Chapter E – Market Power

Competition Policy and Strategy – German Title: Wettbewerbspolitik und -strategie

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English version of my 2020 lecture

Market Power

- Following the EC's Guidelines on the application of Article 81(3) of the Treaty, par. 25, (Art. 81 is now Art. 101 TFEU) market power is defined as follows:

  > *Market power is the ability to maintain prices above competitive levels for a significant period of time or to maintain output in terms of product quantities, product quality and variety or innovation below competitive levels for a significant period of time.*

- Prices above marginal costs are no unambiguous sign of market power as firms have to cover fixed costs.
- Market power leads to lower allocative efficiency, loss in welfare
- That is why we have competition policy and regulate monopolies!

Market Power – Measurement

- Rearranging FOC from monopolist's profit maximization problem gives Amoroso-Robinson Condition: $LI(q_M) = \frac{1}{\eta}$ (Ch. A.2).
- Lerner-Index in Cournot:

$$\max_{q_i} \pi_i(q_i) = (p(q_i, q_{-i}) - c_i)q_i \Rightarrow \frac{p - c_i}{p} = -\frac{\mathrm{d}p}{\mathrm{d}q_i}\frac{q_i}{p}.$$

- Expand with $\frac{\mathrm{d}Q}{\mathrm{d}Q}\frac{Q}{Q}$. We have $Q = \sum_{j=1}^{n} q_i$ such that $\frac{\mathrm{d}Q}{\mathrm{d}q_i} = 1$. It follows that:

$$LI_i = \frac{1}{\eta}\frac{q_i}{Q}.$$

- The ability to exert market power decreases
  - in (own-)price elasticities η.
  - in i's market share, $\frac{q_i}{Q}$.
- Market share as Proxy for market power

Market Power – Measurement

- Concentration rate CR_x: sum of the market shares m of the the x largest firms:

$$CR_x = \sum_{i=1}^{x} m_i.$$

- Herfindahl-(Hirschmann-)Index (HHI): sum of the squared market shares of all firms in the market:

$$HHI = \sum_{i=1}^{n} m_i^2.$$

- Market share m_i computed based on
  - Quantity: $m_i = \frac{q_i}{Q}$.
  - Revenue: $m_i = \frac{p_i q_i}{\sum_{j=1}^{n} p_j q_j}$.
- We have $CR_x \in (0\%, 100\%]$ and $HHI \in (0, 10000]$.
- HHI is sensitive to high market shares due to ^{2}:
  - $(m_1, m_2, m_3, m_4) = (0.25, 0.25, 0.25, 0.25)$ gives $CR_4 = 100\%$ and $HHI = 2500$.
  - $(m_1, m_2, m_3, m_4) = (0.85, 0.05, 0.05, 0.05)$ gives $CR_4 = 100\%$ and $HHI = 7300$.

Market Power – Measurement

- Lerner-Index in practice:
  - Determining marginal costs/price elasticities can be a difficult exercise.
  - Underestimation of market power when marginal costs are inflated due to inefficiency arising from market power.
  - Overestimation of market power when fixed costs are high.
- A firm's market shares gives hints about its market power (LI in oligopoly).
- However, single market share do not give a clear picture about market structure.
- Hints on market structure using CR_x and HHI.
- Note that:
  - Market definition important to determine the relevant market, in particular, relevant competitors
  - Static view on market shares

Market Power – Effects

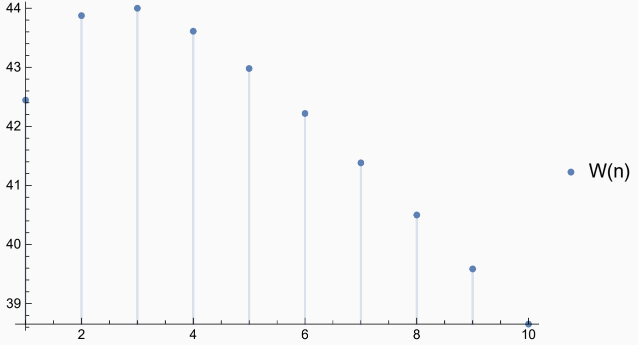
- Market power and prices decrease in the number of firms.
- Caveat: duplicate fixed costs.
- Assumptions
  - Demand for homogeneous good $q = M(a - p)$, where M determines market size
  - Cost function $C(q) = F + cq$
  - Cournot
  - n symmetric firms
- Equilibrium profits $\pi_i^* = M\left(\frac{a-c}{n+1}\right)^2 - F$.
- With free market entry (long run):

$$\pi_i^* \overset{!}{=} 0 \;\Leftrightarrow\; n^* = \pm(a-c)\sqrt{\frac{M}{F}} - 1.$$

- Welfare: $W(n) = \frac{n+1}{2}\left(\frac{(a-c)^2 M(n+3)}{(n+2)^2} - 2F\right)$.
- Welfare-maximizing number of firms: $n_W := \arg\max_n W(n)$.

Market Power – Effects

- With $(a, M, c, F) = (10, 1, 0, 1)$, we have $n^* = 9$ and $n_W \approx 3$.
- Due to duplication of fixed costs, the relationship between the number of firms and welfare is non-monotonic



Market Power – Contestable Markets

- Consider a market for a homogeneous good.
- Production entails fixed costs F.
- Two identical firms can produce the product:
    - A monopolist, the so-called **Incumbent** I, is already active.
    - Another firms, the so-called **Entrant** E, potentially enters the market.
- Two stage game
    1. I sets price p_I. Relevant cases: $p_I > AC$ and $p_I = AC$.
    2. E sets price p_E in case of entry. If no entry, zero profits
- If E enters the market, firms compete á la Bertrand.

Market Power – Contestable Markets

- Backwards induction: analyse second stage first
- If $p_I > AC$ ...
  - ... E enters the market with $p_E = p_I - \epsilon$, $\epsilon \to 0$. Then, $\pi_E \geq 0$ and $\pi_I = -F$. Alternatively, ...
  - E does not enter the market and realizes zero profits.
- If $p_I = AC$ ...
  - ... E enters the market with $p_E = p_I - \epsilon$, $\epsilon \to 0$. Then, $\pi_E < 0$ and $\pi_I = -F$. Alternatively, ...
  - E does not enter the market and realizes zero profits.
- Subgame-perfect Nash-Equilibrium: I sets $p_I = AC$ and realizes zero profits, E does not enter.
- The threat of market entry (contestability) eliminates monopolists' market power

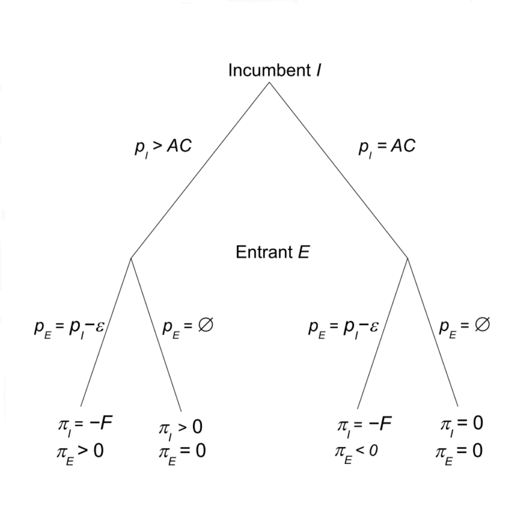


Figure 1: Extensive Form of the game

Market Power – Contestable Markets

- Suppose that E bears sunk costs *entry costs* S in case of entry.
  - This leads to $AC_I < AC_E$.
  - I can deter market entry with $p_I = AC_E$.
  - Given that $AC_I < AC_E$, $\pi_I = (AC_E - AC_I)q(AC_E) > 0$, i.e., I realizes profits.
  - *Entry deterrence*: monopolist chooses prices in a way that entry is deterred (if $S = 0$, no harm to consumers).
  - The higher entry costs S the higher AC_E and π_I. This means that market power increases in entry barriers (here: entry costs).
  - When entry costs are very high, monopolist can deter entry by charging monopoly prices (blockaded entry).
- Does not hold in Cournot: best response $q_E(q_I) = 0$ only if q_I is as in perfect competition *entry deterrence* requires first-mover advantage (Stackelberg Competition)
- Market entry can also be deterred when I can change prices after entry occurs. Then, threatening to deter entry is sufficient and monopolist can charge monopoly prices

Market Power – Switching Costs

- Swichting costs: consumer incurs costs when switching supplier
  - Transaction/learning costs (Search for new supplier, get used to new good, etc.)
  - Contracts
  - Uncertainty about quality
  - Behavioral effects (e.g., status quo bias)
- Competition for the market, stylized example (Klemperer, 1995 RoES):
  - N consumers have willingness to pay R for homogeneous good
  - Two symmetric firms $i \in \{A, B\}$, constant marginal costs c.
  - Consumers buy in period $t = 1$ and $t = 2$.
  - Switching costs s if consumers switches from firm i to firm j
  - Firms set prices (similar results for firms choosing quantities)
  - Share of consumers buying from firm i in $t = 1$ (market share in $t = 1$) reads $\sigma_i = 1 - \sigma_j$.
  - Assumption (i): $s \geq R - c > 0$.

Market Power – Switching Costs

- Backwards induction
- Period $t = 2$: share σ_i (σ_j) bears switching costs s when switching to firm j (i).
- In $t = 2$, both firms charge monopoly price R such that $\pi_i = \sigma_i N(R - c)$ in equilibrium for all i
    - If $p = R$, consumer's net utility in $t = 2$ is $R - p = 0$ in equilibrium.
    - To attract costumers of firm j, firm i would have to set $p_i \leq R - s$.
    - Setting $p = R - s < R$ is optimal iff

$$N(R - s - c) \geq \sigma_i N(R - c) \;\Leftrightarrow\; (1 - \sigma_i)(R - c) \geq s.$$

    - This is ruled out by Assumption (i), $s \geq R - c$: For sufficiently high switching costs s, firms charge monopoly prices in $t = 2$.
- Consumers anticipate that in $t = 1$.

- For analysis of $t = 1$, only firm i is considered.
- From the viewpoint of $t = 1$, i maximizes present value V of per-period profits π_1 and π_2. Profits in $t = 2$ are discounted by $\delta \in [0, 1]$.
- To determine which price i charges in $t = 1$, maximize present value with instrument p_1:

$$\max_{p_1} V(p_1, p_2) = \pi_1(p_1) + \delta \pi_2(p_2, \sigma(p_1)).$$

- FOC:

$$\frac{\partial V}{\partial p_1} = \frac{\partial \pi_1}{\partial p_1} + \delta \frac{\partial \pi_2}{\partial \sigma} \frac{\partial \sigma}{\partial p_1} \overset{!}{=} 0. \tag{1}$$

- Note that:
  - Market share of firm i in $t = 1$ is decreasing in p_1: $\frac{\partial \sigma}{\partial p_1} < 0$.
  - Profits in $t = 2$ are increasing in market shares in $t = 1$: $\frac{\partial \pi_2}{\partial \sigma} > 0$.
  - Profits in $t = 2$ are thus implicitly decreasing in p_1 ($\frac{\partial \pi_2}{\partial \sigma} \frac{\partial \sigma}{\partial p_1} < 0$).
- It has to hold that $\frac{\partial \pi_1}{\partial p_1} > 0$ for (1) to be satisfied.
- For $\frac{\partial \pi_1}{\partial p_1} > 0$, profits are increasing in p_1. Due to second period, prices in period 1 are lower than prices that would maximize first-period profits in isolation (here, $\frac{\mathrm{d}\pi_1}{\mathrm{d}p_1} = 0$).

Market Power – Network Effects

- Network Effects (NE): the utility of one user of a network depends on the number of users on the same node/side of the network (direct NE) or on the number of user/applications on other nodes/sides of the network (indirect NE).
- Examples:
    - Social Media: utility of each user increases in the number of active users on the platform (direkte NE).
    - Auction platforms: utility of buyers increases in the number of sellers and vice versa (indirekte NE).
    - Operating systems or gaming consoles: utility of user of an operating system/gaming console increases in the number of available applications/games developed for the operating system (indirekte NE).

Market Power – Network Effects

- Market Tipping: if network i reaches a certain amount of users, it becomes more and more popular due to NE and competing platforms lose users/popularity ("winner takes all").
- Excess Inertia or persistence of market power can be the consequence. However, there are cases where several networks (systems, standards, etc.) coexist (gaming consoles, credit cards, etc.).
- See also Chapter I.