DISCUSSION

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I would first like to thank our program chairman for the privilege of discussing these papers and hope that my comments will be useful as the authors prepare manuscripts for the proceedings. As the session title suggests, the papers range over a wide variety of topics and I must admit that my understanding of these problems is in some cases limited. In this regard I would like to thank the authors for making my job easier with their self-contained and generally well written papers. The presentations were well organized and expertly delivered, eliminating the need for further elaboration or summarization on my part. I will instead attempt to stimulate discussion from the floor by suggesting areas where these results might be expanded or compared with other related methodologies.

Beginning with the paper on small area estimation by Ghangurde and Gray, I was impressed by the careful derivation of bias and variance for their ratio estimate. Regarding the bias derivation, further discussion would be useful concerning the accuracy of the provincial level population projections used as control totals for ratioing the sample results. Errors in these projections relative to the unbiased but unreliable survey estimates could contribute more to bias than the sampling bias associated with ratio estimation. Discounting this potential source of bias, the authors' results suggest that for areas composed of three or more economic regions, efficiency gains for the ratio estimate can be substantial. Gains in excess of 50 percent were observed for large subgroup totals like the Employed, the Non-Agriculturally Employed, and the Total Labor Force. Finally, some comment is needed on how the authors small area estimation strategy compares with model based synthetic estimators which other researchers have proposed for small area estimation.

Turning to the papèrs on raking ratio estimation by H. Lock Oh, Fritz Scheuren and their colleagues Linda DelBene and Beth Kilss, I want to congratulate the authors on the creative and practically oriented research they have reported. It is clear that raking and particularly their multivariate extension has a great potential for improving the quality of survey estimates. Recognizing the differential coverage and nonresponse problems that plague virtually all surveys, it is clear that some form of post stratification ratio adjustment should generally serve to reduce the associated bias. Compared to adjustments within each cell of a multidimensional poststratification array, raking to selected marginal distributions should in many cases achieve most of the potential bias reduction while running less risk of variance inflation. The ingenious multivariate extension proposed by the authors should retain these advantages while allowing one to adjust weights at the family or household level and thus preserve the consistency of intra-family relationships.

While the authors' example of multivariate raking does a fine job of illustrating the convergence properties of the method and demonstrates that bias and variance reductions will frequently result, I was disappointed that the controls were limited to grand totals for each element of the family response vector. An example controlling the one way margins of the four family classification variables would have been more impressive. Information on the iterations required for convergence with such one way marginal fits would also be enlightening. I would also like to see more work in the area of variance estimation for raked statistics. While sample reuse methods such as balanced repeated replication or jackknifing provide straightforward, efficient variance estimation when maximally balanced replicates are used, a Taylor linearization such as that derived by Koch and Freeman in their 1976 Frederick F. Stephan Memorial Methodology Program paper might prove to be more cost effective in an application where replicate by replicate raking could be fairly expensive. The monte-carlo simulation study reported in the paper by Oh, Scheuren, DelBene, and Kilss would seem to provide an excellent vehicle for examining the properties of these alternative variance estimators. Another comparison I would like to see incorporated into the Monte Carlo design would contrast marginal raking with the traditional cell by cell ratio adjustment. Such a study could confirm speculations regarding the improved stability of raked cell estimates for the uncontrolled variable.

I will move on now to Dr. Weitzmans paper dealing with hypothesis testing or statistical decision theory problems where a hypothesis of equality or strong inequality is inadmissible. The author makes a good case for the need to control errors in both directions when one of two candidates must be selected as the winner. Classical Neyman-Pearson theory exerts direct control over errors in one direction, the type I error or α level. Errors in the other direction are controlled by sample size specification assuming the winning majority exceeds some given amount. Dr. Weitzman shows how sequential testing theory for composite hypotheses can be combined with empirical Bayes procedures to derive a test which controls the total error, or the probability of an error in either direction. To demonstrate the test's performance, a simulation study was performed by successively testing for a presidential election drawn at random from the previous 39 elections. Examining the results of the simulation, I was struck by the wide variation in error rates depending on which of the previous elections was selected. If for example the next election were to pit Carter against Ford and the results were as close or closer than their previous contest, the chance of making an erroneous selection would exceed 1/3. I would like for Dr. Weitzman to comment on the difficulty of obtaining prior information

that would be more relevant to the specific test at hand, and the sensitivity of his test to poor prior information.

The final paper by Dr. Wang on approximations for the variation norm between simple random sampling with and without replacement was an impressive example of numerical analysis. Like the original note by Freeman, this paper suffers from a lack of any motivation or discussion regarding the utility of variation norms. I would have appreciated a few examples illustrating practical application of the tabular results.