ECO 560 Economics of Contracts

# Lecture 9: Introduction to Dynamic Contracts

**Raicho Bojilov**

**15 March 2013**

# 1 Introduction

Empirical work in contract theory has developed slowly in the 1980s and the 1990s. However, in the last 15 years, it has grown rapidly.

There are four objectives in the empirical work:

1. Provide evidence for the source of market failure.

2. Identify the different sources from each other, in particular moral hazard from adverse selection.

3. Quantify the extent of the problem and the inefficiency;

4. Evaluate various policy solutions.

# 2 Testable Implications and Identification

Econometric identification: establish one-to-one relation between the empirical distribution and the parameters of a an economic model

Testable implications of a model:

- predictions about the effect of changes in the environment on economic behavior and outcomes;

- most importantly, statements on what behavior and outcomes the theoretical model rules out: this provides the basis of the falsifiability of a theory;

Model Identification: differences in the testable implications of models that allow the econometrician to establish a one-to-one relation between the empirical data and the theoretical model that has generated it.

Identifying the theoretical model is much more difficult than testing its implications and quantifying the effects.

# 3 Structural and Reduced-Form Econometrics

Structural econometrics: the econometrician assumes that the data was generated by a particular model, estimates the model parameters and then tests whether the model fits the data well

- **Positive sides:** the estimated parameters have clear theoretical interpretation and structural models allow for counterfactual policy analysis;

- **Negative sides:** the whole analysis depends on the assumption that the data was generated by a parametrized model of a particular theory.

  $\longrightarrow$ it is crucial to perform an overidentification test to verify that the data is consistent with the theoretical model (i.e. the best parametric model that you estimate fits the data sufficiently well);

$\longrightarrow$ the overidentification test can only reject a theory, but does not provide information on what feature of the model is inconsistent with the data; a structural model is a black box

$\longrightarrow$ silent on identification of theory.

Reduced-form econometrics, parametric or nonparametric, does not assume that the data was generated by a particular model:

- **Positive sides:** allows to test each theoretical implication separately and to identify models;

- **Negative sides:**

  $\longrightarrow$ even reduced-form models are not theory-free because they should be consistent with a set of theoretical models;

  $\longrightarrow$ identification and interpretation of estimated parameters is quite difficult;

  $\longrightarrow$ they do nod provide the basis for policy analysis.

# 4 Testing Contract Theory

The empirical literature has evolved mostly in two environments:

$\longrightarrow$ insurance markets;

$\longrightarrow$ employer-employee relations

The reason is that in this context there are large data set containing information on standardized contracts, claims and individual characteristics are more easily available in insurance contexts.

## 4.1 Chiappori and Salanié (2000)

The goal is to provide a simple and general test of the presence of asymmetric information in contractual relationships within a competitive context.

Data come from the French car insurance industry that are particularly well suited to such empirical investigations: main focus on the relation between contracts and accidents.

Main (robust) testable predictions of contract theory:

1. Under adverse selection, observationally equivalent agents are likely to be faced with menus of contracts, among which they are free to choose.

2. Within the menu, contracts with more comprehensive coverage are sold at a higher (unitary) premium.

3. Within the menu, contracts with more comprehensive coverage are chosen by agents with higher accident probabilities.

**Empirical work focuses on 3:**

Prediction 3 suggests a simple test: a positive correlation between coverage and frequency of accidents should be observed on observationally identical agents.

This observation is quite general: it does not depend on the firm pricing policy or technology, on preferences, and remains valid in a dynamic setting.

All analysis takes place within observationally equivalent individuals.

Data setting:

- obligatory and voluntary insurances;
- premium depends on the bonus/malus which evolves according to a strict formula based on the accidents.

Econometric model:

The empirical analysis is based on a pair of binary choice models for each insurance period:

- decision to get a comprehensive insurance:

$$y_i = 1[X_i\beta + \varepsilon_i > 0]$$

- occurrence of an accident:

$$z_i = 1[X_i\gamma + \xi_i > 0]$$

where $X_i$ contains all available information to the econometrician.

Adverse selection and asymmetric information more generally imply that $\rho(\varepsilon_i, \xi_i) > 0$.

- Adverse selection implies $\rho > 0$ because individuals with higher propensity of accident sort into comprehensive insurance.

- Moral Hazard implies that a driver with full insurance is more likely to drive carelessly.

Limitations:

1. The model cannot distinguish between moral hazard and adverse selection.

2. For moral hazard, why do people decide to buy a full insurance in the first place?

The same approach can be applied to credit markets:

- Adverse selection implies $\rho > 0$ because riskier borrowers are more likely to borrow (anticipating default)

- The larger the loan, the lower the return on effort implying lower effort.

## 4.2 Distinguishing Between Moral Hazard and Adverse Selection

- Exploit dynamics: Chiappori, Heckman, Pinquet (2004)
- Natural experiments: Lazear (2000)
- Controlled experiments: Karlan Zimman (2011)

## 4.3 Chiappori, Heckman, Pinquet (2004)

Young drivers can either declare a vehicle as their own or as belonging to their parents. If they do the latter, then they benefit from the bonus coefficient of their parents.

For any risk-level, such an option increases the probability of getting a comprehensive insurance.

What is the effect $\alpha$ of parents' driving ability on the probability of their children having an accident?

$\alpha = 0$ if there is no moral hazard and the driving ability of parents and children are not related

$\alpha < 0$ if there is no moral hazard and the driving ability of parents and children are positively related.

$\alpha > 0$ if there is moral hazard.

In more general setting, they exploit the fact that the insurance premium goes up more after the n+1st accident than after the n-th accident.

- Moral hazard implies a negative correlation in the probability of having an accident.

- Adverse selection implies a positive correlation between the probabilities.

## 4.4 Lazear (2000)

Lazear considers the change in the compensation schedule from hourly wages to a piece rate in a factory that produces windscreens for cars.

Workers can choose either to keep an hourly wage or accept a piece rate.

The firm hires workers before and after the introduction of the pay scheme.

Distinguish between self-selection based on unobserved heterogeneity in ability and the effect of moral hazard using difference in difference approach over time.

- Moral hazard predicts that the introduction of a piece rate would increase both average performance $y$ of existing employees and will increase the variance in performance if effort and ability are complements.

- Adverse selection implies that the introduction of the piece rate will attract workers of higher ability.

Lazear uses within variation in individual performance to identify the effect of incentives.

- The effect of moral hazard is identified by the change in performance for those who work under both piece rates and hourly wages.

- The effect of adverse selection is identified from the difference in the performance of workers under the piece rate who were hired before and after the introduction of the piece rate.

- Identification of adverse selection relies that there are no other time effects and the analysis does not include an explicit model for labor turnover. Lazear controls for it by estimating the model on a set of workers who all stay for a certain period.

## 4.5 Karlan Zimman (2011)

Karlan and Zimman study consumer credit in South Africa with a two stage randomized experiment.

Stage 1: Consumers are randomly offered high H or low interest rates L.

Stage 2: Among those who are offered H, some of them are randomly given L when they go to the bank to accept the initial offer.

Thus, there are three groups of interest:

- A: offered H and given H
- B: offered H and given L
- C: offered L and given L

Comparison between groups A and B identifies the effect of moral hazard.

Comparison between groups B and C identifies the effect of adverse selection.

# 5 Other Literature:

- Chiappori and Salanié (2003) provide a review of the early empirical literature.

- Oyer (2012) provides a review of the empirical literature with a focus on employer-employee relations.

- d'Haultfoeuille and Février (2012) provide a particularly interesting strategy to identify nonparametrically the effect of incentives on wages.

- symmetric learning and incentives: based on Murphy (1994) and Holmstrom (1999): Chiappori, Salanié and Valentin (1999).

# 6 A Few Comments:

IT decreases the cost of monitoring actions $\longrightarrow$ moral hazard problems are mitigated

At the same time, it allows ways to identify types $\longrightarrow$ Principal can capture greater part of the surplus.

IT also makes it easy to implement contracts.

New topics: auctions, platforms, etc.

Big data: real time policy analysis