

**Carnegie Mellon University  
Heinz College**

**90-822 / 90-440 Critical Analysis of Policy Research**  
Course Syllabus, Fall 2024

**INSTRUCTOR**

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**LECTURE**

2:00-3:20 Tuesdays and Thursdays  
Hamburg Hall 1005  
Course website: [canvas.cmu.edu](http://canvas.cmu.edu)

**TEACHING ASSISTANT**

Zhihan Li  
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Office Hours: by appointment

**OBJECTIVES**

This course prepares students to understand, interpret, and critique existing policy research. The course focuses on the development of three essential skills for policy analysts: 1) Read and interpret empirical results in published research. 2) Understand the assumptions needed to infer causal relationships and assess their plausibility. 3) Recognize common problems in policy research, including reverse causality, omitted variables, measurement error, etc., and use graphical methods to determine the direction of the resulting statistical bias. Using these three skills, students will practice understanding and critiquing policy research. Moreover, by identifying and understanding potential problems, students can make valid conclusions even from seriously flawed research. At the end of the class, students demonstrate these skills by independently evaluating an existing piece of research of their choice, presenting their findings in a written report and in-class presentation.

## PREREQUISITE

Any course covering the estimation and interpretation of linear regression.

## COURSE ORGANIZATION

*Web site:* This course will use the **Canvas system** (<https://canvas.cmu.edu/>). As of the first day of class, all registered students should have complete access to the course web site. Important class information, including readings and copies of the lecture notes will be distributed regularly via this web site.

*Reading materials:* All readings listed below will be available through Canvas. Required readings should be completed before the associated lecture, and students must be prepared to discuss the readings during lecture. Supplemental readings provide more in-depth information for the interested student.

*Assignments:* Students will complete six assignments during the course, with due dates listed below. Assignments are due at the beginning of the relevant lecture and will be submitted via the Gradescope link on Canvas. Late assignments will be deducted 20 percentage points per day, beginning just after the start of class. Each assignment is worth **10%** of the course grade, so the six assignments together comprise **60%** of the overall course grade. Grading issues occasionally arise, and regrade request must be emailed to the TA within one week of the grades being posted.

*Final Project:* As mentioned above, the course will culminate in a final project evaluating research on a policy topic of the student's choice. Further information on this project will be provided in lecture 6. The final project is worth **35%** of the overall class grade.

*Class participation:* Class discussions and responses to in-class practice questions are integral parts of the course, and class participation will account for **5%** of the total grade. To receive full credit for this portion of the grade, students must consistently demonstrate through participation in class discussions and practice questions that they have completed the required readings and thought through the related issues in advance of the class.

### *Grading Summary:*

Assignments	60%
Final Project	35%
Participation	5%

## POLICIES

Lecture will be conducted in person and students are expected to attend. If you have an approved need to attend remotely via Zoom, email the instructor for a link. If you expect to utilize this option, please make sure that your Internet connection and equipment are set up to use Zoom and able to share audio and video during class meetings. See this page from Computing Resources for information on the technology you are likely to need:

<https://www.cmu.edu/computing/start/students.html>

Although I will not take formal attendance, I expect that you will attend and will be engaged in the course material while in class. The information presented in lecture will help you to succeed in the homeworks and final project, and I will strive to make everything we cover interesting and relevant to the course's learning objectives.

Lecture notes will be posted on Canvas prior to the relevant lecture. All course materials are provided solely for educational use by students enrolled in the course and may not be distributed to any other person or posted on the internet without the express written permission of the course instructor.

We have a lot of material to cover in a short amount of time, and I plan to start and end class on time. If you must miss class, review the lecture notes and readings and consult one of your classmates to get whatever material you missed.

Assignments must be completed and submitted individually; students are welcome to discuss assignments with others, but each student's answer must be in their own words and reflect their own independent understanding. For written assignments, all sources must be appropriately cited based on standard citation guidelines and CMU policies. Students are responsible for knowing how to cite sources appropriately. For official CMU definitions of cheating and plagiarism, and academic disciplinary procedures that will be followed in the case of a violation, see: <http://www.cmu.edu/policies/student-and-student-life/academic-integrity.html> Plagiarism is a serious offense that can result in the student failing the course. Note that all suspected academic integrity violations will be reported to the Associate Dean. Additional penalties may be imposed. See me if you have any questions about appropriate citation **before** handing in an assignment.

In this class, any use of generative AI for any graded course assignment is prohibited. Passing off any generated content as your own (for example, cutting and pasting content into written assignments or paraphrasing AI content) constitutes an academic integrity violation. As we will see throughout the course, much published research is not particularly credible. Generative AI algorithms trained on such research will not yield credible responses, so it is essential for you to independently assess the quality of the research work you encounter, without seeking assistance from AI tools. If you have questions about using generative AI in this course, please talk to me first before doing so.

If you have a disability and are registered with the Office of Disability Resources, I encourage you to use their online system to notify me of your accommodations and discuss your needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu).

It is my intent that students from diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to

present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

*If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:*

*CaPS: 412-268-2922*

*Re:solve Crisis Network: 888-796-8226*

*If the situation is life threatening, call the police*

*On campus: CMU Police: 412-268-2323*

*Off campus: 911*

The best way to get in touch with me is to send me an email. I will be checking email regularly and will strive to respond within one day. I expect that you will also check your CMU email account at least one per day, as all announcements will be made through the Canvas system, which automatically emails your CMU account.

While the policies described above are designed to provide an excellent educational experience, we may need to make adjustments as the semester continues. Any changes will be communicated in class and through Canvas announcements. If you face any challenges or if you have suggestions for how we can improve upon the course delivery, please let me know.

## TENTATIVE SCHEDULE

**The following represents a tentative schedule that is subject to change. Any changes will be announced in class and through the Canvas system. You are expected to check your CMU email daily to stay up to date on all course-related information.**

Slides	Date	Topics
1	Aug 27	Course introduction and syllabus
		<u>Interpreting Empirical Research</u>
2	Aug 29	Data, bivariate linear regression basics, interpreting regression output
3	Sep 3	Shares, percent, and percentage points; logs; binary independent and dependent variables
4	Sep 5	Multivariate regression, nonlinear effects, interaction terms, bad controls
5	Sep 10	Difference-in-differences and fixed effects
6	Sep 12	Final project introduction
		<u>Causality</u>
7	Sep 17	Correlation vs. causation, potential outcomes, randomized experiments, fundamentally unidentified questions
		<b>Regression Interpretation Assignment Due</b>
8	Sep 19	Counterfactuals and popular research designs
9	Sep 24	Causal inference in-class exercise
		<b>Final Project Proposal Due</b>
		<u>Threats to Causal Interpretation</u>
10	Sep 26	Omitted variables, reverse causality
11	Oct 1	Measurement error, missing data
12	Oct 3	Instrumental variables
—	Oct 8	Catch-up period
		<b>Omitted Variables, Reverse Causality, and Measurement Error Assignment Due</b>
		<u>Modern Research Designs</u>
13	Oct 10	Difference-in-differences and fixed effects with panel data
		<b>Instrumental Variables Assignment Due</b>
		<b>Presentation Slots Assigned</b>
—	Oct 15	No class – fall break
—	Oct 17	No class – fall break
14	Oct 22	Selection on observables
15	Oct 24	Regression discontinuity and regression kink
16	Oct 29	Synthetic controls
		<u>Critique Practice and Final Project</u>
17	Oct 31	Critique application and practice part 1 (OVB/RC)
		<b>Critique Practice 1 Due</b>
—	Nov 5	No class – democracy day
18	Nov 7	Critique application and practice part 2 (IV)
		<b>Critique Practice 2 Due</b>
—	Nov 12	Presentation help session
19	Nov 14	Critique application and practice part 3 (DiD)
		<b>Critique Practice 3 Due</b>
—	Nov 19	<b>Final presentations</b>
—	Nov 21	<b>Final presentations</b>
—	Nov 26	<b>Final presentations</b>
—	Nov 28	No class – Thanksgiving
—	Dec 3	<b>Final presentations</b>
—	Dec 5	<b>Final presentations</b>
		<b>Final paper due 10 days following your presentation date</b>

## TENTATIVE READINGS BY TOPIC

(subject to change no less than one week prior to the associated lecture)

### **Class 1: Course introduction and syllabus**

#### *Required Reading*

This syllabus

### **Class 2: Data, bivariate linear regression basics, interpreting regression output**

#### *Required Reading*

Stock, James H. and Mark W. Watson. *Introduction to Econometrics – Third Edition*. Chapter 4 p111-135. 2011. [25p]

### **Class 3: Shares, percents, and percentage points; logs; binary independent variables; binary dependent variables**

#### *Required Reading*

Handout “Interpreting statements with ‘percent’ vs. ‘percentage point’” [2p]

Cadena, Brian C. and Brian K. Kovak “Immigrants Equilibrate Local Labor Markets: Evidence from the Great Recession” *NBER Working Paper* No. 19272. 2013, Sections 1 and 3. [17p] [*Focus on the motivation behind and interpretation of the main empirical analysis in Table 3.*]

#### *Supplemental Reading*

Gujarati, Damodar N. *Basic Econometrics*. Chapter 6. p.164-193 2004. [30p] *Regression interpretation with logged variables and other transformations.*

Gujarati, Damodar N. *Basic Econometrics*. Chapter 9. p.297-323 2004. [27p] [*Binary independent variables*].

Gujarati, Damodar N. *Basic Econometrics*. Chapter 15. p.580-625 2004. [46p] [*Binary dependent variables*].

### **Class 4: Multivariate regression, nonlinear effects, interaction terms, bad controls**

#### *Required Reading*

Stock, James H. and Mark W. Watson. 2011. *Introduction to Econometrics – Third Edition*. Chapter 6 p186-210. 2011. [25p]

Clark, Ximena, Timothy J. Hatton, and Jeffrey G. Williamson “Explaining U.S. Immigration, 1971-1998” *Review of Economics and Statistics*. 89(2) p359-373. 2007. [15p] [*Focus on interpreting the main empirical analysis in Table 3.*]

#### *Supplemental Reading*

Wooldridge, Jeffrey M. *Introductory Economics: A Modern Approach – Fourth Edition*. Section 7.4 “Interactions Involving Dummy Variables” p.240-245 [5p]

### **Class 5: Difference-in-differences and fixed effects**

Card, David and Alan B. Krueger “Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania” *American Economic Review*. 1994. Read through section III. p.772-786 [15p] [*Focus on the motivation behind and interpretation of the empirical analysis in Table 3*]

Kovak, Brian K. “Regional Effects of Trade Reform: What is the Correct Measure of Liberalization?” *American Economic Review*. 2013. p.1960-1975 [16p] [*Focus on the motivation behind and interpretation of the empirical analysis in Table 1*]

### **Class 6: Final project introduction, how to read empirical research**

#### *Required Reading*

Final Project Description.pdf [5p]

Sample Final Project Proposal.pdf [1p]

Sample Final Paper.pdf [7p]

Presentation Grade Sheet.pdf [1p]

### **Class 7: Correlation vs. causation, potential outcomes, randomized experiments, fundamentally unidentified questions**

#### *Required Reading*

Angrist, Joshua D. and Jörn-Steffen Pischke. *Mostly Harmless Econometrics – an Empiricist’s Companion*. Chapters 1-2. p.3-18. 2009. [16p]

#### *Supplemental Reading*

Holland, Paul W. “Statistics and Causal Inference.” *Journal of the American Statistical Association*. vol.81, no..396 p.945-960. 1986. [16p]  
[*Deep investigation of the potential outcomes framework. Focus on Sections 1-4*].

### **Class 8: Counterfactuals and popular research designs**

#### *Required Reading*

Counterfactual Worksheet.pdf. [4p]

Manski, Charles F. *Public Policy in an Uncertain World*. Chapter 2 p.47-84. 2013. [38 p]  
[*Focus on the portion on p.47-67 on approaches to structuring policy analyses*].

### **Class 9: Causal inference exercise in class**

#### *Required Reading*

analytical\_exercise.pdf. [2.5p]

## **Class 10: Omitted variables, reverse causality**

### *Required Reading*

Massey, Douglas S. "Do Undocumented Migrants Earn Lower Wages than Legal Immigrants? New Evidence from Mexico." *International Migration Review*. Vol. 21 No. 2 1987. p.236-245, 251-263 (skip section "controlling for selectivity") [23p including tables] [*Focus on the motivation behind and interpretation of the empirical analysis in Table 2*]

Cadena and Kovak (2013) Section 3, p.10-18 (see Class 2) [9p]

### *Supplemental Reading*

Stock and Watson (2011) Chapter 6 (see Class 3) for omitted variables.

## **Class 11: Measurement error, missing data**

### *Required Reading*

Ashenfelter, Orley and Alan Krueger (1994) "Estimates of the Economic Return to Schooling from a New Sample of Twins" *American Economic Review*, Vol. 84, No. 5, pp. 1157-1173 (sections I and II) [12p] [*Focus on the concerns about measurement error and intuition behind the ways they address it*]

Black, Dan, Seth Sanders, and Lowell Taylor (2003) "Measurement of Higher Education in the Census and Current Population Survey," *Journal of the American Statistical Association*, Vol. 98, No. 463, pp. 545-554 [10p] [*The entire paper should be relatively accessible*]

### *Supplemental Reading*

Gujarati, Damodar N. *Basic Econometrics*. Section 13.5 "Errors of Measurement." p.524-528 2004. (Measurement error) [5p]

## **Class 12: Instrumental variables**

### *Required Reading*

[*For the following three papers, focus on the endogeneity concerns motivating the use of instrumental variables and the instruments used to resolve those concerns*]

Beaudry, Paul and Ethan Lewis (2014) "Do Male-Female Wage Differentials Reflect Differences in the Return to Skill? Cross-City Evidence from 1980-2000" *American Economic Journal: Applied Economics*. Vol.6, No.2, pp.178-194.

Olney, William W. (2013) "Immigration and Firm Expansion" *Journal of Regional Science*. Vol.53, No.1, pp.142-157.

Qian, Nancy (2008) "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance" *Quarterly Journal of Economics*. Vol.123, No.3, pp.1251-1285.

### *Supplemental Reading*

Wooldridge, Jeffrey M. (2009) *Introductory Economics: A Modern Approach*. United States: Cengage Learning., Chapter 15 pp.506-536. [30p]



### **Class 13: Differences-in-differences and fixed effects with panel data**

#### *Required Reading*

- Abay, Kibrom A., Mulubrhan Amare, Luca Tiberti, and Kwaw S. Andam (2021) “COVID-19-Induced Disruptions of School Feeding Services Exacerbate Food Insecurity in Nigeria” *Journal of Nutrition*. Vol.151, No.8, pp.2245-2254. [Read the Introduction, Statistical analysis, and Results sections, and skim the Methods section to get a sense for context and variable measurement.]
- Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles (2006) “Household Expenditure and the Income Tax Rebates of 2001” *American Economic Review*. Vol.96, No.5, pp.1589-1610. [Read introduction and Sections II, IV (focus on the empirical specification, not PIH details), and V.]
- Bailey, Martha J. and Goodman-Bacon, Andrew (2015) “The War on Poverty’s Experiment in Public Medicine: Community Health Centers and the Mortality of Older Americans” *American Economic Review*. Vol.105, No.3, pp.1067-1104. [Focus on understanding the setting, the research design captured in equation (1), and the baseline results in Figure 5. No need to read past p.1085.]

### **Class 14: Selection on observables**

#### *Required Reading*

- Ahmed, Sayem et al. (2018) “The impact of community-based health insurance on the utilization of medically trained healthcare providers among informal workers in Bangladesh” *PLOS ONE*. Vol.13, No.7, pp.1-16. [A straightforward paper. Focus on the self-selection concerns and use of matching to address them.]
- Deryugina, Tatyana, Alexander MacKay, and Julian Reif (2020) “The Long-Run Dynamics of Electricity Demand: Evidence from Municipal Aggregation” *American Economic Journal: Applied Economics* Vol.12, No.1, pp.86-64. [Focus on the Introduction, Section III.D “Advantages of Matching Estimators with Electricity Data,” and IV.A “Main Results.”]

#### *Supplemental Reading*

- Imbens, Guido W. (2015) “Matching Methods in Practice: Three Examples” *Journal of Human Resources*. Vol.50, No.2, pp.373-419. [Very technical at times. Focus on Section VI “Three Applications” for examples of matching in practice.]

## **Class 15: Regression discontinuity and regression kink**

### *Required Reading*

DiNardo, John and David S. Lee (2004) “Economic Impacts of New Unionization on Private Sector Employers: 1984-2001” *Quarterly Journal of Economics*. Vol.119, No.4, pp. 1383–1441. [Read pages 1383-1422 and focus on the ideas behind the research design rather than the detailed technical notation.]

### *Supplemental Reading*

Matsudaira, Jordan D. (2008) “Mandatory summer school and student achievement” *Journal of Econometrics*. Vol.142, pp.829-850.

Gray, Collin, Adam Leive, Elena Prager, Kelsey Pukelis, and Mary Zaki (2019) “Employed in a SNAP? The Impact of Work Requirements on Program Participation and Labor Supply” *Working Paper* (Later published in *American Economic Journal: Economic Policy*)

Card, David, David S. Lee, Zhuan Pei, and Andrew Weber (2016) “Regression Kink Design: Theory and Practice” *NBER Working Paper* No. 22781. (Later published in *Advances in Econometrics*) [Focused on implementation details for practitioners seeking to use RKD]

## **Class 16 Synthetic controls**

### *Required Reading*

Bohn, Sarah, Magnus Lofstrom, and Stephen Raphael (2014) “Did the 2007 Legal Arizona Workers Act reduce the State’s Unauthorized Immigrant Population?” *Review of Economics and Statistics*. Vol.96, No.2, pp. 258–269. [Read sections I-V, focusing on the logic behind the method]

Hogan, Thomas P. (2022) “De-prosecution and death: A synthetic control analysis of the impact of de-prosecution on homicides” *Criminology & Public Policy*. Vol.21, pp.489-534. [Read through Section 3]

### *Supplemental Reading*

Card, David (1990) “The Impact of the Mariel Boatlift on the Miami Labor Market” *Industrial and Labor Relations Review* Vol.43, No.2, pp.245-257. [Example of informal synthetic controls prior to development of contemporary algorithm.]

Abadie, Alberto (2021) “Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects,” *Journal of Economic Literature* Vol.59, No.2, pp.391-425. [Quite technical review of synthetic controls approach.]

## **Class 17: Critique application and practice part 1**

### *Required Reading*

Pinho-Gomes, Ana-Catarina, Sanne A. E. Peters, and Mark Woodward (2023) “Gender equality related to gender differences in life expectancy across the globe gender equality and life expectancy” *PLOS Global Public Health*. Vol.3, No.3.

## **Class 18: Critique application and practice part 2**

### *Required Reading*

Sharkey, Patrick, Gerard Torrats-Espinosa, and Delaram Takyar (2017) "Community and the Crime Decline: The Causal Effect of Local Nonprofits on Violent Crime," *American Sociological Review*. Vol.82, No.6, pp.1214-1240.

## **Class 19: Critique application and practice part 3**

### *Required Reading*

Kim, Taekyun, Yejin Park, and Wonjoon Kim, "The Impact of Artificial Intelligence on Firm Performance," (2022) *Portland International Conference on Management of Engineering and Technology* (PICMET), Portland, OR, USA, 2022, pp. 1-10.