

PA 715 – Quantitative Policy Analysis

Fall 2025 | Tuesdays 3:00pm – 5:45pm | 113 Tompkins Hall

Instructor	Email	Office Hours	Office Location
Graham Ambrose	gwambros@ncsu.edu	Tuesday 1pm – 2pm & Friday 1pm – 2pm	Winston 125

Course overview

Description

Quantitative Policy Analysis will focus on critical thinking to build a conceptual understanding of statistical techniques and applications for researchers and analysts. This course also will engage with questions about observed relationships versus real-world causes, which types of analysis and statistics are the most informative, and how quantitative evidence should (or shouldn't) influence policy making.

The main focus will be on your ability to appropriately develop and interpret statistical models based on a strong conceptual understanding of modeling assumptions and limitations. Less emphasis will be placed on mathematical proofs and derivations. Topics to be covered in this course include standard OLS regression, regression with qualitative predictors, proper handling of data issues, panel data methods, and data visualization and writing. The course will also cover data wrangling techniques (obtaining, cleaning, transforming, and merging data) that often consume much of a researcher's time but are not often a central focus of statistics and econometric classes.

Learning objectives

1. To help students become informed consumers and producers of empirical research in their respective fields.
2. Teach students how to understand and apply statistics.
3. Teach students the purpose of various research methods as well as their strengths and weaknesses.
4. Teach students how to locate secondary data sources, download relevant data into widely used statistical software packages, prepare the data for analysis, and use advanced statistical methods to answer research questions relevant to their field of study.
5. Provide students with practice writing up statistical results and presenting them to a policy audience. Understand statistical modeling assumptions and limitations

Course Materials

Required

- Wooldridge, J. M. (2020). *Introductory econometrics: a modern approach (5th ed.)*: Cengage Learning. [Different editions are fine, but you should be able to find the 5th ed. cheap, used online]
- Readings assigned on Moodle

Optional

- Long, J.D. & Teetor, Paul (2019). *R cookbook*: O'Reilly. You can access this as an online resource through the NCSU library. You will have full access by following the directions at this link:
 - <https://catalog.lib.ncsu.edu/catalog/NCU4807869>
- The Big Book of R. This is an online repository for all things R. It does a great job of discussing the basics, covering the methods we discuss in this class, and extending far beyond.
 - <https://www.bigbookofr.com/>
- More 'practical' discussions of the topics we will cover in this class and the following methods courses. If you are nervous about econometrics, these could be good companions to Wooldridge.
 - Angrist, J. D., & Pischke, J. S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.
 - Cunningham, S. (2021). *Causal inference: The mixtape*. Yale university press.

Assessments

Midterm and Final

Both exams will be open book and open notes.

Homework

The homework each week will focus on applying the key concepts discussed in class. You will have 10 total homework assignments assigned on Tuesday and *due before the following class (i.e., Tuesday 3pm)*. Late work will be docked 1 point per 24-hour period. Each homework assignment will be posted on Moodle and should be submitted on Moodle. While the Problem Set problems correspond to the problems at the end of each Wooldridge chapter, I will still post a document with full questions in Moodle, as problem numbers change between editions. I encourage you to work with your classmates on these assignments to clarify and check each other's understanding and solutions. Ultimately, each student should complete, write-up, and submit results individually. Please see NCSU's policy on academic integrity below.

Grading

Assessment	Points	Due date
Midterm	25	10/21
Final	25	12/9
Homework Assignments (10)	40 (4 points each)	Ongoing
Class Participation	10	Ongoing

I reserve the right to make changes to the weekly discussion, reading schedule and course syllabus to meet the learning needs of the students and to accommodate other professional expectations which may include research activities, professional conferences and unplanned obligations. Thank you very much for your understanding and cooperation.

Course Schedule

Schedule of classes and assignments is subject to change. In the event of any change in assignment, topic or due date, I will post announcements on Moodle and upload a corrected syllabus.

Week	Topic	Reading	Activities
Week 1 - 8/19	Course overview	Familiarize yourself with the course Moodle site Read the posted syllabus	Download R and RStudio to personal computer, or update to newest version https://rstudio.cloud/learn/primers/1 Work through the programming and visualization basics
	Review of R, RStudio, and Tidyverse	Additional Learning Materials: <ul style="list-style-type: none"> • https://www.brookings.edu/research/what-all-policy-analysts-need-to-know-about-data-science/ • Torfs and Brauer (2014) 	
Week 2 – 8/26	Discussion of causality in Public Administration Research	Additional Learning Materials: <ul style="list-style-type: none"> • Little Ch. 2 • Jaccard and Jacoby Ch. 7 	Homework 1: ‘Box and Arrow Assignment’ in Moodle
Week 3 – 9/2	Thinking clearly with data	Wooldridge chapter 1	Homework 2: Problem Set #1 Wooldridge Ch. 1 <ul style="list-style-type: none"> • Problems 1 & 2 Computer Exercises 2 & 3
Week 4 – 9/9	Simple Regression	Wooldridge chapters 2	Start Homework 3: Problem Set #2
NO CLASS 9/16 – Wellness Day			

Week	Topic	Reading	Activities
Week 5 – 9/23	Multiple Regression	Wooldridge chapters 3	Homework 3: Problem Set #2 Wooldridge Ch. 2 <ul style="list-style-type: none"> Problems 3 & 5 Wooldridge Ch. 3 <ul style="list-style-type: none"> Problems 1, 5 & 7 Computer Exercises 1 & 9
Week 6 – 9/30	Hypothesis testing and interpreting model output	Wooldridge chapter 4	Homework 4: Problem Set #3 Wooldridge Ch. 4 <ul style="list-style-type: none"> Problems 6 Computer Exercises 1 & 5
Week 7 – 10/7	Categorical predictors and interpretations	Wooldridge chapter 7	<ul style="list-style-type: none"> Review for midterm
NO CLASS 10/14 – FALL BREAK			
Week 8 – 10/21	Midterm exam		Homework 5: Problem Set #4 Wooldridge Ch. 7 <ul style="list-style-type: none"> Problems 3 & 8 Computer Exercises 4 & 12 (iii – vi)
Week 9 – 10/28	Non-linear relationships, heteroscedasticity, and issues with regression assumptions	Wooldridge chapter 8	Homework 6: Problem Set #5 Wooldridge Ch. 8 <ul style="list-style-type: none"> Problems 1 & 4 Computer Exercises 4
Week 10 – 11/4	Model specification and data issues	Wooldridge chapter 9	Homework 7: Problem Set #6 Wooldridge Ch. 9 <ul style="list-style-type: none"> Problems 3 & 4 Computer Exercises 2 & 3
Week 11 – 11/11	Panel data part 1	Wooldridge chapter 13	Homework 8: Problem Set #7 Wooldridge Ch. 13 <ul style="list-style-type: none"> Problems 3, 5 & 6 Computer Exercises 7

Week	Topic	Reading	Activities
Week 12 – 11/18	Panel data part 2	Wooldridge chapter 14	Homework 9: Problem Set #8 Wooldridge Ch. 14 <ul style="list-style-type: none"> Problems 5 Computer Exercises 3 & 12
Week 13 – 11/25	Instrumental Variables Estimation and Two Stage Least Squares	Wooldridge chapter 15	Homework 10: Problem Set #9 Wooldridge Ch. 15 <ul style="list-style-type: none"> Problems 1 Computer Exercises 1
Week 14 – 12/2	How to interpret results, and Write Sections on your Data, Results, and Conclusion		Begin reviewing for final exam
	Data visualization & Review	Wickham, H. and Golemund, G. (2017). <i>R for Data Science</i> . Chapter 3: Data Visualization: https://r4ds.had.co.nz/data-visualisation.html Healy, Kieran (2019). <i>Data Visualization</i> . Chapter 3: Make a Plot: https://socviz.co/makeplot.htm#makeplot Wilkes, Claus (2019). <i>Fundamentals of Data Visualization</i> . Sections 1-5: https://clauswilke.com/dataviz/introduction.html	Begin reviewing for final exam
FINAL EXAM – 12/9 3:30 – 6:00			

Course Policies

Assignment Submittal Guidelines: Any written work except for in-class exams is expected to be typed, 12-point standard font (double spaced), on 8.5" x 11" page size with 1" margins. American Psychological Association (APA) 6th edition style, formatting, and references must be used. When R code is required for an exercise, the code can either be copied and pasted into the word file or submitted as a corresponding .R file. All work should be uploaded to Moodle. E-mailed work will not be accepted. Late work will be docked 1 point per 24-hour period.

Attendance Policy: Attendance at all sessions, and for the duration of all sessions, is expected. If you miss a class session, you should obtain any notification of change of future assignments or other course material from a class member—not the faculty member.

Course Modifications: The instructor reserves the right to make modifications to the syllabus and course schedule throughout the course, thus the syllabus is not a contract and may be modified at their discretion. Any changes will be announced in class, on Moodle and/or email; it is the responsibility of the student to adhere to these changes.

Note on Class Meeting Time: Should an emergency or unforeseen circumstances arise for the instructor, it may be necessary to cancel a class meeting. Should the faculty member not be able to meet the class at the regularly-scheduled time, the class will be notified via Moodle and/or email, with as much advance notice as is possible. Alternative online activities or class sessions will be provided within 24 hours of the cancellation to provide content and activities as originally planned for the class meeting. Be sure to check announcements and/or Moodle email on the days of class.

University Policies

NC State University Policies, Regulations and Rules: Students are responsible for reviewing the PRRs which pertain to their course rights and responsibilities. These include:

<http://policies.ncsu.edu/policy/pol-04-25-05> (Equal Opportunity and Non-discrimination Policy Statement),

<http://oied.ncsu.edu/home/> (Office for Institutional Equity and Diversity),

<http://policies.ncsu.edu/policy/pol-11-35-01> (Code of Student Conduct),

<http://policies.ncsu.edu/regulation/reg-02-50-03> (Grades and Grade Point Average),

<https://policies.ncsu.edu/regulation/reg-02-20-15> (Credit-Only Courses),

<https://policies.ncsu.edu/regulation/reg-02-20-04> (Audits), and

<https://policies.ncsu.edu/regulation/reg-02-50-03> (Incompletes).

University Non-Discrimination Policies: It is the policy of the State of North Carolina to provide equality of opportunity in education and employment for all students and employees. Accordingly, the university does not practice or condone unlawful discrimination in any form against students, employees or applicants on the grounds of race, color, religion, creed, sex, national origin, age, disability, or veteran status. See <https://policies.ncsu.edu/category/campus-environment/non-discrimination>.

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services Office in Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. <https://dso.dasa.ncsu.edu/>. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01)

<https://policies.ncsu.edu/regulation/reg-02-20-01> .

Writing and Speaking Tutorial Services: If writing is difficult for you, please visit the Writing and Speaking Tutorial Services to review drafts of assignments before they are due. The Service offers free one-on-one consultation with experienced tutors who can help with all levels and stages of writing. There are six locations around campus that offer drop-in services. For more information go to: <https://asc.dasa.ncsu.edu> .

Academic integrity: The University's Code of Student Conduct (<https://policies.ncsu.edu/policy/pol-11-35-01>) specifically addresses academic integrity in parts 7-9. Students should familiarize themselves with this policy. Plagiarism is of particular concern. In any case, any instance of plagiarism will result in a failing mark for the assignment. Other forms of misconduct outlined at this site will be similarly addressed. This list of resources and authorities is neither exclusive nor exhaustive, and any violation of academic integrity as traditionally understood in the American scholarly context will be referred for University action.

Academic dishonesty includes the following offenses:

1. Claiming as your own work a paper written by another student;
2. Turning in a paper that contains paraphrases of someone else's ideas but does not give proper credit to that person for those ideas;
3. Turning in a paper that is largely a restatement in your own words of a paper written by someone else, even if you give credit to that person for those ideas. The thesis and organizing principles of a paper must be your own;
4. Turning in a paper that uses the exact words of another author without using quotation marks, even if proper credit is given in a citation, or that changes the words only slightly and claims them to be paraphrases;
5. Turning in the same paper, even in a different version, for two different courses without the permission of both professors involved.

If a student is found to have committed one of the above offenses, he/she will receive a failing grade on the assignment or exam. The case may also be sent for University action concerning the student. Please note that I may use Turnitin as a part of this course to help me ensure the academic integrity of submitted works.

Technological Requirements and Electronically-hosted Course Components: Expectations are that students will have both a computer and reliable internet connection to support access to course resources (i.e., Moodle). If you need access to additional technological support, please alert the instructor or contact the Libraries' Technology Lending Service (<https://www.lib.ncsu.edu/devices>).

Furthermore, students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Health and Well-Being Resources: These are difficult times, and academic and personal stress are natural results. Everyone is encouraged to take care of themselves and their peers. If you need additional support, there are many resources on campus to help you:

- Counseling Center ([NCSU Counseling Center](#))
- Student Health Services ([Health Services | Student](#))
- If the personal behavior of a classmate concerns or worries you, either for the classmate's well-being or yours, we encourage you to report this behavior to the NC State CARES team: ([Share a Concern](#)).
- If you or someone you know are experiencing food, housing or financial insecurity, please see the

Pack Essentials Program ([Pack Essentials](#)).

Need Help?

If you find yourself in a place where you need help, academically or otherwise, please review these Step-by-Step Help Topics.

Other Important Resources

- Keep Learning: [Keep Learning](#);
- Academic Success Center (tutoring, drop in advising, career and wellness advising): [Academic Success Center](#);
- Introduction to Zoom for students: <https://youtu.be/5LbPzzPbYEw> ;
- Learning with Moodle, a student's guide to using Moodle: <https://moodle-projects.wolfware.ncsu.edu/course/view.php?id=226> ;
- NC State Libraries [Technology Lending Program](#).

Additional books broadly related to this course

The topics covered in the course, at a high level, consider how we ask questions as researchers to evaluate how X causes Y (or more likely, how variation in X is associated with some variation in Y). We will cover well recognized and accepted methods for doing this in the course – but these are not the only methods of doing this. If you are interested in case study or multi-method approaches, please find a few books below. These books and topics *will not be covered* in this course but are a resource for those interested.

- Gerring, J. (2006). *Case study research: Principles and practices*. Cambridge university press.
- George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social sciences*. mit Press.
- Goertz, G. (2017). *Multimethod research, causal mechanisms, and case studies: An integrated approach*. Princeton University Press.
- Ragin, C. C. (2014). *The comparative method: Moving beyond qualitative and quantitative strategies*. Univ of California Press.
- Miller, J. H., & Page, S. E. (2009). *Complex adaptive systems: an introduction to computational models of social life: an introduction to computational models of social life*. Princeton university press.