

ECON1602 (B09.A) BASIC ECONOMIC CONCEPTS: MICROECONOMICS.

Cost Analyses, Learning Curves and Some Revision Wednesday April 23rd 2008.

A) To begin with, I deal with the subject of economies of scale and long run cost curves etc. which is summarised in the document on Market Structure, Economies of Scale, Natural Monopoly, Cost Functions and Production Functions already on the link. We now must consider the very long run and move onto some analysis of learning curves. The explanation may be couched under the following headings.

- (i) The firm learns over time so there are dynamic changes in costs. As management and labour gain experience with production, the firm's marginal and average cost of producing a given level of output falls. Thus, whereas economies of scale result in movements to the right along the long run average cost curve, the effect of learning is to shift the entire cost curve downwards.
- (ii) This is sometime modelled by the learning curve where we show the degree to which hours of labour per unit of output decline as cumulative output rises. We explain all this by putting numbers into the following relationship: $L = A + BN^{-\beta}$ where N is the cumulative units of output produced, L is labour input per unit of output and A, B and β are constants. See the illustrative table in Pindyck and Rubinfeld where they use the equation $\log(L) = -0.322\log(N/10)$ to derive the numbers. We shall do this in the lecture, but you would be well advised to do this on your own, making use of a scientific calculator.
- (iii) Now think of some application of these ideas and the learning curve in practice. The learning curve for Airbus Industrie is a classic example but we also take examples from the semiconductor industry. Studies of generations of dynamic random access memory (DRAM) semiconductors suggest a learning rate of about 20%. This means that a 10% increase in production would lead to a 2% decrease in cost.
- (iv) Both the market for commercial aircraft and DRAMs are highly competitive. There is an entry fee to be paid to enter the market. This is a massive exogenous sunk cost. In the case of DRAMs this is currently \$2 billion dollars for a new chip factory. When the facility is established, more R & D needs to be done to ramp up production and reduce unit costs. This R & D is a hefty endogenous sunk cost. Learning curves help here to plan the volume of cumulative production and relate it all to costs, hopefully to generate a positive cash flow in the end.
- (v) This is all without considering Stackelberger first mover advantage and game theory competition in the duopoly Boeing Airbus situation. Moreover, in the case of DRAMs, we have the dominance of Samsung (Korean), leading Micron (US), Hynix (Korean), Infineon (German) and Nanya (Taiwan). In 2001, these top five firms accounted for 88% of the world market and are all chasing each other down the learning curve. Presently, Samsung the market leader has over 25% of the market share. Another way of highlighting the learning curve was suggested by Gordon. E. Moore in 1965, who was later to found Intel. Moore's law states that the number of transistors that can fit on a computer chip- thus the capacity to crunch numbers- doubles every eighteen months. This allows computers to double in speed, or to fall in price by half.

B) Now I shall summarise the other main topics covered in this course this year.

- (i) The price system and the resource allocation problem. Consideration of a two-good economy. General equilibrium. Walras Law. Economic systems gather information about exchange opportunities. Interdependence in the economy and the transmission of shocks.
- (ii) The fundamentals of supply and demand, contrasting movements along a schedule (hence a consideration of elasticity) and shifts of the schedule. We analysed the role of expectations and showed how both demand and supply curves can shift at the same time in some circumstances. What would happen to the demand and supply for tickets if Madonna announced that her next concert would also be her last? Our approach was also numerical, and you should be able to solve numerical supply and demand curves and calculate the point elasticities.
- (iii) Optimal pricing strategy draws upon elasticity concepts as does price discrimination. The concept of consumer surplus is also important. Again we used numbers to illustrate principles, including two part pricing and other pricing strategies for amusement parks and private clubs. We also studied the role of advertising, derived the Dorfman-Steiner equation and asked how far this helped determine the optimal amount of advertising.
- (iv) Our approach to demand theory is both theoretical and empirical. We studied the utility approach in detail, going back to UCL origins with Jeremy Bentham and W. S. Jevons. Then we went through indifference curves in a conventional way. After that we explained the Marshallian compensated demand curve and analysed the substitution effect, the income effect, Giffen goods, bliss points etc.

- (v) Continuing with demand, we used the Leibenstein article to explain what he calls non-functional demand and carried out a formal analysis of bandwagon, snob and Veblen effects and taboo goods as well. It is difficult to measure these network externalities except by market research. This is all very different from econometric methods. Whence we showed how demand curves and demand functions can be estimated and interpreted in practice, drawing upon the appendix in Pindyck and Rubinfeld on “The Basics of Regression” and a little more.
- (vi) Turning to supply, we explained the classification of market structures and the structure-conduct-performance model. This was the prelude to textbook material on the necessary and sufficient conditions for profit maximisation in perfect competition contrasted with contrived monopoly. We focussed upon two measures of monopoly power which are related: the Harberger measure of welfare loss and the Lerner degree of monopoly.
- (vii) In the real world we encounter other forms of market structure: monopolistic competition, oligopoly type I, oligopoly type II etc. as well as the market power of oligopsonists and monopsonists. The case study we used is the UK supermarket sector, where there are continuing investigations. You should be familiar with simple five firm concentration ratios, the Hirschmann- Herfindhal index and spatial measures such as isochrone analysis. These all have been used in the many investigations of the Competition Commission and the Office of Fair Trading.
- (viii) Given the reality of privatisation, there are very good reasons why there should be regulation. The question of natural monopoly is related to the issue of how far public utilities should be publicly owned or privately controlled. Appreciate the problems for regulatory authorities in imposing marginal cost pricing. The case of natural monopoly is less easy to deal with than that of contrived monopoly.
- (ix) Removing the assumption of constant costs means we had to consider the sources of economies of scale, both technical and managerial. This can be measured by using both cost functions and production functions. We used the specific forms of $TC = aQ^b$ and $Q = AK^\alpha L^\beta$ in our analysis, noting the duality between production functions and cost functions. This was demonstrated in an analytical sense by using a numerical example of the Lagrange multiplier technique where we maximised the production function $Q = AK^\alpha L^\beta$ subject to the budget constraint $p_K K + p_L L = M$. The principles are covered in the appendix to chapter 7 of Pindyck and Rubinfeld. We explained the nature of costs in economics, both short run and long run. Grafted onto the conventional analysis were the concepts of exogeneous and endogeneous sunk costs.
- (x) Finally, we cover the dynamic changes in costs with the work on learning curves, discussed in part A) of this document. The inverse of a learning curve is the forgetting curve, which may be the concluding joke.

C) Other Comments.

The examination lasts 2 hours and you are required to answer 3 questions out of a possible 10 questions so you do have quite a bit of choice. Do look back at my weekly summaries of what we covered. They usually have further guides to reading. Week by week summaries and other supplementary material, including the four exercise sheets, selected solutions and a former examination, is on the link. Good luck if you need it!

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