Specialization, Entry, and Technology Choice in Networks

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February 25, 2005
Vertical Dis-integration

- Regulatory unbundling
- Market outcome
- Most pronounced in telecom/Internet
- Post-Chicago: strategic foreclosure
- Coase: lower transaction costs
- Stigler: economies of scale
  - “The Division of Labor is Limited by the Extent of the Market”
  - Division of labor – monopoly?
  - Process model
  - Life cycle model
Specialization vs. Scale

- Production with Smithian specialization

\[
x = L_x^\beta, \quad y = L_y^\beta, \quad \beta > 1
\]

- Economies of specialization:

\[
q = f(x, y) = x^{1/4} y^{1/4}
\]
Why Vertically Integrate?

- The Commons
- Coasian transaction cost
- Melting iceberg
- Buy $x$, $kx$ delivered
- E.g. buy 100, 90 delivered, $k = 90\%$
Integration

- Firm must allocate $L_x$ and $L_y$

- Symmetric allocation $L_x = L_y = \frac{1}{2}$

- All firms produce a quantity $q_v^*$

- Constant elasticity demand ($\epsilon = -2$)

- Equilibrium price: $p_q^* = A(Nq_v^*)^{-\frac{1}{2}}$

- Each firm’s profit:

$$\pi_v = p_q^* q_v^* = \frac{A \left( L^\beta \right)^{\frac{1}{4}}}{2^\frac{\beta}{4} \sqrt{N}}$$
Specialization

- A $y$ specialist

\[
\begin{align*}
L & \rightarrow L_y \\
\end{align*}
\]

- Profit function:

\[
\pi_y(q_y, x_d, y_s) = pqy_q + pyys - px_x_d
\]

- Optimal purchases and sales $x_d^*, y_s^*$ depending on prices

- Reversed for an $x$ specialist
Market Equilibrium

- Three markets need to clear:

- The intermediate goods markets:
  \[ N_{xy}^* = N_{yy}^* \quad N_{yx}^* = N_{xx}^* \]

- The final good market:
  \[ p_q^* = A(N_xq_x^* + N_yq_y^*)^{-\frac{1}{2}} \]

- Profits for the two types of firms: \( \pi_x, \pi_y \)
Comparison with Symmetry

• Let $\beta = 2$, $L = 2$, $A = 100$

• Let there be 10 firms

• Under integration, this means $N = 10$

• Under symmetric specialization, this means $N_x = 5$, $N_y = 5$.

\[
\begin{array}{c|c|c|}
   k & \pi_v & \pi_x = \pi_y \\
   \hline
   .4 & 31.62 & 30.45 \\
   .5 & 31.62 & 31.31 \\
   .6 & 31.62 & 32.03 \\
   .7 & 31.62 & 32.66 \\
   .8 & 31.62 & 33.21 \\
   .9 & 31.62 & 33.70 \\
   1.0 & 31.62 & 34.14 \\
\end{array}
\]

Table 1 ($N_x = N_y = 5$)
Comparison with More $x$ Firms

- Let $N_y = 4$ and $N_x = 6$

- The $y$ firms are "incumbents"

- Scarcity rents from $y$ "infrastructure"

- Under integration both $N = 4$ and $N = 10$ are relevant

<table>
<thead>
<tr>
<th>$k$</th>
<th>$\pi_v (N = 4)$</th>
<th>$\pi_v (N = 10)$</th>
<th>$\pi_x$</th>
<th>$\pi_y$</th>
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<td>31.86</td>
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</tr>
</tbody>
</table>

Table 2 ($N_x = 6, N_y = 4$)
Conclusion

• With lower transactions costs, economies of specialization become important

• With asymmetric firms, incentives to specialize can be very different

• Need to add partial specialization

• Different factor intensities

• Indirect entry via a new infrastructure