Structural Econometrics
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Example: Tax & Labour
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Practical session
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Advanced Econometrics in Labour and IO
Week 1 - Static Discrete Choice in Labour

Peter Haan

28 April 2022

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Introduction

- Organization, see outline

If anything **unclear**, please ask.

Presentation: name, study status, main econ interest

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Course schedule

Structure of sessions (take theory to data):

1. Methods
2. Paper discussion ⇒ you **need to read at home**

3. Practical session (numerical methods)
   ⇒ you **need** to do problem sets
   ⇒ you **need** Matlab (toolboxes: statistics and optimization)
   or Julia
   ⇒ you **need** to practice coding

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Evaluation

For students who need to be evaluated

(1) **Special problem sets**

- individually or in pairs
- provide commented code, results, documentation, tables

(2) **Exam**

- 14.7.2022;

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Plan for today

- Structural econometrics vs reduced form estimation
- Example of a structural model
- Practical session, Matlab and example

What is structural econometrics?

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What is structural econometrics?

Structural econometric models...

- "...combine explicit **economic theories with statistical models**" (Reiss and Wolak, 2007)
- "...[infer] underlying parameters that represent **tastes, technology, and other primitives** from observations of individual households and firms..." (Adda and Cooper, 2003)

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Why?

Why do structural econometrics?

Good summary of debate by Rust (2010), thoughtful (and spiteful) comments on Keane (2013) in Fritjers (2013) vs Rust (2013).

Why do structural econometrics?

Some **effects** are of interest, but taste & technology parameters

1. sometimes **interesting per se** - risk aversion, taste for leisure, workers' bargaining power etc.

2. sometimes **required to understand issues** - job offer arrival rate in bad jobs vs. in unemployment.

3. usually required for **counterfactual policy evaluations** - e.g. labour supply elasticity vs. labour demand elasticicty

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Structural vs Atheoretic

Questions to ask structural papers:

- **Where** is the structure?
- What **assumptions** is the structure making?
- What **alternative assumptions** might there be?
- Why do we **need** the structure -
  What can we learn **with vs. without theory**?

Assumptions? Alternatives? Atheoretic answers?

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An Introductory Example

How much revenue raised by **introducing income taxes**?

Simple answers?

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Effects of tax change I

How much **additional revenue (AR)**

1. AR=new tax rate * wage * number of hours worked
2. AR=new tax rate * wage * **hours worked post tax**

How many hours worked post tax?

Effects of tax change II

How many hours worked post tax?

- estimate **observed corr between wages and hours**
- **interpret as L^S-elasticity**?

Effects of tax change III

using theory... why might **number of hours worked change**?

1. **hours margin**: change in hours for (pre- & post-) workers

2. **participation margin**: change in participation pre vs. post-tax:
   - model discrete choice of participation with tax
   - model hours reaction conditional on participating

Effects of tax change IV

3. **life-cycle** margin:
   changing taxes may influence optimal allocation of work over life
   (eg. if progressivity is increased...)

4. **wage** margin: **equilibrium (gross) wage may change**

Conclude: Predicting reduced-form effect (AR) may require theory.

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Before the practical session

10 minute break

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Practical Session

Question: The Flat Party wins elections and wants to **introduce a Flat Income Tax (FIT)**.

We want to know **how much revenue is raised under FIT**.

Why do we need a structural model? Alternatives?
How to model this ?

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What minimal necessary ingredients for a model?

1. decision to participate
2. decision over hours worked (discretize - why?)
3. earnings of participants (pre- and post reform)
4. NB. recognize heterogeneity (e.g. due to different non-labour incomes)

(1) Participation and hours

How do we model this?

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(1) Participation and hours II

Individuals **maximize utility** from consumption & leisure

$$U(c, h) = \gamma \left[\frac{c^\theta}{\theta} - \alpha \; h \right] + \varepsilon_h$$

by **choosing hours per week** $h \in [0, 10, 20, 30, 40]$
faced with constraint posed by wage.

(2) Consumption

Simplest model of consumption in this context?

(2) Consumption II

$$c = w * h$$

What does this imply?
Simplest models of wages?

(3) Wages

Assume workers draw wage rates from normal wage offer distribution *before* choosing hours

$$\log w = \mu_w + \epsilon_w$$

where ε_w from $N[0, \sigma_w]$

Key elements

Estimate...

1. parameters of the wage distribution
2. taste parameters of leisure-consumption choice

Matlab

Principles

1. Use a **script** and **document your code**. Always.
2. There is **always** a solution. Not one.
3. One solution is **fast**,
4. another is **easy to read** & understand,
5. another is **flexible**.
6. You won't find any immediately. No matter. **Try again.**

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Simulate to estimate

Good practice: Simulate before estimating. Why?

In practice: Simulation and Estimation

1. Simulate economic behaviour in model with your favourite parameters.
2. Generate simulated data.
3. Save the data. Forget the parameters.
4. Write the likelihood function as a function of data and parameters.
5. Maximize likelihood of observing your simulated data w.r.t. parameters.
6. Rediscover your favourite parameters.

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Code now...

1. code for simulating hours choice
2. code for estimating hours choice
3. code for simulating a normal wage distribution
4. code for estimating a normal wage distribution