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Not Necessarily Twelve and Not Necessarily Unanimous: Evaluating the Impact of *Williams v. Florida* and *Johnson v. Louisiana*

Bernard Grofman

Introduction

With recent backlogs of court calendars sometimes stretching into years (see Bloomstein, 1968, pp. 119-122; Zeisel, Kalven, & Buchhotz, 1959, especially chapter 6), there has been widespread interest in dispensing with jury trials whenever possible (Zimroth, 1972, p. 14). There has also been interest in modifying the jury size to less than the traditional twelve persons (see Bloomstein, 1968, pp. 32-33; Institute of Judicial Administration, 1971; Ulmer, 1963, p. 178) and/or in lowering the requirement for a verdict from unanimity to some lesser percentage of agreement among the jurors[1] (for further details, see Bloomstein, 1968, pp. 31-33; Institute of Judicial Administration, 1970; Ulmer, 1963, p. 178) in order to speed the processes of jury deliberation and to reduce the costs in time and money of empanelling a jury.[2] Reversing earlier precedents, the constitutionality of felony convictions reached by juries of less than twelve or by less than unanimity, has now been upheld by the U.S. Supreme Court. In *Williams v. Florida* (1970)[3] the U.S. Supreme Court upheld the constitutionality of felony convictions by state juries of less than twelve. In reviewing *Johnson v. Louisiana* (1972)[4] and *Apodaca v. Oregon* (1972)[5] the Supreme Court held that 10-to-2 and 11-to-1 decisions (in Oregon) and a 9-to-3 decision (in Louisiana) did not violate the Sixth Amendment right to a jury trial. In *Colgrove v. Battin* (1973)[6] the Court upheld six-member civil juries. The full impact of these cases is not yet clear, however.

As Fred Graham wrote in *The New York Times*, "If 9 to 3 convictions are constitutional, how about 8 to 4 or 7 to 5? If undersized juries need not be unanimous, how about 3 to 2 or 2 to 1? And when the Court finally does draw the line where in the Constitution will it find the rationale?" (Graham, 1972b, p. 6).

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[1] Nonunanimous verdicts were introduced in Britain in 1967.

[2] Data on comparative costs of six- and twelve-member juries may be found in Institute of Judicial Administration, 1972; and Pabst, 1973, pp. 6-11. Cf. Grofman & Feld (1976).

[3] *Williams v. Florida*, 398 U.S. 78 (1970).

[4] *Johnson v. Louisiana*, 406 U.S. 356, 1620, 1628 (1972).

[5] *Apodaca v. Oregon*, 406 U.S. 404 (1972).

[6] *Colgrove v. Battin*, 413 U.S. 149 (1973).

The Court's findings in these cases are not such as to provide clear answers to Graham's questions. The court majority held, in effect, that there was nothing sacred about either the number twelve or the unanimity requirements and that both were historical "accidents." What minimum size and what minimum decision rules the Court will ultimately decide the Sixth Amendment *does* require is, as far as I can tell, impossible to determine from the Court's reasoning in these cases, although in *Williams*, Justice White (see Footnote 3, p. 91, note 28), speaking for the majority, indicated that there would eventually be a line drawn somewhere, and that a jury size of six was clearly above that line.

These Supreme Court rulings precipitated considerable outcry from constitutional scholars and civil libertarians, including an editorial in *The New York Times* condemning the Supreme Court's "Retreat on Rights." The rulings have generated pressure on state legislatures to move to smaller juries and to less than unanimous jury verdicts in both criminal and civil cases (Retreat on Rights, 1972, p. 44; see also Graham, 1972a, pp. 1, 28; Manning, 1972, p. 4). For more favorable views of the Court's upholding of nonunanimous juries, see "Backward, Run Backward" (1972, p. 629) and Bloom (1973, pp. 126-129). A summary of the current state of changes in court practices is given by Delsner (1975, p. 1).

Lawyers' reactions to the Supreme Court decisions on size and unanimity requirements appearing in law journals have also been quite sharp (see Saari, 1973; Walbert, 1971; Zeisel, 1971). *Trial*'s November/December issue, 1974, contains seven articles dealing with the desirability of reducing jury size and unanimity requirements which range from enthusiastic endorsement of six-member juries (Thompson, 1974) to considerable concern that the recent court rulings will be highly injurious to defendant's rights (Zeisel, 1974). An important recent article on this subject is that of Richard Lempert (1975).

A natural question at this juncture is what difference can the Court's rulings be expected to make. As Ulmer (1963) has put the question:

> Since traditional wisdom and practice holds that justice is best dispensed through collegial decision-making, we may ask what theoretical basis can be deduced for such a claim. . . . Does it really matter whether juries decide by unanimous vote, a bare majority, or some vote in between? Does it make a difference whether the size of a decision-making group is 12, 212, or 10,000? [p. 178].

Intuitively it seems reasonable that the fewer the number of jurors required to convict, the more likely is conviction; thus diminishing jury size and/or permitting less than unanimous verdicts should clearly up the conviction rate, but the question remains, however, "by how much?" Still a further question is "How will increases in the conviction rate affect the probability that defendants who are innocent will be wrongly convicted?" No satisfactory answers to either of these questions is presently available. The Court offers no justification, except intuition, for its claim that:

[A] 100 man jury would undoubtedly be more favorable for defendants than a twelve man jury. But when the comparison is between twelve and six, the odds of continually "handing" the jury seem slight, and the numerical difference in the number needed to convict seems unlikely to inure perceptibly to the advantage of either side [see Footnote 3, p. 78, note 47].

The Court in this case (*Williams v. Florida*) is also guilty of misrepresenting the limited empirical evidence available to them. The Court asserts that "studies of operative factors contributing to small group deliberation and decision-making suggest that jurors in the minority on the first ballot are likely to be influenced by the proportional size of the minorities against them" (Footnote 3, note 48). Although the Court here cites Kalven and Zeisel (1966) as their authority, a co-author of the volume has pointed out that the pages cited say the exact opposite of what the Court claimed and, further, the other alleged empirical evidence referred to by the Court (Asch, 1956) also fail to sustain the Court's assertion about size making no "discernible difference" (Zeisel, 1972, pp. 367-369).

We shall attempt to provide some preliminary answers to these and other questions by making some simplifying assumptions about the nature of the jury decision process. We shall use our tools of analysis, probability theory and combinatorial mathematics, building on the work which was done by early scholars, such as LaPlace (1814), Condorcet (1786), and Poisson (1937),[7] and more recent work by Rae (1969), Taylor (1969), and Curtis (1972). We shall also deal with some of the evidence on how juries actually do reach decisions.

We shall restrict ourselves to cases that actually go to trial—that is, not plea-bargained, settled out of court, or otherwise dispensed with—and we shall restrict ourselves to trials which bring in a verdict of innocent or one of guilty on some single count.

Our comments on the implications of varying jury size and/or jury decision rules on verdict outcomes will, obviously, be *directly* relevant only to that small percentage of cases which go to trial. Nonetheless, varying jury size and/or jury decision-rule may have important *indirect* consequences; for example, on the willingness of defendants to engage in plea-bargaining based on their perceptions of the likelihood of a jury of a given size and decision rule bringing in a verdict of guilty in their case. We shall not try to deal with such indirect consequences in this paper.

The assumption of a single-count dichotomous choice avoids the necessity of dealing with bargaining among jurors across counts as to the nature of the verdict. Such bargaining took place, for example, in the Chicago 7 conspiracy trial. Even if there is more than one count in the indictment, our models may still be appropriate as long as each count may be treated separately. (For a

[7] Relevant sections of LaPlace are reviewed in Ulmer (1963); relevant sections of Condorcet are reviewed in Black (1958, pp. 163-165) and more briefly in Ulmer (1963, pp. 179-180) and Barry (1965, p. 293). The most important points of Poisson's argument are discussed and expanded upon in Gelfand & Solomon (1973, pp. 271-278).

simple model of jury behavior when choosing among verdicts of differing degrees of severity, see Grofman, 1974.)

We shall also assume that it makes sense to talk about the defendant's guilt or innocence of the count charged. Clearly, juries make judgments that are more complex than simply "Has the defendant committed the prescribed act?" For example, jurors may make judgments as to whether the defendant's probable punishment "fits" his crime or as to whether the law under which he is accused is indeed a "just" law by community standards. Such judgments on the part of jurors clearly help determine the defendant's probability of conviction. (For more on this point, see Kalven & Zeisel, 1966.) Moreover, even if the physical "facts" of a case are clear, jurors' judgments may still be difficult—that is, involving judgments as to the defendant's "true" motives or the absence of premeditation. Nonetheless, in American jurisprudence the jury's task is to be the decider of the "facts" whether these be physical or psychological and to abide by the judge's instructions as to the law. Our concern shall be with this "idealized" jury process, one in which defendants are either guilty or innocent of the count(s) charged, and one in which determining that guilt or innocence is the jury's sole concern. Such a view of the jury, while descriptively unrealistic is, we believe, of clear normative importance.[8]

Predeliberation Preponderance and Verdict Outcome

If we are to understand the nature of the jury decision process we must look at the relationship between the predeliberation concordance among jurors and the final verdict.

Available empirical data strongly supports the view that when, prior to the jury deliberations, a majority of the jury is in accord as to the verdict, there is a high likelihood that the deliberations will give rise to a unanimous verdict with outcome congruent with the views of the initial majority. Presumably, the majority persuade (or otherwise browbeat) the minority.

In one study of twelve-member juries, 93 percent of the verdicts accorded with the views of the initial majority, 4 percent of the juries remained hung, and in only 3 percent of the cases did the minority persuade the majority (Broeder, 1959). However, the number of jurors on the majority side is not irrelevant. As Rosenblatt and Rosenblatt note:

In a sample of over 200 criminal cases in Chicago and Brooklyn courts studied by the Chicago Jury Project (Kalven and Zeisel, 1966), all of the hung juries observed possessed a minority on the first ballot of at least three. In most of

[8] I am indebted to an anonymous referee for emphasizing the need to justify the assumption that one can, even in principle, talk meaningfully of the true "guilt" or "innocence" of a defendant.

them the initial majority was four or five. Likewise an initial minority almost never prevailed in persuading the initial majority unless it, too, numbered at least three. Thus, although the final ballot often showed one lone juror holding out for acquittal, it is only after several others had previously shared that opinion. Thus, the "hanging juror" rarely exists except as one who tenaciously refuses to desert an unpopular view after others have fallen away.[9]

We have reproduced the Kalven and Zeisel data at Table 8-1. As Kalven and Zeisel put it, "it requires a massive minority of 4 to 5 jurors (out of 12) at the first vote to develop the likelihood of a hung jury" (1966, p. 462). Their findings suggest that in juries of size twelve, a predeliberation majority of 11-1 (1-11) will go to unanimity with virtual certainty, and a predeliberation majority of 10-2 (2-10) will go to unanimity with very high certainty while lesser majorities will go to unanimity with lower (but still high) probabilities.

These assertions are buttressed by data from other studies. Padawer-Singer and Barton (1975)[10] found that for twelve-member juries no reversal of the initial majority occurred unless the initial minority was at least four. For six-member juries they found no reversal of the initial majority occurred unless the initial majority was at least two in number. They also found that reversals of the initial majority were twice as likely among twelve-member juries as in six-member juries, and suggested that "different processes may take place in 6- v. 12-member juries and that verdicts are reached on different bases" (Padawer-

Table 8-1
First Ballot Votes and Frequency of Hung Jury in Kalven and Zeisel Data

Guilty Votes on First Ballot	*Percent Hung Juries*	*Predictions of Davis Model 3 in Percents*
11	0 $N = 23$	0
10 or 9	0 $N = 56$	10
8 or 7	19 $N = 26$	18
6	0 $N = 10$	25
5 or 4	19 $N = 16$	18
3 or 2	7 $N = 22$	10
1	0 $N = 3$	0

Note: Data drawn in part from Kalven & Zeisel (1966, Table 127, p. 462).

[9] A.M. Rosenblatt and J.C. Rosenblatt, "Six Member Juries in Criminal Cases: Legal and Psychological Considerations," 47 *St. John's Law Review* A15, 631 (1973). © 1973 by St. John's Law Review. Used by permission. All rights reserved.

[10] The Kalven and Zeisel (1966) data are not fully comparable with those of Padawer-Singer and Barton (1975), since the former are reporting first ballot and the latter predeliberation consensus.

Singer & Barton, 1975, Section XI, p. 7). As we shall see below, this conclusion does not really follow from their data (see Table 8-1).

In another study of jury decision-making, R.J. Simon has collected data from mock juries drawn from local jury pools in three different jurisdictions: Minneapolis, St. Louis, and Chicago. Juries were exposed to edited tape recordings of transcripts of trials involving housebreaking (thirty juries) or incest (sixty-eight juries) (Simon, 1967).[11] The relative frequency of decisions observed for each alternative for individual jurors and for twelve-member juries is shown in Table 8-2.

In the housebreaking case the ratio of acquittals to convictions is very similar for individuals and for juries; in the incest case juries are considerably more conviction-prone than are individuals. It is difficult to account for these cases within the confines of a single model. One simple hypothesis (set of hypotheses) is that juries operate by a K/12ths rule—that is, if K or more ($K \geqslant 7$) votes are achieved in the predeliberation period for conviction (acquittal) then the jury will convict (acquit) otherwise the jury will hang. If we take the mean percentage phase of the trial and assume that it is binomially distributed across juries, we may calculate the expected value of P_C (percent convictions) P_H (percent hung juries) and P_A (percent acquittals) for the twelve-member juries under various K/12ths decision-rules such as 7/12ths, 11/12ths, and 12/12ths. The results shown in Table 8-2 suggest that these rules overpredict the ratio of the more common to the less common verdict and except for the 7/12ths rule egregiously overpredict the percentage of hung juries. Furthermore, the relatively low rate of predeliberation juror concordance observed by Simon buttresses the view that the observed high rate of jury verdict

Table 8-2
Decisions by Mock Juries and Individuals in Housebreaking and Incest Cases and Predictions from Various Decision Rule Models

	Housebreaking Case				*Incest Case*			
	N	p_C	p_A	p_H	N	p_C	p_A	p_H
Individual Decisions	360	34%	66%		816	67%	33%	
Jury Decisions	30	27%	56%	17%	68	71%	13%	16%
7/12ths rule	30	7%	80%	13%	68	81%	5%	14%
8/12ths rule	30	3%	61%	36%	68	64%	4%	32%
11/12ths rule	30	0%	5%	95%	68	4%	0%	95%
12/12ths rule	30	0%	1%	99%	68	1%	0%	99%
Davis Model	30	22%	62%	16%	68	66%	18%	16%

Note: Data drawn in part from Davis (1973, Table 4).

[11] I'm indebted to Professor Neil Vidmar for calling this excellent piece to my attention.

unanimity is not attributable to predeliberation jury unanimity as to correct verdict; rather, some form of group conformity process is operative. But, given the poor showing of *K*/12ths rules on the Simon data, the exact form this conformity process takes remains an open question.

Before, however, we too cavalierly write off the usefulness of rules such as the *K*/12ths rules, it is necessary to look at two more recent articles involving experimental work on mock juries, both coauthored by James Davis. In the first of these, Davis, Kerr, Atkin, Holt, & Meek (1975)[12] studied the decision making of mock juries of six and twelve members assigned either a unanimity or a two-thirds majority decision-rule. They found that neither the size nor assigned rule variables exerted a significant overall effect upon the distribution of jury verdicts. They also found that the rule that best predicted overall jury verdicts as a function of predeliberation consensus was a simple two-thirds rule, which was the best predictor under all four experimental conditions.

In the second study, which was confined to six-member juries, Davis, Kerr, Stasser, Meek, & Holt (1975)[13] found a modified two-thirds rule to be best predictor of the relationship between predeliberation consensus and final verdict—a rule in which the jury always voted in accord with the predeliberation majority but did not always hang if no predeliberation majority existed. In this modified form of the two-thirds rule, if the jury were evenly split in its predeliberation views, a verdict of not guilty was predicted 75 percent of the time and a hung jury was predicted for the remaining 25 percent of the time.

In both studies the fit of the two-thirds rule (or its variant) was reasonably good. In the first study in both the six-person unanimous and nonunanimous cases, the predicted overall results were .02 guilty/.88 not guilty/.10 hung versus actual results of .00 guilty/.89 not guilty/.10 hung. In the twelve-person cases, the predicted overall results were .00/.90/.10 versus .00/.72/.28 actual results in the unanimous, and .00/.94/.06 actual results in the nonunanimous case. In the second study Davis et al., report exact relationships between verdict outcomes and the initial jury preference breakdown; we have reproduced those results as Table 8-3. The predicted overall verdict distribution was .40/.52/.08. The actual distribution was .40/.54/.06. Clearly, the modified two-thirds rule predicted very well in the aggregate, even though its detailed predictions (see Table 8-3) are not that good.

Davis has compared predictions of models of the *K*/12th type with a number of other models. See Table 8-4. For example, in his first article (Davis, 1973) he proposed five models for the twelve-member jury case.[14] The

[12] I am deeply indebted to Professor Davis for providing me with an advance copy of this article.

[13] I'm indebted to Professor Davis for making available to me a prepublication copy of this article.

[14] All five models predict conviction (acquittal) in the 12-0 and 11-1 (0-12 and 1-11) cases. In Model 1 distributions 10-2, 9-3, . . . , 2-10 yield hung verdicts with probability one. In Model 2 distributions 10-2, 9-3, . . . , 2-10 yield guilty, not guilty, or hung verdicts with

Table 8-3
Distribution of Verdicts Given Predeliberation Preferences in Six-Member Mock Juries

Juror Predeliberation Preferences		*Jury Verdicts Obtained*			*Jury Verdicts Predicted by S-Curve Model*[a]		
Guilty	*Not Guilty*	*Guilty*	*Not Guilty*	*Hung*	*Guilty*	*Not Guilty*	*Hung*
6	0	–	–	–	1.00	.00	.00
5	1	14(.93)	1(.07)	0(.00)	1.00	.00	.00
4	2	16(.84)	3(.16)	0(.00)	.87	.11	.02
3	3	5(.16)	21(.68)	5(.16)	.42	.42	.16
2	4	1(.06)	17(.94)	0(.00)	.11	.87	.02
1	5	0(.00)	6(1.00)	0(.00)	.00	1.00	.00
0	6	0(.00)	1(1.00)	0(.00)	.00	1.00	.00

[a]Parameters are set at $\alpha = .16, B = 3$.

Note: Adapted from Davis, Kerr, Stasser, Meek, & Robert Holt (1975, Table 4, p. 37).

predictions of these models are shown in Table 8-4. Model 1 is a 11/12ths rule. Model 5 is a modified form of the 7/12ths rule. The model which Davis finds to far and away best fit the Simon data is Model 3, one which is not of the K/12ths form.

The fit of Model 3 to the Simon data is shown in row 7 of Table 8-2.[15] As can be seen from Table 8-3, the fit of this model is reasonably good. Since this model has a rather peculiar asymmetry in the 6-6 case, it might appear that a model identical to that of Model 3 except for giving rise to equal proportions of hung juries, acquittals, and convictions in the 6-6 case might improve the fit. However, a glance at Table 8-3 shows this hope to be in vain, since such a change would decrease the number of convictions, and also increase the number of acquittals, thus worsening the fit more than would be compensated for by the increase in the predicted number of hung juries. While a best fitting model can, in principle, be calculated by looking at each of the thirteen possible predeliberation distributions in the two trials dealt with by Simon and assigning the vector to each that minimizes the sum of squares deviation from actual outcomes, the

equal probability (i.e., 1/3). In Model 3 distributions 10-2, . . . , 6-6 yield guilty with probability $1/N$ and not guilty or hung with probability $1/2\ (i)/(1-N)$ where i is the number of guilty votes in the predeliberation stage; distributions 5-7, . . . 2-10 yield not guilty with probability $(12-i)/N$ and guilty or hung with equal probability $1/2\ 1-(12-i)/N$. In Model 4 distributions 10-2, . . . , 7-5 yield guilty with probability i/n and not guilty or hung with equal probability, $1/2\ 1-(i/N)$, distributions 6-6, . . . 2-10 yield hung with probability one. In Model 5 distributions 10-2, . . . , 7-5 yield hung with probability one; distributions 6-6, . . . 2-10 yield not guilty with probability one. (See Table 8-4.)

[15]For χ^2 values and data on the fit of the other four models, see Davis (1973, p. 106).

Table 8-4
Verdict Predictions of Five Davis Models of Jury Conformity Processes[a] as a Function of Predeliberation Juror Verdict Preferences

Convict-Acquit	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
12-0	(100,0,0)	(100,0,0)	(100,0,0)	(100,0,0)	(100,0,0)
11-1	(100,0,0)	(100,0,0)	(100,0,0)	(100,0,0)	(100,0,0)
10-2	(0,0,100)	(33,33,33)	(83,8,8)	(83,8,8)	(100,0,0)
9-3	(0,0,100)	(33,33,33)	(75,13,13)	(75,13,13)	(100,0,0)
8-4	(0,0,100)	(33,33,33)	(67,17,17)	(67,17,17)	(100,0,0)
7-5	(0,0,100)	(33,33,33)	(58,21,21)	(58,21,21)	(100,0,0)
6-6	(0,0,100)	(33,33,33)	(50,25,25)	(0,0,100)	(0,100,0)
5-7	(0,0,100)	(33,33,33)	(21,58,21)	(0,0,100)	(0,100,0)
4-8	(0,0,100)	(33,33,33)	(17,67,17)	(0,0,100)	(0,100,0)
3-9	(0,0,100)	(33,33,33)	(13,75,13)	(0,0,100)	(0,100,0)
2-10	(0,0,100)	(33,33,33)	(8,83,8)	(0,0,100)	(0,100,0)
1-11	(0,100,0)	(0,100,0)	(0,100,0)	(0,100,0)	(0,100,0)
0-12	(0,100,0)	(0,100,0)	(0,100,0)	(0,100,0)	(0,100,0)

[a]Vectors indicate the predicted percentages of convictions, acquittals, and hung juries, in that order.

raw data for this calculation are not provided by Simon; however, such an idiosyncratic model would in any case be of little value.

Although the Kalven and Zeisel data are not comparable with the Simon data, since they are reporting first ballot rather than predeliberation consensus (and thus we would expect that their data would show a greater consensus than those of Simon), we have, for comparison purposes, applied Davis' Model 3 to the Kalven and Zeisel data. The results are shown in Column 3 of Table 8-1. For simplicity we have weighted cases equally to provide averaged predictions for the Davis model. The fit of the Davis model, while far from perfect, is not unreasonable, with the troublesome exception of the case of an initial 6-6 vote.

As we also observe in the case of the experimental data displayed in Table 8-3, juries that begin evenly split seem rarely to hang–a finding further confirmed in the Padawer-Singer and Barton (1975) study. Why this is so is unclear. Perhaps there is a bias toward acquittal such that an evenly split jury is more likely to tilt to acquittal than either to hang or to convict. (See Table 8-3.) In any case, this result is too well documented to be merely an artifact of sample size.

Davis (1973) concludes that while Model 3 is "more suggestive than definitive . . . nevertheless, the accuracy of Model 3 (for the Simon data) implies that a jury member alone in his decision does not sway the outcome but rather

yields to the majority. If the majority favoring guilty is six to ten in size, the probability of a guilty verdict is the proportion of jury members advocating that decision; otherwise the verdict is as likely to be not guilty as hung. If the majority favoring not guilty ranges from seven to ten, the process is identical but now favors the not guilty verdict in proportion to the number of these advocates" (p. 106). However, we are not as convinced as Davis that the process is as straightforward as either Model 3 or a rule of the $K/12$ths form would suggest. It may be that the relationship between percentage favoring conviction and the probability of a unanimous verdict for conviction is curvilinear rather than the combined step function and linear relationship that Davis postulates, or the step function postulated by models of the $K/12$ths form. One possibility would be a power function model similar to that proposed by Gray, Richardson, & Mayhew (1968).[16] In this model the probability of unanimous conviction in the predeliberation stage—that is, for i initial votes for conviction and N jurors:

$$P_C = \frac{\frac{(i)^B}{(N)}}{\frac{(i)^B}{(N)} + \frac{(N-i)^B}{(N)}}. \tag{1}$$

We assume that no jurors are neutral or undecided. Here, we interpret P_C as the probability that a jury with this predeliberation consensus will bring in a verdict of guilty. This model does not, however, permit for hung juries. A simple modification enables us to accommodate nondecisive verdicts. We let

$$\frac{P_C}{P_A} = \frac{\frac{(i)^B}{(N)}}{\frac{(N-i)^B}{(N)}} = \frac{(i)^B}{(N-i)}. \tag{2}$$

Then, for i initial votes for conviction, we let

$$P_H = \begin{cases} \alpha \dfrac{P_C}{P_A} & \text{if } i \leqslant N - i \\ \alpha \dfrac{P_A}{P_C} & \text{if } i > N - i \end{cases} \tag{3}$$

[16] I am indebted to an anonymous referee of another article of mine for calling this model to my attention, albeit in a rather different context.

Here, P_H is interpreted as the probability that a jury with this predeliberation consensus will hang. Parameters α and B may be fitted to jury data. The relationship between initial consensus and probability of conviction specified by equations (2) and (3) will be an S-shaped curve. Thus, high consensus will result in a virtual certainty of conviction (or acquittal); low consensus will result in a high (or at least higher) probability of a hung jury.

Since $P_A + P_C + P_H = 1$ for any given values of i, solving (2) and (3) for the case where $i \leqslant N - i$ yields

$$P_A = \frac{1 - \alpha \dfrac{(i)^B}{(N-i)}}{1 + \dfrac{(i)^B}{(N-i)}} \tag{4}$$

$$P_C = \frac{\dfrac{(i)^B}{(N-i)} \left[1 - \alpha \dfrac{(i)}{(N-i)}\right]^B}{1 + \dfrac{(i)^B}{(N-i)}} \tag{5}$$

$$P_H = \frac{(i)^B}{(N-i)} \tag{6}$$

Similar expressions are obtained for the case where $i > N - i$.

If we let $B = 3$, $\alpha = .16$, we obtain for the six-member jury the values specified in the right hand columns of Table 8-3. As we see, those values provide reasonably good fit to the Davis et al. data except, of course, for the troublesome case of the initial 3-3 split. This bias for acquittal manifested in the data in Table 8-3 can be compensated for in our model by introducing a bias coefficient, c, such that

$$\frac{P_C}{P_A} = \frac{(i)^B}{(N-i)} = c. \tag{7}$$

We shall not, however, here introduce such a further refinement since we would then have almost as many parameters as data points. The model we have presented is, we should note, very similar to the logit model used by Edward Tufte (1973) to plot the relationship between seats and votes in national legislatures and is a generalized form of the famous "cube law" of electoral politics.[17]

[17] For a review of the origins of the cube-law conjecture and recent work on the seats-vote relationship see Grofman, 1975.

Basic Findings

When individual jurors have some probability of changing their verdict in the direction of the majority consensus it is not necessary for the jury to begin with a phenomenally high predeliberation consensus to arrive at a unanimous verdict almost all the time. For example, in a jury of size twelve, to obtain a percentage of hung juries of 5 percent, we need postulate only a .90 initial concordance to obtain such a low percentage of hung juries if the jury decision process is that of Davis' Model 3; a .75 initial concordance if the jury decision process is that of the 7/12ths rule; a .83 initial concordance (p) if the jury decision process is that of the 8/12ths rule, and so forth.

Of course, jury size interacts with initial preponderance to determine the probability of a hung jury. We show in Table 8-5 the expected percentage of hung juries as a function of jury size (six versus twelve) jury decision rule (various K/Nths rules) and the initial preponderance among members of the jury pool. We see that, if the effective decision-rule is 5/6ths or unanimity juries of size twelve are *always* more likely to hang than juries of size six. If, however, the effective decision-rule in the jury is two-thirds (the rule for which we have found the greatest empirical support), then whether a jury of six or a jury of size twelve will be the more likely to hang depends upon the preponderance of the majority sentiment among members of the jury pool. If the jury pool is evenly split or if the majority view is held by less than 80 percent of the jury pool (under our two-thirds rule assumption) six-member juries will be *less* likely to hang than twelve-member juries. If, however, a single view is held by 80 percent or more of the members of the juror pool, then six-member juries will be *more* likely to hang than twelve-member juries. This finding is, we believe, quite counterintuitive. Moreover, it suggests that any attempt to determine whether twelve-member juries are more "hanging-prone" than six-member juries is doomed to failure unless it takes into account the extent of predeliberation concurrence among the juror pool and the nature of the jury conformity processes in different sized juries. Whether the conformity process is "different" in smaller sized juries is a question very much at issue. Our reading of the available evidence argues for the proportionality rule—that is, two jurors out of six are equivalent to four out of twelve. This proportionality hypothesis is rejected by some scholars (Lempert, 1975, pp. 678-679). We do not, however, regard the limited evidence as in any way conclusive on this question. (See also Grofman & Hamilton, 1975.)

In the murder case used by Padawer-Singer and Barton (1975), jurors in the predeliberation phase were almost evenly divided as to the defendant's guilt or innocence. In their six-member unanimous juries 28.5 percent were hung and in their twelve-member unanimous juries 35.7 percent hung. Thus, as we would expect, even a case that produced almost total disagreement among the members of the juror pool as to the correct verdict still did not lead to a very high

Table 8-5
Percent Hung Juries as a Function of Jury Size, Jury Decision-Rule, and Preponderant View among Members of the Jury Pool

Jury Size/Rule	*2/3rds rule*						*5/6ths rule*						*Unanimity rule*					
Preponderance	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95
6	.31	.28	.19	.08	.01	.00	.78	.73	.57	.34	.11	.03	.97	.95	.88	.74	.47	.26
12	.61	.50	.27	.07	.00	.00	.96	.91	.75	.44	.12	.02	.99+	.99+	.99	.93	.72	.46
Ratio of Hung 12 to Hung 6	1.9	1.8	1.4	.9	.3	.1	1.2	1.2	1.3	1.3	1.1	.6	1.0	1.1	1.1	1.3	1.5	1.8

percentage of hung juries once deliberations began, because the binomial distribution insures that a sizeable percentage of the juries drawn from a nearly evenly split juror pool will, nonetheless, be highly skewed in one direction or the other in their predeliberation preferences.

The effect of the group conformity process that appears to operate in juries is to exaggerate the initial majority sentiment in the direction of a unanimous verdict consonant with the views of that initial majority. This effect is somewhat more marked, in general, in smaller sized juries if what we look at is the percentage of trials that reach a verdict consonant with the views of the predeliberation majority. However, if we look at the ratio of verdicts consonant with the initial preponderance among members of the jury pool to those consonant with the views of the initial minority—that is, if we exclude hung juries—then it is the larger sized juries that more greatly exaggerate the impact of the views of the initial predeliberation jury pool majority. The relationship between jury verdicts and jury size (six versus twelve) jury decision-rule (various *K*/*N*ths rules) and the preponderance among the members of the jury pool is shown in Table 8-6. For example, if we exclude hung juries, a jury pool that begins with a 70 percent agreement as to verdict will give rise to verdicts an expected 91 percent of which will be in accord with that view when a six-member jury is drawn, and will give rise to verdicts an expected 99 percent of which are in accord with that view when a twelve-member jury is drawn!

When juries are allowed to reach nonunanimous verdicts, the probability that the jurors will have already achieved sufficient consensus for a verdict before they begin deliberations is extremely high in smaller sized juries. The percentage of juries with predeliberation accord as to the verdict is shown in Table 8-7 as a function of jury size (six versus twelve), jury decision-rule, (various *K*/*N*ths rules) and the preponderance among the members of the jury pool. For example, we may see from Table 8-7 that in a jury of size six, even if the juror pool is 50 percent acquittal and 50 percent conviction in the predeliberation phase, there is a 22 percent probability (14)/(64) that the jury will have a predeliberation majority of five or six, and a 60 percent (44)/(64) probability that the jury will have a predeliberation majority of at least 4-2. On the other hand, if the jurors are evenly divided as to conviction or acquittal, the likelihood of drawing a twelve-member jury with at least nine members in agreement is only 4 percent and the probability of obtaining at least eight members in agreement is only 39 percent (1588)/(4096). However, for high levels of initial preponderance among the members of the jury pool, the differences between six-member and twelve-member juries virtually vanish. Indeed for very high levels of preponderance coupled with low unanimity requirements (for example, $p \geqslant .9$, unanimity requirements of 5/6ths or less), large sized juries are marginally more likely to walk into the jury room in agreement than are smaller sized juries.

It is useful at this point to remind the reader who is looking for differences

Table 8-6
Jury Verdicts as a Function of Jury Size, Jury Decision-Rule, and Preponderant View among Members of the Jury Pool

Jury Size/Rule	*2/3rds rule*						*5/6ths rule*						*Unanimity rule*					
Preponderance	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95
Minority Verdict	.34	.18	.07	.02	.00	.00	.11	.04	.01	.00	.00	.00	.02	.00	.00	.00	.00	.00
Preponderant Verdict	.34	.54	.74	.90	.98	.99+	.11	.23	.42	.66	.89	.97	.02	.05	.12	.26	.53	.73
Ratio of Preponderant Verdicts to Total Verdicts (Excluding Hung Juries)	.50	.75	.91	.98	.99+	.99+	.50	.85	.98	.99	.99+	.99+	.50	.92	.99	.99+	.99+	.99+
Minority Verdict	.19	.06	.01	.00	.00	.00	.02	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Preponderant Verdict	.19	.44	.72	.93	.99+	.99+	.02	.08	.25	.56	.89	.98	.00	.00	.01	.07	.28	.54
Ratio of Preponderant Verdicts to Total Verdicts (Excluding Hung Juries)	.50	.88	.99	.99+	.99+	.99+	.50	.97	.99+	.99+	.99+	.99+	.50	.96	.99+	.99+	.99+	.99+

Table 8-7

Percent Juries with Predeliberation Accord as to Verdict as a Function of Jury Size, Jury Decision-Rule, and Preponderant View among Members of the Jury Pool

Jury Size/Rule	*2/3rds rule*						*5/6ths rule*						*Unanimity rule*					
Preponderance	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95	.5	.6	.7	.8	.9	.95
6	.69	.72	.81	.92	.99	.99+	.22	.27	.43	.66	.89	.97	.03	.05	.12	.26	.53	.74
12	.39	.50	.73	.93	.99+	.99+	.04	.09	.25	.56	.88	.98	.00	.00	.01	.07	.28	.54

between six- and twelve-member juries that the nature of those differences will depend upon the extent of predeliberation accord as to verdict among the pool from which jurors are drawn. As we see from Table 8-7, for hard cases—that is, ones with low initial agreement as to verdict—six-member nonunanimous juries (5-1 and 4-2) will behave markedly differently than their twelve-member "equivalents" (10-2 and 8-4) in that the smaller sized juries will exhibit a much higher incidence of decisions that required little or no deliberation time because the jurors walked into the jury room in sufficient agreement to reach a verdict immediately. On the other hand, for easy cases—that is, ones with high initial agreement as to verdict—differences as to deliberation time between six-member nonunanimous and twelve-member nonunanimous juries will be obscured; both sized juries will have a very high proportion of cases in which verdicts are immediately reached. Thus, it may be *very* difficult to establish size differences experimentally without a *very* large sample size and cases which will generate significant size effects.[18]

One related point: if a jury is evenly split we would expect about twice as many "opinion reversals" (i.e., verdicts consonant with the predeliberation minority) in twelve-member juries than in six-member juries, exactly what Padawer-Singer and Barton (1975) find in their study, which is one in which jurors in the predeliberation phase were almost evenly divided as to the defendant's guilt or innocence. On the other hand, if the case is an easy one—that is, one with high predeliberation among the juror pool agreement—then differences in reversal rate between six-member and twelve-member juries should be minimal. If we postulate an S-curve relationship, then the bulk of the reversals will occur in the 4-2 and 2-4 cases in six-member juries and in the 8-4, 7-5, 4-8, and 5-7 cases in twelve-member juries. If the jury pool is evenly divided the latter cases occur about twice as frequently as the former.

Because of the group conformity process that has been observed to operate in jury decision-making it is very likely that shifts from unanimous to nonunanimous verdicts will have minimal impact on verdict outcomes as long as jury size is held constant. It appears to be the case that juries that began as near unanimous end up unanimous with virtual certainty. Thus, we would expect a change from a unanimity to a nonunanimity rule to have zero impact, except perhaps as to deliberation time.[19]

[18] Cf. Lempert (1975, pp. 648-653), in which he attempts to estimate the fraction of cases in which jury size can be expected to have a reasonable probability of affecting the verdict. In this chapter we shall not attempt to deal with the issue of minority representation as a function of jury size. See Zeisel (1971) and Lempert (1975, pp. 665-679). We recognize this as an important omission, although we do not concur with Lempert's (1975, p. 699) impression that "the final judgment on six versus twelve will turn on the values that individuals subjectively place on the presence of minority views in the jury room." (Cf. Grofman, 1976, on the weights to be attached to freeing the innocent v. convicting the guilty.)

[19] The Davis, Kerr, Atkin, Holt, & Meek (1975) study, which has some data contradicting this assertion, is marred by deliberation rules that cut off deliberation at a fixed time, which in some cases is before the conformity process can take full effect. This artificially increases the percentage of hung juries among juries requiring unanimity.

Conclusions

We regard the models and results generated in this chapter as only a preliminary to more sophisticated modelling of jury decision processes as sequential decision-making by actors of differentiated status among multiple alternatives. Nonetheless, we feel that the models we have presented can be used as a baseline against which to compare the implications of alternative and more complex models. Limited as our results may be, at least we are explicit about our assumptions and where they lead us, rather than taking glib refuge in intuition, common sense, or misinterpreted social science à la the Supreme Court majority in its recent rulings on the constitutionality of juries which are less than twelve and less than unanimous.

In this chapter we have shown that there *can* be significant verdict and other differences between six-member and twelve-member juries (although not necessarily between unanimous and nonunanimous juries of the same size); but that detecting such "discernible" differences empirically is likely to be quite difficult. We have also shown that modelling size/decision-rule impact necessitates making strong assumptions as to the nature of the underlying group conformity process. Under the assumptions specified in the paper, the impact of jury size will vary tremendously depending upon the extent of predeliberation accord as to verdict.

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