

**STRUCTURAL ECONOMETRICS:**  
**Methods and Applications to Labor Economics**

PhD Programme in Economics  
European University Institute  
Department of Economics

**Instructor**

Ylenia Brilli

Contact details: ylenia.brilli@eui.eu

Office hours: by appointment, either at my office (BF342 at Badia Fiesolana) or at Villa San Paolo

**Course Information**

Spring Term, A.Y. 2014-2015

Schedule: Monday, 8:45-10:45, from April 13 to May 11.

Room: TBA, Villa San Paolo

**Course overview**

During the last decades, the use of structural estimation methods has gained a growing relevance for the understanding of labor market and education dynamics. This course introduces structural econometric approaches in the field of labor economics. The course is structured in two parts. In the first part, we overview the main theoretical frameworks used in this literature; we also discuss the identifying assumptions needed for the model estimation and the validation techniques used in the literature so far. This part is concluded by presenting the methods used for the estimation of these models. First, we review the methods not using simulation (Maximum Likelihood and Method of Moments), and then we describe the main simulation-based methods (Method of Simulated Moments and Simulated Maximum Likelihood).

The second part mainly involves the discussion of empirical applications in the fields of labor economics and economics of education. Particular attention will be devoted to papers analyzing the determinants of female labor supply and of the schooling decisions.

**Prerequisites**

The 1<sup>st</sup> year exams on Econometrics represent a prerequisite for this course.

**Objectives**

At the end of the course, students will be able to:

- A. Understand structural/theory-based econometric methods
- B. Recognize the goals that these techniques can reach and the main identifying assumptions
- C. Evaluate the worthiness of such assumptions and their implications in terms of model validity
- D. Assess the advantages and disadvantages of different methods used for the estimation of structural model

## Assessment

The evaluation for this course is based on a referee report. On the day of the 3<sup>rd</sup> class (April 27, 2015), students receive a structural paper to review, taking into considerations the concepts and methods explained in class. The referee report must be sent by **Sunday, May 31 2015**.

Additional details and information on the structure of the report will be given in class. Moreover, the last two lectures of the course, based on the discussion of existing papers using structural econometrics, are also aimed at presenting to students the most important aspects to consider when writing the report.

## Course structure and selected reading list

### April 13, 2015. Introduction to theory-based econometrics. Solution and estimation of static models.

This class mainly follows Keane M., P. Todd and K. Wolpin (2011), The Structural Estimation of Behavioral Models: Discrete Choice Dynamic Programming Methods and Applications, *Handbook of Labor Economics*, Volume 4A, Pagg. 332-371.

### April 20, 2015. Solution and estimation of discrete choice dynamic models. The course of dimensionality. Solution of continuous choice models.

This class mainly follows Keane M., P. Todd and K. Wolpin (2011), The Structural Estimation of Behavioral Models: Discrete Choice Dynamic Programming Methods and Applications, *Handbook of Labor Economics*, Volume 4A, Pagg. 332-371.

A more formal review of dynamic programming and numerical methods can be found in Adda, J. and R. Cooper (2003), *Dynamic economics: quantitative methods and applications*, the MIT Press, Chapters 2 and 3.

### April 27, 2015. Estimation methods (GMM, Maximum Likelihood, Method of Simulated Moments and Simulated Maximum Likelihood)

This class mainly follows:

- Adda, J. and R. Cooper (2003), *Dynamic economics: quantitative methods and applications*, the MIT Press, Chapter 4.
- Train K. (2003), *Discrete choice methods with simulation*, Cambridge University Press, Chapter 10.

### May 4, 2015. Applications in labor economics: female labor supply.

In this class, we discuss the papers:

- Eckstein Z. and Wolpin K. (1989), Dynamic Labor Force Participation of Married Women and Endogenous Work Experience, *Review of Economic Studies*, 56, 375-390.
- Van der Klaauw W. (1996), Female labor supply and marital status decisions: a life cycle model. *Review of Economic Studies*, 63, 199-235.
- Francesconi, M. (2002), A joint dynamic model of fertility and work of married women, *Journal of Labor Economics*, 20, 336-380.
- Keane, M. and K. Wolpin (2007), Exploring the usefulness of a non-random holdout sample for model validation: welfare effects on female labor supply, *International Economic Review*, 48, 1351-1378.

- Keane, M. and K. Wolpin (2010), The role of labor and marriage markets, preference heterogeneity, and the welfare system in the life cycle decisions of black, Hispanic and white women, *International Economic Review*, 51, 851-892.

**May 11, 2015. Application in labor economics: the schooling decision.**

In this class, we discuss the papers:

- Keane M., and K. Wolpin (1997), The career decisions of young men, *Journal of Political Economy*, 105(3), 473-522.
- Keane M., and K. Wolpin (2000), Eliminating race differences in school attainment and labor market success. *Journal of Labor Economics*, 18, 614-652.
- Keane M., and K. Wolpin (2001), The effects of parental transfers and borrowing constraints on educational attainment, *International Economic Review*, 42, 1051-1103.
- Heckman J. , S. Mosso and P. Eisenhauer (2015), *Estimation of Dynamic Discrete Choice Models by Maximum Likelihood and the Simulated Method of Moments*, available at <http://www.policy-lab.org/sim-methods/>, forthcoming on the *International Economic Review*.

**(A more comprehensive) Reading list**

This reading list includes books and papers useful to understand the econometric methods and their implementation (**Methods** section), and papers, which are applications of the structural methods presented in class (**Applications** section).

**Methods:**

- Adda, J. and R. Cooper (2003), *Dynamic economics: quantitative methods and applications*, the MIT Press, chapters 2-3-4.
- Attanasio, O., Meghir, C., Santiago A. (2011), Education choices in Mexico: Using a Structural Model and a Randomized Experiment to evaluate Progresá, mimeo, University College London.
- Bellman, R. (1957), *Dynamic programming*, Princeton University Press, Princeton.
- Eckstein, Z. and Wolpin K. (1989), The specification and estimation of dynamic stochastic discrete choice models, *Journal of Human Resources*, 24, 562-598.
- Flinn, C. and J. Heckman (1982), New methods for analyzing structural models of labor force dynamics, *Journal of Econometrics*, 18, 114-142.
- Flinn, C. J. (2010), *The minimum wage and labor market outcomes*, The MIT Press.
- French, E. and C. Taber (2011), Identification of models of the labor market, in Ashenfelter, O., Card, D., (Eds.), *Handbook of Labor Economics*, vol. 4A, Elsevier, Amsterdam, 537-617.
- Heckman J. , S. Mosso and P. Eisenhauer (2013), *Estimation of Dynamic Discrete Choice Models by Maximum Likelihood and the Simulated Method of Moments*, available at <http://www.policy-lab.org/sim-methods/>, forthcoming on the *International Economic Review*.
- J. Heckman and B. Singer (1984), A method for minimizing the impact of distributional assumptions in econometric models for duration data, *Econometrica*, 52, 271-320.

- Keane M., P. Todd and K. Wolpin (2011), The Structural Estimation of Behavioral Models: Discrete Choice Dynamic Programming Methods and Applications, *Handbook of Labor Economics*, Volume 4A.
- Keane, M. and R. Sauer (2010), A computationally practical simulation estimator for panel data models with unobserved endogenous state variables, *International Economic Review*, 51(4), 925-948.
- Keane, M. and Wolpin, K. (1994), The solution and estimation of discrete choice dynamic programming models by simulation: Monte Carlo evidence, *Review of Economics and Statistics*, 648-672.
- McFadden D. (1989), A method of simulated moments for estimation of discrete response models with numerical integration, *Econometrica*, 57, 995-1028.
- Train K. (2003), *Discrete choice methods with simulation*, Cambridge University Press, chapters 8-9-10-11.

### **Applications:**

- Adda J., C. Dustmann, C. Meghir, J.-M. Robin (2012), Career Progression, Economic Downturns, and Skills, NBER Working Paper 18832, National Bureau of Economic Research.
- Ben-Porath, Y. (1967), The production of human capital and the life-cycle of earnings, *Journal of Political Economy*, 75, 352-365.
- Bernal, R. (2008), The effects of maternal employment and child care on children's cognitive development, *International Economic Review*, 49, 1173-1209.
- Eckstein Z. and Wolpin K. (1989), Dynamic Labor Force Participation of Married Women and Endogenous Work Experience, *Review of Economic Studies*, 56, 375-390.
- Flinn, C. (2006), Minimum wage effects on labor market outcomes under search, matching and endogenous contact rates, *Econometrica*, 74, 1013-1062.
- Francesconi, M. (2002), A joint dynamic model of fertility and work of married women, *Journal of Labor Economics*, 20, 336-380.
- Gemici, A., and Wiswall, M. (2014), Evolution Of Gender Differences In Post-Secondary Human Capital Investments: College Majors, *International Economic Review*, 55(1), 23-56.
- Gemici.A. (2011), Family migration and labor market outcomes, mimeo, New York University.
- Keane M., and K. Wolpin (1997), The career decisions of young men, *Journal of Political Economy*, 105(3), 473-522.
- Keane M., and K. Wolpin (2001), The effects of parental transfers and borrowing constraints on educational attainment, *International Economic Review*, 42, 1051-1103.
- M. Keane and R. Moffitt (1998), A structural model of multiple welfare program participation and labor supply, *International Economic Review*, 39, 553-590.
- Moffit, R. (1983), An economic model of welfare stigma, *American Economic Review*, 73, 1023-1035.
- Todd P. and K. Wolpin (2006), Assessing the impact of a school subsidy program in Mexico: using a social experiment to validate a dynamic behavioral model of child schooling and fertility, *American Economic Review*, 96, 1384 – 1417.