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Structural Estimation

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1. Introduction

Structural econometric models of optimal individual behavior provide an essential tool for ex ante evaluation of a range of economic policy measures. A typical structural econometric model is a model that is expressed exclusively in terms of structural (or "deep") parameters which determine optimal behavior of individuals in a given institutional environment. Such parameters are, for instance, the concavity parameter of the utility function, the convexity parameter of the cost function etc. Institutional environment in these models is characterized by a set of variables directly chosen by policy makers, such as unemployment benefits, tax rates and so on. Since structural parameters are invariant to policy changes by assumption of the underlying economic theory, having estimated these parameters one can perform any type of comparative statics/dynamics exercise, changing policy variables in any possible way and computing optimal individual response to this change. The difference between model predictions before and after the policy simulation directly leads a structural estimate of the policy effect. This stands in strong contrast to the majority of reduced-form models where model parameters are not invariant to policy changes and are therefore policy evaluation is, as a rule, ex post.

Objective of this seminar is to understand how structural econometric models are formulated and estimated. The focus is on the structural models of microeconomic behavior and microfounded macroanalysis. Typical literature comprises a wide array of applications in labor economics, public economics, health economics, family economics, development economics and economic demography.

2. A brief overview

In what follows we will outline three broad classes of structural models and describe the areas of application for these models. We will also consider key literature that provides methodological input for estimation and inference.

2.1 Structural estimation of single-agent models

Single-agent models provide the framework in which individuals make optimal decisions facing market uncertainty and taking market conditions as given. Original models where related to unemployed job search and information acquisition. Theoretical review is in Mortensen (1986). Among further notable contributions Wolpin (1987) provides both theoretical and empirical model with finitely lived agents and van den Berg (1990) formalizes changing institutional environment, such as for instance legislative time limit to welfare benefits.

Classical papers on the specification and estimation of the one-sided job search model are Flinn and Heckman (1982) and Christensen and Kiefer (1994). Key econometric problem is the non-regularity of the objective function due to the reservation property of the optimal stopping problem. Both papers provide the solution in terms of either application of the order statistics (Flinn and Heckman, 1982) or introduction of measurement error (Christensen and Kiefer, 1994).

The model has been applied in many different contexts. Within the most recent literature Bloemen (2005) investigates incentive effects of the welfare system on reemployment chances and Frijters and van der Klaauw (2006) address market participation decisions. Besides that, Van der Klaauw and van Vuuren (2010) apply the framework to asses the role of information frictions in returns to education. Flinn and Dey (2008) study the demand for health insurance. Paserman (2008) considers policy evaluation in the model with time-inconsistent preferences.

Finally, Eckstein and van den Berg (2007) provide a good survey on the estimation identification and further application areas.

2.2 Structural estimation of multiple agent models

Multiple agent models place the above class of models into the equilibrium context. This allows reconciling optimal decisions of supply and demand sides of the market in presence of information frictions. Comprehensive theoretical review of these models can be found in Mortensen and Pissarides (1999). Among the wide variety of equilibrium search models those with on-the-job search and wage dispersion arising either via wage posting (Brudett and Mortensen, 1998) or via matching offers with counteroffers (Postel-Vinay and Robin, 2002) have the most appealing empirical content.

The first comprehensive treatment of the empirical equilibrium search model with wage posting is provided by van den Berg and Ridder (1998). Bowlus et al. (2001) and Bontemps et al. (2000) set up the specification and provide estimation algorithms for extensions with discrete and continuous productivity distribution of firms, respectively. Estimation and inference in the class of models with offers and counteroffers, given complete heterogeneity of both sides of the market, is provided by Postel-Vinay and Robin (2002) and Cahuc et al. (2006). The latter is also the first empirical model of search with bargaining.

Among recent contributions Jolivet et al. (2006) set up an empirical model of equilibrium search to explain the difference in wage mobility between the US and Europe. Postel-Vinay and Turon (2010) provide comprehensive analysis of equilibrium wage profiles. Robin (2011) specifies and estimates business cycle effects on the dynamics of unemployment and wage distributions. Furthermore, Bowlus and Eckstein (2002) investigate wage discrimination

among workers heterogeneous with respect to skills, and Holzner and Launov (2010) address the optimality of the skill composition of the workforce. Lise (2011) underlines the role of information frictions in wealth formation and wealth inequality.

In an empirical model with matching and bargaining Dey and Flinn (2005) assess joint determination of wage and provision for health insurance. Launov and Wäde (2012) use the nonstationary matching model with bargaining to evaluate a reform of time-dependent unemployment benefit system.

A notable example in recent economic growth literature is Lenz and Mortensen (2008) model of growth with product innovation.

2.3 DCDP and structural life cycle models

The class of discrete choice dynamic programming (DCDP) models in life cycle context provides a comprehensive description of transitions between multiple states of nature. Discreteness of the state space together with discreteness of time in this type of models makes them suitable for replication of fairly complex longitudinal dynamics (e.g. dynamics of market participation) exceeding by far the capacity of the models described in Sections 2.1-2.2. For the same reason, however, as well as for being essentially single-agent models, such models are not particularly useful for describing cross-sectional steady state phenomena. The latter is a particular merit of the continuous time equilibrium search models of Section 2.2.

A very comprehensive review on specification and estimation of this class of models is in Keane et al. (2011).

Earlier prominent examples of empirical analysis within the DCDP framework include Stock and Wise (1990) on option value of retirement and Keane and Wolpin (1997) on the career decisions.

Currently discrete choice dynamic programming models with multiple decision variables proliferate in the literature. To name just the few, Francesconi (2002) sets up the model of joint female participation and fertility decisions. Imai and Keane (2004) specify and estimate the model of optimal human capital accumulation and labour force participation. French (2005) considers the dependence of labour supply and retirement behavior on optimal consumption, human capital accumulation and health status. Sauer (2004) and Lee (2005) address dynamic models of education decisions and career choice respectively. Finally, Keane and Wolpin (2010) provide an encompassing analysis of the influence of multidimensional individual heterogeneity and welfare system on the subsequent life cycle outcomes.

3. Seminar organization

To register for the seminar please send an email message to Ms Silke Brandau (sbrandau@uni-mainz.de). For all other questions please contact either Andrey Launov or Klaus Wälde. Important dates are:

Deadline for paper submission - *August 26, 2012, 23:59 CET*
Seminar takes place on - *September 7, 2012, 10:00 CET*

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