Split Questionnaire Methods for the

Consumer Expenditure Surveys Program

1. Background Statement

The CEQ presents a number of challenges for both interviewers and respondents. First, the interview is long. Depending on the amount and type of expenditures reported, it takes, on average, 65 minutes to complete (BLS *Handbook of Methods*, 2007). Second, some of the questions are detailed and include what was purchased, the amount of the purchase, and when it was purchased. In fact, the respondent is asked to report this information for about 60 to 70 percent of the household's expenses during the previous three months (BLS *Handbook of Methods* 2007). Finally, there is concern over declining response rates. The response rate for the CE was about 80 percent in the early 2000s, but now hovers around 74 percent.

Survey methodological research suggests that there is a relationship between length of a survey and each of response rate, data quality, and burden. More specifically, several studies provide evidence that lengthy survey questionnaires tend to have lower response rates (Adams and Darwin 1982; Bogen 1996; Love and Turner 1975). There is also research suggesting that lengthy questionnaires can have adverse effects on data quality (Herzog and Bachman 1981; Johnson *et al*, 1974; Kraut *et al,* 1975). Finally, Bradburn (1978) identifies length of the interview as one of the key dimensions of respondent burden – suggesting that lengthier surveys are more burdensome. It is also worth noting that total time expended by the survey respondent is the primary component of the Office of Management and Budget's (OMB) concept of respondent burden (OMB *Standard and Guidelines for Statistical Surveys*, 2006).

To address these concerns, one approach may be to administer a shorter questionnaire to each sample unit. A challenge, however, is that we must decide which questions to eliminate from the survey, in an environment where users regularly ask for more data on more topics. An alternative to completely eliminating questions from the full survey is to divide the questionnaire into subsets of questions and then administer each subset to distinct subsamples of the full sample. This creates a shorter questionnaire that still collects the necessary information from at least some of the sample members. These designs are often referred to as split questionnaire (Raghunathan and Grizzle 1995) or multiple matrix sampling (Shoemaker 1973) designs. Opting

for this approach requires careful consideration of two key issues – design and estimation of the split questionnaire.

Modifying the current CE instrument via split questionnaire methods requires a focused attention on the features of the CE that would most influence the design and estimation decisions. First, many of the expenditure items that CE collects information for are rarely or infrequently reported during the interview, such as expenditures for plumbing supplies, floor coverings, and refrigerators. The ability to compute precise estimates of characteristics of these items (e.g., purchase cost) would potentially be hampered by the reduced sample size receiving questions about those items. This is because the sampling variance would increase. Second, primary data users, such as the CPI, preparers of published tables, and microdata users, have specific needs and requirements regarding the CE data. By asking only a subset of questions of each household, there would be missing data on the remaining questions of the full questionnaire that are not asked of that household. An important consideration is the potential impact of this missing data on the key data users and how it is addressed (e.g., imputation, weighting adjustments).

As CE considers a redesign, we are mindful of the quality-cost trade-offs that any redesign would require. We recognize that only shortening the length of the survey would likely not decrease data collection costs since we believer that costs are dominated by locating and contacting sample units and by the primary mode of data collection. However, research on split questionnaires may provide a framework for considering other design modifications that would result in a substantial cost savings. For instance, a shorter CE interview might be more amenable to being administered by telephone, which would likely lead to reduced field costs.

2. Relevant Work

Internal Research

Researchers within the BLS have started to investigate the use of split questionnaire methods as one option for redesigning the CE. Their research has focused on some statistical issues related to these methods. Specific research endeavors are summarized below.

- Gonzalez and Eltinge (2007a) offer a discussion of some of the previous research on matrix sampling methods, survey design considerations, and implementation trade-offs. They highlight three phases of the survey process that warrant consideration – development of the

split questionnaire, data collection, and processing and analysis.[1] In the context of the CE, they also note: (1) if we modify the CE using split questionnaire methods, then the modification should be consistent with the primary objectives of the CE program; and, (2) utilization of these methods must be statistically defensible and operationally feasible.

- Gonzalez and Eltinge (2007b) identified various statistical issues that need consideration if CE is modified via split questionnaire methods. Two key issures are: (1) adjustment of calibration weighting methods to account for subsampling; and, (2) adjustment of standard balanced repeated replication methods of variance estimation. They also provided notation for considering simple design-based and imputation-based estimators of population means under a split questionnaire design.

- Gonzalez and Eltinge (2008) began to explore the use of prior information on a sample unit to inform the design of split questionnaire forms. Specifically, they based the subsampling probabilities for a sample unit (for matrix sampling in the second interview) on the expenditure values reported during the initial interview and evaluated the variance properties of point estimators based on simple weighting adjustments.

- Gonzalez and Eltinge (2009) explored issues related to imputing expenditure values for various categories. Using a regression framework, the authors addressed problems encountered when imputing expenditures (e.g., the flexibility of the imputation procedure to impute "zero-dollar" amounts), model specification, and the potential effect on variance estimation.

External Research

Two key papers external to BLS address design and estimation issues related to split questionnaire methods. These are summarized below.

- Raghunathan and Grizzle (1995) developed a survey design where a questionnaire was split into components and individuals were administered various subsets of the components. They developed a multiple imputation method for analyzing the data collected under this design. They concluded that little was lost by administering only parts of the questionnaire to each sample unit.

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[1] We take the perspective that design of a split questionnaire encompasses issues related to both development of the split questionnaire and data collection.

- Thomas *et al.* (2006) developed an algorithm for designing split questionnaire forms in which questions were allocated to different forms based on their correlation with the other items. The idea was that highly correlated items would be allocated to different forms so that imputation could be used more effectively to analyze the data. They also required a fixed "core" set of questions (that are asked of all sample units). This included questions that were highly predictive of responses to several other items, were of special interest, and/or had certain precision requirements.

3. Key Issues

We seek recommendations for alternative designs that could be implemented as part of a redesign of the CE surveys. However, if split questionnaire methods are adopted, then CE will have to determine the "most efficient" way to split the questionnaire while still collecting all of the necessary information. The "most efficient" design would be informed by both cognitive (e.g., flow of questionnaire) and statistical (e.g., impact on precision of certain estimates) issues. In addition, CE will have to explore different methods for meeting the statistical requirements of various data users. This would include appropriate methods for estimation (e.g., weighting, imputation). Finally, the cost of implementing a split questionnaire design must also be a key consideration since the cost of any redesign must be consistent with the current CE budget.

4. Discussion Points

1. What is the impact of breaking up the interview on data quality (e.g., reporting, response rates) and respondent burden?
2. What are the cognitive aspects of breaking up the interview that CE should consider?
3. What features of the current CE (e.g., types of expenditures being collected, panel) would have the greatest influence on design and estimation issues?
4. What are the primary statistical issues, in addition to the ones cited above, that CE needs to address when investigating the utility of these methods?
5. What are the implications for the primary CE data users (e.g., CPI, published tables, and academic community)?
6. What are the operational challenges associated with implementing these types of designs?
7. What should the next steps be to explore and research this issue?

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