University of California, Berkeley
ECON N171
Economic Development

Instructor: Rajveer Jat (rjat001@berkeley.edu, Evans Hall 531)
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Summer Session, 2026

Class Hours: Tue & Thu 5:00-7:59 pm, Fri: 12:00 to 1:59 pm — Office: Evans Hall 531
Class Room: Social Sciences Building 20 — Office Hours: Tue & Thu 4:00-4:50 pm

Course Description

Brief Introduction

This course covers theory and empirical evidence on the determinants of economic development and the global fight against poverty. It introduces students to modern empirical research methods and econometric techniques used to inform real-world policy making in developing countries. By integrating rigorous mathematical modeling with empirical data analysis, students will bridge economic theory and practice, translating conceptual frameworks into formal statistical models. Working with real-world datasets, students will gain hands-on experience implementing these quantitative tools for impact evaluation using Python.

Learning Goals

By the end of this course, you should be able to learn the major concepts related to the following in light of the economics of development:

Theories of Economic Development

1. Growth Theory: Convergence and Poverty Traps
2. Structural Transformation
3. Role of Infrastructure and Technology in Development
4. Role of Human Capital (Education and Health) in Development
5. Role of Government and Finance in Development Process

Data Analysis in Python

1. Analyze real-world policy problems in depth using data analysis tools in Python.
2. Conduct a statistical test to prove or disprove a claim, therefore making your arguments technically sound.
3. Test statistical assumptions or detect abnormal patterns in data and ensure the validity of empirical findings.

Scientific Communication and Documentation

- Creating dynamic reports (coding + documents) with Python Notebooks.
- Ability to debate and scientifically argue in favor or against environmental policies and issues.

Prerequisites/Corequisites

Intro to Macroeconomics and Econometrics will be helpful. No prior programming knowledge is assumed.

Required Materials

- *Textbook:* "Development Economics: Theory and Practice" By Alain de Janvry, Elisabeth Sadoulet, 2nd Edition, eBook ISBN: 9781003024545. The textbook is available through the UC Berkeley Library; both physical and digital versions can be accessed for free with Berkeley credentials.
- Required non-textbook readings (journal articles and working papers) will be posted on bCourses as PDFs.

Class Structure

- **Tuesdays & Thursdays**
  These meetings follow a traditional lecture format, in which the Instructor will introduce theoretical concepts, connect them to real-world data, and demonstrate the corresponding analysis in **Python**.

  1. **5:00 to 6:15 PM: Lecture (Theory)**
     - The Instructor will introduce the concepts and theoretical framework.
  2. **6:15 to 6:30 PM: Break**
  3. **6:30 to 7:10 PM: Lecture (Data/Empirical)**
     - We will examine the empirical dimensions of the assigned research papers, including econometric methods, policy evaluation, data sources, statistical validity, and the potential applications of modern machine learning techniques.
  4. **7:10 to 7:59 PM: Programming**

– The Instructor will introduce the programming skills required for data analysis.

- **Fridays**
  Friday meetings are interactive and discussion-based. Students are expected to submit a one-page summary of the week's material, attend peer presentations, and provide written reflections noting additional insights or critical observations from each presentation.

  1. **12:00 to 12:10 PM**: Summary of Week's Lectures by Instructor.
  2. **12:10 to 12:45 PM**: Presentation on Week's Learning by Group-1.
  3. **12:55 to 1:30 PM**: Presentation on Week's Learning by Group-2.
  4. **1:30 to 1:59 PM**: Time for Editing and Submission of the Weekly Homework.

Table 1: Friday session schedule for Summer 2026.

Session	Date	Activity
1	June 26, 2026	Discussion-0: ML, Big Data & Frontiers in Economics
2	July 3, 2026	*Independence Day — No Class*
3	July 10, 2026	Discussion-1: Group 1 & Group 2 Presentations
4	July 17, 2026	Discussion-2: Group 3 & Group 4 Presentations
5	July 24, 2026	*Midterm Exam*
6	July 31, 2026	Discussion-3: Group 5 & Group 6 Presentations
7	August 7, 2026	Discussion-4: Group 7 & Group 8 Presentations
8	August 14, 2026	*Final Exam on Aug 13th — No Friday Session*

Assessments

Success in this course depends on consistent homework completion and active participation in presentations. Homeworks consist of handwritten summaries of assigned lectures and, where applicable, written reflections on peer presentations. Exams are intentionally straightforward, drawing primarily from homework material; the goal of this course is conceptual learning, not stressful testing. No coding will be required on any exam. Students are permitted to use Gen AI to brainstorm or outline, but the final submission must be written by hand. All homework submissions are due by the date and time indicated in Table 2. Late submissions will incur a 2% penalty for every hour past the deadline. Exceptions may be granted at the instructor's discretion with appropriate documentation.

We understand that unavoidable circumstances can arise. Students who need to miss more than one class session for genuine and documented reasons may be assigned a make-up project in lieu of attendance points. Please communicate any such situations to the Instructor as early as possible.

Table 2: Homework schedule for Summer 2026. Each lecture summary is approximately half a page; all submissions must be handwritten at ≈10pt font size.

HW	Due Date	Lecture Summaries	Summary Pages	Comments Pages	Total Pages
HW-1	July 7, 2026 (Tue, in class)	Lectures 1, 2, 3, 4	2	—	2
HW-2	July 17, 2026 (Fri, 1:59 PM)	Lectures 5, 6	1	1 (Discussion-2)	2
HW-3	July 31, 2026 (Fri, 1:59 PM)	Lectures 7, 8	1	1 (Discussion-3)	2
HW-4	August 7, 2026 (Fri, 1:59 PM)	Lectures 9, 10, 11	1.5	1 (Discussion-4)	2.5
HW-5	August 13, 2026 (Thu, 5:00 PM)	Lectures 13, 14	1	—	1

Weights

- Homeworks: 25% (5 homework assignments)
- Presentation: 15%
- Mid-term Exam: 15%
- Attendance and participation: 20% (total 20 meetings)
- Final Exam: 25%

Grading Policy

I reserve the right to curve the scale dependent on overall class scores at the end of the session. Any curve will only make obtaining a certain letter grade easier. The score to conversion table is given below; the square bracket '[' means it includes the value, while parenthesis '(' means it does not include that value; for example, [90,95) means from 90 to 95 but includes 90 and excludes 95.

Table 3: Score to Letter Grade Conversion Policy (All values are in percentage)

A+	[95, ∞)	A	[90, 95)
A-	[85, 90)	B+	[80, 85)
B	[75, 80)	B-	[70, 75)
C+	[65, 70)	C	[60, 65)
C-	[55, 60)	D+	[50, 55)
D	[45, 50)	D-	[40, 45)
F	[0, 40)		

Schedule and Weekly Learning Goals

The schedule and learning goals below are tentative and may be updated throughout the course. Learning goals highlight the core concepts expected from each week's lectures. Each homework summary should be approximately half a page per lecture, handwritten at ≈10pt font size. For the homework schedule, see Table 2. For the Friday session schedule, see Table 1.

The weekly schedule below covers Tuesday and Thursday sessions, which focus on lecture-based instruction. Friday sessions are dedicated to the consolidation and discussion of material covered during the week. Starred (*) readings will not be asked in the exam.

- **Lecture-1: Introduction** June 23, 2026
  - Course Overview.
  - Basic Concepts in Development Economics
    (Reading: Ch 1 of the textbook)
  - *Data Analysis in Python:*
    1. Google Colab setup and introduction to Jupyter notebooks.
    2. Python basics: data types, variables, operators, lists.
    3. Control flow: if/else, for loops, functions.
    Notebook: `lecture1_python_basics.ipynb` [Link]
- **Lecture-2: Methods of Impact Evaluation** June 25, 2026
  - Econometric Techniques for Development Economics
    (Reading: Ch 4 of the textbook)
  - Guest Lecture: Development Beyond Economics Textbooks.
  - *Data Analysis in Python:*
    1. NumPy: arrays, vectorized operations, matrix algebra.
    2. Broadcasting and linear algebra with `numpy.linalg`.
    Notebook: `lecture2_numpy.ipynb` [Link]
- **Discussion-0: Big Data and Machine Learning in Economics** June 26, 2026
  - An introductory overview of new data sources and computational methods broadening the frontier of economic research.
  - Topics: Satellite imagery and remote sensing in development economics; Volume, Velocity, and Variety (3V) framework for high-dimensional data; challenges of big data for causal inference; introduction to machine learning concepts in economics.
  - Reading: Donaldson, D. and Storeygard, A. (2016)*; Ng, S. (2017)*
- **Lecture-3: Poverty and Inequality** June 30, 2026
  - Poverty and Vulnerability Analysis (Reading: Ch 5 of the textbook)
  - Inequality, Inequity, and Inclusive Growth (Reading: Ch 6 of the textbook)
  - *Data Analysis in Python:*
    1. Pandas I: DataFrames, loading data, filtering, sorting, indexing.
    2. Working with real-world development datasets.
    Notebook: `lecture3_pandas_I.ipynb` [Link]
- **Lecture-4: Growth Theory** July 02, 2026
  - Solow Model (Reading: Ch 8 of the textbook)
  - Poverty Traps and Big-Push

- *Data Analysis in Python:*
  1. Pandas II: GroupBy, merging datasets, reshaping, panel data.
  2. Cleaning and transforming development panel data.
  Notebook: `lecture4_pandas_II.ipynb` [Link]
- *Homework-1 due July 7 (Tue, in class): Summary of Lectures 1–4*

- **Lecture-5: Trade and Industrialization** July 07, 2026
  - Using trade policy for development: tariffs and subsidies.
  - Industrialization Strategies (Reading: Ch 7 of the textbook)
  - *Data Analysis in Python:*
    1. Data visualization with `matplotlib` and `seaborn`.
    2. Publication-quality figures: scatter plots, bar charts, line plots, subplots.
    Notebook: `lecture5_visualization.ipynb` [Link]

- **Lecture-6: Structural Transformation-I** July 09, 2026
  - Demographic Constraint: Malthusian Theory (Reading: *malthus.pdf* on *bCourses*)
  - The Development Process: Some Stylized Facts (Reading: *stylized_fact.pdf* on *bCourses*)
  - *Data Analysis in Python:*
    1. Exploratory Data Analysis (EDA): summary statistics, distributions, correlation.
    2. Replication: Gollin, Lagakos & Waugh (QJE, 2014) — agricultural productivity gap.
    Notebook: `lecture6_eda.ipynb` [Link]

- **Discussion-1: Presentations/Discussion on Lectures 1–4** July 10, 2026
  - Presentation by Group-1.
  - Presentation by Group-2.

- **Lecture-7: Structural Transformation-II** July 14, 2026
  - Agricultural Productivity Gap
    (Reading: Gollin, Lagakos & Waugh, QJE, 2014; *Gollin.pdf* on *bCourses*)
  - Agricultural Productivity Gap in Informal Markets
    (Reading: Jat & Ramaswami, JDE, 2026; *Jat.pdf* on *bCourses*)
  - *Data Analysis in Python:*
    1. OLS regression with `statsmodels`: interpretation, diagnostics, robust standard errors.
    2. Multiple regression and specification comparisons.
    Notebook: `lecture7_ols.ipynb` [Link]

- **Lecture-8: Labor and Migration** July 16, 2026
  - Labor, Employment, and Urbanization (Reading: Ch 12 of the textbook)
  - Seasonal Migration and Consumption: RCTs
    (Reading: Jensen, QJE, 2012*; Bryan, Chowdhury & Mobarak, Econometrica, 2014*)

- *Data Analysis in Python:*
  1. Nonparametric regression and bootstrap confidence intervals.
  2. Replication: Jat & Ramaswami (JDE, 2026) — informality and the agricultural productivity gap.

  Notebook: `lecture8_nonlinear.ipynb` [Link]

- **Discussion-2: Presentations/Discussion on Lectures 5–6** July 17, 2026
  - Presentation by Group-3.
  - Presentation by Group-4.
  - *Homework-2 due 1:59 PM: Summary of Lectures 5–6 and Critical Comments on Presentations*

- **Lecture-9: Infrastructure** July 21, 2026
  - Transport infrastructure and development (Reading: *infra.pdf* on *bCourses*)
  - Theory: Von Thünen's model
  - Empirical: Rural roads and structural transformation (Reading: Asher & Novosad, AER, 2020*)
  - *Data Analysis in Python:*
    1. Randomized Control Trials (RCTs): balance tests, ITT estimation.
    2. Replication: Bryan, Chowdhury & Mobarak (Econometrica, 2014).

    Notebook: `lecture9_bryan_RCT.ipynb` [Link]

- **Lecture-10: Technology** July 23, 2026
  - Agricultural R&D: adoption, welfare impacts, regulation (Reading: *tech.pdf* on *bCourses*)
  - Labor vs capital augmenting technology.
  - *Data Analysis in Python:*
    1. Regression Discontinuity Design (RDD): running variable, cutoff, local linear estimation.
    2. Validity checks: density test, covariate balance, bandwidth sensitivity, placebo tests.
    3. Application: Asher & Novosad (AER, 2020) — rural roads and non-farm employment.

    Notebook: `lecture10_rdd.ipynb` [Link]

- **Mid-term Exam** July 24, 2026
  - Syllabus: until last lecture. No coding required.

- **Lecture-11: Human Capital: Education & Health** July 28, 2026
  - How education and health affect development (Reading: Ch 17 of the textbook)
  - Returns to schooling and the endogeneity problem.
  - *Data Analysis in Python:*
    1. Instrumental Variables (IV) and Two-Stage Least Squares (2SLS).
    2. Instrument validity: relevance (first-stage F-statistic) and exclusion restriction.
    3. Manual 2SLS for intuition; correct inference with `linearmodels`.
    4. Application: Card (1995) — distance to college as instrument for schooling.

    Notebook: `lecture11_iv_reg.ipynb` [Link]

- **Lecture-12: Energy & Climate Change** July 30, 2026
  - Energy access and development: electrification and energy poverty.
  - Climate change impacts on developing economies.
  - Environmental Kuznets Curve (EKC).
  - *Data Analysis in Python:*
    1. Spurious regression: why OLS fails with non-stationary series (Monte Carlo demonstration).
    2. Unit root testing: Augmented Dickey-Fuller (ADF) test.
    3. Cointegration: Engle-Granger test for long-run relationships.
    4. Granger causality.
    5. Application: energy consumption and GDP in developing countries (World Bank API).

    Notebook: `lecture12_timeseries.ipynb` [Link]
- **Discussion-3: Presentations/Discussion on Lectures 7–8** July 31, 2026
  - Presentation by Group-5.
  - Presentation by Group-6.
  - *Homework-3 due 1:59 PM: Summary of Lectures 7–8 and Critical Comments on Presentations*
- **Lecture-13: Finance for Development** August 04, 2026
  - Financial services for the poor (Reading: Ch 13 of the textbook)
  - Conditional cash transfers and human development.
    (Reading: Gertler, AER P&P, 2004*; Schultz, JDE, 2004*)
  - *Data Analysis in Python:*
    1. Difference-in-Differences (DiD): parallel trends assumption, interaction estimator.
    2. Event study: dynamic treatment effects and pre-trend verification.
    3. Placebo and falsification tests.
    4. Replication: PROGRESA conditional cash transfer program (Schultz, JDE, 2004).

    Notebook: `lecture13_did_progresa.ipynb` [Link]
- **Lecture-14: Poverty Eradication Programs** August 06, 2026
  - Targeting of social programs: benefits and costs (Reading: Ch 14 of the textbook)
  - Institutions and long-run development
    (Reading: Acemoglu, Johnson & Robinson, AER, 2001*)
  - *Data Analysis in Python:*
    1. Synthetic Control: constructing a data-driven counterfactual for a single treated unit.
    2. Constrained optimization for weight selection (`scipy.optimize`).
    3. In-space placebo tests and permutation inference.
    4. Application: Botswana, institutional quality, and long-run GDP.

    Notebook: `lecture14_synthetic_control.ipynb` [Link]

- **Discussion-4: Presentations/Discussion on Lectures 9–11** August 7, 2026
  - Presentation by Group-7.
  - Presentation by Group-8.
  - *Homework-4 due 1:59 PM: Summary of Lectures 9–11 and Critical Comments on Presentations*
- **Lecture-15: Cutting-Edge Methods: Machine Learning for Causal Inference** Aug 07, 2026
  - From prediction to causation: why standard ML fails for causal inference and how modern methods bridge the gap.
  - High-dimensional selection and valid inference:
    1. Double LASSO (Belloni et al., 2014): post-selection inference with many controls.
    2. Application: Jat (2025), Sufficient Instruments Filter (SIF) for instrument selection.
    3. Double/Debiased Machine Learning (DML): Chernozhukov et al. (2018), orthogonalization and cross-fitting to remove regularization bias.
  - Reading: Belloni et al., 2014*, Chernozhukov et al. (2018)*, Jat (2025)*
- **Lecture-16: Role of Institutions & Government** August 11, 2026
  - Institutional innovations and development (Reading: Ch 20 of the textbook)
  - Political economy and the role of the state (Reading: Ch 21 of the textbook)
  - *Homework-5 due August 13 (Thu, 5:00 PM): Summary of Lectures 13–14*
- **Final Exam** August 13, 2026 (5:00–7:30 PM)

References

Textbook

- de Janvry, A. and Sadoulet, E. (2021). *Development Economics: Theory and Practice*, 2nd Edition. Routledge. eBook ISBN: 9781003024545.

Journal Articles and Working Papers

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- Schultz, T.P. (2004). School Subsidies for the Poor: Evaluating the Mexican PROGRESA Poverty Program. *Journal of Development Economics*, 74(1), 199–250.

Academic Integrity

For all of your papers and assignments, please make sure that your work is original unless required to work in groups. Please understand that intentionally copying another person's paper or submitting someone else's work as your own is considered cheating and is against the academic integrity policies. All students involved in such behavior will automatically lose all points for that assignment and will be subject to any additional penalties as outlined by the administration at the University of California, Berkeley.

Electronic Gadgets and Generative AI Policy

Electronic devices, including phones, tablets, and laptops, are not permitted during the first two hours of lecture unless absolutely necessary. This policy is based on direct feedback from prior graduates and is designed to foster focused classroom engagement and discussion. Laptops may be used during the programming portion of the lecture. Generative AI tools are permitted for brainstorming and outlining purposes; however, all final homework submissions must reflect the student's own original work and must be written by hand.

Students with Disabilities

Students with disabilities who wish to request special accommodations are encouraged to contact me via email, during office hours, or by appointment, and I will be happy to help you in any way that I can. Please understand that the earlier you contact me, the more I will be able to accommodate you for the course.

Acknowledgement

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