3rd GESIS Summer School in Survey Methodology
Cologne, August 2014

Syllabus for course 7:
“Understanding and Modeling Measurement Error in Social Surveys”

Instructors: Jaak Billiet  Melanie Revilla
Email: Jaak.Billiet(at)soc.kuleuven.be  melanie.revilla(at)hotmail.fr

Date: August 18-22, 2014
Time: 9:00-13:00

About the instructors:
Prof. Billiet Jaak, PhD, is emeritus professor in social methodology at KU Leuven since 2007. He is a member of the central co-ordination team of the European Social Survey. Methodological research: validity assessment, interviewer and response effects, and the modeling of measurement error in social surveys. Substantive research: longitudinal and comparative research in the domains of ethnocentrism, political attitudes and religious orientations. He played a central role in the implementation of the fourth wave of the European Value Study in 2008. Jaak Billiet has published widely with research fellows from various countries in peer-reviewed journals and specialized books on survey methodology and cross-cultural analysis.

Melanie Revilla, PhD, is a postdoctoral researcher at the Research and Expertise Centre for Survey Methodology (RECSM) and associate professor at Universitat Pompeu Fabra (UPF, Barcelona, Spain). She received her PhD from Universitat Pompeu Fabra (2012) in the areas of statistics and survey methodology, under the supervision of professors Willem Saris (UPF) and Peter Lynn (Essex University). Her dissertation dealt with the effects of different modes of data collection on the quality of survey questions. Besides the impact of the mode of data collection, she is interested in all aspects of survey methodology.

Short course description:
This course provides a comprehensive introduction to measurement error in survey research. This is a crucial topic because there are always errors in the measurement and if we do not take care of them, substantive results may be completely wrong. First, we will discuss examples and ways to reduce measurement error, such as basic rules for question wording. Then, findings of “split ballots” will be critically reviewed. The next step concerns the modeling of measurement error using models for assessing reliability and validity such as the MTMM model. The course will also have a detailed look at response styles in survey questions, as it is an important source of measurement error. We will use acquiescence as a generic example and model it using Structural Equation Modeling (SEM). Finally, the course will investigate the assessment of equivalent measurement in cross-cultural research, which is a key requirement if one wants to compare data across countries or groups. The different kinds of equivalence and procedures to assess them will be introduced. The practical exercises will guide participants to apply the concepts and procedures learned in the theoretical sessions. The software Mplus and data from the ESS will be used.

Course prerequisites:
- students must be motivated to apply what they will learn in their own research and should be interested in the quality of survey data.
- basic knowledge of statistical analysis and structural equation modeling. The examples in the theoretical part are based on LISREL_8® and participants should be able to interpret the
parameters. The practical exercises assume practical knowledge of Mplus. These requirements can be fulfilled by attending course "Introduction to the Structural Equation Modeling framework" in the previous week.

Target group:
Participants will find the course useful if they:

- are PhD students who will use survey data in their work;
- employees in survey or marketing institutes who are engaged in the analysis of survey data, or in preparation of survey questionnaires;
- are exceptionally specialized research master students interested in measurement error if this topic is not covered in their program.

Course and learning objectives:
By the end of the course participants will:

- have acquired a thorough understanding of the different kinds of measurement error related to the instrument (questionnaire) in social surveys;
- be aware of ways to detect, measure and control for errors;
- be familiar with the most recent developments and literature in the field of measurement error, especially in the context of large scale cross-cultural surveys;
- be familiar with the best practices in the field;
- be able to apply the strategies in practice.

Organizational structure of the course:
The course structure includes 4 hours of in-class instruction in the morning, of which 3 hours will be a lecture (9:00 -12:00) and 1 hour will comprise practical exercises (12:00 – 13:00). In addition, the participants are expected to take part in 2 hour guided exercises in presence of a course instructor (14:00-16:00), which will take place in the PC-pool the afternoon. In the afternoon, participants can also make appointments with the course instructors for individual consultations. The presence in the PC-pool during this time is considered to be an important part of the learning for this course, as we will learn how to work with different software than the one used for the lectures.

Software and hardware requirements:
Course participants will not need to bring a laptop computer for this course. This course will take place in a computer lab.

Long course description:
This course provides a comprehensive introduction to measurement error in survey research. To start with, the basic concepts and sources of measurement error as well as the concepts of validity and reliability will be introduced in the context of measurement quality, measurement validity, and conceptual (construct) validity. We will discuss examples of and ways to reduce measurement error, such as basic rules for question wording as well as strategies for single indicators. Then the course will introduce participants to the measurement of measurement error. In this context, the use and findings of ‘split ballots’ will be discussed and critically reviewed. Measurement error will be related to the concept of ‘attitude strength’, classical as well as recent cognitive models of the question-answer process (e.g. Zaller’s RAS model) and the concept of response instability. The next step concerns the modeling of measurement error using models for assessing reliability and validity such as the test-retest model, simplex model, RMM model, congeneric model, and the MTMM model as well as their application. We will study their advantages and disadvantages as well as the true-score MTMM model. The course also covers meta analysis of MTMM models and how to adjust their correlations.

The course will also have a detailed look at response styles in survey questions, as it is an important source of measurement error: What are response styles, and what are the different kinds of response styles? We will use acquiescence as a generic example and model it using Structural Equation Modeling (SEM). What are the advantages of modeling acquiescence in a cross-cultural context? Do we measure an acquiescence method effect? We will also examine whether this kind of modeling is useful for other response styles.
Finally, the course will investigate the assessment of equivalent measurement in cross-cultural research. The different kinds of equivalence and procedures to assess them will be introduced. We will discuss what to do in the case of single indicators and social-background variables, as well as the assessment of equivalence for multiple indicator latent variables. The course will also consider what to do if some indicators are not equivalent.

The practical exercises are focused on practical measurement problems in large datasets and will guide participants to apply the concepts and procedures they have learned in the theoretical morning sessions. The software Mplus and data from the ESS will be used. The course will be applicable to surveys of individuals.

Day-to-day schedule and literature used in the course:

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<tr>
<th>Day</th>
<th>Topic(s)</th>
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| 1   | Introduction to the course and basic concepts:  
  - Data quality and measurement error  
  - Sources of measurement error  
  - The idea of a latent variable measured by multiple indicators;  
  - The distinction between measurement validity and conceptual  
  - (theoretical) validity  
  - Necessary conditions for measurement validity and what with conceptual validity?  
  - Approaches to validity and reliability assessment  
  - How to reduce measurement error?  
  - Discussion of several strategies used for single indicators  
  - Basic rules for question wording  
  - Examples of measurement error related to translation of items in cross-cultural context.  
  Introduction to first set of exercises:  
  - Discuss different existing questions that have been used or proposed to be used in the ESS. Propose improvements.  
  - Operationalize some complex concepts.  
  - Formulate questions for single items related to own research.  
  Individual work and supervision  
| 2   | Approaches to reliability and validity: the measurers approach (I) split ballots:  
  - The classical approach: split ballots.  
  - What are split ballots?  
  - Pro’s and con’s of split ballots in kinds of question wording effects detected.  
  - A typology: question constraint, unintended information in the question text and response scales, leading question and loaded questions, context effects in questions.  
  - Kinds of context effects (assimilation and contrast). How to recognize them.  
  - Rules for specific kinds of question wording effects  
  - The concept of “attitude strength” and its methodological relevance  
  - How to explain question wording effect: cognitive models of question-answering (classical and new approaches)  
  - Zaller and the problem of response instability  
  Introduction to second set of exercises:  
  - Introduction to the SQP program (version 2)  |
| 3 | **Approaches to reliability and validity: the measurers approach (II)**  
Modeling measurement error:  
- Models for assessing reliability and validity: test-test model,  
- simplex model, congeneric model modeling measurement error, the MTMM model  
- How to use the MTMM parameters for adjusting observed correlations  
- Meta analysis of MTMM models and how to adjust correlations  
- Advantages and disadvantages of each model  
- The true-score MTMM model  
- Applications of MTMM models  
**Introduction to third set of exercises:**  
- Use Mplus to estimate several MTMM models (“classical”, true score, multiple group)  
- Use the quality estimates from SQP to compute the true correlations from a set of observed correlations  
**Individual work and supervision**  
**Compulsory reading:**  
**Suggested reading:**  
| 4 | **Modeling response styles:**  
- What are response styles?  
- Kinds of response styles  
- Generic example: acquiescence and approaches to acquiescence  
- Short introduction into SEM  
- Modeling acquiescence with SEM, necessary conditions, possible models, how to interpret the parameters?  
- Advantages of modeling acquiescence in a cross-cultural context?  
- Do we measure acquiescence method effects?  
- Is this kind of modeling useful for other response styles? Examples  
**Introduction to fourth set of exercises:**  
- Use Mplus to estimate some of the models presented in the lecture  
- Go through the questionnaire given and found a set of questions that can be used to be analyzed in a model including an acquiescence factor  
- Estimate the model using Mplus.  
**Individual work and supervision**  
**Compulsory reading:**  

**Individual work and supervision**  
- Use it to look at the impact of different aspects usually studied by split-ballot and to improve the questions made on Monday  
- Use Mplus to estimate simple measurement models: 1 factor with 1, 2, 3 indicators (to see identification issue), 2 correlated factors with several indicators  
Suggested reading:

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The assessment of equivalent measurement in cross-cultural research:
- Kinds of equivalence and procedures to assess equivalence
- What in case of single indicators?
- Equivalence of social-background variables
- How to obtain equivalent measures
- The research in Gesis on the equivalence of background variables (Hoffmeyer-Zlotnik et al.)
- The assessment of equivalence for multiple indicator latent variables: the concept of DIF.
- Kinds of invariance, models for equivalence testing.
- Assessment of equivalence taking method effects into account: approaches.
- What to do if some indicators are not equivalent
- How to detect errors in translation
- Examples of consequences of in-equivalent measurement

Introduction to fifth set of exercises:
- Use Mplus to test configural, metric and scalar invariance of different concepts across groups
- Discuss the findings and how to continue if invariance does not hold
- Introduction of the program JRule for Mplus that can be used to test the model at the parameter level and taking the power into account.

Individual work and supervision

Compulsory reading:

Suggested reading:

Preparatory reading:

Additional recommended literature: