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FOREWORD

The last two decades have witnessed an enormous increase in the use of statistical logic in courtrooms and hearing rooms across the United States. A substantial part of the increase is attributable to recent civil rights legislation, especially that directed against employment discrimination. Except for certain blatant instances (e.g., "no Irish need apply"), employment discrimination is usually a matter not of overt and total exclusion or isolation but rather of disproportionate share, a slight but systematic tendency of an almost-neutral practice to favor some segment of the work force distinguishable on the basis of its members' age, race, religion, gender, or ethnicity. In such cases, the unfavorable experience of one plaintiff employee usually cannot serve to indict an employer's practices since the employer may, on another occasion, have treated favorably an employee having the same characteristics as the plaintiff. If a practice does tip slightly, but systematically, in favor of a particular group of employees, that tendency is often apparent only when the impact of many applications of the practice is viewed. Preparation of the information, numerical and otherwise, that permits such a viewing is inherently a statistical task.

But civil rights legislation alone does not account for the increased use of statistical logic in litigation. Usage has grown in areas unrelated to employment discrimination including occupational health and safety, unfair trade practices and antitrust, computer code copyright, jury selection, and product liability. Part of the growth is probably due to the increased ease with which numerical and qualitative data can be processed, condensed and displayed. Computer programs for performing a broad range of analyses have been developed at several centers over the last twenty years; these programs have now been rigorously tested, thoroughly documented, and widely distributed. Most major computer installations have access to one or more of these statistical analysis packages so that it is easier now, more than ever, for an analyst to gain access to such a package and, through it, to examine thoroughly and efficiently even a large body of data. The current rush toward microcomputers is likely to bring statistical analysis capabilities within

reach of even more people and thus to foster continued growth in the use of statistical methods.

Another force that doubtless makes some contribution to the surge in statistical usage, though not independent of those already mentioned, is that law schools and business schools, especially the latter, have in the last two decades introduced statistical methods into their curricula. Almost every recent master of business administration graduate has had at least one course in statistical analysis as applied to business problems; many recent law school graduates have at least had the opportunity to elect a course on the use of statistics for the analysis of legal problems.

With the increasing courtroom use of statistical logic have come modifications and refinements in the use of that logic. In the early days of litigation under Title VII of the Civil Rights Act of 1964,¹ formal statistical models were rarely, if ever, used. Instead, when numbers were used at all, comparisons were based on percentages or proportions, with no allowance for random selection effects or the effects of legitimate explanatory factors. It was a time when the phrase "inexorable zero" was a valuable element in the vocabulary of a plaintiff's attorney because the absence of black persons or females from a job group, however small, might be construed as evidence of discriminatory practices. No one seemed to recognize how innocent some zeroes in an employer's minority workforce distribution might be. By the middle 1970's, formal statistical models were being used in courts occasionally; but a veritable eruption occurred later in the decade, abetted by an approving article² in the *Harvard Law Review* in late 1975 and several Supreme Court decisions citing statistical models.³

Not only has there been a shift toward the use of formal statistical models, but there is now growing concern about the appropriateness of particular models to the issues at bar. No longer can one rely on a model that fails to distinguish the effects of employer decisions made prior to its period of liability from those made during such period. No longer can one apply a binomial selection model when one with stratified pools or a hypergeometric structure would be much more realistic. And no longer is it wise to let an analyst select explanatory variables for a regression without sound advice on the legal and managerial implications of each.

Closely watching these developments, and occasionally helping them unfold, are people with a variety of academic and nonacademic affiliations and a common interest in observing, recording, and influencing the use of statistics in legal contexts. Many of the most prominent have contributed to the present collection of papers on statistical inference in litigation.

The Honorable Patrick Higginbotham starts the discussion with his thoughts on the current relationship between statistics and the federal judiciary, pointing out some possible areas of concern. In the first article, David H. Kaye addresses a

1. Civil Rights Act of 1964, Pub. L. No. 88-352, tit. VII, 78 Stat. 241, 253-66 (1964) (codified as amended at 42 U.S.C. §§ 2000e-2000e-16 (1976 & Supp. V 1981)).

2. Note, *Beyond the Prima Facie Case in Employment Discrimination Law: Statistical Proof and Rebuttal*, 89 HARV. L. REV. 387 (1975).

3. *Hazelwood School Dist. v. United States* 433 U.S. 299, 311 n.17 (1977); *Castaneda v. Partida* 430 U.S. 482, 496-97 n.17 (1977).

topic that has needed clarification for some time. While the standard of proof in most civil litigation is "preponderance of the evidence," suggesting that plaintiff should prevail if it is more than 50% likely that its allegations are true, much of the discussion of statistical analysts centers on whether a data imbalance is "significant at the 5% level." The disparity between 5% and 50% seems glaring and requires explanation. As Mr. Kaye does explain, there are two quite different probabilities involved here, and unfortunately, neither can be converted into or substituted for the other.

David W. Barnes explores, in the second article, the use of quantitative evidence in Federal Trade Commission (FTC) cases concerned with deceptive advertising. The FTC interests itself in enjoining those advertising practices that are demonstrably misleading; and Mr. Barnes, illustrating his points with numerous cases, discusses legal and methodological aspects of such demonstrations, including the contrast between statistical and practical significance. He concludes with suggestions for structuring deceptive advertising litigation that would involve disclosure of technical information about sample definition, sample content, and methods of analysis well before trial. Such measures, he argues, would simplify litigation and where appropriate, speed settlement while preserving the integrity of the factfinding process.

In the next article, W. Kip Viscusi discusses problems of measuring the value of accidental injuries and deaths, a recurring issue in product liability litigation. He observes that there are many bases on which one might build an estimate of such a value, including the amount people would pay to prevent loss of health, the amount they would like to be compensated if they suffered a decline in health, and the amount they would need after a health decline to restore their level of welfare. He shows the variety of life and injury values that have resulted from labor market models and notes that an appropriate measure of the value of life depends on whose life is being valued. In closing, Mr. Viscusi opines that some undercompensation for welfare losses from accidents is desirable because it encourages would-be victims to be more careful.

The following two articles focus on the use of statistics in antitrust litigation. In the first, Daniel L. Rubinfeld and Peter O. Steiner provide an overview of the various ways quantitative techniques can help determine the impact, if any, of certain trade practices on plaintiffs. Using as illustrative cases in which one or both had an active role, the authors show that simple analysis sometimes suffices to expose the relevant facts but that oftentimes complex analysis is required. One form of complex analysis is regression, which they explain and demonstrate extensively, with equal emphasis on the power of regression to aid as well as to deceive the finder of fact. One of the highlights of the paper appears in the final section, where it is noted that expert testimony on statistical matters, unlike much expert testimony, can and should be judged on the quality and results of the analysis rather than on the credentials of the expert or the smoothness of his or her presentation. If such testimony is judged on its methodology and results then, the authors argue, it may be desirable to make greater use of court-appointed experts to advise the finder of fact and to allow appellate review of technical evidence.

In the second article dealing with antitrust litigation, Michael O. Finkelstein and Hans Levenbach focus on the use of regression to estimate damages in price-fixing cases. They note that while multiple regression is generally endorsed by theoreticians as being appropriate for such estimates, there are numerous practical drawbacks. The authors discuss these drawbacks with reference to particular cases and conclude that the judicial system is presiding over the payment of large sums as damages when the econometric evidence of injury is equivocal at best.

The following four articles pertain to various aspects of the use of statistics in employment discrimination litigation. Robert Follett and Finis Welch illustrate the basic paradigm for testing the equitability of an employment practice. They point out that although many employment discrimination suits initially call into question a wide variety of an employer's practices, in later stages the suits often focus on just a few practices. This may be unfair because a perfectly nondiscriminating employer with many employees will have a few practices which at times work to the disadvantage of some protected group or other by more than two or three standard deviations, a degree of imbalance that is sometimes used as a threshold for a finding of liability. For such an employer, it is misleading to focus only on the practices and time periods with such imbalances while ignoring the mitigating effects of other practices and time periods.

A. E. Boardman and A. R. Vining expand on the basic paradigm of Messrs. Follett and Welch, showing the variety of comparisons entertained and ruled upon by courts. Their theme is that while courts have progressed far and well in their receptiveness to and understanding of statistical arguments, the Uniform Guidelines on Employee Selection Procedures⁴ pose a threat to continued progress. The threat lies in the Guidelines' reliance on the 80% rule for detecting discriminatory selection procedures, a rule that is largely inconsistent with the body of statistical thought courts have come to accept and rely on. With simplicity as its only virtue, the 80% rule could be used to exonerate employers whose statistical records evidenced flagrant discrimination and indict those whose statistical records contained only the most innocent departures from perfect parity. An observation of my own is that even the virtue of simplicity is fading in importance because the 80% rule calculations are probably often done on hand-held calculators and it would be a simple matter to have such calculators programmed to do the "right" calculations.

In the next article, Elaine W. Shoben (who has written elsewhere about the shortcomings of the 80% rule) analyzes many different legal theories of intent and contrasts them with the theories of intent peculiar to employment discrimination. Having clarified the features of the latter, she describes the ways in which statistical analysis may be used to establish or dispel intent. She notes that if an employment practice exhibits a statistical pattern of imbalance along, for example, racial lines, its continued use, without proper justification, should be construed as evidence of intentional discrimination, provided the employer is aware of the pattern. Especially intriguing is her suggestion that an employer's awareness of the

4. Uniform Guidelines on Employee Selection Procedures, 29 C.F.R. § 1607.4D (1982).

pattern might result not from formal statistical analysis but from informal observation and inference, a highly unstructured process.

The final article in this series contains ideas that, when implemented, will significantly advance the art and science of employment discrimination measurement. Bruce Levin and Herbert Robbins describe an urn model approach as an alternative to methods based on regression analysis as usually applied. Statisticians and econometricians have been slow to recognize that employment discrimination is properly detected by determining the exact latitude the employer had for making employment decisions and then measuring the extent to which, relative to this set of possibilities, the decisions made affected a protected class of employees in a systematically adverse way. All too often, analysts have based their expert advice and even their testimony on calculations that do not adequately reflect the latitude the employer had to do things differently.

In striving to define this latitude, Messrs. Levin and Robbins are led to randomization rather than population models. They work with cohorts and then aggregate results across cohorts rather than attempting a single comprehensive regression model. Their analytical framework requires none of the artificial and troublesome background assumptions that underlie regression analysis. Some aspects of their approach just recently won judicial approval in *Sobel v. Yeshiva University*,⁵ and with further refinement and publicity, other aspects will surely win acceptance.

In the last article, Sara Sun Beale discusses the use of statistical evidence in challenges to the selection of grand and petit juries. She demonstrates that, although courts have used similar methods in equal protection and fair cross section claims, the two kinds of challenges require different methods. In particular, Beale discusses the advantages and disadvantages of the absolute disparity method, the comparative disparity method, the absolute impact method, and the standard deviation method. She also analyzes the degree of disparity which must be shown under each of these tests, as well as the appropriate basic data for comparison.

The student note recounts some of the instances in which regression analysis has been used in Title VII litigation. It includes a discussion of some of the problems inherent in this use of regression and the burdens they impose on the litigants.

An extensive bibliography, compiled by Michael Chiorazzi and featuring works primarily of recent vintage, completes this issue of *Law and Contemporary Problems*.

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5. 566 F. Supp. 1166 (S.D.N.Y. 1983).

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