

# GESIS Summer School in Survey Methodology 2025

## “Causal Inference in the Social Sciences”

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Date: 04-08 August 2025

Time: Mo: 10:00-17:30 | Tu-Th: 9:00 – 16:30 | Fr: 9:00 – 16:00

Venue: Onsite at GESIS Cologne

### About the Lecturers

**Matthias Collischon** is a researcher (tenure-track) at the Institute for Employment Research (IAB) in Nürnberg. He is an IZA-research affiliate and a LASER research fellow. His research interests include gender differences in the labor market, the effects of unemployment on various well-being measures and long-term effects of the COVID-19 pandemic on the labor market. His work has been published in high-ranking journals such as *Social Forces*, *Sociological Science*, the *Journal of Human Resources*, *European Sociological Review* and *Socio-Economic Review*, among others.

**Florian Zimmermann** is a researcher (tenure-track) at the Institute for Employment Research (IAB) in Nürnberg and a member of the management research group. His current research interests comprise firms, gender inequality, social stratification, and migration studies. His work has been published in journals such as *Proceedings of the National Academy of Sciences of the United States of America*, *Sociological Science*, *European Sociological Review*, *European Societies*, and *Sociology*, among others.

### Selected Publications

- Collischon, M., & Eberl, A. (2020). Let's talk about fixed effects: Let's talk about all the good things and the bad things. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 72(2), 289-299.
- Collischon, M., Kuehnle, D., & Oberfichtner, M. (2024). Who Benefits from Cash-for-Care?: Effects of a Home Care Subsidy on Maternal Employment, Childcare Choices, and Children's Development. *Journal of Human Resources*, 59(4), 1011-1051.
- Collischon, M., Eberl, A., & Wolbring, T. (2024). Parental well-being when children move out: A panel study on short-and long-term effects. *Advances in Life Course Research*, 62, (online first).
- Scur, D., Ohlmacher, S., Van Reenen, J., Bennedsen, M., Bloom, N., Choudhary, A., ... & Zimmermann, F. (2024). The international empirics of management. *Proceedings of the National Academy of Sciences*, 121(45), e2412205121.
- Zimmermann, F., & Collischon, M. (2023). Do organizational policies narrow gender inequality? Novel evidence from longitudinal employer–employee data. *Sociological Science*, 10, 47-81.
- Zimmermann, F. (2022). Managing the gender wage gap—how female managers influence the gender wage gap among workers. *European Sociological Review*, 38(3), 355-370.

### Course Description

This course will introduce you to the concepts and methods of causal inference and causal modeling in the social sciences. It will highlight the relevance of research design, analytical methods, and their systematic combination to optimize the validity of causal inferences drawn from empirical studies. Building on existing knowledge concerning linear regression modelling and research design, the course will then cover key methods to estimate causal effects, including fixed effects estimations with various addons, event study analyses, matching, difference-in-differences,

regression discontinuity, and instrumental variables. Throughout the course, you will apply these concepts and methods in hands-on sessions to real-world examples in the social sciences. The application will be conducted with the statistical software package Stata. A solid background in Stata is expected. By the end of the course, you will have the skills and knowledge to design, conduct, and interpret causal inference studies in the social sciences. You will be able to engage with the contemporary literature of causal inference and identify state-of-the-art methods which might be most relevant to your specific research question.

## Organizational Structure of the Course

The course will be split into three-hour morning and three-hour afternoon sessions, including coffee breaks. To secure a close link between the learning and the application of contents, we will switch between lecture format (~50%) and hands-on exercises, tutorials, or lab sessions (~50%) in a flexible way. The exercises include the application of causal inference methods to estimate effects based on existing datasets using Stata. Lecturers will be available for individual consultations to support work on group assignments and to facilitate discussions within groups.

## Keywords

Causal inference, econometrics, observational data

## Target Group

You will find the course useful if you:

- have a background in the social, behavioral or economic sciences (economists, political scientists, sociologists, criminologists, psychologists, etc.),
- are interested in methods for causal inference based on observational data, especially panel data,
- have a firm knowledge in linear regression modelling,
- are motivated to apply the concepts and statistical approaches in hands-on sessions.

## Course and Learning Objectives

By the end of the course, you will:

- have acquired an understanding of up-to-date causal estimation approaches to understand and critically reflect on current studies,
- be able to conceptually design your own studies to identify causal effects,
- bring the conceptual considerations into practice and conduct the relevant estimations.

## Course Prerequisites

- Knowledge of basic statistical concepts and their formal background, including the principles of (multiple) linear regression and binary logistic regression
- Solid background in Stata
- Basic understanding of designing quantitative studies

## Software and Hardware Requirements

You will need to bring a laptop computer with a recent version of Stata (15 or higher) installed to successfully participate in this course.

GESIS will provide you with short term licenses for Stata for the duration of the course if needed.

To familiarize yourself with the statistical software Stata, you can use the following textbooks:

- Kohler, U./Kreuter, F. (2008). *Data Analysis Using Stata*. College Station: Stata Press.

- Cameron, A. C., and Trivedi, P.K., 2022. *Microeconometrics Using Stata*, Stata Press.

For an introduction or refresher in Stata programming, you might also consider enrolling in GESIS's two-day hybrid (onsite in Cologne/online via Zoom) course, **“Introduction to Stata for Data Management and Analysis”** held the in the first week of the Summer School.

## Recommended Literature to Look at in Advance

For a basic understanding of linear regression analysis, the first chapters from:

- Angrist, J. D./Pischke, J.-S. (2014). *Mastering'metrics: The path from cause to effect*. Princeton University Press. <https://doi.org/10.1007/s00712-015-0451-7>

## Day-to-day Schedule and Literature

Day	Topic(s)
1	<p><b>A primer on regression analysis and an introduction to causal identification</b></p> <p>10:00 – 13:00</p> <ul style="list-style-type: none"> <li>▪ Quick update on Ordinary Least Squares (OLS) estimation</li> <li>▪ Counterfactual model and the fundamental problem of causal inference</li> <li>▪ Different types of experiments and their link to the counterfactual model</li> </ul> <p>14:30 – 17:30</p> <ul style="list-style-type: none"> <li>▪ OLS with control variables</li> <li>▪ <i>Stata application</i>: OLS with controls</li> <li>▪ Good controls, bad controls</li> </ul>
2	<p><b>Cross-sectional Data</b></p> <p>9:00 – 12:00</p> <ul style="list-style-type: none"> <li>▪ What is your estimand?</li> <li>▪ ATE, ATT, LATE</li> </ul> <p>13:30 – 16:30</p> <ul style="list-style-type: none"> <li>▪ Matching: (Coarsened) Exact Matching, Propensity Score Matching</li> <li>▪ <i>Stata application</i>: Matching</li> </ul> <p>Literature:</p> <ul style="list-style-type: none"> <li>▪ Iacus, S. M., King, G., &amp; Porro, G. (2012). Causal inference without balance checking: Coarsened exact matching. <i>Political analysis</i>, 20(1), 1-24. <a href="https://doi.org/10.1093/pan/mpr013">https://doi.org/10.1093/pan/mpr013</a></li> <li>▪ Lundberg, I., Johnson, R., and Stewart, B.M. (2021). What Is Your Estimand? Defining the Target Quantity Connects Statistical Evidence to Theory. <i>American Sociological Review</i>, 86, 532–565. <a href="https://doi.org/10.1177/00031224211004187">https://doi.org/10.1177/00031224211004187</a></li> <li>▪ Morgan, S.L., and Winship, C. (2015). <i>Counterfactuals and Causal Inference: Methods and Principles for Social Research</i>. New York: Cambridge University Press (2nd Edition). Chapters 4, 5 &amp; 6. <a href="https://doi.org/10.1017/CBO9781107587991">https://doi.org/10.1017/CBO9781107587991</a></li> </ul>
3	<p><b>Panel Data</b></p> <p>9:00 – 12:00</p> <ul style="list-style-type: none"> <li>▪ Longitudinal (in particular panel) designs and data quality</li> <li>▪ Panel regression models: Pooled OLS, first-differences, and fixed-effects regression</li> <li>▪ Fixed-effects regression with individual slopes</li> </ul> <p>13:30 – 16:30</p>

	<ul style="list-style-type: none"> <li>▪ <i>Stata Application:</i> Panel regression models</li> <li>▪ Event-study designs and impact dummies</li> </ul> <p>Literature:</p> <ul style="list-style-type: none"> <li>▪ Allison, P.D. (2009). <i>Fixed Effects Regression Models</i>. Thousand Oaks: Sage. <a href="https://doi.org/10.1007/s00712-015-0451-7">https://doi.org/10.1007/s00712-015-0451-7</a></li> <li>▪ Brüderl, J., and Ludwig, V. (2014). Fixed-effects Panel Regression. In: Best, H., and Wolf, C. (eds.): <i>The Sage Handbook of Regression Analysis and Causal Inference</i>. London: Sage, pp. 327–357.</li> <li>▪ Collischon, M., &amp; Eberl, A. (2021). The link between relative pay and job satisfaction revisited. <i>European Sociological Review</i>, 37(2), 238-252. <a href="https://doi.org/10.1093/esr/jcaa045">https://doi.org/10.1093/esr/jcaa045</a></li> <li>▪ Ludwig, V., and Brüderl, J. (2021). What You Need to Know When Estimating Impact Functions with Panel Data for Demographic Research. <i>Comparative Population Studies</i>, 46, DOI: 10.12765/CPoS-2021-16. <a href="https://doi.org/10.12765/CPoS-2021-16">https://doi.org/10.12765/CPoS-2021-16</a></li> </ul>
4	<p><b>Natural Experiments: RDD and DiD</b></p> <p>9:00 – 12:00</p> <ul style="list-style-type: none"> <li>▪ <i>Stata application:</i> Event-study designs and impact dummies</li> <li>▪ Natural experiments I: Regression discontinuity</li> </ul> <p>13:30 – 16:30</p> <ul style="list-style-type: none"> <li>▪ Natural experiments II: Diff-in-diff-estimation</li> <li>▪ <i>Stata application:</i> Diff-in-diff-estimation</li> </ul> <p>Literature:</p> <ul style="list-style-type: none"> <li>▪ Cunningham, S. (2021). <i>Causal Inference. The Mixtape</i>. New Haven/London: Yale University Press. Chapters 6 &amp; 9. <a href="https://mixtape.scunning.com/">https://mixtape.scunning.com/</a></li> <li>▪ Dunning, T. (2012). <i>Natural Experiments in the Social Sciences. A Design-Based Approach</i>. Cambridge, UK: Cambridge University Press. Chapters 1, 2 &amp; 3. <a href="https://doi.org/10.1017/CBO9781139084444">https://doi.org/10.1017/CBO9781139084444</a></li> </ul>
5	<p><b>Instrumental Variables &amp; Outlook</b></p> <p>9:00 – 12:00</p> <ul style="list-style-type: none"> <li>▪ Natural experiments III: Instrumental variables</li> <li>▪ <i>Stata application:</i> Instrumental variables</li> </ul> <p>13:00 – 16:00</p> <ul style="list-style-type: none"> <li>▪ Instrumental variables and fuzzy regression discontinuity designs</li> <li>▪ Wrap-up and outlook</li> </ul> <p>Literature:</p> <ul style="list-style-type: none"> <li>▪ Angrist, J.D., and Pischke, J.-S. (2009). <i>Mostly Harmless Econometrics. An Empiricist's Companion</i>. Princeton: Princeton University Press. Chapter 4. <a href="https://doi.org/10.2307/j.ctvc4j72">https://doi.org/10.2307/j.ctvc4j72</a></li> </ul>

## Additional Recommended Literature

- Allison, P. D. (2019). Asymmetric fixed-effects models for panel data. *Socius*, 5, 2378023119826441. <https://doi.org/10.1177/2378023119826441>
- Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates?. *The Quarterly Journal of Economics*, 119(1), 249-275. <https://doi.org/10.1162/003355304772839588>

- Bollen, K. A. (2012). Instrumental variables in sociology and the social sciences. *Annual Review of Sociology*, 38, 37-72. <https://doi.org/10.1146/annurev-soc-081309-150141>
- Cunningham, S. (2021). *Causal inference: The mixtape*. Yale university press. [online: <https://mixtape.scunning.com/>]
- Giesselmann, M., & Schmidt-Catran, A. W. (2022). Interactions in fixed effects regression models. *Sociological Methods & Research*, 51(3), 1100-1127. <https://doi.org/10.1177/0049124120914934>
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2), 254-277. <https://doi.org/10.1016/j.jeconom.2021.03.014>
- Huntington-Klein, N. (2021). *The effect: An introduction to research design and causality*. CRC Press. [online: <https://theeffectbook.net/>]
- Imbens, G. W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of econometrics*, 142(2), 615-635. <https://doi.org/10.1016/j.jeconom.2007.05.001>
- Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of economic literature*, 48(2), 281-355. DOI: 10.1257/jel.48.2.281
- Mogstad, M., & Torgovitsky, A. (2018). Identification and extrapolation of causal effects with instrumental variables. *Annual Review of Economics*, 10, 577-613. <https://doi.org/10.1146/annurev-economics-101617-041813>
- Roth, J., Sant'Anna, P. H., Bilinski, A., & Poe, J. (2022). What's trending in difference-in-differences? A synthesis of the recent econometrics literature. arXiv preprint arXiv:2201.01194. <https://doi.org/10.1016/j.jeconom.2023.03.008>