

How Judo Economics can help small firms to survive Bertrand competition: evidence from the lab

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Judo Economics

- the term *Judo Economics* was first presented in *Gelman/Salop (1983, RAND)*
- basic idea: firm enters a monopolized market with a strict capacity limitation
 - for the monopolist losing some customers is preferred to cutting prices for all customers

"To capture the image of a small firm using its rival's large size to its own advantage, we call this a strategy of *judo economics*."

Judo-type situations

- small enterprises entering markets dominated by at least 1 big firm
- either concentrating on niches: e.g. Capital One (1988), Palm (1993)
- or limiting size: Kiwi Airlines (1992)
 - only 2 leased airplanes and 1 route (Chicago → Newark → Orlando → Chicago)

Judo equilibrium

- assumptions:
 - 2 symmetric firms in a sequential price competition
 - no product differentiation, but lexicographic preferences
- Bertrand equilibrium: no capacity limitation
 - prices at the marginal cost level, no entry for small firm
- Judo equilibrium: capacity limitation for small firm
 - small firm serves part of the market at low price
 - dominant firm serves residual market at high price

Judo equilibrium in theory

- Sørsgard (1995, IJIO): model with entrant choosing capacity first, then a repeated game with simultaneous price competition is started
 - when collusion is expected the entrant installs high capacity at the beginning to make the non-collusive outcome less attractive
- Allen et al. (2000, Econ theory): model with sequential capacity installing before a simultaneous price competition
 - when the incumbent faces a cost advantage he installs a capacity to induce the Judo equilibrium
- Dechenaux & Kovenock (2011, Econ Theory): Judo outcome in a simultaneous price and quantity competition
 - limitations in prices as well as in quantities are used to avoid a non-collusive respond from a dominant firm

Judo economics in practice

- Wilson (1996): reports the story of Kiwi Airlines in detail
- Thomas (1999, IJIO): analyzes empirical data to compare incumbents' observed behavior with theoretical predictions
 - incumbents mainly use an aggressive price response to compete with new entrants
 - empirical evidence for less aggressive responses towards Judo-like entrants

Related experiments

- market entry experiments often focus on the coordination aspect
 - Camerer/Lovallo (1999, AER), Rapoport/Zwick (2002, Exp Econ), Duffy/Hopkins (2005, GAMES)
- Jung/Levin/Kagel (1994, RAND): experimental chain store game with strong and weak monopolists and random entrants
 - weak monopolists use predatory pricing to imitate stronger ones and deter entry in later periods
- standard duopoly experiments with only one decision variable
 - Cournot: Huck/Normann/Oechler (2004, JEBO), Bertrand: Dufwenberg/Gneezy (2000, IJIO), Stackelberg: Huck/Müller/Normann (2001, EJ)
 - results are more cooperative (higher average prices and profits) than theoretical predictions

Baseline

- basic structure of the experiment is very close to *Gelman/Salop (1983)*
 - 1 small enterprise (*SE*) and 1 dominant enterprise (*DE*) with equal marginal cost in a sequential game
 - 1 SE decides on its price and capacity
 - 2 DE decides on its price (no capacity limitation)
 - 3 the firm with the lowest price sells up to its capacity
 - if prices are equal, the DE is preferred

Baseline

- fixed pairs
- the experiment consists of three stages
 - 1 control stage: 10 rounds with no SE
 - 2 practice stage: 20 rounds with random capacity for the SE
 - 3 payment stage: 20 rounds with capacity and price choices

Treatments

- 2x2 factorial design (6-7 observations each)
 - the number of DE: Judo against a **monopoly** or a **duopoly**
 - the relative marginal cost: Judo **with** or **without** a **cost advantage** for the SE

	1 DE	2 DE
symmetric cost	SYM-1	SYM-2
cost advantage	ADV-1	ADV-2

Game theoretic predictions

- SYM-1
 - SE enters with limited capacity, asks price above cost
 - DE accommodates (does not undercut SE)
- SYM-2
 - SE does not enter
 - DEs play price war (Bertrand competition amongst DEs)
- ADV-1
 - SE enters with limited capacity, asks price above SYM-1
 - DE accommodates (does not undercut SE)
- ADV-2
 - SE enters without limited capacity, asks competitive price
 - DEs play price war (DEs compete for residual demand)

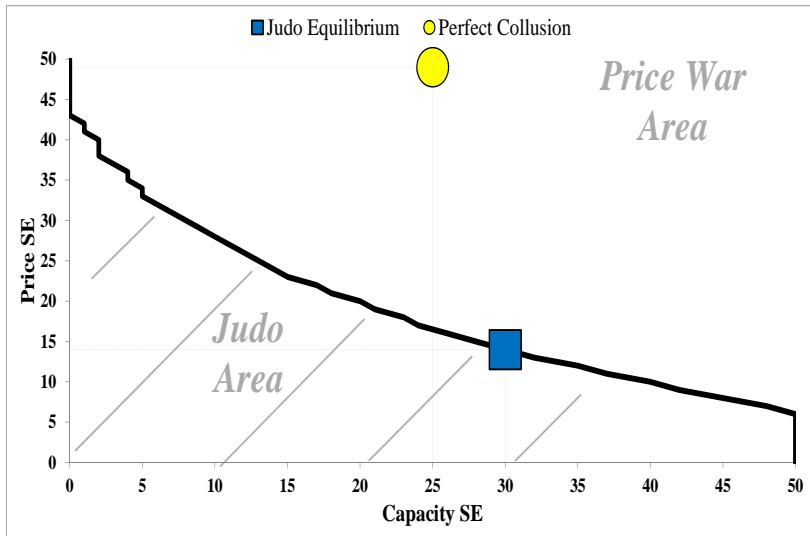
Behavioral predictions

- SYM-1
 - Judo outcome or even more collusive
 - similar to symmetric 2-player Bertrand experiments
- SYM-2
 - attempts to collude break down over time
 - price war as in Bertrand experiments with multiple players
- ADV-1
 - Judo outcome or even more collusive
 - higher profits for SE than in SYM-1
- ADV-2
 - immediate price war at the marginal cost level of DE

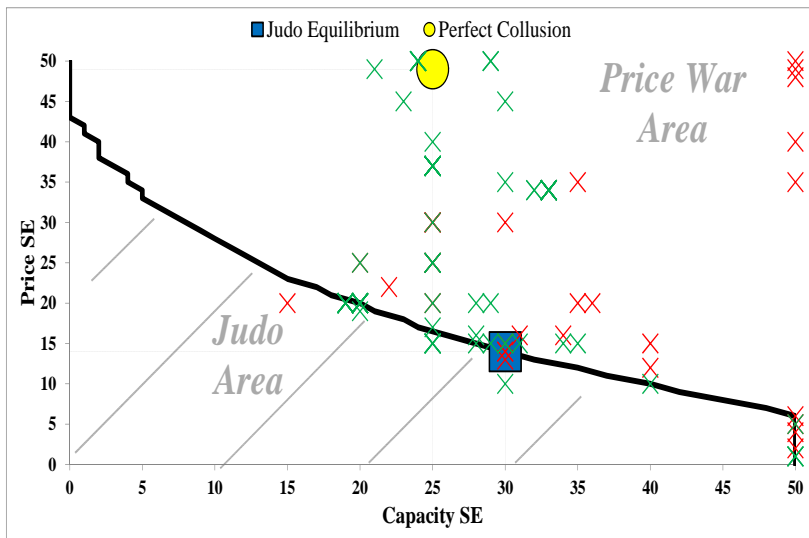
Research questions

- 1 How does SYM-1 fit to the Judo equilibrium prediction?
- 2 How does SYM-2 compare to the Bertrand prediction?
- 3 How does ADV-1 compare to SYM-1?
- 4 How does ADV-2 compare to SYM-2?
- 5 What are the economic implications?

SYM-1: Price-capacity pairs of the small enterprise



SYM-1: Price-capacity pairs of the small enterprise



SYM-1: Summary of responses of the dominant enterprise

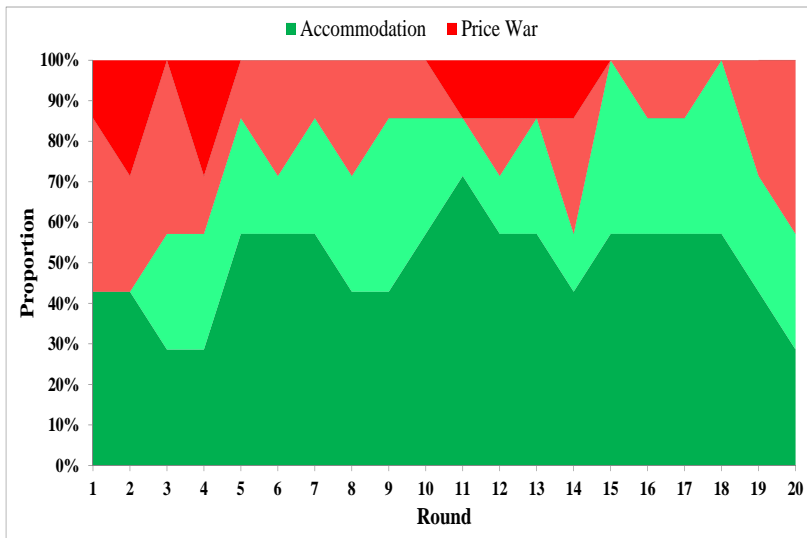
best response cooperative aggressive	<i>in Judo Area</i>	<i>outside Judo Area ($k \leq \text{Judo}$)</i>	<i>outside Judo Area ($k > \text{Judo}$)</i>	Σ
<i>Accommodation response</i>	25.0%	34.3%	15.0%	74.3%
<i>Price War response</i>	6.4%	9.3%	10.0%	25.7%
Σ	31.4%	43.6%	25.0%	100.0%

SYM-1: Entry decisions - successful entry vs. price war

	Successful entry	Price war
Capacity choice**	27	34
π_{SE} (assuming entry)	739	807
π_{DE} (assuming entry)**	1333	1055
$\pi_{DE} - \pi_{SE}$ (assuming entry)	594	248
π_{DE} (assuming price match)*	1881	1649
opportunity cost of entry	548	594

* $p < 0.1$, ** $p < 0.01$ (one-sided MWU)

SYM-1: Development of market outcomes



Main results

1. SYM-1: Judo equilibrium not observed frequently, but Judo-type outcomes are majority in original setting
 - collusive behavior even improves the firms' situation above the Judo level
2. SYM-2: competition amongst 2 DEs reduces the space for the small enterprise, Judo does not work anymore
 - SE has no chance to survive in DE-duopoly
3. ADV-1: cost asymmetry to the advantage of the SE, behaviorally goes against the SE
 - high capacity choice seems to induce very aggressive DE responses, which in turn scare SE out
4. ADV-2: with cost advantage SE survives DE-duopoly, but in a very hostile market

Implications

- I. small enterprises (local firms, niche businesses) that do not face a cost advantage can use the Judo (size) limitation as an entry strategy to avoid a price war
 - basic necessity: credible capacity limitation (e.g. concentrating on a specific part of the market, limited number of machines)
- II. Judo Economics is not only an entry strategy but can also be used in the long run
 - when the interaction with the dominant enterprise is repeated, less aggressive behavior can even increase profits
- III. a cost advantage (e.g. technological innovation or a per unit subsidy) for the SE can improve its situation
 - in a competitive market the SE can use the cost advantage to earn positive profits
 - in a monopolized market the SE must keep to its limitation to avoid a price war

My main issues

- recent introductory example: Deutsche Bahn or Deutsche Telekom vs. local competitors?
- experimental design: one-shot model but fixed pairs with repeated interaction
- surprising result of ADV-1: more behavioral explanation?

Thank you for your attention.