



Ex-post harmonization of cross-national survey data: advances in methodological and substantive inquiries

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Published online: 5 July 2021

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1 Introduction

In the social sciences, comparative surveys are a powerful tool to study how individual-level conditions for action link to contextual factors, such as levels of democracy, economic development, and various inequalities that shape opportunity structures and social phenomena across cultures and time. To ensure that answers from respondents surveyed in different settings carry minimal methodological errors and biases and can be meaningfully compared, both data producers and secondary users combine surveys from different sources, that is, they harmonize survey data. Generally, they do so at different stages of the survey lifecycle. Data producers mostly employ harmonization *ex-ante*, when designing and implementing comparative studies (input harmonization) and when processing the survey data in preparation for their public release (ex-ante output harmonization). These methods are also referred to as *prospective* harmonization (e.g Fortier et al. 2011a, b). Secondary users apply harmonization methods retrospectively to already released data files. This approach is known as *ex-post output* harmonization, or, simply, *ex-post* or *retrospective* harmonization (Granda, Wolf and Hadorn 2010; Fortier et al. 2011a, b; Granda and Blasczyk 2016).

A brief sidestep into the realm of choral music provides a good analogy to the three different types of survey harmonization. A choir joins many singers' voices into an art piece they perform simultaneously. Individually, each voice sounds well, but to sing in harmony, it takes effort and practice (input harmonization). Once singers record their performance, certain sounds may be changed in the studio before the music is released (ex-ante output harmonization). In addition, creativity and modern technology create a

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new possibility to produce a choral piece by blending existing recordings made by different individual singers or choirs performing in various places and even at different times (ex-post output harmonization).

This Special Issue is devoted to methodological advances in *ex-post* output harmonization of cross-national survey data and their application to substantive research. To examine how attitudes and behaviors of individuals and social groups relate to features of the contexts we live in, calls for data with sufficiently large number of observations and substantial differentiation between country characteristics. Yet, single international survey projects, even purportedly world-wide ones like the World Value Survey and the International Social Survey Program, have coverage shortcomings: back in the 1980s, they included mostly Western Europe and North America, and even nowadays, historically marginalized countries in Africa, Asia, and the Middle East are underrepresented. At the same time, they generally target a country's general population, which can raise small sample size issues when research interest pertains to specific sub-populations.

Ex-post harmonization provides a way to overcome such limitations using information from cross-national files of different survey projects, which researchers reprocess to fill gaps in representation of social groups, countries, and periods (Burkhauser and Lillard 2005). Scholars pool variables that capture the same theoretical concept (*source* variables) in datasets not designed as comparative, recode and rescale them into indicators (*target* variables) that characterize respondents in the pooled country-years, and in doing so, build a new, *integrated, harmonized* cross-national dataset that can be analyzed as a single data source (Tomescu-Dubrow and Slomczynski 2016; Wysmulek 2019). The growing number of large harmonized social science datasets (Dubrow and Tomescu-Dubrow 2016) reflects both scientists' and funding agencies' view that ex-post harmonization carries a real potential. The advantages of ex-post harmonization are that it increases "the sample sizes (..), improves the generalizability of results, helps ensure the validity of comparative research, encourages more efficient secondary usage of existing data, and provides opportunities for collaborative and multi-centre research" (Doiron et al. 2012, p.1). Simultaneously, this approach can maximize the use of extant data resources and strengthen research programs' cost-efficiency (Burton et al. 2017; Roger et al. 2015).

The wealth of publicly available international survey projects, the academic aspiration to test substantive theories in a global context and technological developments have contributed advances in the methodology of ex-post harmonization of cross-national survey data (Minkel 2004; Fortier et al. 2011a, b; Slomczynski et al. 2016; Slomczynski and Tomescu-Dubrow 2018). However, serious challenges remain. There is surprisingly little agreement on ex-post harmonization standards and strategies. After examining the institutional and intellectual history of large-scale ex-post survey data harmonization projects in the social sciences, Dubrow and Tomescu-Dubrow (2016) conclude that the developments in the field of survey data harmonization result in "accumulated practicalities, and not with the coordination or institutional apparatus one would expect from a 30 year effort" (p.1). It means that, although harmonization has become inherent to cross-country dataset production, it is rarely transparent and well-planned, and there is still a lot of experimenting and learning in action.

A key problem that researchers face is data comparability (Behr et al. 2014; Wolf et al. 2016). Even under the (rather strong) assumption that *within* an international survey project selected for ex-post harmonization, comparability is strong (thanks to *ex-ante* harmonization), the methodological variability that exists *between* projects—due to differences in sampling, interviewing mode, properties of the source variables, data processing, among

others—needs to be accounted for to construct valid and reliable target variables (Fortier et al. 2010; Kołczyńska and Slomczynski, 2018; Oleksiyenko et al. 2018; Slomczynski and Tomescu-Dubrow, 2018).

Another set of difficulties is raised by the structure of the harmonized datasets, where respondents are often clustered, on the one hand, within country-years and countries, and on the other hand, within national surveys, project-waves/rounds and international projects. Missing data at different levels of this dataset may bring about complex problems in the substantive analysis. This complex nesting requires advanced statistical methods for substantive analysis (Durand et al. 2016, Slomczynski et al. 2016).

The five papers of this Special Issue present both the potential and the challenges in ex-post harmonization of cross-national survey data, as they provide insights into innovative harmonization methods and their application to substantive cross-national research. We briefly discuss them below.

2 Papers in this special issue

This special issue features five papers that discuss issues of ex-post harmonization of survey data in comparative, cross-national context. Out of five, three papers put forward methodological questions and two papers provide substantive analyses with the use of unique and original datasets harmonized ex-post. Table 1 summarizes the main types of contribution that each paper makes and briefs in about the harmonized datasets, key harmonized variables and main analytical approaches used in papers of this special issue. It shows that the survey data harmonization is used to test a variety of social theories, from those pertaining to political trust and voting behavior, to church attendance and institutional trust around the world. To test these various social theories with datasets constructed via ex-post harmonization, researchers face similar problems, including comparability of measurement, variability in source data quality and possible bias from missing data. The papers in this special issue discuss these methodological challenges.

In “Electoral integrity matters: how electoral process conditions the relationship between political losing and political trust,” Marlene Mauk examines two indirect venues through which political losing affects political trust: satisfaction with the incumbent government and citizens’ perceptions of the fairness of the electoral process. Mauk also tests whether the indirect effect of political losing on political trust through perceptions of electoral fairness is contingent on electoral integrity. Using multilevel structural equation models, Mauk finds that political losing decreases political trust, yet this link is mediated through satisfaction with the current government and perceptions of electoral fairness. What is more, political losing has a weaker effect on political trust in countries with higher electoral integrity. Mauk explores direct and indirect effects of political losing on political trust by creating the Electoral Integrity dataset that harmonizes survey data from the Asian Barometer Survey 2010–2012, European Social Survey 2012–2013, and Latinobarómetro 2012–2013 with macro-level data from the Varieties of Democracy Project for 45 countries in Europe, Latin America, and Eastern Asia. In this dataset, Mauk rescales the different ranges of the response on the source variables into a 0–1 scale to make them comparable. The code to recreate the harmonized dataset is available at: [dataverse.harvard.edu/dataverse/mmauk](https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7927/H73K-NB95).

In the paper “Church Attendance and Religious change Pooled European dataset (CARPE): a survey harmonization project for the comparative analysis of long-term trends

Table 1 Papers in the Special Issue on Cross-national Survey Data Harmonization

Paper	Main type of contribution	Harmonized dataset	Key harmonized variables ^a	Analytical approach
Mauk ^b	Substantive	Electoral Integrity dataset: Three survey Projects 2010–2013 45 countries	Vote choice; political trust; perceived electoral fairness; gov- ernment satisfaction	Multilevel structural equation models
Biolcati, Molteni, Quandt and Vezzoni ^b	Methodological	CARPE dataset: Five survey projects 1973–2016 45 countries	Church attendance	Multilevel models
Durand, Patricio, Ibarra, Rezgui and Wutchiett	Substantive	Institutional Trust in the World dataset: 17 survey projects 1995–2017 142 countries	Institutional trust	Multilevel models
Wutchiett and Durand	Methodological	Institutional Trust in the World dataset	NA	Multilevel multiple imputation
Schneider	Methodological	NA ^c	Education	Multilevel models

^aThe harmonization process for these specific ‘key’ variables is explicitly discussed in the paper^bThe paper published online first in 2020^cWhile the paper does not harmonize data ex-post, it analyzes ESS rounds 5–9

in individual religiosity” Ferruccio Biolcati, Francesco Molteni, Markus Quandt and Cristiano Vezzoni introduce the new harmonized CARPE dataset, which is designed to examine long-term trends in religiosity in Europe. CARPE harmonizes 1665 national surveys conducted in 45 countries between 1973 and 2016 as part of five cross-national survey projects. The dataset is available through the Data Archive for the Social Sciences of the GESIS—Leibniz Institute for the Social Sciences based in Cologne. Biolcati and colleagues provide the detailed information about the process of survey data harmonization in CARPE, including the selection of surveys, harmonization procedures, and reliability checks of the key harmonized variable of church attendance. When harmonizing various answer options from the church attendance question, Biolcati and colleagues estimate an implied probability of weekly church attendance from the reported attendance frequency. The detailed description of their harmonization strategy is valuable not only for the study of church attendance but also for harmonization of other frequency-type variables. They also discuss potential research agenda and methods for analyzing CARPE in the future research.

In the paper “How to Combine and Analyze all the Data from Diverse Sources: A Multilevel Analysis of Institutional Trust in the World”, Claire Durand, Luis Patricio, Peña Ibarra, Nadia Rezgui and David Wutchiett show the process of harmonizing the institutional trust measures using 1327 surveys of 17 survey projects conducted from 1995 to 2017 in 142 countries. This harmonized dataset is available at dataverse.scholarsportal.info/dataverse/clairedurand. The extensive country coverage of their harmonized dataset allows them to examine historically marginalized countries outside Western Europe and North America. They also propose a four-level multilevel approach for trust in various institutions—which the surveys ask in the questions—nested within respondents clustered within national surveys in the country sources (survey projects). Using the unique multilevel models, they analyze the general pattern of institutional trust over time in different countries by controlling for the possible variation in each level.

The harmonized dataset by Durand and her colleagues is also used in another paper of this special issue: “Multilevel and time-series missing value imputation for combined survey and longitudinal country-level data.” In this paper, David Wutchiett and Claire Durand discuss a crucial challenge of missing data imputation in the analysis of harmonized survey data with cross-national time-series macro data. They treat country-year-level contextual variables as individual level variables and test three imputation approaches—(1) multilevel multiple imputations with fixed effects for the time, (2) multilevel multiple imputations with a random slope for time and (3) two-step univariate time-series imputations for country-year-level missing data followed by multilevel multiple imputation for individual-level missing data—using 554,104 individuals nested within 27 countries between 1993 and 2016. They suggest that among three approaches, multilevel imputation with a random slope has an advantage because it estimates unique country-level longitudinal trends in the contextual variables.

In the paper “The classification of education in surveys: a generalized framework for ex-post harmonization,” Silke Schneider provides a new classification framework for harmonizing education variables ex-post in cross-national survey projects, called “generalized ISCED,” or GISCED for short. As suggested by its name, GISCED builds on the International Standard Classification of Education (ISCED) by adding a new ‘unspecified’ category at each ISCED digit and a new (“generalized”) digit to the official three-digit ISCED. This additional digit is placed as second in ISCED to indicate the upper bound of the category, while at the same time the first ISCED digit becomes the indicator of the lower bound. Schneider also creates extension variables that carry information which may

appear in source variable but is not captured by GISCED, such as stratification in secondary education track, type of higher education, and different types of vocational education and training. GISCED and the extension variables allow harmonization with minimal loss of information and provide a clear educational scheme for comparative research.

3 Conclusions

Survey data harmonization is an emergent field in survey methodology that is challenging but promising. This special issue responds to the growing interest in ex-post harmonization as means to broaden the scope of comparative research while making the most of already collected surveys. The papers in this special issue explore methodological opportunities and challenges of harmonizing survey data ex-post and using the resulting datasets for substantive inquiries.

The impetus for this special issue is the Survey Data Recycling (SDR) project (asc.ohio-state.edu/dataharmonization), in which we harmonize information from 3,485 national surveys of 23 international projects conducted from 1966 to 2017 in 169 counties or territories, to study political participation, democracy, social capital and wellbeing (dataverse.harvard.edu/dataverse/sdr). To do so, the SDR project has developed a new research paradigm that integrates existing international surveys, accounts for data-quality, and explicitly models methodological differences between surveys in the harmonization process. As our work progressed, we have recognized the benefits that broader visibility of scholarly efforts on survey data harmonization entail for knowledge accumulation and advances in methodological and substantive inquiries. Important harmonization work exists across disciplines that do not routinely communicate with each other, like demography, epidemiology, sociology and political science and involving data that do not fit a narrow definition of surveys, such as censuses (Ruggles et al. 2015) and time use data (Jarosz 2018). We hope that this special issue contributes to triggering active discussion about ex-post survey data harmonization and disseminating it across projects and disciplines.

Creating largescale comparative datasets via ex-post harmonization methods is a laborious, time-consuming endeavor that strongly benefits from interdisciplinary cooperation among social scientists, and between them and computer scientists. The result of such work opens possibilities for new methodological and substantive inquiries. Generally in academia, and in harmonization initiatives in particular, cooperation and building on existent work with own original input is very important and pushes the science forward. In this light, we encourage paying a close attention to the new methodological developments and newly created harmonized datasets presented in this special issue, which are available free of charge through data archives.

Acknowledgements We thank all current and past members of the SDR Project Team for their support of the project. We thank colleagues who served as anonymous reviewers for the papers this special issue provides, and Q&Q journal editors and management team for their continuous support throughout the stages of preparing the volume. Last but not least, we express our appreciation to the Institute of Philosophy and Sociology, Polish Academy of Sciences (IFiS PAN, ifispan.edu.pl), CONSIRT of The Ohio State University and PAN (consirt.osu.edu), and the Institute for Social and Economic Research at the University of Essex (iser.essex.ac.uk) for their organizational support.

Funding The authors disclose receipt of the following financial support for the research, authorship, and/or publication of this article: This material is based on work supported by the National Science Foundation under Grant No. PTE Federal award 1738502.

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