Lecture 9: Experimental Comparisons of the Learning Models

symmetric Cournot oligopoly with finite strategy sets

collusive quantity $<$ Cournot quantity $<$ Walrasian quantity (parameter such that all quantities unique)

Which quantity will subjects learn to choose?

Basic Idea: Different information feedback allows for different types of learning

1. Huck et al.

Comparison of one-period best reply (implying Cournot quantity) and imitation (implying Walrasian quantity).

4 firms, 40 rounds, group composition changes randomly from round to round (strangers treatment)

exogenous inertia probability of $\frac{1}{3}$

5 information treatments

BEST: demand and cost functions of all players known, after each round subjects informed about total quantity and resulting price.

FULL: like *BEST*, plus after each round individual quantities and profits.

NOIN: demand unknown, cost function of other players unknown, unknown that demand and cost functions constant over rounds. No information about other players' quantities and profits.

IMIT: market conditions unknown as in *NOIN*, but information about other players quantities and profits.

IMIT+: like *IMIT*, plus information that demand curve is downward sloping.

With *FULL* and *BEST*, the players can calculate the best reply - best reply learning possible

Under *FULL*, *IMIT*, and *IMIT*+ imitation possible

"Imitate the average" possible in all treatments but *NOIN*.

Experimental results:

Result 1: In all treatments observed quantities are above the Cournot level.

Result 2: More information about the market structure induces lower, more information about individual quantities and profits induces higher quantities.

Result 3: When individual have the necessary information to calculate the best reply, many subjects revise their strategies into the best reply direction, but the adjustment remains nearly always incomplete. If in addition subjects can imitate, at least some subjects become pure imitators.

$\Longrightarrow$

Information has the predicted influence on learning.

If information allows for best reply as well as imitation, many choose incomplete best reply and some become perfect imitators.

2. Offerman et al

Comparison of one-period best reply (implying Cournot quantity) and imitation (implying Walrasian quantity).

Investigates also "follow the exemplary" learning model: Subjects imitate of all chosen last period quantities that one which would yield highest sum of payoffs for all players.

$\Longrightarrow$ choice of collusive quantity by all players is the only stochastically stable state.

3 firms, 100 rounds, group composition stable (partners treatment).

no exogenous inertia probability

3 information treatments

Q: demand and cost functions of all players known; After each round, overall quantity and resulting price revealed, but not individual quantities and profits of the other firms. (like *BEST* in Huck et al)

Qq: like Q, plus individual quantities of other players

$Qqpr$: like Qq, plus individual profits of other players (like FULL in Huck et al).

Note that Qq information sufficient to calculate the profits of other firms - if subjects have zero computation costs (and this is common knowlegde), information conditions Qq and $Qqpr$ are equivalent.

For all three conditions, best reply can be calculated.

Imitation and "follow the exemplary" only possible for Qq and $Qqpr$.

Experimental results

Result 1: In all treatments observed quantities are close to, but below the Cournot level.

Result 2: Quantities are highest in *Qqpr*, and lowest in *Qq* treatment.

Result 3: When testing for individual behavior, learning of all three types is found whenever possible. In *Qq* "imitate the exemplary" behavior is observed, whereas in *Qqpr* imitation is more widespread.

Problem with this study, possible explanation for difference to Huck et al: partners treatment, repeated game effect