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# Measuring the Economic Effects of Cartels in Developing Countries

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# The context

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Is there a positive impact of the antitrust enforcement in developing economies?

- **NO** because
  - Competition law enforcement can be too costly with respect to the benefits
  - Competition law implies too much competition from outside firms because it requires free trade, but national champions must be protected
  - Too much competition reduces profits, hence investments
  - Market specifics (e.g. scale economies) and failures call for market intervention

# The context

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Is there a positive impact of the antitrust enforcement in developing economies?

- **YES**

- There is evidence that the impact of cartels might be significant:
  - M. Levenstein, V. Suslow and L. Oswald (2003)
  - F.Jenny (2006)
  - J. Connor (2010)

- **BUT**

- An objective and global measure of the economic harm to consumers is still missing

# Our Research

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- Sets a significant database on cartels in developing countries
- Develops and employs a more precise method to evaluate the economic harm to consumers caused by these cartels
- Provides a **lower** bound of the **aggregate measure** of the economic harm

# Terms

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- **Cartel** - an agreement between firms to fix their prices or market shares in order to increase total profits ('hard core' cartel)
  - Clearer damage to consumers
  - Illegal in majority of jurisdictions
- **Economic harm** - cartel excess profits resulted from price overcharges
- **Price overcharge**- measured as a share of the cartel price

# Research outline

| Step  | Description  | Output   |
|---|--|--|
| Step 1. Data collection                                     | <ul style="list-style-type: none"><li>• Gathering of the existing knowledge</li><li>• Questionnaire</li></ul>  | Comprehensive database on cartels containing necessary micro and macro data  |
| Step 2. Estimation of missing price overcharges             | <ul style="list-style-type: none"><li>• Application of the original methodology on a case by case basis to recover missing price overcharges</li></ul>   | Competitive (“but for/counterfactual”) prices and market shares<br>-> price overcharge<br>-> cartel excess profits |
| Step 3. Estimation of the aggregate impact of cartelization | <ul style="list-style-type: none"><li>• Aggregation of the obtained measures of cartel excess profits</li><li>• Comparison to the GDP and to the budget of the competition authority</li><li>• Estimation of the deterrence rate</li></ul> | Estimation of the aggregated economic effect of cartelization [min bound]  |

# Countries and cartels covered by the Research

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## Selection criteria

Active state of the competition authority and sufficiency of the expertise for the period 1995-2013

## Selected countries

Argentina, Brazil, Chile, Colombia, Egypt, El Salvador, Indonesia, Kazakhstan, South Korea, Kenya, Malawi, Mauritius, Mexico, Pakistan, Peru, Russia, South Africa, Tanzania, Turkey, Ukraine, Zambia, Zimbabwe

**Total: 22 countries, 249 cartels**

# Step 1. Data collection

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- **Existing knowledge** (database of J. Connor, UNCTAD, OECD, annual reports, etc.)
- **Questionnaire:**
  - **List of major ‘hard core’ cartels for the period 1995-2013**
  - **Detailed data on each cartel** (members and nationality, period of existence, date of discovery, data on prices, market shares and sales)
  - **Industry data** (non-cartel companies, their volumes and prices (before, during and after cartelization))
  - **Budget of the competition authority**



# Descriptive statistics of the collected sample

| Variable                 | #obs. | Mean | Median | St. dev. | Min | Max  |
|--------------------------|-------|------|--------|----------|-----|------|
| Duration, months         | 185   | 46   | 27     | 50       | 1   | 420  |
| Number of cartel members | 200   | 15   | 5      | 37       | 2   | 300  |
| Price overcharge, %      | 83    | 23.1 | 20.0   | 14.6     | 2.4 | 75.0 |

Compared to developed countries (Connor (2011)):

- Similar median number of cartel members (5)
- Shorter median cartel duration (27 months vs 50 in the North America and 70 in the E.U. )

## Step 2.1 Estimation of price overcharges: calibration of demand and supply parameters

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Differentiated product market with LOGIT demand and  $J$  firms  
with constant marginal costs forming the cartel

$$\text{Demand: } U_{ij} = \delta_j - \alpha p_j + v_{ij}, \quad \forall i \in N, j \in \overline{0, J}$$

$$\text{Supply: } \Pi_j = (p_j - c_j)q_j - FC_j \quad \forall j = \overline{1, J}$$

# Step 2.1 Estimation of price overcharges: calibration of demand and supply parameters

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Recover from the market data

①  $\ln(s_j) - \ln(s_o) = \delta_j - \alpha p_j, \quad \forall j = \overline{1, J}$   
(Demand equation, Berry 1994)

②  $p_j^{cartel} - c_j = 1/\alpha s_o, \quad \forall j = \overline{1, J}$   
(Cartel's profit maximization problem)

To solve the system we need 2 parameters to be set exogenously:

- Relative/brute cartel margin
- Share of the outside option

Under hypothesis:

$$p_j^{cartel} - c_j = const, \quad \forall j = \overline{1, J}$$

## Step 2.1 Estimation of price overcharges: cross check for demand and supply parameters

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- Market/industry knowledge
- Control parameters
  - e.g. elasticity
- Additional model constraint:
  - Positive marginal costs:

$$|\epsilon_d| > p^{\text{cartel average}} / \text{Min}\{p_i^{\text{cartel}}\}, \quad \forall i = \overline{1, J} \quad \text{where } p^{\text{cartel average}} = \sum_{i=1}^J s_i * p_i^{\text{cartel}}$$

## Step 2.2 Estimation of price overcharges: simulation of the competitive state

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Competitive equilibrium:

$$① \frac{p_i - c_i}{p_i} = \frac{1}{|\epsilon_i|} = \frac{1}{\alpha p_i (1 - s_i)}, \quad \forall i = \overline{1, J}$$

$$\longrightarrow p_i^{compet}, s_i^{compet} \quad \forall i = \overline{1, J}$$

$$② s_i = \frac{\exp(\delta_i - \alpha p_i)}{1 + \sum_{j=1}^J \exp(\delta_j - \alpha p_j)}, \quad \forall i = \overline{1, J}$$



- **Price overcharge**, and also
- Output effect
- Consumers welfare losses

# Estimation results – 11 cartel cases

| Industry (country)               | Period of existence | Price overcharge |        | Output losses |        |
|----------------------------------|---------------------|------------------|--------|---------------|--------|
|                                  |                     | Min              | Max    | Min           | Max    |
| Civil airlines (Brazil)          | Jan'99-Mar'03       | 3.20%            | 33.90% | 10.00%        | 24.2%  |
| Crushed rock (Brazil)            | Dec'99-Jun'03       | 3.40%            | 11.25% | 15.69%        | 25.80% |
| Security guard services (Brazil) | 1990-2003           | 4.80%            | 27.84% | 14.93%        | 23.15% |
| Industrial gas (Brazil)          | 1998-Mar'04         | 4.12%            | 29.96% | 5.00%         | 22.77% |
| Steel bars (Brazil)              | 1998-Nov'1999       | 5.49%            | 37.84% | 10.99%        | 27.81% |
| Steel (Brazil)                   | 1994-Dec'99         | 13.55%           | 40.13% | 5.00%         | 29.22% |
| Medical gases (Chile)            | 2001-2004           | 37.50%           | 49.40% | 2.00%         | 14.93% |
| Petroleum products (Chile)       | Feb'01-Sep'02       | 4.57%            | 9.90%  | 10.43%        | 23.35% |
| Construction materials (Chile)   | 20 Oct'06           | 47.78%           | 83.48% | 7.24%         | 22.95% |
| Petroleum products II (Chile)    | Mar'08-Dec'08       | 1.78%            | 11.13% | 9.63%         | 18.99% |
| Cement (Egypt)                   | Jan'03-Dec'06       | 28.20%           | 39.3%  | 5.00%         | 10.00% |
| Average for the category         |                     | 14.04%           | 34.01% | 8.68%         | 21.94% |
| Average                          |                     | 24.02%           |        | 15.41%        |        |
| Median                           |                     | 18.6%            |        | 16.9%         |        |

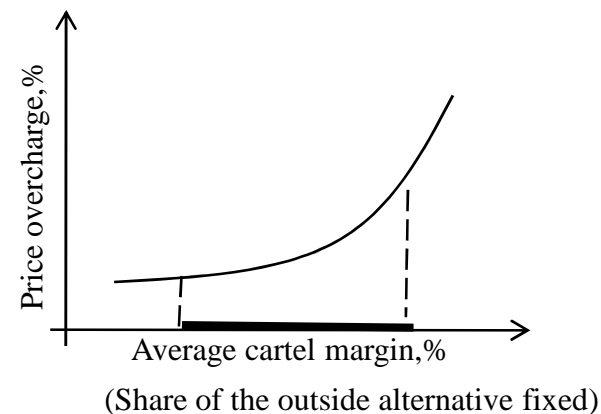
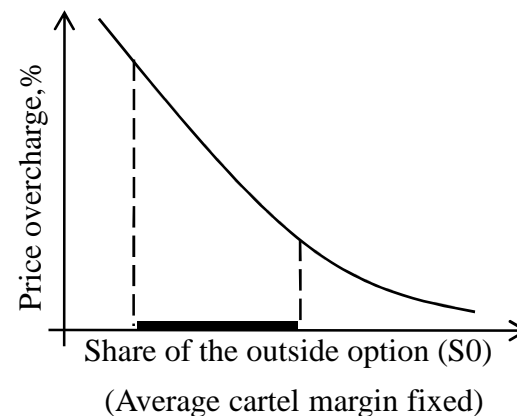
# Role of the exogenous parameters

## Exogenous parameters:

- Average cartel margin (AM)

$$AM = \sum_1^J s_i^{cartel} \frac{(p_i^{cartel} - c_i)}{p_i^{cartel}}$$

- Market share of the outside alternative ( $s_0$ )



# Aggregation of the economic impact

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1. Take the recovered price overcharge estimates into account
2. Supplementary data treatment
  - Missing values (sales, cartel excess profits)
  - Denomination
3. Allocation of cartel excess profits
4. Aggregation of the estimated economic harm
5. Relation to corresponding GDP and competition authority budget



# Illustration of the cartel allocation principle (Brazil, 1995-2005)

|                                       | '95 | '96 | '97 | '98 | '99 | '00 | '01 | '02 | '03 | '04 | '05 |
|---------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Civil airlines                        |     |     |     |     |     |     |     |     |     |     |     |
| Retail fuel dealers (Goiania)         |     |     |     |     |     |     |     |     |     |     |     |
| Retail fuel dealers (Florianopolis )  |     |     |     |     |     |     |     |     |     |     |     |
| Retail fuel dealers ( Belo Horizonte) |     |     |     |     |     |     |     |     |     |     |     |
| Retail fuel dealers (Recife)          |     |     |     |     |     |     |     |     |     |     |     |
| Industrial gas                        |     |     |     |     |     |     |     |     |     |     |     |
| Hermetic compressors                  |     |     |     |     |     |     |     |     |     |     |     |
| Security guard services               |     |     |     |     |     |     |     |     |     |     |     |
| Crushed rock                          |     |     |     |     |     |     |     |     |     |     |     |
| Steel                                 |     |     |     |     |     |     |     |     |     |     |     |
| Steel bars                            |     |     |     |     |     |     |     |     |     |     |     |
| Air cargo                             |     |     |     |     |     |     |     |     |     |     |     |
| Construction materials (sand)         |     |     |     |     |     |     |     |     |     |     |     |
| Maritime hose                         |     |     |     |     |     |     |     |     |     |     |     |

# Aggregated measures of the cartels' economic impact

| Country                  | Aggregated excess profits / GDP, % |               | Affected sales/ GDP, % |               | Aggregated excess profits / CA Budget |             |
|--------------------------|------------------------------------|---------------|------------------------|---------------|---------------------------------------|-------------|
|                          | Average                            | Max (year)    | Average                | Max (year)    | Average                               | Max (year)  |
| Brazil (1995-2005)       | 0.21%                              | 0.43% (1999)  | 0.89%                  | 1.86% (1999)  | 308                                   | 1232 (1998) |
| Chile (2001-2009)        | 0.06%                              | 0.23% (2008)  | 0.92%                  | 2.63% (2008)  | 23                                    | 91 (2008)   |
| Colombia (1997-2012)     | 0.001%                             | 0.002% (2011) | 0.01%                  | 0.01% (2011)  | 7                                     | 36 (2006)   |
| Indonesia (2000-2009)    | 0.04%                              | 0.09% (2006)  | 0.50%                  | 1.14% (2006)  | 29                                    | 58 (2004)   |
| Mexico (2002-2011)       | 0.01%                              | 0.02% (2011)  | 0.05%                  | 0.11% (2011)  | 7                                     | 19 (2011)   |
| Pakistan (2003-2011)     | 0.22%                              | 0.56% (2009)  | 1.08%                  | 2.59% (2009)  | 245                                   | 518 (2008)  |
| Peru (1995-2009)         | 0.002%                             | 0.007% (2002) | 0.01%                  | 0.023% (2002) | 6.44                                  | 25 (2004)   |
| Russia (2005-2013)       | 0.05%                              | 0.12% (2012)  | 0.24%                  | 0.67% (2012)  | 0.58                                  | 1.45 (2008) |
| South Africa (2000-2009) | 0.49%                              | 0.81% (2002)  | 3.74%                  | 6.38% (2002)  | 124                                   | 214 (2005)  |
| South Korea (1998-2006)  | 0.53%                              | 0.77% (2004)  | 3.00%                  | 4.38% (2004)  | 144                                   | 214 (2004)  |
| Ukraine (2003-2012)      | 0.03%                              | 0.03% (2011)  | 0.15%                  | 0.16% (2011)  | 0.84                                  | 0.88 (2011) |
| Zambia (2007-2012)       | 0.07%                              | 0.09% (2007)  | 0.18%                  | 0.24% (2007)  | 11                                    | 27 (2007)   |
| Average                  | 0.14%                              |               | 0.9%                   |               | 76                                    |             |

# Our estimates represent the very minimal bound of the potential economic harm to consumers

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- Missing data on detected cartels (no records, confidentiality issues, etc.)
- No output or quality effects
- No price umbrella effects
- No impact proliferation on other industries
- Hidden nature of cartels
  - Deterrence rate 24% (methodology from Combe et al (2008))