Market Power in Electricity Generation and Transmission

Prepared by
Diana KORSAKAITE

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Different market designs - examples

- Perfect competition
- Monopoly
- Monopolistic competition
- Oligopsony
- Oligopoly
- Monopsony
How monopoly is born?

**Monopoly** – the only supplier of a product, having no close substitutes, all over the market.

**Barriers to entry the market** – the reason, why other entities do not come to the market, and the monopoly persists.

**Sources of entry barriers:**
- Essential resource, owned/controlled by monopoly;
- Exceptional rights to engage the activity, granted by Government;
- Structure of production costs, enabling one entity to operate more efficiently than two or more;
- Growth through mergers and acquisitions.
Comments on sources of monopoly

**ESSENTIAL RESOURCE** – due to economic processes’ globalization, in practice there is a few of examples, control over essential resource being the only one source of monopoly persistence.

**STATE PROTECTION** – enjoying monopoly deliver both, gains through encouraged anticipated behavior and flaws through monopolistic price-making.

**NATURAL MONOPOLY** – representing essential economic conflict: large number of active economic entities - mandatory prerequisite to competitive market – contradicts to lowest cost of production – the benefit delivered via competitive market, which in the case of NM is ensured while active a single entity.

**EXTERNAL GROWTH** – through mergers, acquisitions, takeovers increases concentration of the industry, enables entity to accrue market power against other market participants, and to obtain incentives and possibilities to develop new barriers preventing entry.
Monopoly price making

- Consumer surplus
- Producer surplus
- Deadweight loss

$P$ vs. $Q$ graph with $P_M$ and $P_C$, $Q_M$, $Q_C$, $MR$, and $MC$.
Consequences of monopoly

Monopoly profit affects the distribution of surplus shared by beneficiaries, but does not reduce the whole amount of economic surplus received after the transaction in question.

- Problem is - monopoly supplies quantity far less than the quantity maximizing the entire benefit of society, and therefore
- Total loss of a share of entire surplus is the real “bad news” to economist.
- If monopoly uses additional costs to preserve its monopoly status, the lost share of entire surplus is increased to the amount of these costs.
- The distribution of surplus after the transaction is a concern to policy makers, and regulators of course!
Monopoly entity has incentives and possibilities to apply prices higher than:

- prices in competitive market,
- marginal costs (MC),

This way overtaking partially or entirely the surplus of consumer, if compared to the surplus acquired by consumer in a competitive market.

In some – exceptional - cases monopoly might ensure effective (Paretto) resource allocation, however, in all cases, the allocation of welfare (surplus) calls for improvement.
Public Policy choices

- Transformation
- Regulation
- Abstaining
- Nationalization

4 choices
Regulatory mission and objectives – to put it simply

Best deal for consumers, via
  Competition –
    results long-lasting, sustainable, self-strengthening, non-depending on individuals, etc.
  Price-regulation –
    results re-confirmable periodically, depending on individualistic context, etc.
# Characteristics of competitive market as *public policy towards monopoly choice #1*

<table>
<thead>
<tr>
<th>Characteristics of competitive market as public policy towards monopoly choice #1</th>
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</thead>
<tbody>
<tr>
<td>Great number of small suppliers</td>
</tr>
<tr>
<td>Great number of small consumers</td>
</tr>
<tr>
<td>Products are (or almost are) homogeneous</td>
</tr>
<tr>
<td>No entry barriers</td>
</tr>
<tr>
<td>No exit barriers</td>
</tr>
<tr>
<td>Full awareness of suppliers</td>
</tr>
<tr>
<td>Full awareness of consumers</td>
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</tbody>
</table>

| Individual supplier is price-taker |
| Means of production are mobile |
| No scale economy in the market |
| Conditions of transactions are equal to all |
| Market is closed |
| Consumer is not only informed, but also able to understand information |
| Consumer is sure about his ongoing and future needs |
| Before the transaction, distribution of welfare is proper |
Supply in competitive market, short and long term as *public policy towards monopoly choice #1*

![Diagram showing supply in competitive market, short and long term](image)
Comments on competitive market as public policy towards monopoly choice #1

Prices go down to competitive level, in any time perspective
Competitive prices ensure nothing more than just normal economic profits
Quantity is not an issue of concern
Lost of economic surplus is not present
Distribution of welfare is satisfactory to all
Regulating the activity as *public policy towards monopoly choice #2*

Objectives of price-regulation:

- **Monopoly rent** shall be (fully or at least partially) *transferred to consumers*;
- **Ensure effectiveness of the supply side** – provide signals and incentives to providers and investors (the regulated) increase efficiency of activities;
- **Ensure effectiveness of the demand side** – provide signals and incentives to consumers to efficient usage of services;
- **Ensure adequate revenue** – foreseen potential opportunity to the regulated to earn enough revenue and attract capital;
- **Ensure fairness** – just and reasonable prices, increasing universal affordability of the product and non-distorting competitive environment.
Tasks of regulation, in very simplistic manner as public policy towards monopoly choice #2

In the most simple manner – to reduce the amount of lost welfare, resulting with monopoly pricing.
The first task (not the only one!) – to determine the “right” price,
The second task (not necessarily at the priority sequence) – to distribute the welfare „fairly“.

\[ \text{Tasks of regulation, in very simplistic manner as public policy towards monopoly choice #2} \]

\[ \text{MC} \]

\[ \text{Q} \]

\[ \text{max} \]

\[ \text{Q} \]

\[ \text{ef} \]

\[ \text{P} \]

\[ \text{P}_m \]

\[ \text{P}_\text{ef} \]

\[ \text{D} \]

\[ \text{M} \]

\[ \text{R} \]

\[ \text{Q}_\text{max} \]

\[ \text{Q}_\text{ef} \]
Comments on regulated monopoly as *public policy towards monopoly choice* #2

Natural monopoly – serving alone the whole market is more effective with respect to total costs than serving market by two or more entities.

Natural monopoly has a number of origin sources, however, in any case it tends to maximize profits and ensure monopoly surplus.

Task of regulation – to set prices ensuring breakeven point, and preventing collection of monopoly surplus.

Theoretically, the regulator perfectly knows the costs of the regulated monopoly, therefore, the task is straightforward.

Practically, the regulator needs to develop such a package of incentive-based mechanisms, that would extract the real information on monopoly present costs and would encourage monopoly to implement cost reductions in future.
### Monopoly and competitive market, at a glance

<table>
<thead>
<tr>
<th>Similarities</th>
<th>Competition</th>
<th>Monopoly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiming</td>
<td>Π max</td>
<td>Π max</td>
</tr>
<tr>
<td>Rule of maximization</td>
<td>MR=MC</td>
<td>MR=MC</td>
</tr>
<tr>
<td>Ekonomic profit at short term?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Differences

<table>
<thead>
<tr>
<th>Differences</th>
<th>Competition</th>
<th>Monopoly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of market participants</td>
<td>Many</td>
<td>One</td>
</tr>
<tr>
<td>Price</td>
<td>P=MC</td>
<td>P&gt;MC</td>
</tr>
<tr>
<td>Entity’s role in the market</td>
<td>Price taker</td>
<td>Price maker</td>
</tr>
<tr>
<td>Quantity, maximizing welfare?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ekonomic profit at long term?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Possible price discrimination?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## Other considerations to take (1)

### Risks:
- Market demand $D$ and price $P$
- Technological shifts in the market, outdating the active entities and making them noncompetitive
- Administration decisions on exploitation, personnel, investment, etc.
- Credit risk

### Regulated market
- **Consumers take the majority of risks,**
  - And thus way they get the majority of benefit, if regulator successfully manages the risks,
  - In the case of innovation, consumers pay the old technology bills either,
  - In demand falls below forecasted level, consumers pay higher prices to cover excessive capacities.

### Competitive market
- **Investors take majority of risks**
  - And thus way they get the majority of benefit, if take proper decisions,
  - Investors are the “owners” of technology risks,
  - Advance preparation to demand and price dynamics stipulate flexibility in decisions,
  - Exploitation plans are aligned to the forecasted price peaks – “sharpened pencil” effect due to profit motif !!!

### The main difference –
- the subject taking the risks
Other considerations to take (2)

Extreme poles of market organizational types – C and M. In practical terms – often matters “extent of competition”.

Intensity of competition is determined:
- Market structure,
- Behavior of market entities.

Effective competition

Competition – the means to maximize benefit of consumers:
- Efficiency criteria

Effective competition contents is better understood through the contrast non-effective competition:
- Anticompetitive practices in place (abuse of domination, collusions, concentration, etc.)
- Excess entry, duplication of infrastructure, etc.
Other considerations to take (3)

CARTELS
- Price fixing
- Output limiting
- Sharing of the market
- Coordinated price increase

MERGERS AND ACQUISITIONS
- Market concentration / capture
- Market power gaining / increase

STATE AID

ABUSE OF DOMINANT POSITION
- Output limiting
- Price discrimination
- Predatory pricing
- other

NON-EFFECTIVE MARKET

MONOPOLY / OLIGOPOLY

STATE OWNERSHIP UNDER COMPETTIVE MARKET
- Inside efficiency is increased – monopoly looses one of its greatest benefit, i.e. “quite life”,
- “informational monopoly” is removed,
- Possibilities and incentives for innovation.

ALLOCATIVE EFFICIENCY AND ECONOMY OF SCOPE
- What number of market participants maximizes the benefit of society?
- Can free entrance to market cause too high or too low number of market entries?
So, where does the market stand?

- Transitory, competition is projected;
- Competition will work, to some extent, in future;
- The entity is holding significant market power, enabling to act independently.

- Monopoly, competition is not projected;
- The entity is holding absolute market power, no challengers.
What is the public choice?

Competition in the market as public choice
- Expectations are related to competitive mechanism,
- Results are anticipated out of the interaction of entities, free entry, independent efforts, free-will contracts,
- Neither governments nor entities take full responsibility for prices, quality, etc.,
- The only privileged guaranteed for entities – the privilege to compete.

Single entity in the market as public choice
- Exceptional responsibility to ensure provision of service at quality, via license;
- Obligation is of wider scope than in the case of private entity;
- All possible forms of control - exercised;
- Protection against competition is offered in return;
- Society in general trusts long-term planning, exercised by the single company and by controlling subjects, in the context of privileges, responsibilities and public obligations.
As A.E. Khan put it in 70’s,

...the marriage of those concepts is difficult. Especially, when it is mixed marriage. However, mixed marriage is better than no marriage at all... Especially, when it can offer better standards and more efficiency ...
Where does the territory for competition stand?

Factors determining possibilities for competition to (non)develop:

- Cost structure in the sector,
- Economy of scope *per se* (in)capable to eliminate potential,
- Threat by potential competition,
- Cross-subsidies applied,
- Social aspects of economic assignments.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Potential for competition</th>
</tr>
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<tbody>
<tr>
<td>Electricity</td>
<td></td>
</tr>
<tr>
<td>Generation</td>
<td>Good</td>
</tr>
<tr>
<td>High-voltage transmission</td>
<td>Nil</td>
</tr>
<tr>
<td>Distribution</td>
<td>Nil</td>
</tr>
<tr>
<td>Supply</td>
<td>Good</td>
</tr>
<tr>
<td>Gas</td>
<td></td>
</tr>
<tr>
<td>Extraction</td>
<td>Good</td>
</tr>
<tr>
<td>Distribution</td>
<td>Nil</td>
</tr>
<tr>
<td>Supply</td>
<td>Good</td>
</tr>
<tr>
<td>Telecommunications</td>
<td></td>
</tr>
<tr>
<td>Local network</td>
<td>Moderate</td>
</tr>
<tr>
<td>Long-distance and Intl. network</td>
<td>Good</td>
</tr>
<tr>
<td>Services</td>
<td>Good</td>
</tr>
<tr>
<td>Water and Sewage</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Nil</td>
</tr>
<tr>
<td>Supply</td>
<td>Moderate</td>
</tr>
</tbody>
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*Baldwin, R., Cave, M.*
What is specific about power markets’ failures?

What is specific about power markets “failures”, in our case?

- Security of supply is not ensured – it is public good with accompanying consequences
- Anticipating the dynamics of fossil fuel prices in long-term (rising?) and short-termism of investment programs
- External effects of energy production, delivery, use (environmental issues)
- Failing to take into account interests of future generations
- Some markets are monopolistic by nature (conventional understanding) and consumers need to be protected against exploitation

If competition is the choice - the problem is that “it is impossible to identify what the outcome of a competitive market would be without letting competition to take place” (Kirzner, 1997)

As the consequence, regulatory regime might seem as having no firm anchor, regulatory objectives less clear, and more uncertainty generated to market entities. However, if to consider competition as a process of knowledge creation and discovery, regulator, instead of guessing the ideal perfect competition result and trying to emulate it, shall start the competitive process.
Variety of steps towards competitive electricity market

- Privatization
- Unbundling
- Horizontal restructuring
- Designation of ISO
- Establishment of wholesale market
- Unbundling of retail tariffs
Models of industry structure

- Vertically integrated monopoly
- Single buyer structure
- Wholesale competition structure
- Retail competition structure
Vertically integrated monopoly

Generation

Transmission & SO

Distribution

Consumption

Generation

Transmission & SO

Distribution

Consumption
Single buyer system
Wholesale competition

Transmission, SO WHOLESALE MARKET

IGS

Distribution

Large consumer

Consumption

Distribution

Large consumer

Consumption
Retail competition

Transmission, SO
WHOLESALE MARKET

Distribution
RETAIL MARKET

Supplier

DSO/Supplier

Supplier

DSO/Supplier

Supplier

Consumption

Consumption

Consumption

Consumption

Consumption
Considerations regarding market power

1 model:
- Fully concentrated within one entity and limited to regulatory boundaries;

2 model:
- “Life-long contract” for generators acting in monopsony market,
- The incumbent acts as the single buyer,
- Parties are limited by regulatory efforts;

3 model:
- Full competition (theoretically expected) in the wholesale level,
- Role of transmission system operator and “gate closure”;

4 model:
- Full competition (theoretically expected) in the wholesale and retail level,
- Role of transmission system operator and “gate closure”;
- Market power moves to consumers’ side.
Industry structure - which to choose?

Chosen industry structure –
- Matter of policy,
- Structural changes and reallocation of functions,
- Essentially different tasks to regulatory institution.

If the objective is competition in generation,
- 3 model is enough,
- however, to which extent?

If the objective is sustainable competition and long-lasting value to active consumers,
- 4 model is the choice,
- Ex ante role of regulator is underlined.
Determinants of Market Structure – Entry Barriers

Barriers to enter the power market (non-exhaustive list):

- Administrative – concessions, permits, licenses, procedures, NIMBY political and social obstacles,
- Environmental regulations / legislation (eg., hydro),
- Regulation per se – clarity, balance of rights, (un)certainty for new-comers and related cost of capital,
- Historical inheritance and acquaintance to technologies,
- experience, know-how, access to information & technologies,
- Investment as sunk costs;

Barriers could be even:

- Created by strategic behavior by incumbent.

Regulation is supposed to eliminate or at least reduce those barriers.
Determinants of Market Structure – Market Power at use

![Graph showing market power and market structure](image)

- Market Price
- DEMAND
- MW

Points labeled A to I represent different market prices and market power scenarios. The graph illustrates how changes in market structure affect prices and market power.
Market Power

Market power – ability of an entity to modify (manipulate) market price from the competitive level to its own benefit.

- Non-storability is important aspect here!
- “Normal price” or “expected price” is competitive equilibrium price.
- Benefit – substantial and durable.
- Existence of market power and abusing the market power are different phenomena.
- Existence of market power depends on market structure, and not on rules of the market.

In US, market power is “ability of on or more firms to profitably increase prices, reduce output, choice or quality of goods and services, diminish innovation, or otherwise influence parameters of competition”.

In EU, more widely used term is “dominant position”, and ECJ defines “economic strength enjoyed by undertaking which enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave to an appreciable extent independently of its competitors, customers, suppliers and ultimately of its consumers.”
Indices

Market concentration – $C_x$
- $C_4$, $C_{10}$,
- # of generators at 95% of the market,
- # of generators with ≥5% of the market

Industry concentration - $R_H$
- HHI at ranges, with 1800 a threshold

Indices, while serving as first idea to market concentration, do not provide info on sizeable impact on MP – amount of base-load, marginal capacity, technology mix, availability of manageable hydro resources, margin of supply over demand, etc.

Pivotal Supplier Indicator – $PSI_f$

Residual Supply Index - $RSI_f$

Number of hours during which the generator was marginal

Lerner Index - $L_I$

High value – a sign of market imperfection. Low value – not necessarily a decisive positive.
Market Power Exercises

How:
• Cooperative Models
  – Collusion
  – Cartel
• Strategic Competition
  – Limit pricing
  – Predatory pricing
  – Investment in over-capacity

Ways:
• Price is higher than competitive one
  – Attraction to new investment
• Price is lower than competitive one
  – Withdrawal of supply

Entry barriers are the decisive factor!
Mitigating the Market Power

- Divestment, partial
  - a. Prohibition to increase market share

- Freezing part of capacity revenue
  - a. Virtual power plant auction

- Facilitating entry of new entities

- Interconnection with neighboring markets

- Demand elasticity increase

To change market structure!
Regulatory actions at changing the industry structure

Accounting separation

Functional separation

Legal separation

Ownership separation
Regulatory actions to sustain and stimulate competition

- Market power / monitoring & actions is necessary
- Market entry control
- Universal service obligations
- Access to essential infrastructure
Final comments of TSO Market Power

Transmission grid operator has enormous market power, since:
- it is critical to power supply to consumers,
- but also it decides on maintenance of existing lines and development of new lines over time;

System operator takes decisions on
- secondary and tertiary reserves, using competitive mechanisms, preferably,
- balancing power and all the other ancillary services

Remuneration of TSO – as natural monopoly (?) –
- shall be regulated, and conditions for open non-discriminatory access to the grid shall be safeguarded.

Transmission grid preferably and SO imperatively shall be independent from market players.
THANK YOU FOR YOUR ATTENTION!

Diana KORSAKAITE

E-mail: korsakaitediana@yahoo.com

LinkedIn