ORIGINAL RESEARCH

Dependent philosophical majorities and the skeptical argument from disagreement

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Abstract

According to the skeptical argument from disagreement, we are mandated to suspend judgement about a question if we discover that others disagree with us. Critics, however, have proposed that this skeptical argument fails if there are not equally many people on either side of the debate: numbers matter. The present paper explicates this as the argument that a group can be more likely to arrive at the correct view by majority rule than the members are on their own. Defenders of the skeptical argument have resisted that numbers matter by observing that if group members depend on each other when forming their beliefs, then the group can be less competent than its members. However, neither side of the debate has accompanied their views with quantitative estimates of how detrimental dependence is for group competence. This paper tries to improve this situation by drawing on jury theorems from social choice theory. The paper cannot settle the debate, but it shows that even the lower limit on group competence will exceed the average individual competence when dependence among voters remains moderate. This should give confidence to those who propose that asymmetry between the disputing parties can counter the skeptical argument from disagreement since being in the majority can thus be higher-order evidence for the disputed proposition.

Keywords Peer disagreement · Jury theorems · Dependent votes · Skeptical argument · Philosophical belief

1 Introduction

Should you give up your views when you learn that other people, just as smart as you are, disagree with you? And does it matter whether your view is in the majority?

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Recently, the latter question has been raised in the literature on peer disagreement in reaction to the skeptical argument from disagreement implied by the former question. According to this skeptical argument, one should suspend judgement about a question if the answer to the question is disputed by an epistemic peer, and in philosophy this is argued to entail that hardly any philosophical view can be rationally held. However, Grundmann (2013) and Kelly (2016), among others, object that it must be relevant for this skeptical argument how many philosophers we find on either side of a debate. Thus, which view is the majority view would be another relevant piece of higher-order evidence, and they speculate that this might be sufficient for those in the majority to be steadfast, or at least not so conciliatory that they suspend judgement. In contrast, Carey and Matheson (2012), among others, reject the view that the distribution of philosophical opinion is relevant for the skeptical argument. They observe that a group can be less likely to arrive at the correct answer than a single individual from the group, if the group members have *depended* on each other when they formed their belief. While both Grundmann and Kelly recognize this problem, they are optimistic that the dependence among philosophers will not be too detrimental to group competence and that the philosophical majority therefore remains relevant to the skeptical argument from disagreement whereas Carey and Matheson are more pessimistic in this regard.

Neither side in this debate, however, provides any quantitative estimates of the effect of dependence among philosophers on group competence and their respective optimism and pessimism therefore rest on a meager foundation. It is this condition that this present paper seeks to improve by drawing on jury theorems and related results from social choice theory that can inform the effect of dependence on group competence. Since the individual competence of philosophers and their dependence are unknown, the debate cannot be settled here. However, by an analysis of a lower bound on group competence, it is shown that a dependent group will be more competent than its average member even with the worst possible distribution of dependence if the dependence is not too large and the individuals are relatively competent on average. I think this should encourage optimists like Kelly and Grundman.

The paper proceeds as follows: Sect. 3 introduces the skeptical argument from disagreement and Grundmann and Kelly's objection to it based on the distribution of philosophical opinion. Section 4 then distinguishes two different objections implicit in Grundmann and Kelly's accounts and details the one objection based on group competence which will be the focus of this paper. Section 5 introduces Carey and Matheson's opposing view and discusses in greater details the interrelated complications that dependence among group members gives rise to. These are then implemented in an expression for the lower limit on group competence in Sect. 6. Using the example of scientific realism, Sect. 7 finally gives a quantitative estimate of the consequences of dependence for the lower limit on group competence before the conclusion follows.

2 The skeptical argument from disagreement

According to the conciliatory view of disagreement, if you discover that someone disagrees with one of your beliefs, then this should—under certain circumstances—make you reconsider your confidence in the matter under dispute. More specifically,

this *conciliatory* attitude is argued to be mandated if you disagree with an epistemic peer, i.e. if the two of you "are familiar with all the same evidence and arguments and are equals with respect to the general intellectual virtues" (Feldman & Warfield, 2010, p. 3). While one party is wrong in a peer disagreement [except perhaps in cases of 'faultless disagreement' (Kölbel, 2004)], you are as likely to be mistaken as your epistemic peer, or so the argument goes. Therefore, David Christensen argues, "[t]he rational requirement to take account of one's epistemic peers' contrary judgments is really just a special case of the more general rational requirement to take into account evidence of one's own possible error" (Christensen, 2007, p. 208). If you believe some first-order proposition but discover that a peer disagrees with you, then this is higher-order evidence that you may have made a mistake when you assigned your credence in that proposition. According to Christensen and the other proponents of the conciliatory view, this mandates you to reduce your credence in that proposition.

This also applies to peer disagreements in philosophy, and Christensen proposes that most disagreements in philosophy are between epistemic peers. The conciliatory view of disagreement therefore mandates philosophers to reduce their credence in those of their philosophical views that they discover are disputed by other philosophers. Indeed, Christensen speculates "that in fields like philosophy, taking account of disagreement in the ways I've been defending would lead to general withholding of belief in many cases" (Christensen, 2007, p. 215).[1] In many philosophical debates, philosophers should simply suspend judgement and as a consequence "a broad skepticism about philosophical matters threatens" (Kornblith, 2010, p. 33). The version of this argument that will be discussed here assumes the (weak)[2] Lockean thesis (Foley, 1992) that you are rational to believe in a proposition only if your credence in that proposition is above some threshold value.[3] When it is revealed that someone disagrees with your belief in some proposition, then the conciliatory view mandates you to reduce your credence in that proposition. This skeptical argument from disagreement then follows if your credence, as a result, falls below that threshold for belief. According to Christensen, the latter will be widespread in philosophy.

The fact that the skeptical argument from disagreement is even considered is indicative of an important assumption that will be relevant for the subsequent discussions. According to the skeptical argument as presented here, the discovery of the peer disagreement mandates a reduction in credence such that the credence falls below the threshold value for belief. In other words, prior to the discovery of the disagreement, philosophical belief can be warranted. The skeptical argument from disagreement does not argue—as some other skeptical arguments do—that belief (in philosophical ques-

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[1] The consequences of philosophical disagreement are also discussed by Brennan (2010), Kornblith (2010), Ribeiro (2011), and Plant (2012) among others.

[2] This version of the skeptical argument from disagreement is weak since it only assumes that high credence is necessary for belief. It is left open whether high credence is sufficient for belief. It should be noted that Christensen (2004) endorses the stronger version of the Lockean thesis where high credence is both necessary and sufficient for belief, but this is of no consequence for the present discussion.

[3] The Lockean thesis is disputed (e.g. Buchak, 2014; Kyburg, 1961; Smith 2016) and so is its implicit reduction of beliefs to credences (e.g. Moon and Jackson, 2020; Ross and Schroeder, 2014; Staffe, 2019). In assuming the Lockean thesis these concerns also apply here, though the objections from the lottery paradox and the naked statistical evidence are blunted when the present discussion only assumes that high credence is *necessary* for belief.

tions) is not rational at the outset. In the skeptical argument from disagreement, it is higher-order evidence in the form of a revealed disagreement that mandates the change from belief to suspension of judgement. If philosophical belief was not rational in the first place, then the skeptical argument *from disagreement* would not be needed. This implies that replies to this skeptical argument can safely assume that philosophers are competent in their assessment of philosophical questions *and* that the evidence relating to philosophical questions is good enough that philosophers typically surpass the required threshold value for belief.

Thomas Grundmann (2013, p. 74) identifies three necessary conditions that a disagreement must satisfy for the skeptical argument to be sound: That the disputants are epistemic peers, that their disagreement is genuine, and that there is a roughly equal number of people on either side of the debate. Genuineness will simply be assumed presently even though it is certainly debatable whether this is always satisfied in philosophical disagreement.[4] Likewise, peerness will be assumed, but this assumption will prove relevant later when it is considered if the competence of the disputants can vary. The present interest is instead in Grundmann's third condition for the skeptical argument that the disagreement must be *symmetric* in the sense that the opposing parties must be of the same size. In defense of this symmetry condition, Grundmann offers the intuition that if 100 philosophical peers discuss a philosophical question, then if only one person disagrees with me whereas the other 98 persons agree, then I should not suspend judgement. In such cases, Grundman suggests, the skeptical argument does not hold. As more formal evidence, Grundmann refers to Condorcet's jury theorem (CJT) whose implication Grundmann summarizes as follows: "If the majority of people whose judgments are independent of each other and who each have a more than 50 percent chance of getting it right agree on a certain proposition in the relevant domain, then the probability of the majority view being true soon approaches one when the number of judging peers increases further" (Grundmann, 2013, p. 73). Under certain (rather restrictive) conditions, CJT shows, in other words, that groups deciding by simple majority are much more reliable to arrive at the correct verdict than any one of the individuals comprising the group [see Dietrich and Spiekermann (2020) for a review of this and other jury theorems]. Grundmann concludes from this that "[o]nly if there is no clear majority view am I rationally required to suspend judgement" (Grundmann, 2013, p. 74).

Thomas Kelly (2016) gives similar reasons why symmetry is relevant for how to react to disagreements in philosophy. Also referring to CJT, Kelly considers the example of a group of 50 individuals that each have a 60% chance of being correct. If they split 30 against 20 on some dichotomous question, then the probability of the majority being correct is more than 98% (Kelly, 2016, p. 388).[5] Kelly accompanies this by the example of a group of people that look at a sign at a distance. Each person reads its first word as 'our' or 'out'. However, if a substantial majority leans towards 'our' rather than 'out', then this should arguably increase their credence that the sign

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[4] Metaphysical deflationism, for instance, argues that metaphysical debates are shallow in some way or other (e.g. Carnap, 1950; Price, 2013; Yablo, 1998). If this is so, then metaphysical debates should arguably not be considered genuine.

[5] Kelly does not specify how he arrives at this figure, but it agrees with results that can obtained through Eq. (2) from Sect. 5.

says 'our'. Based on this reasoning, Kelly concludes that "the correct account of how we should take the opinions of others into account might very well recommend not agnosticism but rather a relatively confident opinion in the majority view" (Kelly, 2016, p. 390).

In its concrete form, the skeptical argument from disagreement is meant to show that the (epistemic) circumstances relating to a particular philosophical disagreement are such that suspension of judgement about the disputed proposition is rationally required. In response, Grundmann and Kelly call on CJT to argue that a relevant consideration for this skeptical argument is that the disagreement involves more than two people and that a majority, therefore, might favor one view over the other. According to both Grundmann and Kelly, asymmetry between the disagreeing parties can defeat the skeptical argument. The argument, it seems, is that such asymmetry can serve as additional higher-order evidence for the disputed proposition that might counter the reduction in credence that is required by the revealed disagreement.[6] If being in a peer disagreement is evidence that you may have made a mistake when forming your belief (as Christensen suggests), then finding your view to be in the majority might in turn be evidence that you did not make a mistake after all.

The purpose of the subsequent sections is therefore to *indicate* under what circumstances the distribution of opinion *can* warrant an increase of credence in a proposition. 'Can' is emphasized since the aim is not to argue that the distribution of opinion requires philosophers to update their credence. In particular, the subsequent arguments are not meant to show that those in the minority must change their view.[7] 'Indicate' is emphasized since the present analysis does not proclaim to consider subtle cases or to provide a general argument to the effect that this type of higher-order evidence is relevant at all.[8] The analysis is instead aimed at those who *already* regard the disagreement over some philosophical view as relevant for philosophers' credence in that view which should include proponents of the skeptical argument from disagreement. At least in more straightforward cases, these should also regard it as relevant higher-order evidence who is in the majority, or so this paper argues. The present discussion will not settle when such evidence permits an increase in credence at the first order sufficient to counter the decrease that the conciliatory view mandates in the face of disagreement, but it shows when the distribution of opinion must be taken into account as well.

3 Two objections from asymmetry

When Grundmann and Kelly object to the skeptical argument based on asymmetry in the distribution of opinion, they observe with reference to CJT that the majority view is more likely to be correct, but they also give more concrete examples of lop-

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[6] In providing *additional* higher-order evidence, the argument may as well apply to other skeptical arguments.

[7] See Pettit (2006) for a further discussion of when and if those in minority should convert to the majority view.

[8] See, for instance, Barnett (2017) for a discussion of how philosophy might insulate itself from such higher-order evidence.

sided majorities—Grundmann's 99 against 1 and Kelly's 30 against 20—as additional evidence. Though neither Grundmann nor Kelly makes the distinction, there are, however, two different objections here: The latter is based on the particular distribution of opinion and the intuition that the larger the majority is, the stronger higher-order evidence it provides for the majority view. However, this reply to the skeptical argument from disagreement neither utilizes the jury theorem due to Condorcet—mentioned by both Grundman and Kelly—nor any other jury theorem for that matter. Jury theorems instead estimate the probability that a group, for instance a jury, collectively chooses the correct alternative under some voting rule, typically simple majority. Jury theorems are, in other words, attempts to inform our decision-making *before* the actual distribution of votes is known, and the probabilities they assign are therefore independent of whether the majority turns out to be big or small. Nevertheless, the CJT shows that a group deciding by simple majority can be much more likely to choose the correct of two options than any of its group members. Such group competence can therefore serve as higher-order evidence for the majority view that may counter the reduction in credence mandated by the skeptical argument from disagreement. Since Kelly and Grundman do not distinguish between these two lines of argument, no contention is made here whether they endorse any of them. Instead, the claim is that both lines of argument can provide additional (though related) higher-order evidence—like that provided by a revealed disagreement—relevant for first-order philosophical propositions. The focus here will be on the argument from group competence while the argument based on the probability that a view is true given a particular voting outcome—the *posterior probability*—will be detailed in future work.

Both, however, assume the same basic setup: a dichotomous question whose possible answers we shall denote 1 and 0 for convenience and a group of n individuals that vote on this question. The number of votes for 1 is then $V \equiv \sum_{i=1}^{n} v_i$, where v_i is the vote of group member i. The posterior probability then concerns the probability that the state of the world (denoted X) is 1 given that the number of votes for 1 is h, i.e. $P(X = 1 | V = h)$. In contrast, the CJT and other jury theorems instead seek to assess how likely it is that a simple majority will vote for the correct answer. These, in other words, concern the probability that a majority votes 1 given that the state of the world is 1, i.e. $P(V > n/2 | X = 1)$, where $V > n/2$ entails that more than half of the voters voted for 1. This conditional probability is what we shall denote the 'group competence' under simple majority. This is so since it captures the probability that the group collectively arrives at the correct answer by adopting this voting rule. In the following, the voting rule will always be simple majority since this can be shown to be the voting rule that maximizes group competence in all (reasonable) circumstances if each individual has more than 50% chance of being correct (Kaniovski & Zaigraev, 2011). Consequently, 'group competence' will subsequently denote the probability that a simple majority will vote for the correct answer.

Group competence can feature in a response to the skeptical argument from disagreement if it holds, as CJT claims, that larger groups are more competent than smaller groups. A special case of this result is that a group of people is more competent than any subgroup or single individual of the group, though if the individuals of the group have varying competence, then the group would only be more competent than the average individual or subgroup. Thus, being part of a group that decides on a question

by simple majority could make you more confident in the group decision—if you held the majority view—than you initially were in your own assessment of the question. The group decision would, in other words, be higher-order evidence for the proposition believed by the majority over and above your own assessment of the question since the group competence is higher than your individual competence. Discovering that you are in the majority is an occasion to update your credence in your first-order view. If groups are indeed more competent than the individuals comprising them, then this argument from group competence provides a way in which the distribution of opinion among philosophers might counter skeptical arguments: Philosophers may as a group be competent enough to be resolute with respect to whatever view turns out to be in the majority.

The other objection to the skeptical argument from disagreement appeals to the posterior probability that the answer to some dichotomous question is 1 given that a specific number of people voted for 1 over the alternative, i.e. $P(X = 1|V = h)$. According to the figures given by Kelly, this posterior probability *can*[9] greatly exceed the individual competence, that is, exceed the probability that each individual votes for the correct answer. Kelly's example thereby indicates a way to resist the skeptical argument where such a posterior probability is appealed to as a reason to significantly increase your credence in a proposition; presumably also enough that you are rational to believe that proposition even though others disagree with your belief.

4 Against the relevance of symmetry

While the previous section showed that the objection from group competence is distinct from the objection based on the posterior probability, these two objections still rely on the same basic ingredient, namely the probability that h votes are cast for 1 given that the state of the world is 1, i.e. $P(V = h|X = 1) \equiv P_h$. Thus, all the complications involved in the estimation of P_h as detailed below are relevant to both the argumentative strategies, though they will only here be explicitly related to group competence.

The probability that a majority votes for 1 given that 1 is the correct answer can be expressed as the sum of the probability of each voting outcome, P_h, where h is large enough to be a majority (Grofman et al., 1983, p. 264):

$$P\left(V > \tfrac{n}{2}|X = 1\right) = \sum_{h>n/2} P_h \tag{1}$$

In general terms, P_h is an aggregation of the probability that each person votes for 1 given that 1 is the correct answer whereby P_h must depend on the individual competence of each voter. The CJT assumes a *homogeneous* jury whereby all voters are assumed to be equally competent. For a random assembly of people, this assumption is clearly violated for most conceivable questions. Some members of the group may be highly qualified to answer the question—perhaps they even know the answer in

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[9] Notice that 'can' is emphasized since Kelly's figures might at best be considered an upper bound on the probability while the probability is much lower in most realistic circumstances due to dependence among voters.

advance—whereas others will have no clue and hence will be as competent as a fair coin. As such, homogeneity seems to be a rather questionable assumption to make. Presently, however, we specifically consider the relevance of symmetry in *philosophical peer disagreement* which might render this assumption a little more plausible. First, the questions are consequently limited to philosophical questions. In most if not all cases, this entails that no one can be certain about the answer. There is some upper bound on individual competence. Second, the group is assumed to consist of philosophers. They will have the same basic training that at least provides them with preliminary knowledge of the relevant evidence—typically in the form of various arguments—for many philosophical views. Now, it is still questionable whether an expert on some philosophical question is equally likely to be correct as someone working on a completely different topic. Even philosophers disagreeing over a philosophical question will not in general have homogeneous individual competence.

One way to deal with this objection would be to drop the assumption of homogeneity (which we shall do in parts of Sect. 7). Alternatively, one might appeal to peerness to defend homogeneity. the skeptical argument from disagreement assumes that the disagreement is between epistemic peers. Presumably, this will not be satisfied if one of the disagreeing parties is (much) more likely to be correct than the other, that is, if they have (very) different individual competence. Thus, if the disagreeing parties are epistemic peers, then their competence must be (approximately) homogenous. Both Grundmann and Kelly in fact also object to the skeptical argument because they argue that peerness is difficult to establish in philosophical debates. Since so few debates in philosophy are resolved, peerness cannot for instance be based on a track record method.[10] One might worry that Grundmann and Kelly thereby defeat their own argument: If peerness is difficult to establish, then it arguably follows that the homogeneity assumption is similarly difficult to defend. However, in so far as the aim is to defeat the skeptical argument from disagreement, then it does not matter whether the conditions of peerness or symmetry fail. Instead, the connection between the two indicates that if one is permissive of when peerness obtains—possibly to resist the objections of Grundmann and Kelly—then one must also be permissive about homogeneity in individual competence and vice versa. For the sake of argument, this more permissive attitude will be adopted here whereby peerness is assumed to obtain, but so is homogeneity, at least approximately. However, it will still be highlighted where this assumption is made.

Even if the individual competence is the same, the aggregation of these individual probabilities into P_h introduces further problems. The CJT assumes that the votes are Bernoulli random variables that have binomial distribution. This entails that voters are treated as biased coins (with the probabilities of outcomes set in accordance with the individual competence). The probability of h votes for 1 is then found in the same way that one would estimate the probability of h heads in n tosses (Grofman et al., 1983, p. 264):

$$P_h^{(B)} = \binom{n}{h} p^h (1-p)^{n-h} \tag{2}$$

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[10] See also King (2012), Schafer (2015), and Rotondo (2015) for similar discussions of problems relating to establishing peerness.

where p is the individual competence or the probability that the coin will land on heads. Superscript *(B)* is added to $P_h^{(B)}$ to signify that this probability assumes that the votes are Bernoulli random variables. Inserting into Eq. (1) then gives the group competence under this (contentious) assumption. For $p > 0.5$, it follows from inserting Eq. (2) into Eq. (1) that group competence always exceeds p. For $p < 0.5$, the group will be less competent, and $p > 0.5$ is therefore crucial for a group to be more competent than its members on a dichotomous choice.

A central assumption of Bernoulli trials is that they are independent. Thus, if the first trial gives heads, then this cannot change the probability that the second trial—or any other of the n trials—gives heads. This is typically satisfied for coin tosses. However, any common causes between votes will violate independence whereby the votes cannot be modelled as Bernoulli trials. A slight change of Kelly's example from Sect. 3 nicely illustrates why dependence between votes is relevant for the aggregation of votes. Suppose that the group looking at the sign gave their verdict on its first word one by one. Arguably, if the first person said 'our', then the second person would be more likely to say that as well. Obviously, the effect of this would only be more significant if the first person were a kind of group leader that the rest always sought to agree with. If everyone agreed simply because they followed the lead of the first person, then one should arguably have less confidence in the majority view than otherwise and perhaps only the same confidence in it as one would have in the view of the first person (see Lackey, 2013 for a discussion). Such dependence, in other words, affects group competence, and it occurs already if the group members share the same evidence as discussed below in Sect. 5.1.

Carey and Matheson (2012) raise exactly the issue of independence when they argue that the distribution of opinion on a philosophical question is irrelevant for the skeptical argument from disagreement. They argue that dependence is widespread for instance among philosophers "who went to the same school, took the same classes, had the same advisor, etc." (Carey & Matheson, 2012, p. 142). Such philosophers will be more prone to vote the same and, Carey and Matheson continue, "thus the combined weight of their opinions is less than it would otherwise be."[11] Indeed, dependence among voters can have the consequence that group competence is *less* than the individual competence of the group members. This is so since dependence can cause voters to cluster on the wrong answer; especially in (but not restricted to) cases where the individual competence is low and the number of voters is small (Ladha, 1992). Ladha finds that "votes will be correlated because the judges or experts (1) share common information; (2) communicate with each other; and (3) are influenced by various schools of thought or opinion leaders espousing the same or opposite positions" (Ladha, 1992, 624). All of these factors seem immediately relevant in cases of philosophical disagreement.

Now, group competence may still surpass individual competence even in the presence of dependence, but Carey and Matheson argue that the skeptical argument should get the benefit of the doubt since "we are often unaware of both the degree of independence two opinions have as well as the degree to which that level of independence should affect the weight given to the combined opinions" (Carey & Matheson, 2012,

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[11] Palmira (2015) raises a similar criticism of Goldman's (2010) CJT-based defense of the use of intuitions in philosophy.

p. 142). While Kelly ([2016](#), p. 388) explicitly recognizes these same challenges, he seems more confident that the skeptical argument from disagreement has the burden of proof.[12] Neither party, however, nor anyone else in the literature gives any quantitative estimates of the effect of dependence between philosophers. It remains therefore unexplored how detrimental this failure of independence is for the claimed relevance of symmetry for the skeptical argument from disagreement. In the next section, an attempt will be made to better this situation. In particular, the aim is to use the findings of social choice theory to explore how dependence among voters affects group competence in circumstances like those that obtain in philosophical disagreement. Section[7] will then go on to illustrate how this plays out in the particular case of scientific realism.

Before proceeding, however, a remark is in order about the limitations of the present analysis imposed by the assumption of a dichotomous choice. In philosophy, there are certainly questions that are not well captured as a choice between two clearly demarcated views. One can remedy this by framing the question as a choice between a view and all the views that are different from it, but one should be aware that this may require a reassessment of individual competence. Given three options, an individual could be more likely to choose the correct option than choosing each of the wrong options—the individual would in this sense be competent—without, however, being more likely to be correct than not correct. The probability distribution could for instance be probability 0.4 for the correct option and 0.3 for each of the wrong options. If this is modelled as a choice between the correct option and the rest, then the individual competence would only be 0.4 whereby a group of such individuals would not be more competent. If, however, the probability of choosing the correct option exceeds 0.5, then the situation can be modelled as a dichotomous choice following the analysis below by grouping the alternative options into one (though some care must then be taken, if the majority prefers this group of alternatives). Furthermore, even in cases with more than two options where the probability of choosing the correct alternative is less than 0.5 and is only slightly larger than the probability for each of the wrong alternatives, it is possible to show that the probability that the correct option is preferred by most group members exceeds the individual competence even in relatively small groups (List & Goodin, [2001](#)). There are, in other words, ways to extend the present analysis beyond dichotomous choices, but with the present focus being the worry about dependent votes, these will be pursued further elsewhere. It does not matter whether the votes are dependent for the worry that philosophical debates cannot be modelled as a dichotomous choice, and this question will therefore be set aside in the following.

5 Dependent voters

Dependence among voters occur when voters share evidence, when they deliberate, and when they belong to the same school of thought or follow the same opinion leader. From an abstract point of view, such dependence among voters can be captured

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[12] Whether this confidence applies to the argument from group competence or that from posterior probabilities is unclear since Kelly does not distinguish between the two.

by correlations between the variables used to model the voters. The simplest form of correlation is pairwise correlation among voters. For a yes–no question, pairwise correlation entails that if voter A votes 'yes' then this changes the probability for B to vote 'yes'. If the correlation is positive, then A's 'yes' increases the probability that B will vote 'yes' and if correlation is negative, then A's 'yes' decreases the probability that B will vote 'yes'. Correlated votes have been studied extensively in social choice theory and this work falls in two general categories: Those that study generic correlations (e.g. Berg, 1993; Kaniovski, 2010; Ladha, 1992; Pivato, 2017) and those that study the effects of specific types of dependence for instance due to opinion leaders (e.g. Estlund, 1994), shared evidence (e.g. Dietrich & List, 2004), the decision problem (e.g. Dietrich & Spiekermann, 2013a), and deliberation among voters (e.g. Gerardi & Yariv, 2007). Recently, causal networks (e.g. Dietrich & Spiekermann, 2013b) have been used for a general exploration of the various ways voters may depend on each other with the purpose of establishing independence conditions adequate for these different causal models. The present proposal, however, is that dependence among philosophers can be modelled by combining existing results on shared evidence (Sect. 5.1) an generic correlations (Sect. 5.2).

5.1 Shared evidence

The most obvious source of correlation in philosophy is the shared evidence relevant for the philosophical topic in question. Since we are assuming that the disagreeing parties are epistemic peers, it arguably follows that they will share most of the relevant evidence. In other words, the evidence—such as the various arguments made in a philosophical debate—is a common cause shared between all voters who, in this particular case, are a group of philosophers having a peer disagreement. In being common to all participants, shared evidence must be treated differently from dependence due to shared schools of thought, education, biases, etc. which will typically only be shared among a subset of group members. Shared evidence is also different since it forms an intermediate between the voters and the state of the world that the vote is meant to have some bearing on. As Dietrich and List (2004) argue in a discussion of jury theorems and shared evidence in general, jurors do not give a direct signal about the state of the world. Rather, Dietrich and List propose that "the body of evidence is a noisy signal about the state of the world; and a juror's vote is a noisy signal about the body of evidence" (Dietrich & List, 2004, p. 183). Arguably this also applies to philosophers. Philosophers do not have direct (even imperfect) access to the state of the world as it pertains to a particular philosophical question; say whether scientific realism is true or not. Rather, philosophers form their beliefs about the state of the world, for instance whether they should be scientific realists or not, based on the available evidence. The shared evidence is the direct causal parent of philosophers' belief on a particular philosophical question, while these beliefs are only causally connected to the state of the world through the shared evidence. A consequence of this is that the individual competence cannot be regarded as the probability that a voter is correct

about the state of the world.[13] Instead, individual competence is the probability that an individual gives an ideal interpretation of the shared evidence. These will come apart if the evidence is such that even an "ideal interpreter", as Dietrich and List (2004, p. 183) denote it, has some non-zero probability of being wrong about the state of the world given the evidence. This follows since even an ideal interpretation of the evidence in that case will have a chance of being wrong. Thus, if the evidence underdetermines the state of the world even from the perspective of an ideal interpreter, then Eq. (2) only gives the probability that the group has interpreted the evidence as well as the ideal interpreter (assuming that there is no dependence among voters besides shared evidence). The probability that h voters are correct about the state of the world will therefore in addition depend on the probability, p^I, that an ideal interpreter interprets the evidence correctly (Dietrich & List, 2004, p. 184):

$$P_h = p^I \cdot P_h^{(E)} + \left(1 - p^I\right) \cdot P_{n-h}^{(E)} \tag{3}$$

where $P_h^{(E)}$ is the probability that h voters interpret the evidence as well as an ideal interpreter. In the absence of any other dependence among voters $P_h^{(E)} = P_h^{(B)}$ if the individual competence, p, is re-conceived as the probability that an individual gives an ideal interpretation of the evidence ('individual competence' and 'p' will be used in this sense from here onwards).

Equation (3) brings shared evidence center stage. Irrespective of how good each individual is at interpreting the evidence, they can, not even as a group, outperform the ideal interpreter: "As the jury size increases, the probability of a correct majority decision (given the state of the world) [denoted $P(V > n/2|X = 1)$ above] converges to the probability that the evidence is not misleading $[p^I]$" (Dietrich & List, 2004, p. 191). When Dietrich and List here describe the probability that an ideal interpreter will interpret the evidence correctly as "the probability that the evidence is not misleading", they point to an immediate problem this role of shared evidence can generate for the relevance of symmetry to the skeptical argument from disagreement: evidence can be misleading (such that $p^I \ll 1$) and in that case neither individuals nor groups will be very competent. Thus, if evidence could be argued to be generally misleading in philosophy, then Dietrich and List's framework would provide an easy way to resist the relevance of symmetry to the skeptical argument from disagreement. Suppose evidence in philosophy were so misleading, ambiguous, or meager that even an ideal interpreter would have little more than 50% chance of interpreting the evidence correctly, too little to justify belief. Since the ideal interpreter's competence bounds group competence from above, it follows that majorities in such cases could never provide higher-order evidence for raising one's credence above the threshold for belief which is what is required to resist the skeptical argument from disagreement. However, Sect. 2 already briefly sketched a way to resist such arguments based on the idea that the epistemic conditions in philosophy are generally poor: For the skeptical argument from disagreement to be relevant for philosophical belief, it must be assumed that philosophers are (at least sometimes) entitled to philosophical beliefs *before* they discover

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[13] More formally, this follows from the parental Markow condition. See Dietrich and List (2004) for further details.

that there are philosophical peers who disagree with the belief. This will also have implications for the conception of the character of evidence in philosophical questions *if* belief is assumed to require evidential support which is arguably already implicitly assumed by the role of shared evidence in Dietrich and List's framework. If some philosophical belief is rational to hold before a disagreement is revealed and if it is the available evidence that justifies this belief, then the condition of this evidence cannot be too bad. In particular, this must entail that the probability that an ideal interpreter interprets the evidence correctly is well above the threshold value for belief. This is so since the probability that a single person votes for the correct state of the world is at most equal to that of the ideal interpreter and less if that person is a worse interpreter than the ideal interpreter. Assuming that philosophers are sometimes rational to have philosophical beliefs but that they are generally short of being ideal interpreters, it follows that an ideal interpreter—in the cases where belief is rational—would surpass the threshold for belief with place to spare. Thus, the probability that an ideal interpreter interprets the evidence correctly, p^I, must be relatively high for the skeptical argument from disagreement to be relevant for philosophical belief, though exactly how high will depend on the stipulated threshold for belief and the individual competence.

5.2 Generic correlation

While shared evidence was argued to be a common cause of the vote of all group members, other kinds of dependence will take the form of common causes only for subgroups. These will therefore give rise to intricate patterns of correlation between group members such that some, but not other, group members are correlated and to different degrees. From the perspective of the formalism, it is irrelevant what the source of the dependence is, and the following will therefore limit the discussion to these generic correlations.[14]

Alexander Kaniovski (2010) develops a concrete framework for including correlations where each order of correlations—second, third, etc.—take the form of corrections to Eq. (2). However, for anything but homogeneous second order correlations, i.e. pairwise correlations that are the same between all group members, these corrections become intractable and the framework that Kaniovski ultimately proposes therefore assumes that all higher-order correlations vanish and that all pairwise correlations are equal. Furthermore, it assumes that all individuals have the same competence. While these are very restrictive assumptions, Kaniovski's framework is currently the only one that can give a concrete estimate of P_h for dependent votes.

In the case of group competence, however, there exists a lower bound on group competence as shown by Ladha (1992) which shall be the focus here. This result has the advantage that it depends only on the average individual competence, $\overline{p}$. Thus, any worries that the disagreeing parties have different competence can be ignored in this case (and the result therefore applies even if one rejects the argument for homogeneity from peerness). Furthermore, the dependence among voters only enters as an average

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[14] See Lackey (2013) and Barnett (2019) for a more detailed qualitative discussion of belief dependence in philosophical disagreement.

though it is as the average probability that two voters simultaneously vote for the correct alternative, $\bar{r}$, which is a different measure of the dependence among voters:

$$r_{i,j} = c_{i,j} \sqrt{p_i - p_i^2} \sqrt{p_j - p_j^2} + p_i p_j \tag{4}$$

where $c_{i,j}$ is the pairwise correlation between the two voters i and j.

The bound is then as follows (Ladha, 1992, p. 626):

$$\inf P\left(V > \tfrac{n}{2} | I(E) = 1\right) \geq \frac{(0.5 - \bar{p})^2}{\frac{\bar{p}}{n} + \frac{n-1}{n}\bar{r} - \bar{p}^2 + (0.5 - \bar{p})^2} \equiv P_M^{LB} \tag{5}$$

where $I(E) = 1$ is added to capture that the probability is conditional on the probability that an ideal interpreter, I, interprets the evidence, E, in favor of the answer 1. In giving a lower bound on group competence, Eq. (5) can only be used to say when group competence is certain to be higher than the average individual competence. This lower bound can, in other words, be below the individual competence for some average dependence, while the competence of a group with that average dependence can surpass the average individual competence. Indeed, since the bound cannot be shown to be tight, there might be no actual dependence structure for which the group competence agrees with the lower bound.

To take into account the effect of both shared evidence and generic correlations, Eqs. (3) and (5) are here combined to give a bound on the probability that the majority votes for 1 given that the ideal interpreter interprets the evidence in favor of the answer 1 and that 1 is correct (see Appendix):

$$\inf P\left(V > \tfrac{n}{2} | X = 1 \text{ and } I(E) = 1\right) \geq p^I \cdot P_M^{LB} + \left(1 - p^I\right) \cdot \left(1 - P_M^{LB}\right) \tag{6}$$

where $\left(1 - P_M^{LB}\right)$ can be interpreted as an upper bound on the probability that the minority interprets the evidence as well as an ideal interpreter. The next section will explore Eq. (6) with the purpose of indicating when the lower limit on group competence is higher than the average individual competence.

6 Dependence in philosophy: the case of scientific realism

In their defense of the skeptical argument from disagreement, Carey and Matheson (2012) recognize that it is highly likely that opinions are asymmetric, but they argue that one should in most cases suspend judgement about *which* view is in the majority. However, concrete surveys, they concede, could reveal that a particular view is in the majority. The largest survey of philosophical opinion is made by Bourget and Chalmers (2014) among 1972 faculty members at what they describe as "99 leading departments of philosophy" (Bourget & Chalmers, 2014, p. 468).[15] The survey asked 30 philosophical questions and was completed by 931 of the invited respondents which gives a response rate of 47.2%.

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[15] For a critical discussion of this survey, see Cappelen (2017).

Carey and Matheson, however, object that such particular surveys cannot decide which view is actually in the majority:

> Various polls and surveys could be taken with the result that we could become justified in believing that certain opinions on these matters are in fact the majority opinions. That said, things are not quite so easy since it seems that it is not only the opinions of our living contemporaries that matter. There have been many great thinkers who were roughly as informed as our contemporaries on the relevant issues (Carey & Matheson, 2012, p. 141).

Carey and Matheson's objection is that no questionnaire will ever be able to survey the opinion of all relevant parties to the disagreement which they argue make them inconclusive about who really is in the majority. Fortunately, the results of Sect. 6 make no assumption about the group of people being exhaustive or even representative. There are results in social choice theory that assume that voters are exchangeable in a particular technical sense (e.g. Ladha, 1993; Peleg & Zamir, 2012), but none of them are appealed to in the present analysis. Rather, the results used here depend only on the number of voters, the voters' average individual competence, their average correlation, and the character of the evidence. What Carey and Matheson could object is that in asking contemporary philosophers, we might get a biased answer since contemporary philosophers might be subject to current trends. This, however, is not an objection to the use of the survey as such but rather an argument that the surveyed philosophers should perhaps be regarded as slightly positively correlated because they share this bias.

For purposes of the analysis, some threshold for belief is required. Grundmann (2013, p. 77) stipulates that a probability of being correct above 0.7 is sufficient for belief in a proposition. The same assumption will be made here, though the discussion below can be carried out for any value in the open interval between 0.5 and 1. In Sect. 3, it was argued that the skeptical argument from disagreement is only relevant for philosophical belief if it is assumed that philosophers are (at least sometimes) rational to believe in a philosophical proposition *before* it is revealed to them that an epistemic peer disagrees with this belief. Thus, from the stipulated threshold for belief it follows that philosophers in those cases at the outset have more than 70% chance of being correct about that philosophical question. Using the framework above, this can be converted into the constraint that the evidence cannot be more misleading than that a group comprising of a single individual must have 70% chance of being correct. Since there is no correlation in a group of one person, it follows from inserting Eq. (2) into Eq. (3) that

$$P(X = 1|v = 1) = p^I \cdot p + (1 - p^I) \cdot (1 - p) = 0.7 \qquad (7)$$

This does not determine p^I or p, but it says that we cannot be too pessimistic about the character of the evidence and the individual competence at the same time. More precisely, Eq. (7) implies that p^I, $p \geq 0.7$. In Sect. 5.1, it was argued that p^I, i.e. the probability that an ideal interpreter interprets the evidence correctly, should be well above the threshold for belief. For the purposes of the analysis, it is therefore stipulated that $p^I = 0.85$. This allows for the possibility that even an ideal interpreter

is occasionally misled by the evidence in a philosophical debate, which seem likely given the character of the evidence in philosophical debates. Equation (7) then entails that $p = 0.785$. This is, in other words, the stipulated probability that a philosopher interprets the evidence as well as an ideal interpreter. These values will be assumed for the purpose of the analyses below, though they are admittedly somewhat arbitrary solutions to the constraint of Eq. (7).

For the analyses, the survey question about scientific realism and the distribution of replies will be used as an example, but similar analyses are possible for any question where the distribution of opinion has been surveyed, for instance the other 29 questions from Bourget and Chalmers' survey. According to the survey, 75.1% (699/931) of all respondents accepted or leaned towards scientific realism (Bourget & Chalmers, 2014, p. 398), and the same is the case for 59.6% (56/94) of the respondents that identified their field of expertise to be general philosophy of science.[16] The skeptical argument from disagreement assumes that the disagreeing parties are epistemic peers. For the distribution of opinion in a group to be relevant for the skeptical argument, the group members must therefore also be epistemic peers, though treating the distribution of opinion as separate higher-order evidence might allow for weakening this constraint. However, the argument here does not pursue this possibility. Rather, the contention is that the 931 philosophy faculty of the survey, or at least the 94 of them who identified as experts on general philosophy of science, are epistemic peers with respect to the question of scientific realism. This question is so central in philosophy of science that experts in this field must be aware of the various arguments and positions relating to this question, and the same might even be said of professional philosophers in general. We shall here proceed on this assumption noticing again that if we are very strict on peerness in this context, then the same standard must apply when the skeptical argument from disagreement appeals to peerness.

As already mentioned, the group competence does not depend on the particular distribution of opinion, i.e. the 75.1% and 59.6% for scientific realism among all respondents and experts on philosophy of science, respectively. Rather, group competence precedes the results of the survey. More precisely, group competence gives the probability that a majority will vote the same as an ideal interpreter and group competence therefore informs how much epistemic weight you should assign the majority view whatever it turns out to be and how big or small majority is. With the survey data in, we find, however, that the group's competence should be counted in favor of scientific realism. Under the assumption that the only dependence among voters is due to shared evidence, it follows from inserting Eq. (2) into Eq. (3) that the probability that the majority will vote for the correct alternative is 0.8499999998[17] for $n = 94$ while the probability is even closer to the 0.85 of the ideal interpreter for $n = 931$. Under the (contentious) assumption that shared evidence is the only source of dependence and still presupposing that $p = 0.785$ and $p^I = 0.85$, both the group of philosophy

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[16] This is according to the more detailed results of the survey that can be acquired on https://philpapers. org/surveys/results.pl?affil=Target+faculty&areas0=5932&areas_max=1&grain=coarse (accessed November 11, 2020.).

[17] Giving this number with so many decimals obviously provides for a false sense of precision.

of science experts and the group of philosophy faculty are as competent as the ideal interpreter and more competent than the individual group members.[18]

However, dependence among philosophers is precisely the central objection in Carey and Matheson's critique of the relevance of symmetry for the skeptical argument from disagreement. It is not surprising that the case with no dependence besides shared evidence reproduces the picture that makes Grundmann and Kelly confident that symmetry is relevant. An indication of the effect of such dependence can be obtained from Eq. (5). It gives a lower bound on group competence based on the average dependence among voters and their average individual competence. The average dependence among voters enters Eq. (5) as the average probability that two voters will both vote for the correct alternative which was denoted $\bar{r}$ above. For independent voters, this value is given as the product of the average individual competences such that for $\bar{p} = 0.785$, we have $\bar{r} = 0.616$. If the voters are positively correlated, then the probability that they both vote for the correct alternative will be larger than it would be otherwise. Thus, for positive correlation and $\bar{p} = 0.785$, we would have $\bar{r} > 0.616$.

Figure 1 shows the lower bound on group competence as evaluated by Eq. (5) for $n = 931$ and $n = 94$ as a function of the average dependence in the form of the probability, $\bar{r}$, that two voters vote for the correct alternative. As seen, the difference in group size only has a marginal impact on group competence. Thus, whether all the 931 faculty or only the 94 experts on philosophy of science can be considered epistemic peers with respect to scientific realism will not decide if group competence is relevant higher-order evidence for scientific realism. Both for $n = 931$ and for $n = 94$, the lower limit on group competence is monotonically decreasing in $\bar{r}$ and for $\bar{r} > 0.638$ group competence can be worse than the average individual competence among group members even in the large group of 931 individuals. A similar pattern is displayed for groups of all sizes if the average individual competence is more than 0.5, though the exact values will vary for when the lower limit on group competence becomes less than the average individual competence.

The generality of this pattern confirms the worry that dependence among voters can be detrimental to group competence. However, it also shows that groups can be significantly more competent than their average member even in the presence of moderate dependence. Furthermore, Eq. (5) only gives a lower limit on group competence whereby group competence can be considerably better than for instance Figure 1 indicates if the dependence among voters is structured more favorably. Unfortunately, Eq. (5) says nothing about the dependence structure among voters and whether for instance few, many, or most dependence structures will give a group competence close to the lower bound. Furthermore, the bound cannot be shown to be tight and there may therefore be no dependence structure for which the probability is equal to that of the lower bound. It is therefore difficult to say whether the lower bound on group competence reflects a widespread, let alone realistic or even actual, dependence structure. What Eq. (5) shows is, in other words, that dependence *can* be detrimental to group competence, but it does not say whether group competence is likely to be compromised

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[18] For $n = 94$, the probability that the majority interprets the evidence as well as the ideal interpreter is 0,9999999997 under these assumptions.

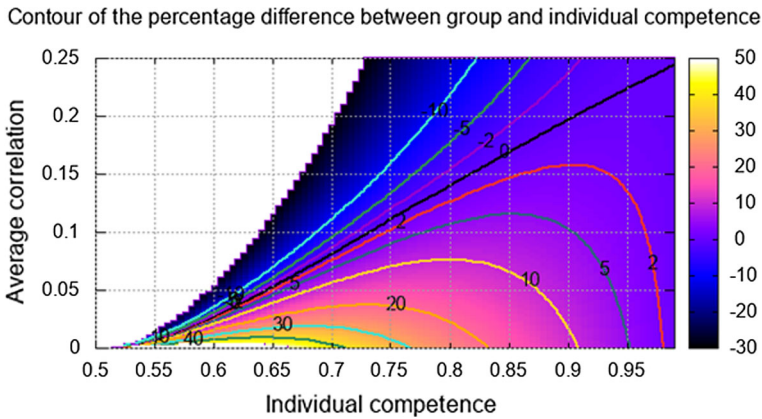Comparison of group competence and individual competence for p=0.785
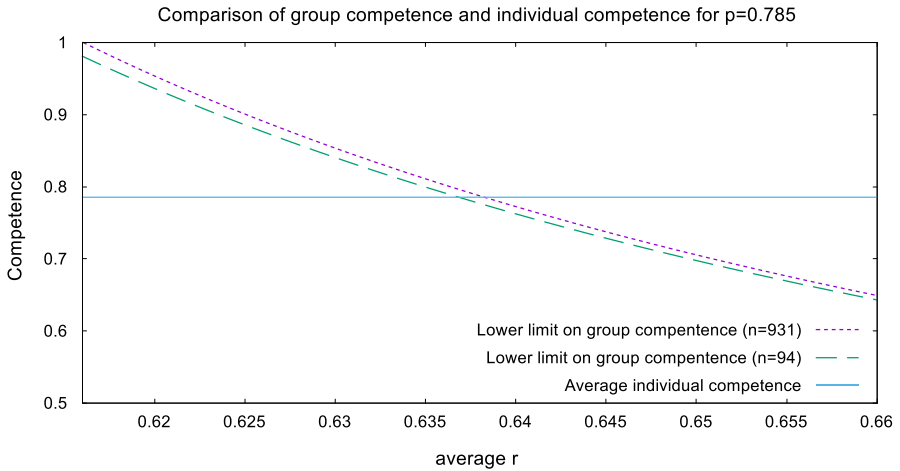
Fig. 1 The lower bound on group competence (based on Eq. (5)) in a group of 931 individuals as a function of $\bar{r}$ (dashed), in a group of 94 individuals (striped), and average individual competence (solid)

even when $\bar{r}$ exceeds the value where the lower limit on group competence becomes less than the average individual competence.

When average dependence is small enough, however, Eq. (5) entails—as Fig. 1 also illustrates—that even the lower bound on group competence exceeds the average individual competence, at least for $\overline{p} = 0.785$. Fig. 2 extends this picture in the case of $n = 931$ by treating the average individual competence as a variable as well. Since r depends on p (as Eq. (4) shows), the dependence must in this case be expressed by the average correlation, $\bar{c}$, in order for the variables to be independent. Though both $\bar{c}$ and $\bar{r}$ are measures of the average dependence among voters, their relation is complicated if the competence of the individuals in the group vary, though it is still such that "a low value of $\bar{r}$ would correspond to a low value of the average correlation" as Ladha (1992, p. 625) observes. The following will therefore adopt the simplifying assumption that individual competence is homogeneous whereby $\bar{r} = \bar{c} \cdot (p - p^2) + p^2$. Under this assumption, Fig. 2 depicts a contour plot of the percentage difference between the lower limit on group competence and the individual competence as a function of the average correlation and the (homogeneous) individual competence. To the right of the 0%-contour, the group is more competent than an average individual from the group. As seen, a dependent group can be more competent than an individual even if the individual competence approaches 0.5. This affirms that dependence among voters is not always detrimental to group competence. The observation that philosophers' opinions are dependent does not, in other words, in itself defeat the relevance of group competence for the skeptical argument from disagreement so long as $p > 0.5$ (remember that the constraint of Eq. (7) is violated for $0.5 < p < 0.7$, so if individual competence falls in this interval, then the threshold for belief must be adjusted accordingly).

Fig. 2, however, also reaffirms that dependence among voters can be detrimental for group competence and furthermore that a moderate average correlation can render the group less competent than its individuals if individual competence is low. Generally,

Fig. 2 Contour plot of the percentage difference between the lower limit on group competence and the individual competence as a function of the average correlation and individual competence (with n = 931). For positive values, the group is more competent than the average individual. For completeness, the interval $0.5 < p < 0.7$ has been included though these values of individual competence violate the constraint of Eq. (7)

for $\bar{c} > 0.15$, the lower limit on group competence will at most be only marginally higher ($\leq 3\%$) than the individual competence, irrespective of the individual competence. Being a lower limit, the group competence can of course be higher, and it might therefore (greatly) exceed the individual competence even for $\bar{c} > 0.15$ if the dependence structure is more favorable. Thus, so long as this lower limit is the only accurate measure of group competence in dependent groups, the debate between optimists like Kelly and Grundman and pessimists like Carey and Matheson can continue. However, the optimists could be vindicated if the average correlation proves to be relatively small and the individual competence proves to be high. Fig. 2 shows that a group of 941 people will outperform the average group member by 5% or more even in the worst-case scenario if $\bar{c} < 0.1$ and $0.78 < p < 0.9$. Adding more people to the group will for all practical purposes leave these intervals unchanged. As Fig. 1 shows, group competence is reduced in the smaller group of 94 people, and this effect becomes significant for even smaller groups. Thus, the figures given here assume that there are sufficiently many peers that can disagree such that the group can consist of about 100 people or more.

Furthermore, group competence only reflects the probability that the group will choose the same interpretation of the evidence as an ideal interpreter. As captured by Eq. (7), if an individual philosopher is assumed to have a fixed probability of being correct, then a higher stipulated individual competence implies a lower probability that an ideal interpreter will interpret the evidence correctly. Thus, higher group competence will not always entail that the group is more likely to vote for the correct alternative (under this assumption). Fig. 3 shows the effect of this in the case of $\bar{c} = 0.1$ and $n = 931$. While group competence goes to 1 as the individual competence goes to 1, this does not imply that the group is more likely to choose the correct alternative by majority rule since p^I goes to 0.7 for p going to 1, i.e. the probability that an
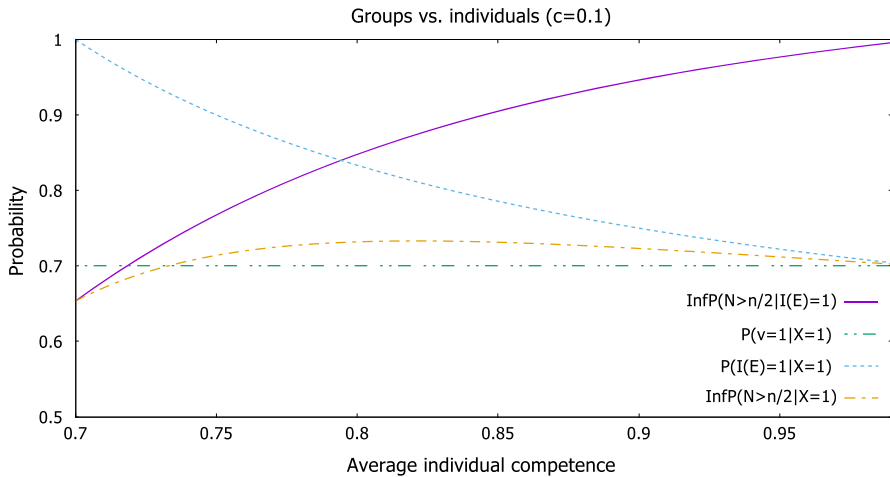
Fig. 3 Comparison of the lower bound on group competence (solid), the probability that an individual votes for the correct alternative (· · -), the probability that an ideal interpreter interprets the evidence correctly (· · ·), and the probability that the majority votes for the correct alternative (- · -) as a function of individual competence assuming that c = 0.1

ideal interpreter interprets the evidence correctly reduces when individual competence increases due to the constraint of Eq. (7). Nevertheless, the group is more likely to choose the correct alternative than any individual for $p > 0.73$, though the increase in probability is relatively small due to the correlation being high in this example.

The above only gives ranges of average correlation and individual competence where the group can be less competent than the individuals of the group and ranges where it cannot. However, what are realistic values of average correlation and individual competence among philosophers? No published estimates appear to exist for these two quantities. For individual competence, there might be good reasons why this is so. With so few philosophical disputes having been decisively settled,[19] such an estimate cannot be based on the philosophers' track-record on previous questions. Thus, the individual competence among philosophers may prove very hard to estimate.

In contrast, the dependence among philosophers would be relatively easy to estimate. The probability that two philosophers, i and j, will vote for the same philosophical view (the probability denoted $r_{i,j}$ above) could be estimated by simply asking the two philosophers many philosophical questions and see how often they agree. To find the average of this probability—what was denoted $\bar{r}$ above—in a group of philosophers, one would only have to repeat this for all pairs of group members and take the average. The average correlation can be estimated using the same data, i.e. the answers of all group members to a list of questions, by following the usual ways that one estimates the Pearson correlation coefficients, though some care must be taken when averaging such correlations (Corey et al., 1998). Despite these complications, there is reason to be hopeful that it is possible to obtain a good estimate of the average correlation in a group of philosophers which would indicate where we are on the y-axis of Fig. 2.

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[19] See, however, Stoljar (2017) for a more optimistic view of the progress in philosophy.

Since the figure only gives a lower limit and since the individual competence remains unknown, this will not settle the question whether group competence can serve as higher-order evidence for first-order philosophical propositions. However, it might at least inform whether optimism or pessimism is a more appropriate attitude when faced with these unknowns. With information about the full correlation matrix for the group, i.e. all pairwise correlations, numerical methods might also be employed to give a tighter bound on group competence, for instance following the method of Zaigraev and Kaniovski (2012).

7 Conclusion

The skeptical argument from disagreement proclaims that disagreements in philosophy are higher-order evidence that mandates philosophers to reduce their credence in the disputed views to a degree where suspension of judgement is rational for most philosophical questions. The present paper argues that being in the majority can be additional higher-order evidence that might counter this effect. When this is the case will depend on the details of the group; more particularly on the average individual competence and the average dependence among voters. However, the discussion of this paper informs the debate by showing that the distribution of opinion *can* be a relevant factor even if philosophers' beliefs are dependent since group competence can nevertheless (significantly) exceed individual competence. Indeed, if the average correlation among voters is less than 0.1 and the average individual competence is between 0.78 and 0.9, then even the *lower* bound on group competence will be at least 5% higher than individual competence for a sufficiently large group! A dependent group will, in other words, outperform the average individual even with the worst possible distribution of dependence if the dependence is not too large and the individuals are relatively competent on average. Critics like Carey and Matheson can stick to their guns and propose that the dependence among philosophers' beliefs—which undoubtedly exists—will prove the average correlation to be larger than 0.1 and perhaps even much larger. Should this be the case, then the lower bound on group competence would be less than the average individual competence, but this would not in itself prove that the distribution of philosophical opinion is irrelevant since the group's competence could still exceed this lower bound. Should the average correlation prove to be less than 0.1, however, then Carey and Matheson would have to argue that the individual competence is either very high or rather low—with the complications this entails relating to the ideal interpreter as sketched in Sect. 7—or argue that Eq. (5) fails to apply, for instance by criticizing the assumption of a dichotomous choice. However, as argued in Sect. 5, the latter concerns, not dependence among voters, but the use of jury theorems in general.

In summary, the present analysis should encourage optimists like Kelly and Grundman since being in the majority can be relevant higher-order evidence for a philosophical proposition. Being in the majority may therefore be able to counter the reduction in credence in that proposition that the conciliatory view mandates when it is discovered that the proposition is disputed. The mere observation that philosophers' beliefs are dependent is not sufficient to defeat this argument.

Appendix

To show that Eqs. (3) and (5) can be combined to give Eq. (6), consider first the general assumption that the total probability of voting outcomes must sum to 1: $\sum_{h=1}^{n} P_h = 1$. From this it follows (for odd n) that:

$$1 - \sum_{h > \frac{n}{2}}^{n} P_h = \sum_{h < \frac{n}{2}}^{n} P_h = \sum_{n-h < \frac{n}{2}}^{n} P_{n-h} = \sum_{h > \frac{n}{2}}^{n} P_{n-h} \tag{8}$$

To find the probability that the majority is correct, we insert Eq. (3) into Eq. (1) and use Eq. (8):

$$P\left(V > \frac{n}{2} | X = 1\right) = \sum_{h > \frac{n}{2}}^{n} \left(p^I \cdot P_h^{(E)} + \left(1 - p^I\right) \cdot P_{n-h}^{(E)}\right)$$

$$= p^I \cdot \sum_{h > \frac{n}{2}}^{n} P_h^{(E)} + \left(1 - p^I\right) \cdot \left(1 - \sum_{h > \frac{n}{2}}^{n} P_h^{(E)}\right) \tag{9}$$

Since Eq. (5) precisely gives the lower bound on the probability that the majority chooses the same alternative as an ideal interpreter, i.e. $\inf \sum_{h > \frac{n}{2}}^{n} P_h^{(E)} \geq P_M^{LB}$, we get Eq. (6) from inserting into Eq. (9).

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