Measuring Competition in Regulation & Antitrust – Principles and Examples

Workshop on Effective Competition in Network Industries

Dr. Hans W. Friederiszick, ESMT CA Giessen, 27.5.2010

Editorial note: ESMT Competition Analysis has been renamed to E.CA Economics
Measuring Competition – Why?

• Defining competition without **defining a welfare measure** is meaningless:
  - firms bribing officials to win contracts may be considered cut-throat competition – but with disastrous welfare implications
  - ‘Protecting rivals’ policy standard results in complaint driven antitrust policy (may be ok in the field of state aid)

• **Simple measures** often **go wrong** or result in battles on market definition, distracting attention from the **REAL** issues
  - Number of firms, market shares, CR or HHI

• Hence, define an objective
  - Consumer welfare or total welfare
  - Productivity
  - Static or dynamic focus

• and then go for the **effects**!

• **Disclaimer**: In regulated industries number of firms, market share measures etc. are more meaningful. Here the (transitory) objective is market opening
Measuring Competition – Why?

• In antitrust cases measuring competition is carried out to understand the extend of rivalry between two firms, i.e. closest competitor analysis; evidence against coordinated effects
• This helps to understand the consequences of a merger, a collusive agreement or exclusionary conduct on competitors
• Typical analysis include:

  **Price/ quality competition:**
  − Switching analysis/ diversion ratios,
  − Critical loss analysis or recently UPP
  − Hedonic price regressions
  − Cross price elasticities
  − Bidding analysis

**Dynamic competition**
− Patent analysis, e.g. numbers, validity, scope/ breadth, blocking position
− Investment levels, e.g. strategic withdrawal of capacity

**Methodology** comprises descriptive analysis up to reasonably complex econometrics; reduced form vs. structural modeling/simulations
Agenda

Introduction

Measuring competition – endogeneity problem (example railway industry)

Measuring competition – dynamic effects (example pharmaceutical industry)

Some other problems and conclusion
Measuring Competition – Endogeneity Problem (Example Railway Industry)

- A general problem for measuring competition and its effects on market outcome is the endogeneity issue:
  - Market concentration, entry etc. affect prices, but prices also drive market structure
    - e.g. measuring the impact of local HHI on prices turns out to be negative
  - The same is true for regulatory measures
    - e.g. measuring the impact of access regulation on telecommunication investment becomes (negatively) significant only after controlling for reverse causality
- Generally solved by instrument variable approaches or quasi natural experiments (e.g. unexpected plant closure)
Example Railway Industry: Background and Motivation

• The EU Commission’s “Third Railways Package” foresees market opening of the European long-distance passenger rail sector after 2010

• European rail operators initiated or plan co-operations on long distance passenger transport

• There was concern that this co-operation would be anti-competitive

• DB argued that this concern was unfounded because inter-modal competition from low-cost airlines (“LCAs”) servicing long-distance destinations provided sufficient competitive pressure
Example Railway Industry: Our Assessment

- Examine effect of LCA entry and operation on DB
  - Prices
  - Passenger numbers

- Large, representative panel data set
  - With a rich set of controls

- Grapple with endogeneity
  - Standard panel data methods
  - IV methods accounting for the possibility that LCA entry is a strategic response to DB pricing
Example Railway Industry: Data Set

- **DB Data**
  - Average first and second class ticket prices
  - Passenger numbers
  - For long-distance O&Ds wherein either the origin or destination (or both) lies within Germany

mostat: 207 O&Ds observed over a period of 22 months from January 2006 to October 2007: 4554 O&D-month observations

- **LCA competition: press releases and airline contacts**
  - LCA entry and operation
  - LCA presence in 2006

- **Control variables**
  - Population & fuel cost data: Eurostat, Statistisches Bundesamt
  - Train type, railroad costs and track data: DB Trassenpreise; EICIS
  - Driving duration: Marco Polo Route planner 06/07
  - Number of airline seats and flights: Arbeitsgemeinschaft deutscher Verkehrsflughäfen (ADV)
  - Flight duration and delay: Association of European Airlines (AEA); ADV; Lufthansa
Example Railway Industry: Descriptive Statistics – LCA Entry during Observation Period

16% of full sample (207 O&Ds) experienced LCA entries between January 2006 and October 2007.
Example Railway Industry: Circumstantial Evidence of LCA Entry

Effect on passenger numbers (second class) due to LCA entry in May 2007

Entry of LCA
Example Railway Industry: Panel Data Analysis – Model

Econometric model:

\[ y_{it} = \delta LCA_{it} + \gamma z_{it} + \lambda_t + \varepsilon_{it} \]

Where:

- \( i \): a given O&D pair
- \( t \): time
- \( y_{it} \): dependent variable, logarithm of
  - (i) passenger numbers (lpax), (ii) average ticket price (lavprice), (iii) revenue (lrev), (iv) passenger-kilometres (lpkm)
  - first class and second class
- \( LCA_{it} \): dummy variable equal to 1 in the period of entry and subsequent operation for those routes which experienced LCA entry over our observation period
- \( \delta \): key indicator of the analysis: long-term percentage change of \( y \) because of LCA entry
- \( z \): vector of control variables
- \( \lambda_t \): control variable for seasonal effects
- \( \varepsilon_{it} \): the error term
Example Railway Industry: Panel Data Analysis – Endogeneity of Entry

- LCA entry is a strategic decision
  1. Entry $\rightarrow$ lower price (negative relation/correlation between entry and prices)
  2. High price $\rightarrow$ entry of LCA (positive relation/correlation between entry and prices)

- We are interested to identify effect 1

- In order to correctly support an antitrust analysis, the empirical methodology must account for this endogeneity and separate the effects!
  - We use instrumental variables
  - Instruments is the number of LCAs operating into or out of the destination (origin), to or from a city other than the origin (destination) corresponding to O&D $i$ at time $t$. 
Example Railway Industry: Effect of LCA Entry – Summary of Results

- **Passengers - second class**
  - Statistically and economically significant negative effect on passenger numbers
  - 7%-17% decrease of passenger numbers, depending on dataset

- **Passengers - first class**
  - Negative effect on passenger numbers less pronounced
  - Up to 18%, depending on dataset

- **Prices**
  - Strategic entry is important
  - *After* accounting for strategic entry (endogeneity), LCA entry results in significantly lower prices in both the first and second class. Price effects vary between 16% and 27%
Example Railway Industry: Conclusions

Policy conclusion

- LCAs induce substantial competitive pressure
- Competitive pressure can be observed in first and second class and has an effect on both passenger numbers and prices
- Intermodal competition has to be part of a competitive assessment of future rail alliances

General Issues

- “Simple” treatment effect approach (see Angrist/ Pischke 2010)
- But ex post assessment: what do we learn for the world post liberalization?
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Measuring Competition – Dynamic Effects (Example Pharmaceutical Industry)

• Many areas of competition policy involve **ex post assessment**
  – Abuse of dominant position cases (102 TFEU)
  – Horizontal agreements (101 TFEU)

• But what about areas which involve an **ex ante assessment**:
  – Merger assessments
  – State aid cases
  – Or implications of regulatory measures on infrastructure investment?

• Here a major issue is how to measure **the implications of measures taken today on the future**

• One approach are **simulation techniques**
Example Pharmaceutical Industry: Pharmaceutical Innovation and Pricing Regulation

- In the context of healthcare cost-containment efforts, pharmaceutical products are increasingly subject to strict pricing and reimbursement conditions in many European countries and likely the U.S.

- Relatively little attention has been paid to the (potentially adverse) consequences that pricing and reimbursement regulation may have on pharmaceutical innovation:
  - affects on the number and characteristics of drugs that will be launched in the market in the future?
  - Tension between the global nature of pharmaceutical innovation and the national nature of pricing regulation?

- We set out to evaluate the effect of pricing regulation on innovation in the pharmaceutical industry by performing policy experiments in the context of a (semi-) dynamic decision tree model.
Example Pharmaceutical Industry: Development process: Costly, long-lasting, and risky process

- Phase I
- Phase II
- Phase III

Therapeutic Area 1
Therapeutic Area 2
... Therapeutic Area N

Highly innovative project
Other project

Cluster of highly innovative projects
Lead highly innovative project
Back-up highly innovative projects
### Example Pharmaceutical Industry: Selected Pricing and Reimbursement Regulatory Schemes in Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>External Price Benchmarking</th>
<th>Internal Reference Pricing</th>
<th>Value-Based Pricing</th>
<th>Other Schemes</th>
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<tbody>
<tr>
<td>Czech Republic</td>
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<td>Denmark</td>
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<td>Germany</td>
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<td>Market-based pricing of highly innovative, on-patent, drugs</td>
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<td>Netherlands</td>
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<td>Risk sharing (conditional pricing)</td>
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<td>Poland</td>
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<td>Cost-plus price regulation</td>
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<td>Pharmaceutical Price Regulation Scheme (PPRS) Risk sharing (conditional pricing)</td>
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Example Pharmaceutical Industry: Pricing Regulation Around the World

Regions and pricing regulation

**Region A**
- Internal Reference Pricing (IRP)

**Region B**
- External Price Benchmarking (EPB)

**Region C**
- Market-Based Pricing, Low Willingness to Pay

**Region D**
- Market-Based Pricing, High Willingness to Pay

\[ P^I = \lambda \cdot P^F \]

\[ P^E = \sum_{j \in \{A, C, D\}} w_j \cdot P_j \]
Example Pharmaceutical Industry: Drug Development
A Project’s Market Launch

• Net sales of a drug:

$$\max \left\{ \sum_{j \in \{A, B, C, D\}} \left( P_j - c \right) * Q_j \left( P_j \right), \sum_{j \in \{A, B, D\}} \left( \hat{P}_j - c \right) * Q_j \left( \hat{P}_j \right) \right\}$$

• Launch in Region C?
  - Trade-off between gaining net sales in Region C and losing net sales in Region B (EPB)
### Example Pharmaceutical Industry: Policy experiments

*...after solving the model and calibrating*

<table>
<thead>
<tr>
<th>Policy Scenario</th>
<th>Market-Based Pricing</th>
<th>Internal Reference Pricing</th>
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<tbody>
<tr>
<td>Number of potential projects</td>
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<td>Highly innovative</td>
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<td>32 30 29 26</td>
<td>54 49 51 45</td>
</tr>
<tr>
<td>Expected number of projects launched</td>
<td>13.98 12.92 12.68 11.38</td>
<td>21.94 20.15 20.64 18.61</td>
</tr>
</tbody>
</table>
Example Pharmaceutical Industry: Policy Experiments

Value of the selected portfolio

- As a result of Internal Reference Pricing, the value of the selected portfolio moves from USD 24,808m under Market-Based Pricing to USD 21,912m—a drop of 11.7%

- As a result of External Price Benchmarking, the value of the selected portfolio moves from USD 24,808m under Market-Based Pricing to USD 23,389m—a drop of 5.7%

- As a result of Pricing Regulation, the value of the selected portfolio moves from USD 24,808m under Market-Based Pricing to USD 19,904m—a drop of 19.8%
Example Pharmaceutical Industry: Conclusions

Policy conclusion

• Pricing and reimbursement regulation affects pharmaceutical innovation, by
  - Reducing the value of pharmaceutical projects and the resources available to carry them out
• The benefits of more affordable or cost-effective drugs must be traded against the costs of less pharmaceutical innovation
  - Fewer projects are developed in general
  - Different therapeutical areas will be developed

General Issues

- Specific model assumptions and calibration requirements
- Sensitivity analysis important
- But: forward looking and potentially this is the only way possible for quantification (see Nevo/Whinston 2010)
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- There are many complicating effects when measuring competition
  - Endogeneity and dynamics
  - Specific issues in regulated industries – prices are (partially) regulated
  - (Semi-)public firms with different objective function – social objectives, turnover maximization
  - Network effects and 2SM, etc.
- Within an adversarial environment there are is an trade-off between accuracy vs. practicality…
- …and who holds the information
- In general in Europe
  - An accepted canon of robust methods to measure competition exists (e.g. see Davis et al. 2010)
  - Economic assessment has identification power
  - Economic analysis has raised the standard of the competitive assessment to the benefit of competition policy
Thank you!

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