## IPEN 5140: Quantitative Analysis and Empirical Methods

Fall 2023

HKUST(GZ)

Tuesday, 6:00 PM – 8:50 PM

Classroom: E1-122

Instructor: Dr. Chenyang Li

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Office hours: Thursday, 3:30-4:30 pm, or by appointment

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                    Office Hours: Room 305 of the library from 4:30 pm to 6:00 pm every Wednesday.

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                    Office Hours: Room 428, E3. 16:00-17:30, Friday.

**COURSE DESCRIPTION**

This course introduces students to empirical methods and data management tools used in the current social science disciplines, with some special focuses on strategy, finance and applied microeconomics. The overall approach is to understand the common methods and research design used in empirical research through intensive reading and replicating papers published in top journals. From this course, you would also get yourself proficient in the use of computer software that is widely used in analyzing quantitative data via empirical assignments. In addition, this course provides a brief introduction to more advanced empirical methods such as machine learning and structural estimation.

The focus of this course is more on how to design and conduct credible inference based on empirical data, rather than the mathematical/statistical properties of the econometrics. These would not be covered comprehensively in this course and students are expected to learn either by themselves or from other courses.

**LEARNING OBJECTIVES**

1. Understand basic statistical concepts and methods used in social research.
2. Process and present data by proper approach.
3. Assess a range of methods to choose the best approach for a specific empirical design.
4. Critique the analytical methods used in existing analysis.
5. Write research proposals in which empirical design method and regression models are properly used.

**TEXTBOOKS AND MATERIALS**

1. Angrist, Joshua D., and Jörn-Steffen Pischke. [Mastering metrics: The path from cause to effect.Links to an external site.](https://www.masteringmetrics.com/) Princeton university press, 2014.
2. Angrist, Joshua D., and Jörn-Steffen Pischke. [Mostly harmless econometrics: An empiricist's companion.Links to an external site.](https://www.mostlyharmlesseconometrics.com/) Princeton university press, 2009.
3. Cameron, Adrian Colin, and Pravin K. Trivedi. Microeconometrics using stata. Vol. 2. College Station, TX: Stata press, 2010.
4. Wooldridge, Jeffrey M. Econometric analysis of cross section and panel data. MIT press, 2010. (A more technical textbook)

**COURSE EVALUATION**

1. **Class participation**(10%):I appreciate active participation. Your level of engagement during the class would be recorded for each session.
2. **Paper presentation**(20%): Throughout this semester, you are expected to write paper summaries for 7 papers. Your paper summary should be strictly **no more** than two pages (A4, 12 points, double spaced, Times New Roman). Moreover, you should present your paper summaries at least once in a group of 3 or 4 in class. Each written summary counts 2% of your final grades, and the in-class presentation counts 6%. Your presentation would cover the following points:
	1. Research question of this paper
	2. Identification challenge and proposed solution
	3. What in your view is the greatest contribution
	4. Potential issues or limitation of this empirical strategy
3. **Empirical (replication) exercises**(30%): There are a total of three empirical exercise sessions in class. You should form a group of 3 or 4 and finish the empirical exercises as a group. The replication project would be based on published papers (or recent working papers) with readily available datasets. You are also expected to perform additional analysis to study the robustness of the paper as well as possible extensions. Specific requirements of replication exercises would include the followings.
	1. Your replication of the author(s)’ main results
	2. Discussions of your thoughts over how these results could be (better) presented/estimated using other methods
	3. Extension of the paper itself (other results you evaluate to be interesting based on the same dataset or a new dataset you constructed based on merging current dataset used by the focal paper and some other sources)
4. **Final collaborative project**(40%): The final project will be a collaborative project and will be heavily empirical based. You will be asked to submit your written codes and your reports together as a team of 3 or 4. The goal of this final project is for you to write a proposal that can be eventually developed into a high-quality published paper. I encourage you to continue working on this project, and I would be more than happy to provide you with necessary help. Detailed requirements would be released in the middle of this class.

**COURSE TOPICS**

**^ Suggested reading (background info)**

**\* Paper summaries and presentations (must-read)**

**# Empirical exercises**

Week 1 (5Sep): Introduction: Empirical research 101

\* Do Powerful Politicians Cause Corporate Downsizing? (JPE 2011)

\* Do Powerful Politicians Really Cause Corporate Downsizing? (JPE 2016) (Summary and presentation both papers)

^ Angrist, Joshua D., and Jörn-Steffen Pischke. "The credibility revolution in empirical economics: How better research design is taking the con out of econometrics." Journal of Economic Perspectives 24.2 (2010): 3-30.

Week 2 (12 Sep): Data Management

\* Koh, Ping-Sheng, and David M. Reeb. "Missing R&D." Journal of Accounting and Economics 60.1 (2015): 73-94.

Week 3 (19 Sep): Panel Data

\* Hsu, David H., and Prasanna Tambe. "Startup labor markets and remote work: Evidence from job applications." Available at SSRN 3894404 (2021).

Week 4: (26 Sep): Binary Dependent Variable

^ Flammer, Caroline, Michael W. Toffel, and Kala Viswanathan. "Shareholder activism and firms' voluntary disclosure of climate change risks." Strategic Management Journal 42.10 (2021): 1850-1879.

# Hoisl, Karin, Hans Christian Kongsted, and Myriam Mariani. "Lost Marie Curies: Parental impact on the probability of becoming an inventor." Management Science (2022).

Week 5 (10 Oct): Standard Errors Clustering

^ Angrist and Pischke (Chapter 8)

^ Abadie, Alberto, et al. When should you adjust standard errors for clustering?. No. w24003. National Bureau of Economic Research, 2017.

\* Angrist, Joshua. "Estimating the labor market impact of voluntary military service using social security data on military applicants." (1995).

Week 6: (17 Oct): Potential Outcomes and identification

^ Angrist and Pischke (Chapter 2, Chapter 3.2.1, Chapter 3.3.1)

# Empirical exercise: Hou, Yun, Ivan PL Png, and Xi Xiong. "Social Value of Patents: Evidence from the US Court of Appeals for the Federal Circuit." Available at SSRN 3828299 (2021).

Week 7 (24 Oct): Selection and matching

\* Azoulay, Pierre, Toby Stuart, and Yanbo Wang. "Matthew: Effect or fable?." Management Science 60.1 (2014): 92-109.

Week 8 (30 Oct): Instrumental Variables

^ Angrist and Pischke, Chapter 4

\* Fisman, Raymond, 2001. Estimating the Value of Political Connections. American Economic Review, 91, 1095-1102

Week 9 (7 Nov): Difference-in-Differences I

^ Bertrand, M., E. Duflo, and S. Mullainathan, 2004. How Much Should We Trust Difference-in-Differences Estimates? Quarterly Journal of Economics 119: 249-275

\* Bernstein, Shai, Xavier Giroud, and Richard R. Townsend. "The impact of venture capital monitoring." Journal of Finance 71.4 (2016): 1591-1622.

Week 10 (14 Nov): Difference-in-Differences II

# Empirical exercise: Moser, Petra, and Alessandra Voena. "Compulsory licensing: Evidence from the trading with the enemy act." American Economic Review 102.1 (2012): 396-427.

Week 11 (21 Nov): Regression Discontinuity, Introduction to Structural Estimation.

\* Howell, Sabrina T. "Financing innovation: Evidence from R&D grants." American economic review 107.4 (2017): 1136-64.

^ Reiss and Wolak, 2007, "Chapter 64 Structural Econometric Modeling Rationales and Examples from Industrial Organization." Handbook of Econometrics, Volume 6A

Week 12 (28 Nov): Machine learning and causality

^ Athey, Susan. "Machine learning and causal inference for policy evaluation." Proceedings of the 21th ACM SIGKDD international conference on knowledge discovery and data mining. 2015.

^ Athey, Susan, and Guido W. Imbens. "Machine learning methods that economists should know about." Annual Review of Economics 11 (2019): 685-725.

Week 13 (5 Dec): Final project presentation