancing self-interest. This follows from divorcing moral reasons for voting from prudential reasons, which is characteristic of the causal responsibility approach. But it also follows from the interdependence of moral and epistemic reasons, as well as integrating the logic of the CJT into the causal responsibility approach. In this way, we showed not only that there is no longer any need for relying on prudential reasons to solve the rational voter paradox but also that another logic and another view of rationality may be more appropriate to that endeavor, that is, we showed that relying on epistemic rationality and the CJT might be a much better way to solve the rational voter paradox than a calculus of voting that is based on rationality understood in terms of advancing self-interest.

Third, the interdependence of moral and epistemic reasons that is characteristic of the causal responsibility approach is of the utmost importance for our solution. Without it, the costs of voting might outweigh epistemic reasons. That is why divorcing moral reasons from prudential reasons is so important to solve the rational voter paradox. But, to solve the problem, it is also necessary that epistemic reasons are tied to moral reasons. Finally, it follows from our analysis that, even if the conditions of the CJT are substituted by relaxed conditions in (9), this might still provide a solution to the rational voter paradox and the problem of rational ignorance.

Objections and Replies

Since our new solution to the rational voter paradox depends on the causal responsibility approach and the CJT, in this section we will consider whether criticism of each of these components may affect our main conclusions. We

12 On this point, see also: Miller (1986: 191).

13 This also means that it works in the order that is characteristic of the CJT (from individual competence to the reliability of the majority). On the idea that the CJT might also work the other way around, see: Goodin and Estlund (2004).

will first consider some criticisms of the causal responsibility approach and then focus on the critique of the CJT. However, our analysis is limited to those aspects of criticizing the causal responsibility approach and the CJT that are relevant to our solution.

Recall that, in Goldman's view, the causal responsibility approach to voting has both an explanatory and a normative dimension. Brennan and Sayre-McCord argue that both dimensions of the causal responsibility approach have their own shortcomings (Brennan and Sayre-McCord 2015). We start with their objection to the explanatory dimension of the causal responsibility approach. Brennan and Sayre-McCord notice that, in the context of real-world democratic decision-making, there is often uncertainty concerning which of the candidates or options is better, especially in moral terms (Brennan and Sayre-McCord 2015: 56). Quite contrary to Goldman, they argue that, when taking this uncertainty into account, the causal responsibility approach may offer reasons to abstain rather than to vote to avoid making the mistake of choosing the bad candidate. So, in explaining turnout, this approach might be no better than Downs's economic theory of democracy. Although we think that, even in the context of real-world democratic decision-making, it is sometimes possible to have a clear view of which of the candidates is morally better or more competent, we concede Brennan and Sayre-McCord's point concerning the explanatory dimension of the causal responsibility approach. This gives us the opportunity to point out that, even if their criticism is accepted, this doesn't undermine our results because the solution we offer is purely normative. So, our solution to the rational voter paradox is to be understood as offering normative reasons why someone ought to vote and why it might be rational to vote, not an explanation of why people do vote.

Although Brennan and Sayre-McCord's criticism of the explanatory dimension of the causal responsibility approach to voting doesn't affect our conclusion, we also have to take into account their criticism of the normative dimension, to which we now turn. Since in order to offer a solution to the rational voter paradox we rely on the normative dimension of the causal responsibility approach, it is necessary to see whether their criticism undermines our main results. Brennan and Sayre-McCord use the following example to illustrate how the causal responsibility approach gives the wrong normative advice in the case of voting (Brennan and Sayre-McCord 2015: 49–50). Suppose that pre-election polls estimate that 60% of voters will vote for J. Imagine that A has to decide whether to vote for J or to do something else that will bring some, not especially large, benefit to society as a whole but that will also prevent A from voting as it requires her to be out of town. Brennan and Sayre-McCord point out that the causal responsibility approach will give the wrong advice, namely, to stay and vote, because someone can earn more moral credit by voting than by going out of town and doing something else that will not benefit society to that large an extent. They think that much better advice is to do something else, since it is certain that a single vote will not be pivotal, that is, it will not bring

much to the outcome of the election. Obviously, their advice hinges on the logic of decisiveness that is characteristic of the economic theory of democracy.

But then Brennan and Sayre-McCord change the example slightly so that uncertainty as to how many people will vote makes every vote important. In that case, both accounts give the same advice, i.e., that A should stay and vote. The reason for this is "the likelihood that J will lose *because* A doesn't vote" (Brennan and Sayre-McCord 2015: 50). But then, just as in the previous case, it is the logic of decisiveness characteristic of the economic theory of democracy that provides the reason for the correct advice, not the causal responsibility approach. If Brennan and Sayre-McCord's criticism is well taken, this might affect our solution to the rational voter paradox to the extent that the calculus of voting that maximizes expected utility might give better advice regarding when people ought to vote. Note, however, that both in the original example and in the changed version everything hinges on prior acceptance of probability p and the related logic of decisiveness. However, although this logic tells voter A that she ought to vote in the second case, in the first case, it tells not only voter A, but all other voters too, that they are not required to vote since their vote will bring close to nothing to the outcome. But, if that is the case, then it is obvious that the causal responsibility approach offers the correct normative advice. And, because of that, the logic behind the causal responsibility approach might be more appropriate normative justification for voting than the logic of decisiveness that is characteristic of the economic theory of democracy. For that reason, our solution to the rational voter paradox is immune to Brennan and Sayre-McCord's criticism of the normative dimension of the causal responsibility approach.

Jason Brennan has developed an argument against the CJT based on the idea of an optimum number of voters, which challenges CJT's general result that increasing the size of the electorate always increases the accuracy of collective decision-making (Brennan 2011). For the sake of argument, Brennan accepts all the original assumptions of the CJT but claims that the theorem is nevertheless a poor model of democracy. The core of Brennan's argument is the claim that there is an optimal size for the electorate beyond which increasing the number of voters does not lead to better collective decision-making. Instead, once a specific threshold is reached, each additional vote contributes little or nothing to the final result while still having a substantial cost for the voter.

Brennan's argument is supported by the mathematics behind the theorem. The CJT's result is that increasing the number of voters increases group competence. However, the group competence grows so rapidly with new voters, that it reaches the level of near certainty (0.99999...) with a relatively modest number of voters – much smaller than the number of voters in many contemporary real-world democracies. This is the case even if we presuppose that each voter has a fairly low individual competence of 0.51. If we assume that individual competence is higher, the threshold behind which correct decisions are reached with near certainty is hit even sooner. With this effect in mind, Brennan suggests calculating the Nth voter's marginal contribution towards

group competence as follows (Brennan 2011: 56): $\Delta P_N = P_N - P_{N-1}$. Thus, the marginal contribution is a difference between the probability that a group of *N* voters makes the correct decision and the probability that the same group makes the correct decision without its *N*th member. According to the CJT, and provided that the competence assumption is satisfied, ΔP_N always has a positive value. However, Brennan is right to conclude that its value rapidly decreases with each additional voter. Therefore, as *N* approaches infinity, ΔP_N approaches zero (Brennan 2011: 57). From here, Brennan derives the *expected marginal value* of the *N*th voter's vote by the following equation (Brennan 2011: 58): $E_v = \Delta P_N(V_c - V_w)$.

In this equation, V_c and V_w are the expected values of the correct and wrong choice, respectively, while C_o is the opportunity cost of voting. Brennan infers that, even if we make the most generous assumption on behalf of the democratic interpretation of the CJT, the expected marginal value quickly becomes insignificant and later wasteful. Thus, Brennan concludes that even on those generous assumptions, having more than 100.000 voters is a waste of time and resources.[14] We will provide three remarks by which we aim to answer Brennan's criticism of the CJT application to democratic decision-making.

First, Brennan's argument concerns *mass* democracy only. In cases involving juries, citizens' assemblies, or small electoral bodies, the expected marginal value of each vote remains relatively high. Even if, as Brennan suggests, the CJT favors a group of 100,000 randomly selected citizens over mass participation, it may also compel residents of a small town to vote in a mayoral election. Thus, whenever the electorate is sufficiently small, the CJT becomes an argument *for* participation. We should note that in some small elections, however, even the classic expected utility approach may support voting, since the probability of a vote being decisive can be significantly higher when compared to large elections. In such cases, there is an instrumentally rational incentive to vote in addition to the higher epistemic contribution of a single vote.[15]

Second, Brennan's argument presupposes the original form of the CJT. However, if we apply some of the previously suggested extensions, the optimum number of voters may be well over 100,000. One possibility, suggested by Brennan himself, is to abandon the premise that all voters are sufficiently competent and instead focus on *average* competence (Brennan 2011: 61). This

14 Brennan intentionally uses quite unrealistic assumptions where the opportunity cost of voting is as low as $1, while the net value of selecting the correct option is $10 trillion. Even under these assumptions, Δ*PN* of 100.003rd voter is so low that her expected marginal value is negative (Brennan 2011: 59).

15 We thank the anonymous reviewer for highlighting the connection between expected utility calculus and the CJT framework in the context of small elections. The reviewer suggested, however, that this defense of the CJT model may be redundant, as small elections already represent a non-paradoxical case for voting. We would like to clarify that our response to Brennan's criticism addresses the applicability of the CJT model to democratic decision-making broadly, regardless of its link to the expected utility approach.

is a possible defense of mass participation because, in such cases, many more voters may be needed to ensure a good outcome is reached.[16] Another extension of the CJT may increase the required minimum number of voters, even if all citizens are sufficiently competent. Under List and Goodin's application of the CJT to *k* options, group competence grows at a slower rate when there are many more options than just two. Thus, if there are many more options than just two, which is not uncommon in many contemporary democracies, the optimum number of voters is much higher as well.

Third, and most importantly, despite its focus on collective epistemic benefits rather than individual self-interest, Brennan's argument remains relevantly similar to concerns raised by Downs. Both approaches conclude that once a certain number of voters is reached, it is no longer beneficial for an individual voter to participate. As such, Brennan's objection is already answered by our interconnection of the CJT and causal responsibility approach. Even if the epistemic contribution of each additional voter becomes less significant over time, the moral credit can still be attributed to each additional voter. Thus, we believe that integrating the CJT and the causal responsibility approach provides an incentive for voting, even when the optimum number of voters has already been met.

Conclusion

In this paper, we offered a new solution to the rational voter paradox. Our solution is based on integrating the logic of the CJT into the causal responsibility approach. We have seen that because of the synergy between the causal responsibility approach and the CJT not only the rational voter paradox but the problem of rational ignorance as well can be solved. It is crucially important for our solution that rationality is understood in epistemic terms and that there is an interdependence of moral and epistemic reasons as per the causal responsibility approach. We showed that, when epistemic reasons that are characteristic of the causal responsibility approach are interpreted as satisfying the competence condition, the solution to the rational voter paradox follows from the assumptions and logic of the CJT. We also showed that our solution

16 If there are many voters whose competence is below the required threshold, or lots of ignorant citizens who vote randomly (thereby canceling one another's votes), mass participation is desirable if there are reasons to believe that, at least on average, citizens' competence is high enough. Anonymous reviewer pointed out that this response to Brennan's argument may be incompatible with the previous one, since we claimed that the CJT functions in smaller elections, but also claimed that large groups are sometimes necessary for sufficient average competence. To clarify, we distinguish between different applications of the CJT framework that respond to Brennan's concerns in complementary ways. In smaller elections, the CJT can support voting due to the high expected marginal value of each vote, while in large-scale elections the extensions of the CJT could accommodate mass participation by considering the average competence. The two responses therefore address different contexts in which the CJT can support voting.

is robust under various forms of relaxed assumptions and related jury theorems. We examined several objections to the causal responsibility approach and the CJT and concluded that they do not undermine our solution to the rational voter paradox.

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Nova rešenja za paradoks racionalnog glasača

Apstrakt

Paradoks racionalnog glasača ukazuje na to da racionalna osoba nema podsticaj da glasa ukoliko očekivane koristi premašuju troškove. Međutim, verovatnoća da pojedinačan glas odluči ishod izbora obično je mala, što očekivane koristi čini zanemarljivim. Kao odgovor na ovaj paradoks, ovaj rad predlaže novo rešenje zasnovano na Goldmanovom pristupu kauzalne odgovornosti, koji tvrdi da glasači daju delimični kauzalni doprinos izbornom ishodu čak i kada njihov glas nije presudan. Rad integriše logiku Kondorseovog teorema porote u pristup kauzalne odgovornosti, tvrdeći da to dovodi do rešavanja paradoksa racionalnog glasača.

Ključne reči: racionalnost, kauzalna odgovornost, demokratsko odlučivanje, Kondorseov teorem porote, normativni razlozi za glasanje