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ON LEGAL INTERPRETATIONS OF THE
CONDORCET JURY THEOREM

*PAUL H. EDELMAN**

ABSTRACT

There has been a spate of interest in the application of the Condorcet Jury Theorem to issues in the law. This theorem holds that a majority vote among a suitably large body of voters, all of whom are more likely than not to vote correctly, will almost surely result in the correct outcome. Its uses have ranged from estimating the correct size of juries to justifying the voting of creditors in Chapter 11 reorganizations. While the mathematics is unassailable, the legal interpretation of the conclusion is dependent on the model of probability one uses when invoking the assumption that the voters are "more likely than not to vote correctly." In this paper, I show how different probabilistic models lead to different interpretations of the results. Establishing which is the appropriate model has normative implications as well. This analysis is then employed in critiquing the work of Saul Levmore and of Lewis Kornhauser and Lawrence Sager.

I. INTRODUCTION

RECENTLY there has been a spate of interest in the Condorcet Jury Theorem among legal academics.[1] The Condorcet Jury Theorem (hereinafter CJT), a lesser known result of the Marquis de Condorcet,[2] was motivated by Condorcet's efforts to justify the use of majority rule and to assess the optimal size of a deliberative body. Unfortunately, as with many other examples of

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[1] For example, see Saul Levmore, Conjunction and Aggregation, 99 Mich. L. Rev. 723 (2001); Richard H. McAdams, A Focal Point Theory of Expressive Law, 86 Va. L. Rev. 1649 (2000); Michael Abramowicz, En Banc Revisited, 100 Colum. L. Rev. 1600 (2000); Richard A. Posner, An Economic Approach to the Law of Evidence, 51 Stan. L. Rev. 1477 (1999); Kevin A. Kordana & Eric A. Posner, A Positive Theory of Chapter 11, 74 N.Y.U. L. Rev. 161 (1999).

[2] Condorcet is better known for being the first to notice that there may be cycling under majority rule and proposing the Condorcet criterion as a way to choose a winner. See, for example, Dennis C. Mueller, Public Choice II, at 112 (1989).

interdisciplinary scholarship in law,[3] applications of the CJT to legal problems are often not sensitive to the subtleties of its use and, ultimately, lead to flawed conclusions. Such is the case with a number of articles in the literature.

We can simplify (and modernize the language of) the CJT as follows:

Condorcet Jury Theorem.   Suppose that there are n voters who must decide between two alternatives, one of which is correct and the other incorrect. Assume that the probability that any given voter will vote for the correct alternative is greater than $\frac{1}{2}$. Then the probability that a majority vote will select the correct alternative approaches 1 as the number of voters gets large.[4]

In modern times, the CJT, with or without various embellishments,[5] has been employed to analyze juries,[6] justify majoritarian democracy,[7] and support the proposal of creditor voting in Chapter 11 proceedings.[8] Many of these applications interpret the CJT as a theorem about the aggregation of information.[9]

But using Condorcet's theory in this way raises a host of questions.[10] I will briefly discuss two issues later: how one might compute the probability

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[3] For recent critiques of the pseudo-interdisciplinary legal scholarship, see, for example, Lee Epstein & Gary King, The Rules of Inference, 69 U. Chi. L. Rev. 1 (2002); Mark A. Graber, Law and Sports Officiating: A Misunderstood and Justly Neglected Relationship, 16 Const. Commentary 293 (1999); Jack Rakove, Two Foxes in the Forest of History, 11 Yale J. L. & Humanities 191 (1999); Brian Leiter, Heidegger and the Theory of Adjudication, 106 Yale L. J. 253 (1996); Mike Townsend, Implications of Foundational Crises in Mathematics: A Case Study in Interdisciplinary Legal Research, 71 Wash. L. Rev. 51 (1996); Martin S. Flaherty, History "Lite" in Modern American Constitutionalism, 95 Colum. L. Rev. 523 (1995).

[4] Condorcet was not naive about the assumption that voters would vote for the correct alternative more often than not. He in fact concludes that in societies in which the level of enlightenment is not uniform, then "there is just ground for men less enlightened than its members to submit their will to the decisions of this assembly." Marquis de Condorcet, Essay on the Application of Mathematics to the Theory of Decision-Making, in Condorcet, Selected Writings 50 (Keith Michael Baker ed. 1976). For an interesting discussion of Condorcet's philosophy, see Cheryl D. Block, Truth and Probability—Ironies in the Evolution of Social Choice Theory, 76 Wash. U. L. Q. 975 (1998).

[5] One can relax some of the requirements of the theorem as stated. See Bernard N. Grofman, Guillermo Owen, & Scott L. Feld, Thirteen Theorems in Search of the Truth, 15 Theory & Decision 261 (1983).

[6] Steven Penrod & Reid Hastie, Models of Jury Decision Making: A Critical Review, 86 Psychol. Bull. 462 (1979).

[7] Bernard Grofman & Scott L. Feld, Rousseau's General Will: A Condorcetian Perspective, 82 Am. Pol. Sci. Rev. 567 (1988); Krishna K. Ladha, The Condorcet Jury Theorem, Free Speech, and Correlated Votes, 36 Am. J. Pol. Sci. 617 (1992).

[8] Kordana & Posner, *supra* note 1.

[9] Information Pooling and Group Decision Making (Bernard Grofman & Guillermo Owen eds. 1986).

[10] Some are minor. For instance, there is no particular need for all of the probabilities to be identical, and, indeed, they do not all have to be greater than 12, as long as enough of them are. For this and other refinements and strengthenings, see Grofman, Owen, & Feld. *supra* note 5.

mentioned in the theorem and what one might mean by "correct" in various contexts.

The main topic of this article, however, is what we mean by the statement "the probability that any given voter will vote for the correct alternative is greater than $\frac{1}{2}$." Hidden in this intuitively clear remark are assumptions about how the model is working, which determine how we interpret the results. For instance, we might believe that the voters had some a priori knowledge of the issue at hand that let them vote correctly with a probability of .75, in which case, we might view the vote as aggregating the private information of the voters. On the other hand, we might view the voters as flipping an unfair coin that comes up "correct" 75 percent of the time, and that is how they choose their vote. In this case, to speak of "aggregating information" would seem silly. Unfortunately, in most of the applications of the CJT, there is little if any attention paid to this question. These different potential meanings of the statement about the probability depend on how randomness enters into the model. That crucial issue is largely ignored.

As an example of what I mean by how randomness enters into the model, consider the following statement: "Professor X will vote in favor of hiring candidate Y with probability $\frac{2}{3}$." What does this statement mean? One interpretation is that, when asked, Professor X rolls a die, and if the roll is a number between 1 and 4, she votes "aye" and otherwise she votes "nay." Note that under this interpretation, if the vote were to be done over, Professor X might vote differently.[11]

A different interpretation is that among all professors eligible to vote, $\frac{2}{3}$ of them will vote for candidate Y, and hence the likelihood that Professor X will do so is $\frac{2}{3}$. In this interpretation, Professor X's vote itself is not random, but our guess about its outcome is nevertheless probabilistic. In particular, we are trying to predict how Professor X is going to vote on the basis of her membership in the group about whom we have some general information.

Finally, the statement could mean that Professor X has historically voted for candidates $\frac{2}{3}$ of the time, and hence the likelihood that she votes in favor of Y is $\frac{2}{3}$. In this interpretation, we are relying on knowledge particular to Professor X to make a prediction.

Each of these three models is a legitimate interpretation of the claim that Professor X will vote for candidate Y with probability $\frac{2}{3}$. Moreover, suppose we claim that the likelihood of each professor on the faculty voting in favor of Y is $\frac{2}{3}$; then to answer questions about, say, how many affirmative votes there are likely to be for Y, it is not necessary to specify which of these models we are thinking of. All of them are equivalent mathematically for the purpose of computing probabilities.

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[11] This is similar to the use of mixed strategies in game theory. See Guillermo Owen, Game Theory 13 (3d ed. 1995).

However, how we interpret a given number of affirmative votes depends very much on which model we are applying. For example, if we are adopting the second model (that $\frac{2}{3}$ of the faculty will vote in favor of Y), we might interpret a majority vote in favor of Y as being just a pure majoritarian exercise of the popular position in favor of Y winning. If we instead adopted the last model (that each individual faculty member votes in favor of Y with probability $\frac{2}{3}$), we might interpret such an outcome as being a deliberative exercise in which the considered opinion of the majority was in favor of Y. Thus, how we color the outcome (but not the outcome itself) is influenced by our view of the underlying probabilistic model.

The interpretive problem arises because probabilities are not computed for fixed one-time events. They are computed in circumstances in which there is some repeated event, either explicit or implicit. When we say that the probability of winning the lottery is one in 52 million, we mean that there are 52 million possible outcomes and that the bettor has chosen to put money on one of those outcomes. That is, we would expect that the number picked by the bettor would likely appear once every 52 million draws. In order to interpret the results obtained under each model, then, we need to know the events to which we are comparing the average voter's probability of being right in order to interpret the results.[12]

To illustrate, let us return to our earlier faculty-hiring scenario. In the language of probability, how should the different models of faculty voting previously discussed be described? In the dice model, we are comparing the results for candidate Y with other rolls of the die: $\frac{2}{3}$ of the time, the die will turn up with a number between 1 and 4, and one-third of the time, it will produce a 5 or a 6. In the second model, we are comparing Professor X's vote to the votes of all other eligible faculty members: since $\frac{2}{3}$ of all faculty members would vote "aye," the likelihood that the randomly chosen Professor X will vote "aye" is $\frac{2}{3}$. The third model is quite different, however, since it depends on individualized knowledge about Professor X. In this model, we are comparing Professor X's decision on candidate Y to Professor X's decisions on all other possible candidates. Since we know that she voted for $\frac{2}{3}$ of the candidates, in the absence of any further information, we guess that the likelihood is $\frac{2}{3}$ that she will vote for any given candidate (including candidate Y).

The typical paper using the CJT never bothers to discuss what model of randomness is being assumed.[13] As an example, consider this typical de-

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[12] Formally, in order to specify the probabilities, one must define the relevant probability space. See Emanuel Parzen, Modern Probability Theory and Its Applications 8 (1960).

[13] The most cited text for issues related to the CJT is Grofman & Owen eds., *supra* note 9. The issue of the underlying probabilistic model is not addressed directly anywhere in this volume. Occasionally there will be a remark that implicitly assumes one or another of the models we describe. I will say more about these in the next section. The only place in the literature where this question is explicitly mentioned is in Ladha, *supra* note 7, which gives

scription of the model: "All citizens wish to improve the 'quality of life' in their country, but they disagree over whether this quality is higher when the sale of drugs is legalized than when it is not. If we assume that the probability that an average citizen knows the *right* answer to this question is greater than 0.5, then a national referendum on this issue, with the outcome decided by majority rule, would choose the right answer with a probability of almost 1.0."[14]

The source of the trouble in this particular interpretation of the CJT is how to make sense of the statement "the probability that an average citizen knows the *right* answer . . . is greater than 0.5." While it is an intuitively clear statement, and one that allows a computation of other related probabilities, it is not precise enough to describe which of the three possible models it is using.

If we are going to use the CJT, we must decide which interpretation of the probabilities is appropriate for the context in which we use it. In the next section of this paper, I outline three different ways in which the CJT might legitimately incorporate randomness into the model and discuss the situations in which they might apply. In a subsequent section, I show that some of the applications of the CJT in the literature use the models in inappropriate situations.

II.   THREE POSSIBILITIES

In this section, I give a more precise formulation of the Condorcet Jury Theorem and then present three different descriptions of the underlying probability space—that is, the underlying events that we are using for comparison—all of which are consistent with the hypotheses of the Condorcet Jury Theorem. I will outline them here somewhat informally, but it is a small matter to make them mathematically precise. In addition, I will discuss some of the circumstances in which each of these different models might be appropriate. So that I can compare the various models, and for added concreteness, I will always assume that there are 12 voters (rather than N), that these voters are voting on some issue, and that the probability that each vote is "right" is $\frac{2}{3}$ (rather than some number $p > \frac{1}{2}$).

A.   The Random Model

As I noted earlier, the die-tossing or coin-flipping model is the most natural one to think of when interpreting the CJT. Recall that we are assuming that there are 12 voters and one issue. Each voter has a coin that, when flipped, appears right with probability $\frac{2}{3}$ and wrong with probability $\frac{1}{3}$.

one interpretation but does not mention any alternative formulations. I will discuss Ladha's remarks later in this paper.

[14] Dennis C. Mueller, Constitutional Democracy 158 (1996).

The key fact to observe about this particular interpretation is that a single voter repeatedly faced with the same issue will vote randomly each time and thus may reach different answers to the same question. This fact seems to rule out this interpretation when analyzing election voting, expert assessments, or juries: we expect voters, experts, and juries to come to their original conclusion if asked to vote again on the same issue with the same information. One can envision one situation in which the random model might apply, however. Suppose there was a perception experiment, in which the subject is shown a picture either quickly or in dim light, so it is just at the edge of the ability of the subject to recognize it. Then, being shown the same picture repeatedly might well lead to the sort of coin-flipping recognition that this model describes, and having a large number of voters vote on what they see might well lead to a more accurate guess about what is being observed.

B. The Polling Model

Suppose we are given one issue and we have an infinite pool of voters, $\frac{2}{3}$ of whom will vote right on the issue and $\frac{1}{3}$ of whom will vote wrong.[15] Choose at random 12 voters from this infinite pool. Since $\frac{2}{3}$ of the pool of voters will vote right, the likelihood of each voter voting right is also $\frac{2}{3}$. If the pool is not infinite but only very large with respect to the number of voters chosen, the calculations remain essentially the same.[16]

Note that this model is also a reasonable interpretation of the assertion that the probability of a voter voting right is $\frac{2}{3}$. The difference is that in the random model, we take vacillating voters and assert that the probability of any particular voter voting right this time is $\frac{2}{3}$, while in this model, we take consistent voters and assert that there is a $\frac{2}{3}$ probability that we have chosen a voter who always votes right. Moreover, in the polling model, what is considered right is the same as the outcome of a majority vote among all of the voters. Interpreted this way, the CJT is saying that a majority vote of a small number of randomly chosen voters will approach with probability 1 the result of a majority vote among all possible voters. In this interpretation, we can actually avoid the assumption that there is an objective right answer and just assume that what is considered right is the answer that the majority of all voters would pick. Indeed, in this model, there is no assumption made that the voters have any special knowledge about the issue on which they are voting, and since the model incorporates the randomness by means of

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[15] The reader might wonder what one means by 23 of an infinite number of voters. One can make this precise in a number of ways, but for the time being, imagine that the infinite number of voters are the numbers in the interval between 0 and 1 and that the voters with in the interval 0 to 23 vote right and those between 23 and 1 vote wrong.

[16] Or one can think of choosing voters with replacement, that is, allow for the choice of the same voter multiple times. This model is mathematically equivalent to the one with an infinite pool of voters.

the selection of voters, we assume that the voters will not have any individualized a priori information about the issue.

What situations would be appropriate to model in this way? This model is fairly accurate to describe the problem of polling a small subset of a large population about their views on some yes or no question. With a sufficiently large and sufficiently random sample, the sample's majority opinion will accurately reflect the majority opinion of the entire population. Like the random model, moreover, the larger the number of voters we ask, the greater the probability that their combined answers will be right.

C. Aggregation Model

The last model to which the CJT might apply is defined by having a fixed set of 12 voters and an infinite collection of issues. Suppose that each voter will vote right on $\frac{2}{3}$ of the issues and wrong on one-third of them, although different voters might vote differently on any given issue.[17] That is, even though voters might disagree on any given issue, each will vote right on $\frac{2}{3}$ of the issues considered as a whole. It is easily shown that the probability of any particular number of right votes is the same as in the earlier models. It is also a simple matter to alter this model so the probability of voting right is different for different voters or to modify it so there are only a finite number of issues.

The important thing to note about this model is that the randomness is incorporated by the choice of the issue, not by the random selection of the voters. As a result, we are assuming that the voters are familiar with a large class of issues about which they have some information, and the question is exactly which of these issues they have to deal with. This particular model, then, is especially appropriate for analyzing a situation in which there are a fixed set of "experts" who are called upon to issue an opinion about some question related to their expertise.[18]

To summarize, the difference between the polling model and the aggregation model is in how randomness is incorporated into the model. In the polling model, we assume that the issue is fixed and that the uncertainty arises because of the choice of the voters. In the aggregation model, we assume a fixed set of voters and that the uncertainty arises because of the choice of issue before them.

To illustrate how the use of these different models can affect interpretation, consider the following variant of my earlier hiring example: Suppose that the probability of Professor X voting correctly on candidate Y is $\frac{2}{3}$, where

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[17] One can make this precise by viewing each issue as a 12-tuple of numbers ($a, b, \ldots, l$), with each coordinate corresponding to one of the 12 voters. Each number is between 0 and 1; if a number is between 0 and 23, then the corresponding voter votes right on the issue, and if it is between 23 and 1, then that voter casts a wrong vote.

[18] Kordana & Posner, *supra* note 1.

by "correctly" we mean that if Professor X votes in favor of hiring Y, then Y goes on to a successful academic career, and if X votes against Y, then Y goes on to an unsuccessful career.[19] If we interpret this $\frac{2}{3}$ probability in terms of the random model, we imagine that X has a weighted coin that comes up with the correct answer $\frac{2}{3}$ of the time, and, depending on the outcome of a flip, X votes one way or the other. In this case, we have to assume that the coin has psychic powers.

If we use the polling model, then the assertion that X is correct $\frac{2}{3}$ of the time means that $\frac{2}{3}$ of the faculty will vote correctly on Y's candidacy. If $\frac{2}{3}$ were replaced by 99/100, we might say that Y's case is a "no-brainer." If $\frac{2}{3}$ were replaced by $\frac{1}{2}$, we might say that Y's case is very close call. In either case, the interpretation would focus on the issue of Y's candidacy and not on what X's particular insight might be.

Compare this with the use of the aggregation model. In this interpretation, Professor X has voted correctly on previous candidates $\frac{2}{3}$ of the time. In this case, we might say that X is an excellent evaluator of academic potential. If $\frac{2}{3}$ were replaced by $\frac{1}{2}$, we might say that X does not have a clue as to what qualities predict academic success. Thus, the interpretation using the aggregation model focuses on X's ability to evaluate academic talent and not on the particular merits of Y.

These models are meant to be illustrative rather than exhaustive. They can, for example, be combined in various ways. But the analysis will be the same as it is for these archetypal examples: it does not matter, for instance, whether we assume a finite or infinite number of voters in the polling model or a finite or infinite number of issues in the aggregation model. It is also important to note that, for numerical purposes, all of these models lead to the same conclusions. So, if we use the CJT to produce a functional model of a voting situation, that is, a model for making predictions about certain numerical behavior,[20] then it does not matter which of these models is used. Indeed, one need not even choose one beforehand. We do need to specify which model we are using if we plan to interpret the outcome by labeling it, say, "the will of the people" or "the most accurate assessment of the situation."

III.   PREVIOUS DESCRIPTIONS

Although I know of no other comparison among underlying probabilistic models of the CJT in the literature, some authors who use the CJT have, either implicitly or explicitly, referred to which model they were using. We will examine some of those instances here.

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[19] We will assume that there is general agreement as to what constitutes a "successful academic career."

[20] See Paul H. Edelman & Suzanna Sherry, All or Nothing: Explaining the Size of Supreme Court Majorities, 78 N.C. L. Rev. 1225, 1233 (2000).

The earliest explicit discussion is in Krishna Ladha's work on modeling the effects of free speech in an election by extending the CJT to the case in which the voters need not cast their votes independently.[21] Ladha recognizes the problem that "[i]n much of the CJT literature, the treatment of uncertainty is rather informal. Consequently the reader fails to learn precisely why the votes are random and independent, and what the assumption $p > .5$ implies."[22] Here is how Ladha describes the source of randomness in his model: "Consider a simple example. Suppose I have a coin that comes up heads with a probability p. While I do not know the value of p, I know that $p = .6$ or .3. I give the coin to a "jury" explaining that p is either .6 (state A) or .3 (state B). Before voting for either A or B, each juror is allowed to observe privately the outcomes of k trials but is forbidden from communicating with the other jurors. Assume that juror I ($I = 1, \ldots, n$) would vote for A if the observed proportion of heads h_i exceeds a certain threshold t_i."[23]

Ladha's description of the origins of randomness is even more detailed than the present discussion, in that it describes how the voters actually acquire their prior beliefs. Nonetheless, his description is essentially that of my aggregation model in which the issues correspond to the private information gotten by each voter from the flipping of the coins.

Lewis Kornhauser and Lawrence Sager also give an explicit description of the underlying probability model.[24] In a section on multimember courts and accuracy, they invoke the CJT to assert that larger collections of judges are more likely to give accurate decisions.[25] After describing the hypotheses of the CJT more or less the way I have done above, they proceed to discuss how randomness enters into their model: "Given these circumstances, we may consider each judge's decision as the draw of a single marble from a bag with marbles of two colors (white for a correct decision, blue for an incorrect decision), mixed in proportion to the likelihood of any judge's choosing the correct outcome. Adding judges simply adds draws (with replacement); as long as the proportion of white marbles in the bag exceeds $\frac{1}{2}$, the more draws there are, the more likely it becomes that more than half of the marbles drawn will be colored white or 'correct.' "[26]

Of course, what Kornhauser and Sager are describing is the random model. The shortcomings of this as a descriptive model are quite clear in this context: if, after a judge decides a case, we were to rewind time and have the judge decide under identical circumstances the identical case, her decision might

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[21] Ladha, *supra* note 7.

[22] *Id.* at 622.

[23] *Id.*

[24] Lewis A. Kornhauser & Lawrence G. Sager, Unpacking the Court, 96 Yale L. J. 82 (1986).

[25] "The fact that there are more judges on a panel thus implies that the panel is more accurate, that is, more likely to reach the correct decision." *Id.* at 98.

[26] *Id.* at 97.

be different. Moreover, the likelihood of coming up with a different decision would be independent of the particular case. Whatever this is a model of, it is not what we would normally consider "judging." But which of the other two models would be appropriate? We will return to consider that issue in the next section.

Compare Kornhauser and Sager's model of appellate courts with that of Michael Abramowicz.[27] In proposing a remedy to some perceived problems of the U.S. courts of appeals, Abramowicz needs to define the notion of a "correct" or "incorrect" decision. He does this by appealing to majoritarian principles: "Of course, I can not in this space develop a comprehensive substantive theory of what makes a decision 'correct' or 'incorrect.' But I can offer a suitable working definition. Just as we structure legislatures around majoritarian principles, so too, I will argue, should we seek to ensure that when a panel reaches a decision, it is the decision that a majority of all judges on the courts of appeals would reach if given adequate time to consider the issue. A decision is thus 'correct' if it is the hypothetical majoritarian one."[28]

Later Abramowicz goes on to apply the CJT to support the position that "[l]arger panels, however, are more likely to decide cases as the majority would resolve them. This is the simple logic of Condorcet's famous Jury Theorem, and if it makes sense for juries, it makes sense for judges too."[29] Thus, we see Abramowicz applying the polling model to appellate courts, in contrast to the random model employed by Kornhauser and Sager.

In his discussion (and critique) of the application of CJT to justifying simple majority rule, Dennis Mueller is never explicit in his assumption about the probability model, but he seems to adopt the polling model. For example, he states that "Condorcet assumes that citizens are on average right on issues such as these [guilt or innocence of a defendant] and he treats a jury as a random sample of the citizens. A national referendum is a still larger sampling that would, under the Condorcet assumptions, nearly always get the correct answer."[30]

My final example is drawn from the work of Kevin Kordana and Eric Posner on bankruptcy.[31] If a firm files for bankruptcy under Chapter 11, a reorganization plan is ultimately proposed that must be voted on by the creditors. If we assume that all of the creditors vote sincerely, then "the optimal Chapter 11 would solve the problem of how to a gather information

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[27] Abramowicz, *supra* note 1.

[28] *Id.* at 1602 (footnotes omitted).

[29] *Id.* at 1632 (footnotes omitted).

[30] Mueller, *supra* note 14, at 158.

[31] Kordana & Posner, *supra* note 1.

from parties and aggregate this information in the proper way."[32] They then go on to model this process of aggregation using the CJT:

Suppose that a single plan is proposed, and creditors vote either for the plan or for liquidation. Assume that every creditor has an equal probability, p, of voting correctly, and that probability is greater than .5. The latter assumption seems reasonable: A completely uninformed creditor who flipped a coin would vote correctly with a probability of 0.5, so if a creditor has any information, its probability will exceed 0.5. The Condorcet Jury Theorem shows that if the probabilities are independent (that is, creditors do not imitate each other or base their estimate on the same information), then as the number of creditors increases, the probability of the correct decision being made increases rapidly and approaches 100%. The significance of this result is that even if each creditor has relatively little information, and even if it is barely better than a flip of the coin, a large enough group can make quite a good estimate.[33]

Evidently, Kordana and Posner are applying the aggregation model. We can infer this from the fact there is a fixed set of creditors and that the creditors are assumed to have some private information about the firm in question.[34] Note also that they interpret the CJT to demonstrate that the group estimate is superior to the estimates of the individuals.

The question thus arises of whether these scholars (and others) are using the best model for the circumstances. But before I get to that question, which is the heart of the article, I need to digress to consider the questions of computing the probability p of a voter voting correctly and determining what the right answer is. The answers to these questions will help in the final section, where I consider two particular applications of the CJT in the legal literature.

IV.   A DIGRESSION ON p AND RIGHT

While not directly related to the main thrust of this paper—that which model we use affects how we interpret the outcome—the issues of how to evaluate the value of p (the probability that a voter will vote right) and how we identify the right answer are worth discussing. In particular, how one decides on these values is dependent on which model one is using.

The easiest of the three models to deal with empirically is the polling model. Once the appropriate group of voters is established, the probability p and the right answer are endogenous to the model. That is, given the pool of voters and the binary choice that has to be made, the right answer is the

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[32] *Id.* at 167.

[33] *Id.* at 168 (footnotes omitted).

[34] This point is made somewhat clearer later in Kordana and Posner's discussion where they say "[i]t is highly unlikely that the judge has more competence than the average creditor, and even more unlikely that the judge has more competence than the most competent creditor." *Id.* at 169.

one that would be chosen by the majority of the pool, and the probability p is the proportion of the voters in the pool who would make that choice.

For example, suppose we were to model a vote in a legislature on whether or not to allow a certain kind of biomedical research. If we were going to do this using the polling model, we might assume that the legislators were drawn randomly from the entire population, and thus that the right answer would necessarily be the one preferred by the majority of the population. The value of p would be the proportion of the population that adhered to this view, and we could thus make a guess as to how the vote in the legislature would turn out. The CJT would predict that, assuming the legislature was suitably large, the outcome would mirror the wishes of the majority. In particular, we need make no normative judgments as to the substance of the right answer.

It is important to note, however, that the fact that the right answer is endogenous to the polling model does not imply that there is no normative reason for this answer being right. A majority of the population might prefer this answer because it is normatively right. Thus, even if there is an accepted normative argument for what the right answer is, the appropriate model might still be the polling model. The key to deciding if the polling model is appropriate is whether the uncertainty in the model is due to the variation in the voters rather than to the variation in the issues being voted on.

In contrast, the aggregation model requires an exogenous choice of the right answer and a separate computation of the likelihood that a voter will choose that answer. In some situations, if there is an objective measure for right and a clear enough history of choices among the voters, this can be done easily. For example, consider the votes of the "elves" on the recently canceled television show *Wall Street Week with Louis Rukeyser*. Each week, the host reported on the predictions of a group of 10 "elves"—technical analysts of the stock market—as to whether or not the Dow Jones Index would be up 5 percent over the subsequent 3 months.[35] He also reported on whether the prediction of each elf 3 months previously was correct or not. Here is a situation in which the right answer is clearly defined and the history of voting by each voter sufficiently clear that we could make a good estimate of the numbers involved.[36]

Of course, this example is a particularly clean one. Suppose instead that I wanted to model the vote in the legislature on the issue of biomedical research using the aggregation model instead of the polling model. I would then be considering the biomedical research question as being one of a

[35] Actually, each elf predicted whether the Dow Jones Index would be up 5 percent, stay within 5 percent, or drop 5 percent from the current level. I have phrased the problem the way I did to conform with the CJT model of assuming a binary choice.

[36] It is not clear whether the assumption that each elf votes independently is met in this example.

collection of related questions, and I would have to make a normative decision identifying the right answer. Having done that, I would have to look at the record of each legislator's votes on issues in this collection and decide how often he was right.

The problem of identifying the right answer can sometimes be sidestepped, though, even in the aggregation model. Nicholas Miller[37] applies the CJT to elections by assuming that right is decided by each individual according to her own utility functions and then generalizes the CJT to show that as long as each individual votes right (where right is defined for each individual separately as opposed to universally) with likelihood greater than $\frac{1}{2}$, then a majority vote will very likely give the outcome considered right by the majority of voters.

In summary, although we will not consider further the issue of determining what the right vote is or how one might compute the voting probability p, how one would do that is dependent on which of the underlying probabilistic models is being used. If one is working with the polling model, these parameters are endogenous, while in the other two models, they are exogenous. The ability to calculate the probability is very dependent on individual context.

V.   WHICH MODEL WHEN?

The various models, as we have seen, incorporate randomness in different ways. These differences have implications not only for how we calculate p and how we determine the right answer but also for how we interpret the results. Which model we use determines whether, in a particular context, we can justifiably assert that the CJT gives us more confidence in a collective decision than we would attribute to individual decisions. But, as we have also seen, the scholars who have used the CJT to make such an assertion seem unaware even of the existence of multiple models, much less of the implications that follow from the different models.

This failure to recognize differences in randomness has led scholars astray. Although the remainder of this paper focuses on two particular instances in which the underlying assumptions are not appropriate to the context in which the CJT is being used, the problem is widespread. Because no one has previously outlined the different assumptions and their implications, it is more or less fortuitous whether a particular article's conclusions actually match those that would follow from an appropriate use of the CJT.

The papers that I consider are two of the most interesting applications of the CJT in a legal context. The first, by Kornhauser and Sager,[38] is the first

[37] Nicholas Miller, Information, Electorates, and Democracy: Some Extensions and Interpretations of the Condorcet Jury Theorem, in Grofman & Owen eds., *supra* note 9.

[38] Kornhauser & Sager, *supra* note 24.

attempt to model multimember courts and to apply the CJT to the analysis. The second, a recent paper by Saul Levmore,[39] is a novel use of the CJT to explain the behavior of juries.

I begin with the Kornhauser and Sager model of adjudication in multi-member courts.[40] They are interested in developing a theory of adjudication by multimember courts; to this end, they identify a number of measures of performance by such a court. The two measures relevant to this discussion are "accuracy" and "fit."[41] By accuracy, they mean that the court gets the right answer. By fit, they mean that the court gets the same answer as some reference group, which for them would seem to be society at large.[42] Having introduced these measures, they proceed to focus on the measure of accuracy and its relationship to the size of the court: "In what follows, we restrict our detailed attention to the feature of accuracy and the question of why three heads might be better than one as a means of 'getting it right,' or why nine might be better than three. We adopt this focus because we, in common with most philosophers of law, consider most adjudication to be judgement-based, and because it is the relationship between accuracy and tribunal size that seems most perplexing."[43]

Since Kornhauser and Sager restrict their interest to the question of accuracy and assume that there is an accepted right answer, the exact probabilistic model they use in invoking the CJT is actually irrelevant. Whichever model we apply will show that three judges are more likely than one judge to come to the right answer. Indeed, as mentioned before, Kornhauser and Sager propose the random model for their application of the CJT.[44] But surely in a paper dedicated to a nuanced understanding of adjudication, the random model is not viable.[45] So is a three-judge panel an example of the aggregation model or the polling model? I would guess that Kornhauser and Sager would say the aggregation model; indeed, the title of the relevant subsection of their paper is "Aggregating Judgments."[46] Moreover, they focus on the probability of individual judges' making the right decision,[47] which is consistent with an aggregation model and not with the polling model. For instance, one of

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[39] Levmore, *supra* note 1.

[40] Kornhauser & Sager, *supra* note 24.

[41] *Id.* at 91.

[42] Kornhauser and Sager are not entirely clear on this point, but it is implied in their discussion in the text. *Id.* at 95.

[43] *Id.* at 96.

[44] *Id.* at 97.

[45] I will not consider the random model further in this context. If I have not yet persuaded the reader that the random model is inappropriate in this context, it is worth noting that the subsequent critique of the aggregation model applies equally well to the random model.

[46] *Id.* at 97.

[47] *Id.* at 98.

their assumptions is that "each judge is more likely to choose the correct outcome than the incorrect one."[48]

If Kornhauser and Sager assume that the aggregation model is the appropriate one, then some basic questions need be resolved.[49] Recall that in the aggregation model, we must determine exogenously both the right answer and the probability that any voter will reach it. Thus, to apply the aggregation model to multimember panels, Kornhauser and Sager should discuss how we might arrive at these exogenously determined solutions. This they never do. With respect to the latter question—the probability that any judge will reach the right answer—they say only that "if each judge were more likely than not to get the answer wrong, we would not seek her judgment about the outcome."[50] How, exactly, Kornhauser and Sager would keep a judge whose vote would be wrong more often than not from hearing the case they do not say. Perhaps they assume that wrongheaded judges will not be appointed. (I leave the reader to draw her own conclusions about the validity of that assumption.)

And even if Kornhauser and Sager could prevent incompetent judges from hearing cases, there is still the problem of knowing a priori what the right answer is. As noted before, if there is not an exogenous right, the aggregation model does not apply. While Kornhauser and Sager discuss at length various properties of good adjudication, they never make the assertion that their methods produce a unique right answer. Indeed, at a number of places, they tacitly assume the contrary. For instance, they suggest that "[t]he argument against the consistency of multi-member courts rests on the possibility that judges on a multi-member court may disagree on the rules applicable to the decisions of specific cases."[51] But if Kornhauser and Sager recognize that judges might disagree on the right outcome, how do we apply the aggregation model?[52]

It is not obvious, then, that the aggregation model is the appropriate one.

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[48] *Id.* at 97.

[49] One might argue that the project in which Kornhauser and Sager are engaged is a normative one, and hence deciding which of these models is really the best description is not relevant. But even to the extent that this is a normative project, it relies on certain positive assertions such as the existence of a right answer and the assertion that every judge is right at least 12 the time. Such positive assertions require some defense even if the ultimate goal is a normative one.

[50] *Id.* at 97 n.19.

[51] *Id.* at 107.

[52] Note that it is not enough to assume that the judges on the court subscribe to some common methodology. All of them may believe that in an originalist interpretation of the Constitution, but that alone does not determine the outcome in any particular case. See, for example, Suzanna Sherry, The Indeterminacy of Historical Evidence, 19 Harv. J. L. & Pub. Pol'y 437 (1996); Suzanna Sherry, An Originalist Understanding of Minimalism, 88 Nw. U. L. Rev. 175 (1993); Daniel A. Farber, The Originalism Debate: A Guide for the Perplexed, 49 Ohio St. L. J. 1085 (1989); Paul Brest, The Misconceived Quest for the Original Understanding, 60 B. U. L. Rev. 204 (1980).

Imagine a large circuit that is ideologically divided over some legal issue. Then the outcome of a panel hearing the case is dependent not on the individual justices aggregating their private information but rather on the luck of the draw of which justices are selected for the panel. The larger the panel, the more likely it is that the outcome will be representative of the wishes of the judges in the circuit as a whole. In this case, then, it is the polling model that is most appropriately applied; the most we can say about the collective judgment is that the larger the panel, the more likely it is that it will reach the same decision that the circuit as a whole would.

This leads us to the measure of fit that Kornhauser and Sager decided to put aside in their paper. If one is interested in the fit between the three-judge panel and the judges in the circuit as a whole, then the best model to apply is the polling model, since that is exactly what it is designed to do. In fact, it is quite hard to see how one would even use the aggregation model for this purpose. If the fit that is being examined is between the judges and the population as a whole, which seems to be the issue for Kornhauser and Sager, it is again better to use the polling model than the alternative. Both would require some work, since it is by no means clear that the views of the judges would be representative of the views of the population at large, and hence we could not be confident that the probability of the judges being right exceeds $\frac{1}{2}$.

In summary, then, it is far from clear that the aggregation model is always the appropriate one to use when modeling multimember courts. If the case before the court is clear, then perhaps one can sustain the argument, but if there are legitimate (or even illegitimate or ideological) differences in interpretation, then the polling model would seem a more accurate description of the behavior of the court. And, of course, most cases that reach the appellate level—to say nothing of the Supreme Court level—involve issues that are far from clear. In addition, if one is concerned with the fit between the outcome of the panel and either the circuit as a whole or the general population, then the polling model seems to be the optimal choice.[53]

The choice of the model has normative implications as well. If we believe that the aggregation model applies to multimember courts, then it is perfectly reasonable to assume that all appellate panels should have the same number of judges. We could argue that there is some trade-off between accuracy and the administrative burden of a large panel, and these trade-offs would remain the same regardless of the number of judges in the circuit.

On the other hand, suppose we believe that the appropriate model for multimember courts is the polling model. Then the size of the panel should be related to the number of judges in the circuit, since a large circuit would

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[53] Recall that Abramowicz uses the polling model for just this purpose. Abramowicz, *supra* note 1.

require a larger number of judges on the panel to be representative.[54] Thus, the polling model would indicate that there should not be a uniform panel size for all of the different circuits.

What about juries, the application that first motivated Condorcet? The CJT and its refinements have been used to model the behavior of juries and to analyze questions of the optimal size of the jury.[55] I will not discuss the success of these attempts because they were meant to give a functional equivalence (that is, to predict jury behavior) and not to provide an interpretation of the behavior of juries. The question that concerns us here is how to interpret the work of a jury: is it a body that aggregates information or one that is meant to be representative of some larger group? This issue is prominent in a recent paper by Levmore.[56]

Levmore's project is to explain the "math-law divide," by which he means the different way in which lawyers and mathematicians deal with conjunctive probabilities. As an example, he poses a liability case in which A is liable to B only if A is negligent and A's negligence is the proximate cause of B's injury.

Imagine now that the fact-finding generates a conclusion that there is a .7 chance of negligence and .6 chance of causation. Doctrinally, the law seems to require that A pay if and only if A is negligent *and* causes B's harm. The question is whether this "and" is conjunctive. Most people who are experienced in probabilistic thinking hurry to say that the logic of the law seems to be that A should be liable if A is both negligent and the causal agent, and that this combined probability is $(.7)(.6) = .42$. The product of the two probabilities, or likelihood of these two events, is thus less than the .5 hurdle established by the preponderance of the evidence ("POE") normally applied to civil claims.

In contrast, most lawyers who have thought about this subject regard the (representative) jury instructions as calling for holding the defendant liable in this case because plaintiff apparently satisfies the first requirement (inasmuch as .7 exceeds the .5 trigger established by the POE standard), and also satisfies the second requirement (again, inasmuch as .6 exceeds the .5 benchmark). At the risk of oversimplification, the problem is that the mathematics of the matter tells us to multiply the two probabilities, following what is known as the "product rule" (for combining independent probabilistic assessments). Law, however, appears not to abide by this rule. Hence the math-law divide.[57]

One of Levmore's attacks on the "math-law divide" is via the CJT. He

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[54] I assume here that the right answer is determined by the views that are held by the majority of the judges in the circuit in which they sit. Kornhauser and Sager might argue that right should be determined by the views of the population at large. If that is truly the goal, then the size of the panel need not be correlated with the size of the circuit. Abramowicz would decide right with reference to all appellate judges, which again would imply that panel size could be independent of the size of the circuit. See page 336 *supra*.

[55] Penrod & Hastie, *supra* note 6.

[56] Levmore, *supra* note 1.

[57] *Id.* at 725 (footnotes omitted).

argues that we can have much greater confidence in the collective vote of the jury than we can in any individual juror's vote. Using the CJT, he suggests that if a majority of jurors each conclude that they are 70 percent certain A was negligent, the probability that A was negligent actually approaches 1.

But now what if a very large jury assessed the likelihood that the requirements for liability have been met as .7 and .6 respectively? Is it not possible that if a single fact-finder or a small jury did so we ought to be comfortable applying the product rule on our way to finding that .42 was less than what the POE rule required, but that when a large group does so we should somehow think it more likely that they are right on both counts? . . . If each juror thinks that .6 is a good assessment of the first requirement, and .7 is a good assessment of the second, then the large jury's overall chance of being right, as to the questions of negligence (or not) and causation (or not), may be quite high with respect to each question. The product rule is still correct, to be sure, but the product rule yields a number almost surely closer to 1.0 than .42.[58]

Levmore is somewhat less than clear as to how he uses the CJT in this context. Recall that the hypotheses of the CJT require that the vote be between two alternatives for which there is a right and wrong answer and that each voter is more likely to vote for the right answer than the wrong one. The conclusion of the CJT is that as the number of voters gets large, the likelihood that a majority vote will result in the right answer approaches 1. Given that, what is the question that Levmore poses for the jury?

If the question is, Is the defendant guilty of negligence by a preponderance of the evidence? and the right answer is, Yes, then the CJT allows us to conclude that a jury vote in favor of negligence is with a very high probability correct. That is, it is very likely that the defendant is negligent by a preponderance of the evidence. The CJT does not allow us to conclude that the defendant is negligent by a standard more stringent than a preponderance of the evidence. But that is what Levmore would like us to conclude when he suggests that we should have more confidence in the jury's aggregate vote than each juror has in her own.

Perhaps the question should be, Is the defendant guilty of negligence? without any further qualifications. But if the jury instructions are to find the defendant negligent if the preponderance of the evidence indicates it, then we are just back to our previous case. Those jurors who think he is negligent by the preponderance of the evidence will vote yes and the others no. In the end, the CJT will allow us to conclude that the defendant is very likely negligent where negligence is defined to be by the preponderance of the evidence. We will not be able to conclude anything stronger than that.

There is another difficulty in Levmore's application of the CJT. He does not clearly specify the probability that a voter will vote correctly. Levmore

[58] *Id.* at 736 (footnotes omitted).

seems to conflate the individual juror's assessment of the likelihood of negligence with the probability that the juror will vote correctly. His specification that a juror assesses the probability of negligence at .6 (for example) is not the same as asserting that the probability that the juror will vote correctly on the question of negligence is .6. To see this, suppose the question before the jury is, Is the defendant guilty of negligence by a preponderance of the evidence? and suppose that a juror thinks the probability of negligence is .6. Then that juror will vote yes with probability 1, since his belief that there was negligence exceeds the preponderance of the evidence standard. So the number .6 cannot be the probability that a juror will vote correctly. Without some discussion of what that number might be, it is impossible to apply the CJT at all.

As an illustration of this problem in Levmore's argument, consider the following scenario. A jury is to vote on whether the roll of a fair die results in a number less than or equal to 4. Each juror concludes that the probability of such a roll is $\frac{2}{3}$, and hence they all vote yes. That is, there is a unanimous vote in favor of the proposition. What can we conclude from such a unanimous vote? We cannot conclude that the unanimity of the jury means that the individual jurors underestimated the odds of such a roll, since the odds are clearly exactly $\frac{2}{3}$. Nor can we conclude that, since the vote was unanimous, the odds of such a roll are larger than $\frac{2}{3}$. Yet Levmore would have us believe that the unanimity of the vote should make us reassess both of these probabilities.

This is not to say that Levmore's intuition is necessarily incorrect, but only that it does not follow from the CJT. Suppose one is debating whether or not to undergo an operation. Each of 12 doctors reports that there is a better than even chance that the operation will be a success. In these circumstances, it may not be unreasonable to conclude that not only will the operation succeed, but, in fact, the odds of success are much better than even. The reasoning might be that one would not expect a unanimous opinion if the probability of success of the operation were close to even odds. The unanimity of the opinions might make us reassess the actual odds. There may well be a mathematical model that would formalize this intuition,[59] but it is not a consequence of the CJT.

These critiques of Levmore's argument are not the most interesting ones, however. Suppose that he had instead argued that the question to the jury was, Is the defendant guilty of negligence by the preponderance of the evidence? and that the probability of a juror voting correctly on this question is greater than $\frac{1}{2}$. Should we view the application of the CJT in this situation

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[59] The start of such a model might look like this: Suppose a group of 12 people vote with an unknown probability p in favor of some proposition. Suppose that the outcome of the vote is unanimous. What can one say about what the likely value of p is given the unanimous outcome? This probability distribution is well known and can be computed explicitly.

as an example of the aggregation model? That is, is it appropriate to view juries as aggregating information, or are they more accurately described by the polling model?

By applying the polling model, I do not mean to suggest that the information gleaned at trial is irrelevant. We could ask the question, If everyone in the jury pool were to hear the evidence presented at trial, what percentage of the pool would vote for the plaintiff? That is, we could view the empaneled jury as being representative of the pool as a whole, and their votes would be representative of the outcome if the jury consisted of everyone in the pool.

In some instances, it is clear that the jury is chosen to be representative of the population as a whole. For instance, if the issue is one of community standards, or there is "reasonable person" standard at issue, the jury is expected to stand in for the community as a whole. Thus, in these situations, one would expect the polling model to be a more accurate depiction of the situation.

But suppose that these are not the issues at stake. Is it reasonable to view a juror as an expert who has some a priori information about the issues at hand the way Ladha describes?[60] Or would it be more accurate to view the juror as being representative of the population as a whole, who considers information about only the case in front of him? Certainly few people would argue that a juror brings to bear any special abilities. As Judge Frank put it: "Is it likely that twelve men, summoned from all sorts of occupations, unaccustomed to the machinery of the law, unacquainted with their own mental workings and not known to one another, can, in the scant time allowed them for deliberation, do as good a job in weighing conflicting testimony as an experienced judge?"[61]

Note that I am not claiming that juries are necessarily incompetent.[62] I am claiming only that jurors in general bring no special information to bear. For the most part, jurors are chosen for their lack of special information about the case at hand, and certainly they are unlikely to have any previous experience with the arcana of the courtroom. To think of them as "experts" with a prior track record on evaluating legal matters strains credulity.

On the other hand, it is well established that "[j]uries reflect the sentiments of the community in their verdicts"[63] and that "[s]tudies of jury decision

[60] Ladha, *supra* note 7.

[61] Quoted in Lloyd E. Moore, The Jury: Tool of Kings, Palladium of Liberty 1 (1973).

[62] For cases that do not rest on technical, scientific, statistical, or expert evidence, it seems that juries generally come to the same conclusions as do judges. See Valerie P. Hans & Andrea J. Appel, The Jury on Trial, in A Handbook of Jury Research §3.02(c), at 3-4 (Walter F. Abbott & John Batt eds. 1999). It is interesting to note that according to Hans & Appel, "[T]he key to jury competence is the fact that jurors decide on verdicts in deliberating in groups," something that is specifically ignored in these models of jury voting. (*Id.* at 3-7.)

[63] *Id.* at 3-13.

making show that jury verdicts mirror local sentiments."[64] So I conclude that the more reasonable interpretation of the CJT in the context of juries is the polling model, where the likelihood of a vote is representative of the population as a whole and does not depend on any particular knowledge of the jury. Indeed, it seems highly unlikely that the aggregation model accurately describes what jurors do.

If we conclude that the polling model is really the more accurate description of jury deliberation, what can we make of Levmore's argument? Levmore wants us to conclude that if each juror thinks that A is negligent with probability .7 and the jury votes in favor of A's negligence, then we should conclude that A is negligent with probability larger than .7 since the jury vote represents an aggregation of the information of the jury. But if we believe the polling model rather than the aggregation model applies, then the probability .7 is interpreted to mean that 70 percent of all possible jurors would believe that A is negligent by a preponderance of the evidence, and we can conclude nothing about how much more likely it is that A is actually negligent. Hence, if the polling model is the more accurate description of a jury, then Levmore's conclusions are again put in doubt.

Whether we use the polling model or the aggregation model significantly affects Levmore's analysis of the conjunction problem as well. Recall that Levmore posits that the jury concludes that there is .7 chance that A was negligent and a .6 chance that A's negligence was the proximate cause of B's injury. If we use the polling model, this would mean that 70 percent of the pool thinks that A was negligent and 60 percent of the pool thinks that this negligence was proximate cause of the injury. What is relevant for Levmore's analysis is the probability that a person chosen at random thinks that both of the conditions of liability were met, but we have no way to assess that with the information presented.

With the numbers as presented, the likelihood that a juror chosen at random believes that A was both negligent and the cause of B's injury could be as high as .6 (if everyone who believes that A was the cause of injury also believed that A was negligent) or as low as .3 (if the 30 percent of the pool that believes that A was not negligent did believe that A was the cause of B's injury). In the first case, Levmore's math-law divide evaporates since a majority of the jurors would find A both negligent and the cause of the injury. In the latter case, his math-law divide is even worse than before since the jury would find A both negligent and the cause of injury with probability of .3 and not .42. So it is the joint distribution that we need to know in order to even test whether the math-law divide is real, if we apply the polling model and not the aggregation model.

Levmore does consider the issue of the joint distribution of these two probabilities, but he dismisses this concern for two reasons. First, if there is

[64] Id.

a significant correlation between the probabilities, "then it often follows that there is little need to have the second requirement in the first place,"[65] and so the only time the law need ask two questions is when there is independence. Moreover, in situations in which there might be some dependence between the probabilities, we can instruct the fact finder "about the necessary modifications if the same factfinder deems the requirements to be somewhat interdependent."[66]

The first response, if true, argues that in the average liability case, the probabilities are independent, but it is not helpful for the analysis of any particular case before a jury. The second response is even more problematic, seen from the point of view of the polling model. Because we view the probabilities as being derived from the choice of the jurors from a pool, the individual juror may not be aware of a dependence between these probabilities, which manifests itself only in the analysis of the entire pool. Thus, to give an individual juror such instructions as outlined by Levmore would be useless.

As in the previous analysis of multimember courts, which of these two models of juries we believe has normative implications, as well. If we believe that the aggregation model applies to juries, then we should strive to have jurors with as much knowledge about the issues in the case as possible.[67] For example, having a panel of lawyers act as a jury for a legal malpractice case would be extremely desirable. On the other hand, if we subscribed to the polling model for juries, having a panel of lawyers for a malpractice case would be indefensible. Instead, we would aim for a cross section of the population who, although not trained in the law or legal ethics, would represent society's view of what constitutes malpractice by a lawyer.

VI. CONCLUSION

The Condorcet Jury Theorem provides a mathematical framework in which to analyze how the outcomes of a majority vote are related to the random behavior of the individual voters. To the extent that one wishes to numerically model certain phenomena, the underlying conception of the probability in the behavior of the voters is not relevant. But if one wants to interpret these results, it is important to understand how the element of randomness enters the model.

I have presented three different ways to incorporate randomness into the CJT. Each of these applies in different circumstances, and the interpretation we give to the outcome varies accordingly. As I have shown by considering

[65] Levmore, *supra* note 1, at 727.

[66] *Id.* at 728.

[67] Of course, jurors whose knowledge might be prejudicial would still have to be excluded. The brother of a murder defendant might very well have excellent information to share, but we could not count on its being unbiased.

the articles by Kornhauser and Sager and by Levmore, failure to pay attention to what might, at first sight, seem a technical detail leads to conclusions that cannot be sustained. Moreover, which of the models we accept leads to differing conclusions as to how we should organize multimember courts and juries.