CE 8214 Transport Economics: Regulation
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Forms of regulation

- Antitrust regulation – government intervention to control market power
- Economic regulation – government intervention to control market outcomes
- Health, safety and environmental regulation – government intervention to control externalities.
Outline

- Economic regulation
- Competition Policy
- Administrative Regulation
Economic Regulation
Regulated Industries

- Electricity
- Telecommunications
- Airlines
- Railroads
- Water supply
- Natural gas
Rationale for regulation

- Economic theory of regulation
  - Government monopoly on legal coercion.
  - Politicians supply coercion.
  - Firms buy coercion to maintain profits.

- Public interest theory of regulation
  - Is there a market failure?
  - Is regulation feasible?
  - Do the benefits outweigh regulation-induced inefficiencies?
Natural monopoly

- Scale and scope are the standard descriptive measures to describe production economies.
- Subadditivity determines whether output can be produced more cheaply by a single firm.
- This in turn determines whether a technology is a natural monopoly in a given market.
Cost Subadditivity

Let $C(y)$ represent the total costs associated with production of output vector $y$.

The overall network cost function $C(y)$ is subadditive if for any and all vectors $y_i \neq y$ s.t. $\Sigma y_i = y$, $C(y) < \Sigma C(y_i)$, where $i$ is an index of firms.
Government intervention

• If $C(y)$ is subadditive and $y$ is significant relative to market demand there may be a need for government oversight.
• Competition policy is an effort by government to establish competition on monopoly networks.
• Administrative regulation typically involves direct oversight by an expert government agency of pricing, investment, entry, exit.
U.S. rail network 1980

High traffic
Sparse network

Low traffic
Dense network
Competition Policy
Let $y^s$ and $y^T$ represent an orthogonal partition of the output vector $y$ into operational activities ($y^s$) and infrastructure-related activities ($y^T$). The cost function is subadditive between operations and infrastructure costs if and only if $C(y) \leq C(y^s, 0) + C(0, y^T)$. 
Operational Subadditivity

Assume infrastructure separation. The cost function for operations is subadditive between operations if for any and all vectors $y_j \neq y$ s.t. $\Sigma y_j = y^S$, $C(y^S,0) < \Sigma C(y_j,0)$. 
Infrastructure output

ties laid in replacement
Operational output

- General Freight
- Bulk
Railroad Cost Function

\[ C = C^c (y_B, y_E, y_I, w_L, w_E, w_F, w_M; H, R, T, U, \theta) + \rho R \]
Infrastructure Separation Test

\[ C(y_B, y_E, y_I) \leq \delta C^U + C^C [y_B, y_E, 0] + C^C [0, 0, y_I] \]
Operational Separation Test

\[ C(y_B, y_E, 0) \leq \delta C^U + C^C [\alpha y_B, \beta y_E, 0] + C^C [(1 - \alpha) y_B, (1 - \beta) y_E, 0] \]
Rail Cost Study Results

• Rail network costs are complements (Ivaldi & McCullough Table 1)
• Rail network costs are subadditive (Ivaldi & McCullough Table 2)
• Vertical disintegration will probably not solve the market concentration problem (Ivaldi & McCullough Table 3)
Administrative regulation
Cost-based Regulation

- Cost of service: \( PQ = OC + rRB + d \)
- Rate Base (RB)
  - Replacement cost
  - Opportunity cost
  - Historic cost
- Fully distributed costs (FDC)
  - Output share
  - Operating cost share
  - Revenue share
Optimal regulation

\[
\begin{align*}
\left( \frac{p_i - \partial C / \partial y_i}{p_i} \right) \epsilon_{ii} &= \left( \frac{p_j - \partial C / \partial y_j}{p_j} \right) \epsilon_{jj} = -\frac{\lambda}{1+\lambda}, \quad \forall i, j
\end{align*}
\]
Incentive regulation

\[
\sum_{i=1}^{n} p_{i}^{t+1} q_{i}^{t} \leq \left( \sum_{i=1}^{n} p_{i}^{t} q_{i}^{t} \right) \left[ 1 + RPI^{t} - X \right]
\]
Efficient Component Pricing Rule

\[ A = b + [P_I - (c_I + b)] \]

where
\[ A = \text{access price based on ECPR} \]
\[ b = \text{unit cost of infrastructure} \]
\[ P_I = \text{incumbent's downstream price} \]
\[ c_I = \text{incumbent's downstream unit cost} \]
Conclusions

- Costs on the US freight rail network are subadditive.
- Costs on other transport networks may be subadditive. See Brueckner, Dyer and Spiller (Rand 1992) for airlines.
- Competition policy (access) does not necessarily solve the natural monopoly problem.
- Network regulation is easy in theory but difficult in practice.