Empirical Economics in the Technology Industry

Lecturer: Dr. Bruno Baránek

Course Description:

Technology firms use large-scale experimentation and empirical analysis to make decisions. Microsoft alone runs tens of thousands of A/B tests a year, and many tested changes, often 70 to 90 percent, do not improve their target metric. Without systematic measurement, firms may adopt ineffective features, set suboptimal prices, or scale decisions that do not work.

The course covers the main methods economists use to answer causal questions and solve empirical business problems: randomized experiments, quasi-experimental methods, and demand estimation. Each method is introduced through its formal framework, the academic literature, and a series of case studies.

The course has two complementary goals. The first is to build a foundation of a practical empirical skill set that economists might use working in the technology sector. The second is to introduce the business context of technology companies: how firms such as Nvidia, Microsoft, Google, and Netflix operate, how to read financial statements, and what incentives arise in two-sided markets such as Uber's or Airbnb's.

Course Prerequisites:

Introductory statistics and microeconomics.

Course Objectives/Learning Outcomes:

The course is aimed at students interested in careers as economists, analysts, or data scientists in technology companies, as well as future managers who need to understand how firms make evidence-based decisions. Alongside empirical methods, the course develops commercial literacy: how technology firms generate revenue, how their markets are structured, and what their financial statements reveal about their economics.

- Understand data-driven decision-making in firms: how metrics and data are constructed, what rigorous empirical work looks like, and when data can or cannot support causal claims
- Design a randomized experiment: define the estimand, determine the required sample size, choose a randomization procedure, and identify threats to validity
- Understand quasi-experimental methods difference-in-differences, instrumental variables, and regression discontinuity; state the identifying assumption each requires and assess its credibility
- Estimate price elasticities and derive corresponding pricing implications
- Understand the most common business models of companies operating in the technology sector
- Read a company's core financial statements
- Understand the incentives in a two-sided market, where the platform must serve both sides of the market at once

Course Assessment:

Component	Weight	Details
Final Exam	25%	Covers all lectures and assigned readings; held at the last session
Midterm Exam	20%	Covers material roughly through the midpoint of the course
Research Design Assignment	20%	Two group assignments, presented and discussed in class workshops
Technology Industry Project	25%	A series of team projects and workshop presentations introducing the class to a specific part of the technology industry. The exact format will reflect the number of students enrolled in the class
Readings	10%	Activity during reading discussions and leading paper discussions in workshops

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Course Format:

The course meets for two sessions a week, at times to be confirmed. The first session is an instructor-led lecture covering the methods, readings, and case studies for that module. Students should expect regular weekly readings in preparation for lectures.

The second session is a workshop. Workshops will often be student-led: students will present assigned projects, discuss each other's work, and lead parts of the class discussion. The course is also planned to include guest lectures by practitioners. The two sessions roughly track the course's two goals. Lectures develop the empirical methods. Workshops focus on the business side of technology firms and on students' own project work.

Grading Policy:

Mandatory Completion Policy
Note that all mandatory assignments and exams must be completed to the best of your ability in order for your final grade to be issued. Failure to complete a mandatory assignment or exam may result in a failing grade.

Letter Grade	Percentage	Description
A+	97-100	Excellent Work
A	93-97	Outstanding Work
A-	90-92	
B+	87-89	Good work
B	83-86	
B-	80-82	
C+	77-79	Acceptable Work
C	73-76	
C-	70-72	
D+	67-69	Work that is significantly below average
D	63-66	
D-	60-62	
F	0-59	Work that does not meet the minimum standards for passing the course

AEP Academic Integrity Policy
Plagiarism and other forms of academic dishonesty are not tolerated. The use of Artificial Intelligence (AI) for the development of knowledge and learning is encouraged at many stages of the learning process. While we value technology for educational purposes, we also value originality and the retainment of knowledge, and thus using AI for assignments and examinations, even if rephrased, is strictly prohibited and considered an academic integrity violation, unless the instructor explicitly allows for it in the context of evaluated work

AEP Non-Discrimination/Harassment Policy
The AEP program in Prague promotes a diverse learning environment where the dignity, worth, and differences of each individual are valued and respected. Discrimination and harassment, whether based on a person's race, gender, sexual orientation, color, religion, national origin, age, disability, or other legally protected characteristics, are repugnant and completely inconsistent with our objectives. Retaliation against individuals for raising good faith claims of harassment and/or discrimination is prohibited.

AEP Diversity Policy
AEP is committed to fostering an inclusive and welcoming community that values diversity in all its forms. We believe that one of the most meaningful lessons of studying abroad is learning to navigate and appreciate differences with curiosity and an open mind. While engaging across differences can sometimes be challenging or uncomfortable, these moments are essential for growth and learning. We recognize that every member of our community, even with the best intentions, may occasionally make missteps. Our commitment is to provide a supportive environment where respectful and honest dialogue helps us learn from these experiences, ensuring that every student has the opportunity to thrive and broaden their perspective.

Modules

Module 1: The Experiment Economy: Causal Inference at Scale

Modern technology firms rely on randomized experiments to make product and business decisions. This module covers the basics of experimental design, including randomization, power calculation, validation checks, and analysis. It also discusses key threats to validity: interference, attrition, or non-compliance.

Applications include field experiments with automation tools at a global e-commerce company, evidence on the productivity effects of AI tools in large firms, or large-scale advertising experiments. We also discuss how companies build engineering systems to run experiments at very large scale, using Microsoft as a central example.

Papers and cases

- Fang, Yuan, Zhang, Donati & Sarvary. Generative AI and firm productivity: field experiments in online retail. Working paper, 2025
- Cui, Demirer, Jaffe, Musolff, Peng & Salz. The effects of generative AI on high-skilled work: evidence from three field experiments with software developers. *Management Science*, 2026
- Bloom, Liang, Roberts & Ying. Does working from home work? Evidence from a Chinese
- experiment. *Quarterly Journal of Economics* 130(1), 2015
- Kohavi, Crook & Longbotham. Online experimentation at Microsoft. *Workshop on Data Mining Case Studies*, 2009
- Gupta, Ulanova, Bhardwaj, Dmitriev, Raff & Fabijan. The anatomy of a large-scale experimentation platform. *IEEE* ICSA, 2018

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Module 2. When You Cannot Randomize: Quasi-Experimental Methods

Randomization is often infeasible due to operational, ethical, or institutional constraints. Credible causal inference then relies on quasi-experimental variation and explicit identifying assumptions. This module covers the foundational models of difference-in-differences, instrumental variables, and regression discontinuity. We will specifically focus on how to assess whether identifying assumptions are plausible in practice.

Applications include minimum wage effects on employment, the impact of GDPR on the data industry, Uber fare changes and market adjustment, returns to paid search advertising at eBay, and the effect of online ratings on restaurant demand.

Papers and cases

- Card & Krueger. Minimum wages and employment: a case study of the fast-food industry in New Jersey and Pennsylvania. *American Economic Review* 84(4), 1994
- Aridor, Che & Salz. The effect of privacy regulation on the data industry: empirical evidence from GDPR. RAND *Journal of Economics* 54(4), 2023
- Hall, Horton & Knoepfle. Ride-sharing markets re-equilibrate. *NBER Working Paper* 30883, 2023
- Blake, Nosko & Tadelis. Consumer heterogeneity and paid search effectiveness: a large-scale field experiment. *Econometrica* 83(1), 2015
- Anderson & Magruder. Learning from the crowd: regression discontinuity estimates of the effects of an online review database. *Economic Journal* 122(563), 2012

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Module 3. Demand, Pricing, and Consumer Value

Pricing and product decisions require credible estimates of demand. This module covers how experiments and quasi-experiments can be used to estimate demand and price elasticities. We translate these estimates into optimal pricing decisions.

Applications include tax sensitivity of demand on Ebay, pricing in ride-hailing platforms, and field evidence on household electricity demand.

Papers and cases

- Guadagni & Little. A logit model of brand choice calibrated on scanner data. *Marketing Science* 2(3), 1983
- Byrne, La Nauze & Martin. An experimental study of monthly electricity demand (in)elasticity. *Energy Journal* 42(2), 2021
- Einav, Knoepfle, Levin & Sundaresan. Sales taxes and internet commerce. *American Economic Review* 104(1), 2014
- Cohen, Hahn, Hall, Levitt & Metcalfe. Using big data to estimate consumer surplus: the case of Uber. *NBER Working Paper* 22627, 2016