Electricity deregulation in Israel: Is it likely to succeed?

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Background: Israel's electricity market characteristics

Service territory: 22,145 km^2

Population: 6.7 million

Israel Electric Corp (IEC): Integrated government-owned utility

A monopoly serving 2.2 million premises at rates set under cost-of-service regulation

IEC's system characteristics in 2003

- Installed capacity: 10,117 MW
- Peak demand: 8,570 MW
- Sales: 41,721 GWh
- Transmission: 400-kV grid
- No interconnection with neighboring countries
- Small but growing number of IPPs: 65MW installed

Key trends

- GDP growth: 3-5% per year for the next 10-15 years
- Electricity demand growth: 3-5% per year for the next 10-15 years, requiring annual addition of a new 500-MW plant
- High reliability critical to Israel's economy, particularly high-tech industry
- *Which policy initiative is more urgent: funding for expansion or market reform? The government chose the latter, which will be shown to be misguided*

Reform proposal

In June 2003, the Israeli government decided to implement a UK-style electricity market reform in two steps:

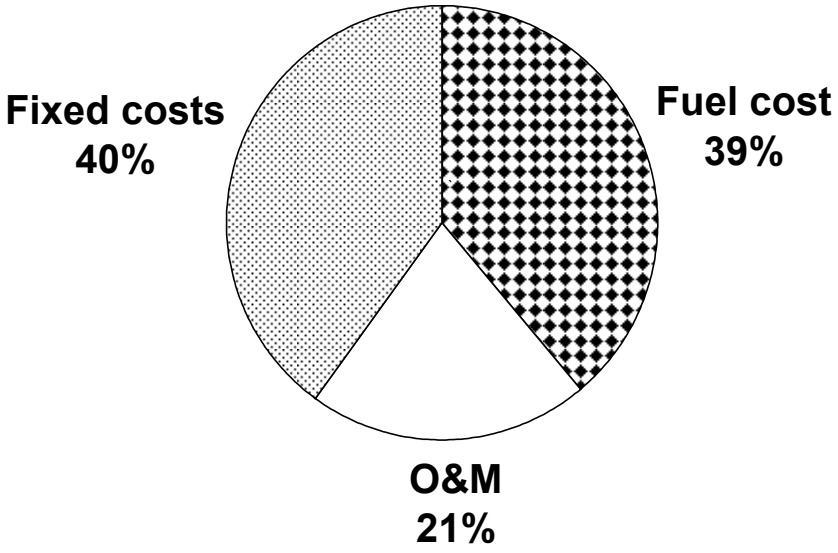
1. 2006: Unbundling generation, transmission, distribution, customer services
2. 2007- 2012: Deregulation followed by privatization

Research Objective

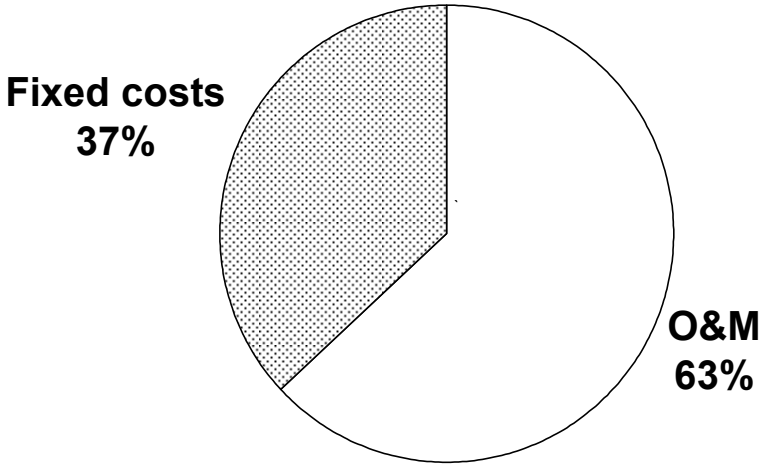
Compare prices, profits and consumer surplus by market regime: *regulation* vs. *deregulation*, thereby assessing if *deregulation* can improve the sector's performance.

Cost shares of electricity price (IEC) and telephony price (Bezeq) in 2003

IEC – electricity price



Bezeq – telephony price



What is the potential gain of deregulation?

Model setup: Two time-of-day market demands supplied by multiple firms using two technologies

- **Market demand:** $Q_t = a_t + b_t P_1 + d_t P_2$
  t = 1 (peak), t = 2 (off-peak)

- **Output of firm *j* by time-of-day:** Q_{ijt}
  i = 1 (CFG: coal-fired generation)
  i = 2 (CCGT: combined cycle gas turbine)
  t = 1 (peak), t = 2 (off-peak)

- **Cost:** $C_{ijt} = \theta_i + c_i Q_{ijt}$
  with $\theta_1 > \theta_2$ and $c_1 < c_2$

Regulation: Average cost ratemaking

Breakeven:
Total revenue = Total cost

Equilibrium:
Monopoly output by time-of-day period = Market demands at breakeven prices by time-of-day period

Deregulation: Cournot equilibrium

K identical firms, each uses *k* CFGs

N identical firms, each uses *n* CCGTs

(*N*+*K*) firms generate by time-of-day period according to the Cournot conjecture

Deregulated market prices

(when cross price elasticities are zero)

$$P_1 = \frac{a_1 + Kc_1 + Nc_2}{K + N + 1} \qquad P_2 = \frac{a_2 + Kc_1 + Nc_2}{K + N + 1}$$

If *K* or *N* increases, prices decline, thus lowering profits but raising consumer surplus

Application to Israel

Data assumptions

Total output in 2010: 58.7 million MWh based on an annual growth of 5%

Own (cross) price elasticities: -0.25 (0.05)

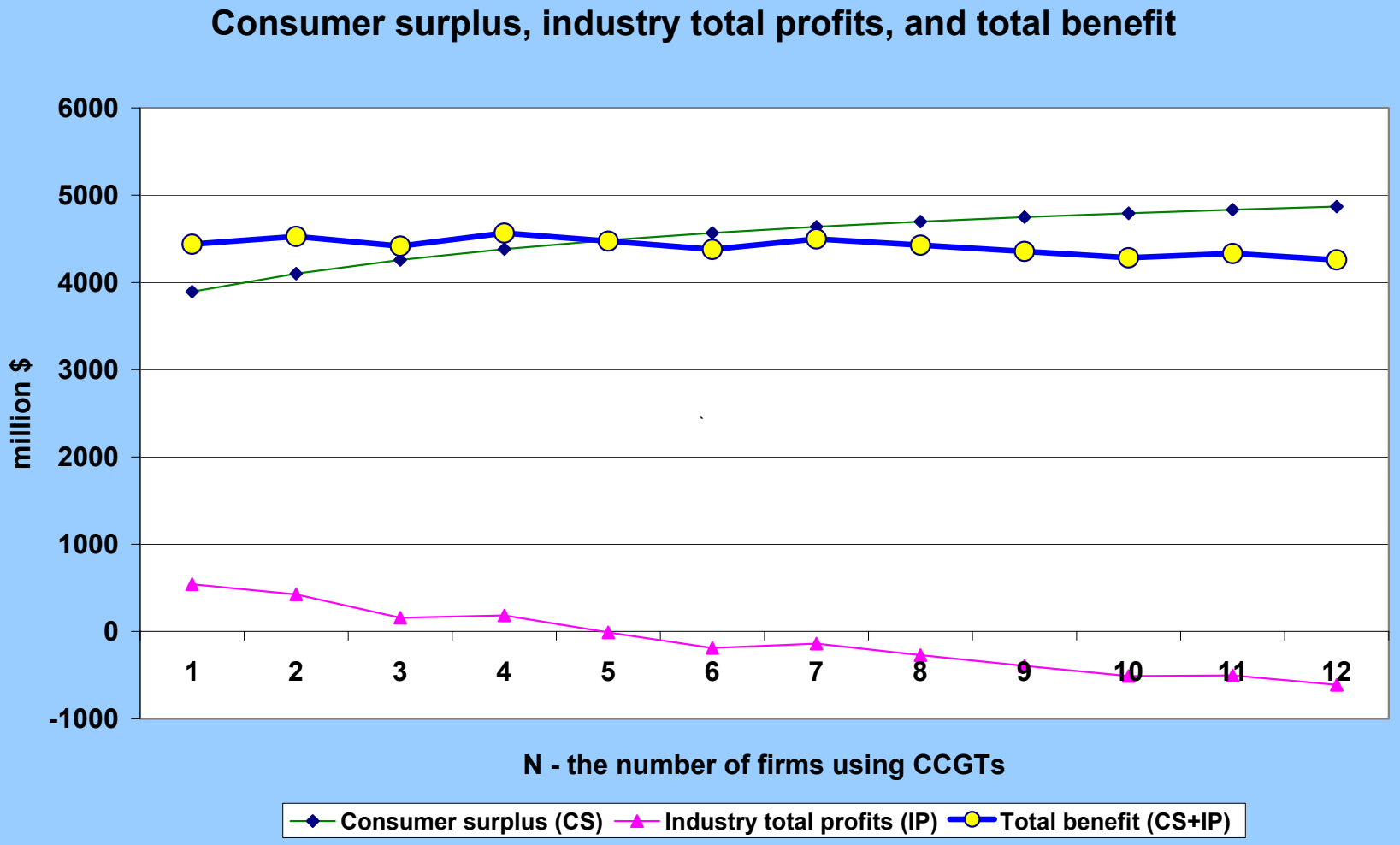
Generator size: CFG: 650 MW; CCGT: 360 MW

Costs:

$\theta_1 = 71.2$ **$ million/year** $c_1 = 15.3$ **$/MWh**

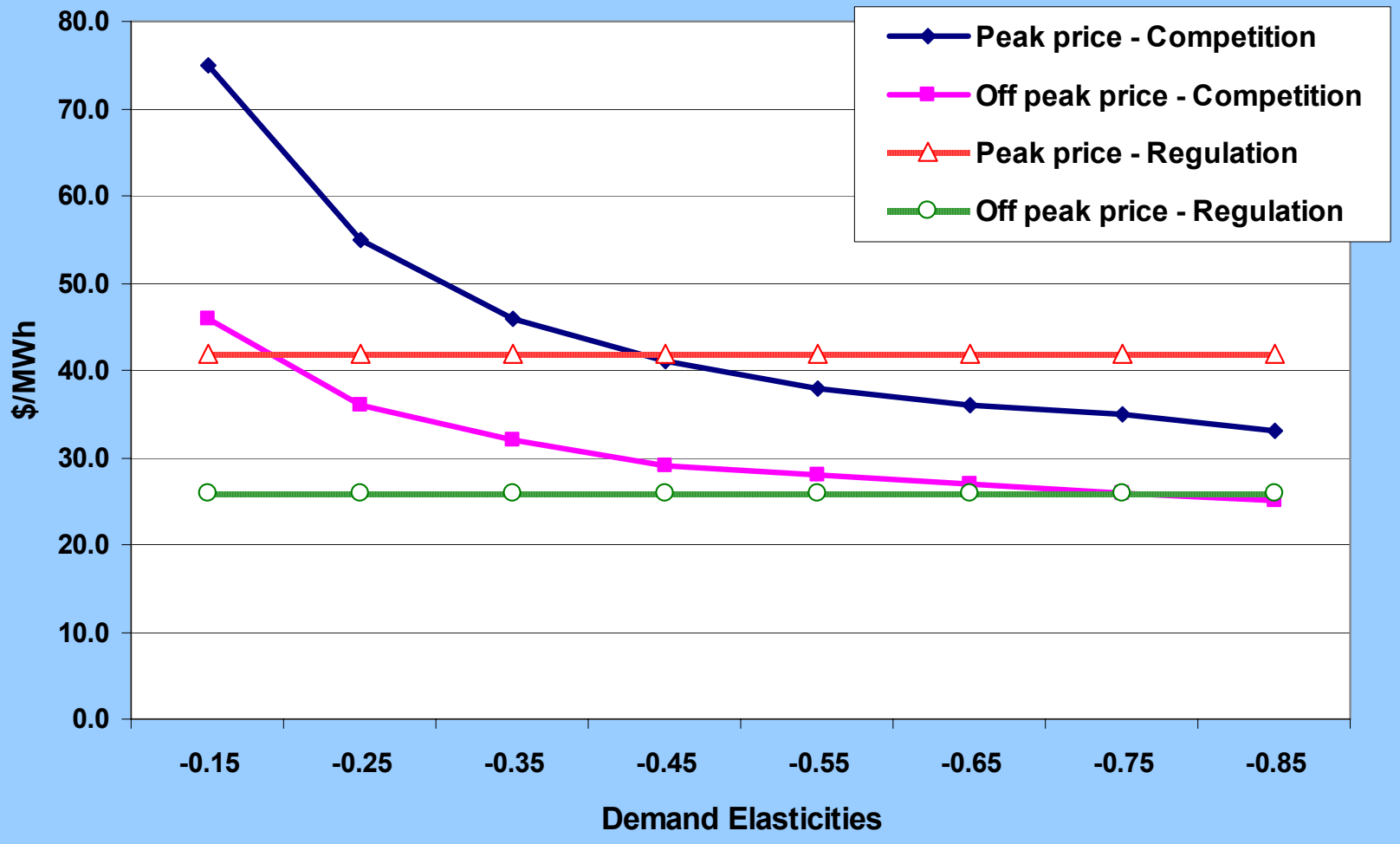
$\theta_2 = 28.2$ **$ million/year** $c_2 = 21.6$ **$/MWh**

Benefits vs. Number of firms



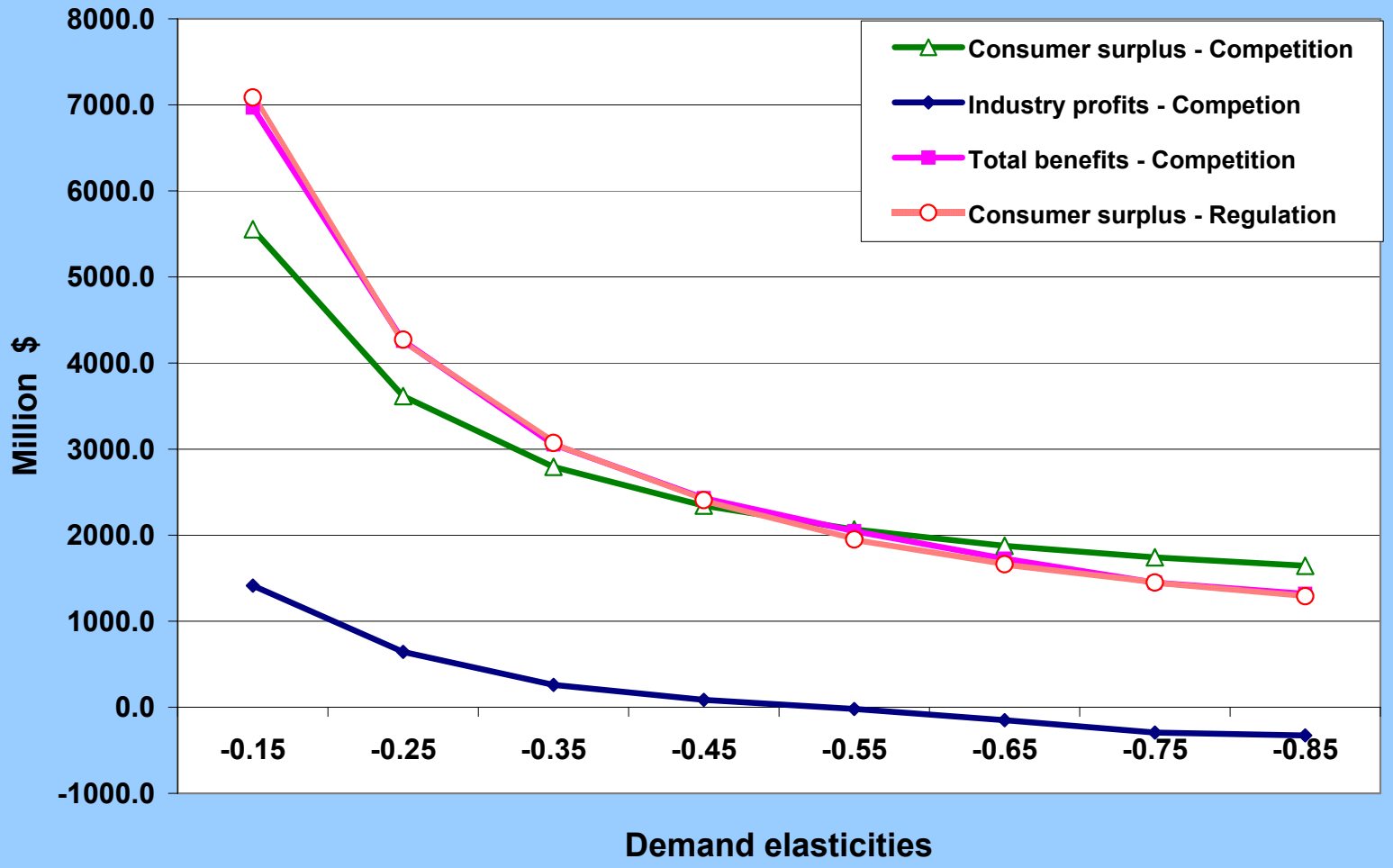
This scenario assumes two coal-using producers (*K*=2), price elasticity = - 0.25 (0.05), and efficiency improvement = 15%. This figure shows that the results are insensitive to the number of firms.

Price vs. Demand elasticity



This figure compares regulated rates and deregulated prices by time-of-day. The deregulation scenario assumes 15% efficiency improvement, $K = 2$ and $N = 3$.

Benfits vs. Demand elasticity



This figure compares consumer surplus, industry profit and total benefit by market regime. The deregulation scenario assumes 15% efficiency improvement, $K = 2$ and $N = 3$. The regulation scenario under the breakeven constraint implies zero profit; and hence, consumer surplus = total benefit.

Key findings

Net benefits under deregulation do not vary with the number of firms due to the large share of fixed costs.

Unless electricity demands have price elasticities under -0.5, deregulation in Israel will likely yield *smaller* net benefits, and certainly *smaller* consumer surplus, than a regulated market.

Conclusion

Reform in Israel is not about implementing a UK-template, a one-size-fits-all approach that has failed in many parts of the world and is unlikely to succeed in Israel.

<u>It is about a process that aims to</u>:

- ***Have an able and knowledgeable regulatory staff;***
- ***Implement regulatory transparency;***
- ***Promote active participation of stakeholders, including the government, utility, end-users, public interest groups; and***
- ***Make the regulatory agency accountable for its actions.***