Economies of Scale, Scope, and Density

EE382

Economies of scale

- Represents the behavior of costs with a change in output when all factors are allowed to vary
- If cost increases less than proportionately with output, the cost function is said to exhibit economies of scale,
- If costs and output increase in the same proportion, there are said to be constant returns to scale
- If costs increases more than proportionately with output, there are diseconomies of scale

- LRMC < LRAC Increasing Economies of scale
- LRMC=LRAC Constant Economies of Scale
- LRMC > LRAC Decreasing Economies of scale

Economies of scope

- Declining average cost as network size increases
- Exists where there are cost economies from multi-product production
- The presence of joint and common costs give rise to economies of scope

Economies of scope are assessed when:

$$S = \{[C(Q^1) + C(Q^2) - C(Q^1 + Q^2)\}/\{C(Q^1 + Q^2)\}$$

where:

$C(Q^1)$ is the cost producing Q^1 units of output one alone;

$C(Q^2)$ is the cost producing Q^2 units of output two alone; and

$C(Q^1 + Q^2)$ is the cost producing Q^1 plus Q^2units of together

Economies of scope exist if $S > 0$

There are economies of scale if $\frac{C}{Q}$ falls as Q expands

Economies of density

- Density economies are said to exist when a one percent increase in all outputs, holding network size, production technology, and input prices constant, increase the firm's cost by less than one percent
- In contrast, scale economies exist when a one percent increase in output and size of network increases the cost by less than one percent, with production technology and input prices held constant

- The presence of density economies can affect the introduction of efficient pricing in the short term, but generally not over the long term since at some point density economies will be exhausted
- In the air market, for example, deregulation has allowed carriers to respond to market forces and obtain the available density economies to varying degrees.

- Returns to Density similar to returns to a capacity utilization when capacity is fixed in the short run.
- Since the plant size (network size for the case of transportation firms) is largely fixed in the short run, RTD measures the behavior of cost when increasing traffic level (output) given the plant size (network size)
- SRMC < SRAC Increasing EOD
- SRMC = SRAC Constant EOD
- SRMC > SRAC Decreasing EOD

Because of the presence of high fixed costs and cost of operating terminals (airport, station, depots), most transportation firms have increasing RTD

- The coming together of economies of scope and density has been characterized by the adoption of 'hub-and spoke' operations

Hub-and spoke operations

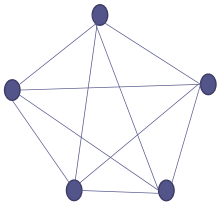
US domestic aviation
- All main airlines basing there services on radial flights from a limited number of hubs

Shipping
- Traffic into Europe coming by large ships to a small number of large ports to be distributed to other ports by small vessels

Bus
- Victoria Coach Station in London as the hub for long distance intercity bus services in the United Kingdom

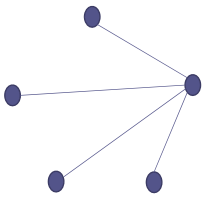
Point-to-point versus hub-and-spoke networks

Point-to-point network



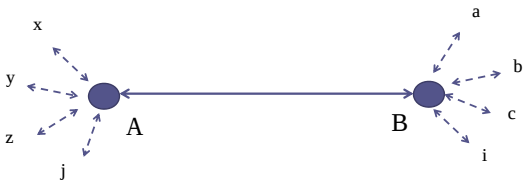
10 different routes

hub-and-spoke network



4 different routes

The 'dog-bone' pattern of international hub-and-spoke operations



Network competition in the air cargo sector

Reference

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