

Lecture #11: Introduction to the New Empirical Industrial Organization (NEIO) -

What is the old empirical IO?

The old empirical IO refers to studies that tried to draw inferences about the relationship between the structure of an industry (in particular, its concentration level) and its profitability.

Problems with those studies are that (i) it is hard to actually measure profitability (ii) structure may be endogenous (iii) little connection between empirical work & theory.

The NEIO is in many ways a reaction to that empirical tradition. NEIO works “in harmony” with (game) theory.

**The Structure – Conduct – Performance (SCP) Paradigm
The Old Empirical IO**

Question: How does industry concentration affect price-cost margins or other similar measures?

The “plain vanilla” SCP regression regresses profitability on concentration.

Economists’ primary model of non-cooperative oligopolistic competition in homogeneous product industries (Cournot) relates market structure to performance.

In such a case, it can be shown that (share weighted) average firm markup in an industry, $\sum_i [(p - mc_i)/p] s_i = -HHI/\eta$, where HHI is the Herfindahl index ($\sum_i s_i^2$) and η is of the industry elasticity of demand.

This implies: $\ln(\text{PCM}) = \alpha_0 + \alpha_1 \ln(\text{HHI}) + \alpha_2 \ln(\eta) + \varepsilon$, (1)

where PCM= the share weighted average firm markup in the industry.

Using cross section data, (1) could be estimated and a test for Cournot would be $\alpha_0=0$, $\alpha_1=1$, $\alpha_2=-1$.

In practice, regressions of the following form were performed:

$$\text{PCM} = \beta_0 + \beta_1 C4 + \varepsilon, \quad (2)$$

where C4 was the share of the four largest firms in the industry.

Cross section industry data was employed.

Why is (2) a reduced form regression? After all, both margins and concentration are endogenous. But we did not derive this equation from industry structure as we did with (1).

That aside, what are the problems with these regressions?

(I) Data

- Data on price cost margins not available, hence accounting returns on assets (as well as census data on manufacturer margins) were often used.
- Additional RHS variables such as the elasticity of demand were often included. But these are hard to measure for many industries.
- Market definitions were problematic. (When using a single industry more thought can be put into the issue.)

(2) Problems with the Experiment

There are simultaneity issues since concentration is endogenous
Demsetz (1973) noted that some firms have a cost advantage. This would lead to a large share and high profits. Hence there could be a correlation between C4 and profits even if the industry is competitive and there are cost differences among firms

Where did this all leave us?

Schmalensee – We can't answer the original question about how industry concentration affects profits, but that doesn't matter because we are only interested in empirical regularities.

Salinger – With refinements of the SCP regressions, we can still answer the original question

NEIO – builds on the econometric progress made by SCP paradigm; it uses economic theory and typically focuses on a single industry.

The New Empirical Industrial Organization

The NEIO describes techniques (more than one) for estimating the degree of competitiveness in an industry.

On the data side, these new studies use bare bones prices and quantities, that is, the techniques do not use cost or profit data and rely.

Typical assumption is that the firms are behaving "as if" they are Bertrand competitors

The studies use comparative statics of equilibria to draw inferences about profits and costs.

The vast majority of the studies are single industry in order to deal better with product heterogeneity, institutional details, really understand price and quantity information, etc.

Structural vs. Reduced Form Modeling

Definition: A structural economic model is a stochastic model of behavior of economic agents. It gives rise to a reduced form model, which is a conditional distribution of endogenous variables on exogenous variables.

Example of a Structural Model: (Supply & Demand)

$$q_t^s = \alpha_0 + \alpha_1 p_t + \alpha_2 x_{1t} + \varepsilon_{1t}$$

$$q_t^d = \beta_0 + \beta_1 p_t + \beta_2 x_{2t} + \varepsilon_{2t}$$

$$q_t^s = q_t^d \equiv q_t \text{ (equilibrium condition)}$$

p_t, q_t –endogenous variables

x_{1t}, x_{2t} –exogenous variables

$\varepsilon_{1t}, \varepsilon_{2t}$ – stochastic shock

α, β parameters

Why is this a structural model?

- Because the demand function specifies a behavioral response of consumers in the market.
- Because the supply function specifies a behavioral response of firms in the market.
- We assume that market is in equilibrium.

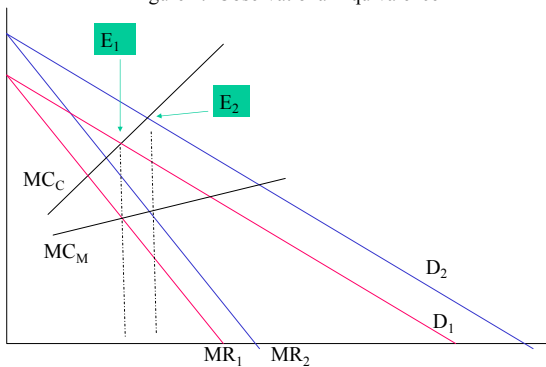
Bresnahan, 1982 (Economic Letters) “The Oligopoly Solution Concept is Identified”

This paper shows that the oligopoly solution concept can be identified econometrically.

- Let demand and marginal cost (MC) be linear
- $Q = \alpha_0 + \alpha_1 P + \alpha_2 Y + \varepsilon$ (1), where Y (income) is exogenous
- $MC = \beta_0 + \beta_1 Q + \beta_2 W + \eta$ (2), where W (weather) is exogenous
- Supply Relationship: $P = \lambda(-Q/\alpha_1) + \beta_0 + \beta_1 Q + \beta_2 W + \eta$ (3), since $MR = P + Q/\alpha_1$ & $MC = \beta_0 + \beta_1 Q + \beta_2 W + \eta$.
- Note that $\lambda=0$ implies perfect competition, $\lambda=1$ implies monopoly, while $\lambda=1/N$ implies Cournot with N firms.
- Since both equations (1) and (3) have one endogenous variable, and since there is one excluded exogenous variable from each equation, both equations are identified.

- But are we estimating $P=MC$ or $MR=MC$?
- Rewrite (3), $P=\beta_0 + \gamma Q + \beta_2 W + \eta$, where $\gamma=(\beta_1 - \lambda / \alpha_1)$.
- We can estimate γ , since the supply equation is identified.
- Although α_1 can be treated as known (because we can estimate the demand equation), we cannot estimate β_1 and λ .
- In figure 1 (next slide), E_1 could either be an equilibrium for a monopolist (or cartel) with marginal cost MC_M , or for a perfectly competitive industry with cost MC_C .
- Increase Y to shift the demand curve out to D_2 and both the monopolistic and competitive equilibria move to E_2
- Unless we know marginal costs, we cannot distinguish between competition or monopoly (nor anything in between).

Figure 1: Observational Equivalence



The solution to the identification problem

- Suppose demand is such that
- $Q = \alpha_0 + \alpha_1 P + \alpha_2 Y + \alpha_3 PZ + \alpha_4 Z + \varepsilon$, where Z is another exogenous variable.
- The key issue is that Z enters interactively with P , so that changes in Y and Z both rotate and vertically shift demand.
- Z might be the price of a substitute good, which makes the interaction term natural.
- Supply relation becomes:
 $P = -\lambda Q^* + \beta_0 + \beta_1 Q + \beta_2 W + \eta$, where $Q^* = Q / (\alpha_1 + \alpha_3 Z)$
- Since the demand equation is still identified, λ and β_1 are identified. (There are two endogenous variables: Q, Q^* , and two excluded exogenous variables: Z and W .)

•Graphically (see figure 2 on the next slide), an exogenous change in the price of the substitute good rotates the demand curve around E_1 .

•If there is perfect competition, this will have no effect on the equilibrium price and it will stay at the point associated with E_1 .

•But, if there is monopoly power, the equilibrium will change (to E_3 as shown in figure 2).

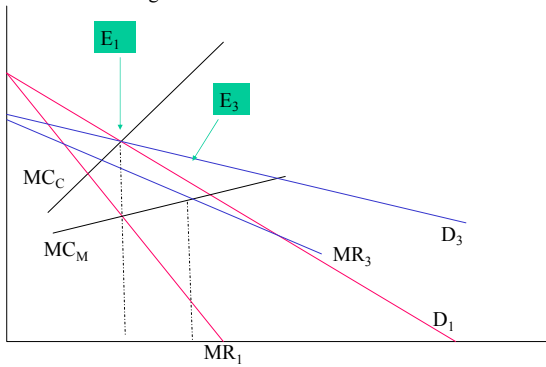
•This result can be generalized beyond linear functions and pictures!

•There are other assumptions that can generate identification.

Marginal cost that does not vary with quantity ($\beta_1=0$).

Use of supply shocks (Porter, 1983).

Figure 2: Identification



Why do we care about the structural model?

•We want to estimate parameters or effects not directly observed in the data (returns to scale, elasticity of demand)

•We want to perform welfare analysis, i.e., measure welfare gains due to entry, or welfare losses due to market power.

•To simulate changes in the equilibrium (impact of mergers)

•To compare relative predictive performance of two competing theories
