Demand Uncertainty Effect on Flexibility & Capacity

Presented by : Azhar Qadri
CEO & Founder ISCAR

ISCAR INSTITUTE OF SUPPLY CHAIN APPLICATION AND RESEARCH
ISCEA International Supply Chain Education Alliance

www.iscea-emea.com

Nowadays firms often face high demand uncertainty. This uncertainty influences the desirability to invest in production capacity, the choice of the capacity level, and it raises the value of being able to adapt the production decision. In order to cope with unpredictable changes in demand, the firm needs to possess some degrees of flexibility in order to stay competitive and profitable.

Uncertainty is present in the sense that the future demand level is unknown and dynamics are taken into account by adopting a continuous time framework. Before the firm is able to produce goods, it has to install capacity. In deciding about capacity investment, the firm has to choose the timing as well as the capacity level. Once the capacity is installed, the firm can decide about the production level. Volume flexibility where at each moment in time production can fluctuate between zero and the capacity level without facing additional adjustment costs.

When the unit cost of holding capacity is low, the firm has a higher incentive to invest in large capacity in order to be able to profit from a large upside potential in case demand increases. This effect weakens when capacity holding cost increases and therefore, capacity decreases. When capacity holding cost is large the negative effect on the firm's overall profitdominates and the firm has a larger incentive to postpone investment.

Comparing the optimal investment timing of the flexible and the inflexible firm, two contrary effects exist. First, the flexible firm has an incentive to invest earlier because being able to vary the production quantity raises the value of the investment project. On the other hand, the fact that the flexible firm wants to install a larger capacity demands a larger current demand level for an investment to be optimal, which in turn implies that this gives the flexible firm an incentive to invest later. The latter effect dominates in a highly uncertain economic environment.

Hence, when demand is highly uncertain, increased flexibility in production further delays investment. The utilization rate in case of capital-intensive industries is high while it can be significantly low for a labor-intensive firm. The labor-intensive firm invests in higher capacity than the capital-intensive firm but leaves a large amount of this capacity idle at the moment of investment. The flexible firm can choose any production quantity from zero to the capacity level, the inflexible firm can only choose between producing at full capacity or refraining from producing.