

“Research Seminar II ”

This version: March 2020

Course coordinator: Marcelo Olivares (molivares@uchile.cl)

Course Schedule: Fall 2020, Tuesday and Thursday 14:30-16:00

Course Summary

The main objective of this doctoral course is to develop skills to conduct creative research in the research lines that comprise the PhD program, including Management Science, Operations Research, Applied Microeconomics, Data Science. In the first Seminar course of the PhD program, students participate as attendants in research seminars with the objective of been exposed to the different research areas that provide the multidisciplinary structure of the doctoral program. In this second seminar series, students will take a more active role: (i) conducting a rigorous and detailed analysis of the research articles studied, using the methods covered in the core curriculum; (ii) present research work developed by other scholars; (iii) develop critical thinking skills to indentify new research questions that make contribution in one or more scientific disciplines.

Students in this course should be familiar with graduate level courses in Optimization (Linear, Non-Linear and Dynamic Programming), Stochastic Processes and Microeconomics, all of which are part of the core of the PhD program.

Ideally, students should also have some background in statistics and empirical research. However, because these are not part of the core requirements of the program, the first part of the course covers several topics related to empirical research and data analysis, which will be useful to study research along this line. This course does not substitute the formal training of a statistics and econometrics courses. A typical statistics and econometrics class will cover in detail the mechanics and statistical properties of different estimators, which is beyond the scope of this class. However, many times students study statistics without a clear understanding on how to apply these methods in their research. This course aims to fill that gap by providing a problem-oriented approach, where the focus is on learning how to identify a suitable empirical strategy to tackle a research question. Because of the limited time, this course does not cover in detail the properties and implementation of the econometric methods used, and students are encouraged to learn those details by taking a series of statistics/econometrics class.

The course format combines lectures and a seminar-style class, where students and the instructor present and discuss published articles and working papers. Students need to prepare before each class by reading selected texts, including papers and book chapters.

The first part of the course provides an overview of empirical research methods. The lectures focus on introducing methods to tackle different challenges that arise in empirical research. Students will also develop skills to work with statistical software to analyze real data (preferably R). Two books will be covered in detail during the first part of the course.

- Train, Kenneth E. 2009. *Discrete choice methods with simulation*. Cambridge university press
- Angrist, Joshua D, Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.

The second part of the course is divided in distinct topics that conform the multidisciplinary research approach that characterizes the doctoral program. This classes combines lectures of various professors that are experts in each research line, who will provide an overview of the methods used, some examples of their research and a list of papers to be presented by the students.

During the course, the students will develop a research idea that can be approached with some of the tools covered in class. By the end of the course, students are expected to submit a research proposal that describes the research question, the data and empirical methodology that can be used to answer it. Students are encouraged to define early in the course the data and research question to be covered in the proposal.

The course final grade combines:

- paper presentations
- assignments and quizzes
- a research project

I Empirical research methods and applications

I.1 Introduction to statistics and empirical research

This topic begins by motivating the use of empirical research to complement analytical modeling and theory. Second, we will review some basic concepts of statistics and hypothesis testing that are required for the rest of the course.

Required readings:

- Case study and computer exercise.
- Apestequia, Jose, Ignacio Palacios-Huerta. 2010. Psychological pressure in competitive environments: Evidence from a randomized natural experiment. *American Economic Review* **100**(5) 2548–64

- Introduction courses to R (link available in course website).

I.2 Introduction to Regression and Causal Analysis

This lecture provides a review of linear regression methods and its potential limitations to conduct causal analysis with observational data. Then, we will cover some approaches to extend regression methods to conduct causal analysis based on Panel Data, Difference in Difference (DiD) and Instrumental Variable methods.

Required readings:

- Regression: Angrist, Joshua D, Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press, Chapters 1-3
- Prediction with regression: Ashenfelter, Orley, David Ashmore, Robert Lalonde. 1995. Bordeaux wine vintage quality and the weather. *Chance* **8**(4)
- Panel data/ Dif-n-Dif: Angrist, Joshua D, Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press, Chapter 5.1, 5.2
- Panel data example: Hsiang, Solomon M, Marshall Burke, Edward Miguel. 2013. Quantifying the influence of climate on human conflict. *Science* **341**(6151) 1235367
- Dif-n-Dif example: Jin, Ginger Zhe, Phillip Leslie. 2005. The case for support of restaurant hygiene grade cards. *Choice* **20**(2)
- Instrumental Variables: Angrist, Joshua D, Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*. Princeton university press Chapters 4.1, 4.2, 4.4

Papers:

- Cachon, Gerard, Santiago Gallino, Marcelo Olivares. 2018. Does adding inventory increase sales? evidence of a scarcity effect in us automobile dealerships. *Forthcoming in Management Science*
- Gallino, Santiago, Antonio Moreno. 2014. Integration of online and offline channels in retail: The impact of sharing reliable inventory availability information. *Management Science*
- Matsa, David A. 2010. Competition and product quality in the supermarket industry. *Quarterly Journal of Economics, forthcoming*
- Kim, Song-Hee, Carri W Chan, Marcelo Olivares, Gabriel Escobar. 2014. Icu admission control: An empirical study of capacity allocation and its implication for patient outcomes. *Management Science* **61**(1) 19–38

- KC, Diwas Singh, Christian Terwiesch. 2011. The effects of focus on performance: Evidence from california hospitals. *Management Science* **57**(11) 1897–1912

Questions to think about:

1. In the paper by Hsiang, Burke and Miguel, Science 2013. (i) What are the problems of estimating the effect of weather using a cross section of countries? ; (ii) What is a "bad control"?
2. In the paper “The Case in Support of Restaurant Hygiene Grade Cards”, Jin and Leslie, Choices 2005. What is the main problem of simply using the difference in hospitalization rate before and after the grade card introduction to estimate its effect? (i.e. not using a control group).

I.3 Modeling consumer choices.

In the second part is a lecture introducing discrete choice models in the context of consumer choices. Many research questions in economics, marketing, operations and management involve analyzing demand. Examples include the effect of promotions on sales (Marketing), the effect of a product stock-out on category sales (Operations), the consumer welfare effects of new product introductions (Economics), among many other examples. This section focuses in applications where regression and reduced form models are inadequate to capture essential aspects of a demand system – in particular, problems where consumers can choose among a discrete set of alternatives. We start with basic discrete choice models (Multinomial Probit and Logit), discuss its limitations and move to more flexible models. Different estimation techniques are discussed through different applications, using individual level and aggregate data.

Applications of this methods in the Operations and Marketing will be presented.

Read:

- Train, Kenneth E. 2009. *Discrete choice methods with simulation*. Cambridge university press , Chapter: 2(all), 3(all), 4.1, 4.2, 5.1, 5.2, 6(all)
- Fader, Peter S, Bruce GS Hardie. 1996. Modeling consumer choice among skus. *Journal of marketing Research* 442–452
- Lu, Yina, Andrés Musalem, Marcelo Olivares, Ariel Schilkrut. 2013. Measuring the effect of queues on customer purchases. *Management Science* **59**(8) 1743–1763
- Conlon, Christopher T, Julie Holland Mortimer. 2013. Demand estimation under incomplete product availability. *American Economic Journal: Microeconomics* **5**(4) 1–30

I.4 Price endogeneity in Demand Estimation

In measuring price elasticities in choice models, omitted variables that capture unobserved product quality can potentially be correlated with price and therefore lead to endogeneity bias. We present several approaches to address this problem using Instrumental Variables. The first is the Control Function approach, which can be used in the context of choice models estimated with individual level data. The second is the “BLP” method, which can be estimated with market level data.

Readings:

Control Function Approach

- Train, Kenneth E. 2009. *Discrete choice methods with simulation*. Cambridge university press, Chapter 13.4
- Albuquerque, Paulo, Bart J Bronnenberg. 2012. Measuring the impact of negative demand shocks on car dealer networks. *Marketing Science* **31**(1) 4–23
- Phillips, Robert, A Serdar Şimşek, Garrett Van Ryzin. 2015. The effectiveness of field price discretion: Empirical evidence from auto lending. *Management Science* **61**(8) 1741–1759

The Berry-Levinsohn-Pakes approach

- Berry, Steven T. 1994. Estimating discrete-choice models of product differentiation. *The RAND Journal of Economics* 242–262
- Berry, Steven, James Levinsohn, Ariel Pakes. 1999. Involuntary export restraints on automobiles. *American Economic Review* **89**(3) 400–430
- Nevo, Aviv. 2000. A practitioner’s guide to estimation of random-coefficients logit models of demand. *Journal of Economics & Management Strategy* **9**(4) 513–548
- Davis, Peter. 2006. Spatial competition in retail markets: movie theaters. *The RAND Journal of Economics* **37**(4) 964–982
- Guajardo, Jose A, Morris A Cohen, Serguei Netessine. 2015. Service competition and product quality in the us automobile industry. *Management Science* **62**(7) 1860–1877

I.5 Structural Estimation

Traditional methods for causal analysis model the dependencies among the different relevant factors through a simplified parametric econometric specification. This approach, often called reduced form estimation, provides the inference of the parameters that describe this econometric model. Structural estimation methods take a different approach, specifying directly the decision process that

generates the data used in the estimation. The specification of the decision model includes primitives which determine the endogenous outcomes of interest. The objective of a structural estimation is to “reverse-engineer” the model to make inference about the primitives that would generate the endogenous outcome observed in the data. Predictions from a structural model consist on a counterfactual (or “what-if” / “simulation”) analysis that predicts how changes in the primitives would affect the outcomes of interest. The estimation of structural models frequently involves ad-hoc non-linear models that can be estimated via Maximum Likelihood or GMM.

This session covers some examples of structural estimation in the context of modeling competition and market design.

Readings:

- Example of merger simulation: Application of BLP to the Toilet Paper Collusion case.
- Dinerstein, Michael, Liran Einav, Jonathan Levin, Neel Sundaresan. 2014. Consumer price search and platform design in internet commerce. Tech. rep., National Bureau of Economic Research

II Research Topics in Management Science, Operations Research, Data Science and Applied Economics

This part of the course combines lectures and paper presentations on specific research topics. The objective is to enable students to familiarize with the distinct research lines that are covered in the work of the academics that form the doctoral program. Students should be thinking about the research questions they would like to study in their thesis and identify potential thesis advisors, writing a research proposal that will be evaluated at the end of the course.

Tentative topics to be covered in this part of the course include:

- Market and Auction design
- Quantitative Marketing
- Revenue Management
- Empirical research in public policy
- Industrial Organization (theory/empirical)
- Applications of Machine Learning
- Healthcare management
- Empirical research in transportation
- Energy systems