Microeconomics: Theory & Applications
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Lecture – 40
Long-run Equilibrium of a Competitive Industry

Hello; welcome back to the lecture series on Microeconomics. We have been discussing firm's long run equilibrium; now we are going to conclude our discussion on the same and you would like to move to the industries long run equilibrium. So, first let us revisit the diagram that we have drawn earlier; to find out what will happen if the long run market price is above the minimum long run average cost curve value.

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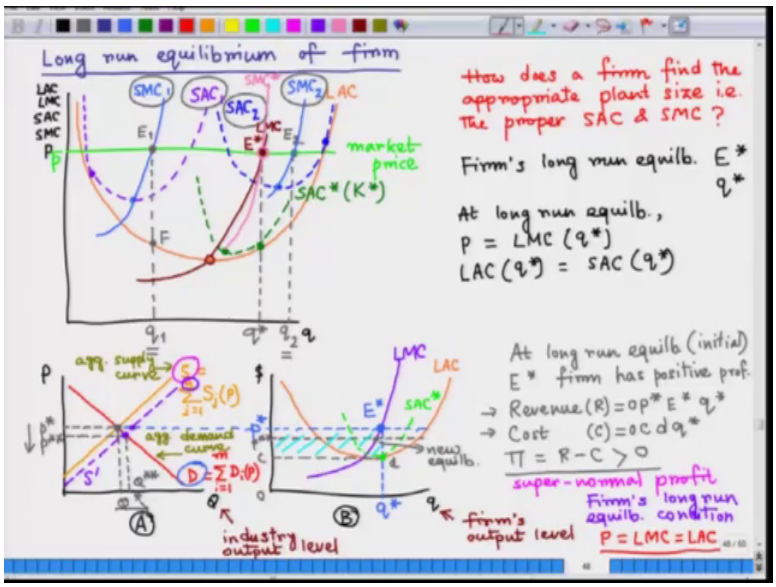

So, we have already found out the revenue and the cost associated with our initial market price p star for our representative competitive firm right. So, in this case let us mention that the profit; that is basically revenue minus cost is positive in this case. So, that positive profit is given by the shaded area that is already marked with the sky blue lines right. Now this case where the firm earns a positive economic profit is known as the case of supernormal profit.

So, what do we mean by supernormal profit? To understand supernormal profit concept we have to introduce another new concept called normal profit. So, normal profit is basically the opportunity cost of the entrepreneur who is running the business, who is

managing the firm right. So, when firm earns some profit which is going to take care of not only the fixed cost and the variable cost, but also this opportunity cost of the entrepreneur; then we call that as a normal profit.

So, now let us look at what will happen if the firm earns a supernormal profit. Firm if it earns super normal profit it is a representative firm. So, there are many other firms are making similar profit as well. So, the people who are waiting outside they see this is very good opportunity to enter the market, produce something and supply that to the market and earn some extra money and earn profit. So, they will start entering the market. So, if that happens then it will have an impact on the supply in the market right.

So, in the diagram we had some initial aggregate supply curve; which is sum over the individual firms supply curves right; given by this expression here. Similarly we had some initial level of aggregate demand curve which is given by this expression. We had already derived aggregate supply curve last time; how to derive the aggregate demand curve, this is simple. So, if you have the individual demand functions the horizontal sum of individual demand functions give the aggregate or market demand curve ok.

So, we have seen that at the equilibrium market price is obtained ok. Now if new firms enter in the business then what will happen? If new firms enter in the market then basically this n this small n which is the number of firms here increases right. And that means that my market supply of output is going to increase at a given market price. So, my new aggregate supply function would be something like this broken line right. So, let me call this S prime right.

So, at any market price now the market supply is higher; because there are more number of firms. So, now, see that it will create a downward pressure on the price because new equilibrium will be obtained at the intersection of the new supply function; which is the broken purple straight line and the red downward sloping demand function right.

So, at the new intersection new price will be obtained and new quantity will be obtained and as we see here with entry of new firms we get a new price P double star which has gone down and we get a new output level Q double star correspondingly and this time the market equilibrium output level has gone up right ok.

So, now; that means, that this representative firm that we started with now phases this new market price P double star and note that as it phases the new price P double star. It will now equate the short run marginal cost and the long run marginal cost with this new price right and it will produce some output level ok. At the intersection it will reach the new equilibrium so the firm hits a new equilibrium at the intersection point of long run marginal cost curve and the P double star line. Note that here also the firm is earning supernormal profit, although the profit level has gone down compared to the previous level, but it still earning a positive profit.

But this is not the end of the story; firms may enter again because there is still some positive profit to make if you know one particular unit of output is sold. So, some more firms will enter in the market and that will put some pressure on the price of the factory inputs as well. So, if more land, more labor, more raw materials are required to supply, to produce and supply more number of more units of output then basically there is a increase in demand for these factor inputs in the factor inputs market that will rise the input prices.

So, the cost, average cost, marginal cost of production will also go up. So, basically from the cost side also there will be shift in this curves. So, basically what will happen the cost will rise and the market price is going to fall. So, in a nutshell as a result the firm supernormal profit is going to go down gradually. And one time we will come when the price exactly becomes equal to the minimum value of the long run average cost curve at that point there is no supernormal profit left. Firm is earning 0 profit but these 0 profit does not mean that there is nothing from the entrepreneur right; there is some profit we have already saved aside for the entrepreneur as the opportunity cost embedded in the cost equation.

So, these entrepreneur or owner of the business is earning some money so that he or she will remain in the business and then we can say that the normal profit is assured, but supernormal profit goes away. So, as supernormal profit vanishes no more firm will enter in the market and the market will now find a steady long run equilibrium right. So, basically the long run equilibrium is to be obtained when price is equal to the minimum value of long run average cost. So, we can write the summary result here so, the summary result is this.

Firms long run equilibrium condition price equals to long run marginal cost equal to the long run average cost; because note that long run marginal cost has to go through the minimum point of the long run average cost and this is the minimum price which is required to keep our firm in the industry. If the price falls below the minimum of long run average cost there is negative profit to make and the firm has no incentive to stay in the business. So, if firm faces a price which is lower than the minimum value of long run average cost then the firm makes negative profit.

So, if the firm makes loss then there is no incentive for the entrepreneur or owner of the business to stay in the market; because this person is unable to secure his or her opportunity cost or normal profit. So, basically in the long run what we find? We find that firms supernormal profit is equal to 0.

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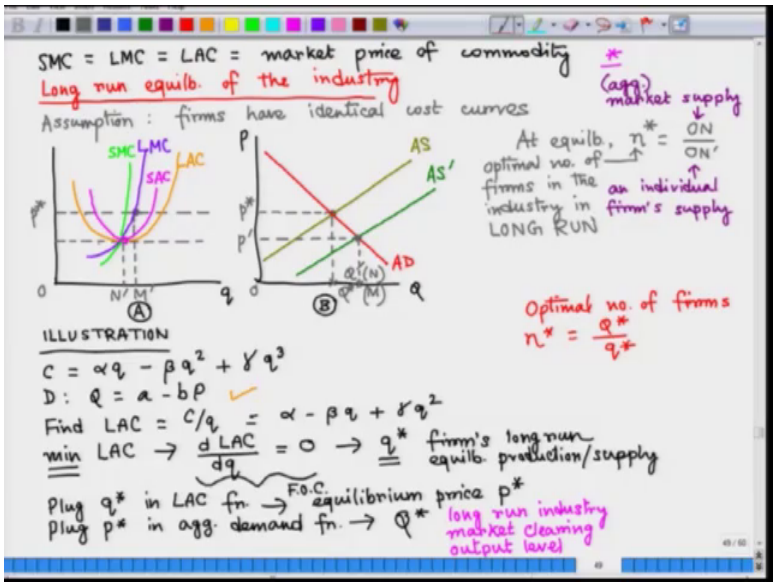

So, the final equilibrium condition can be written as SMC equal to LMC equal to LAC equals to market price of commodity. So, we are done with the discussion on firms long run equilibrium.

Now, let us look at another interesting aspect of theory of firm which is the industries long run equilibrium. So, one may ask how many firms we will operate in long run equilibrium in an industry so that everybody is making some profit, but none of them are making supernormal profit; this is what we are going to discuss now. So, now, we are

going to make an assumption without loss of generality. So, we take the case where all firms have identical cost curves, this will simplify our discussion to a great extent ok.

So, now let us start with a simplified diagram which portrays this basic condition for firms long run equilibrium that we marked by Asterisk ok. So, there will be two panels of diagrams and A for the individual representative firm. Happen in B for the market or industry ok. So, here we will start with the demand function first.

So, let me draw the aggregate demand function AD and there is if aggregate supply function AS and at the intersection point market equilibrium price and equilibrium quantities are determined.

Now, let us draw the cost curves right. So, the equilibrium price is P star capital Q star Q and then we have the individual firm output denoted by small q and all sort of cost variables and price variables are measured along the vertical axis right. So, now, we are going to take this price and superimpose in panel a diagram right.

So, we have this P star now we have to draw the cost curves right. So, basically we start with some average cost curve and there will be this marginal cost curve ok. And we know that at the point of at the point of intersection of price line and the marginal cost curve we denote the initial quantity level.

For simplicity I just assumed this to be M ok. So, let me now assume for I intend to do some graphical analysis so, I now introduce some simplified notation. So, let me assume this Q star as M, let me introduce origin here I can introduce origin here as well ok. And let me call this firms equilibrium output level as M prime right ok.

So now, we in see that the firm is earning some supernormal profit here. So, basically what will happen the firm new firms will enter in the market and the price will fall so, the price will fall to an extent; where in the long run equilibrium the price becomes equal to the minimum value of the long run average cost.

So, suppose it is here now, let me call that price has s P dash. Now basically at that price there is a new supply aggregate supply function which is in operation; because more firms has entered in the market let me denote this as prime.

So, this is basically somewhat repetitive from my previous discussion, but you know I am trying to give you much simpler graphs to look at so, this recap is helpful. So, now, what we see here? We observe that at this intersection point a new equilibrium is obtained and corresponding to the new equilibrium market price P prime.

New output level Qs double star or Q prime say Q prime is obtained and I denote this as N right. So, basically this is my point M and let me make some whom here and this is my point N right fine. So now we see that in this case firm produces right here at the minimum point of its average cost curve.

So, corresponding firm's equilibrium is say N prime. So, the firm produces and supplies ON prime amount of output in the market. So, we figure out at equilibrium n will be this number ON which is basically the industry output divided by ON prime which is basically the firms output level right.

So, let me write this so, this ON is basically total market supply or you can also write this as aggregate supply and this is basically and individual firms supply right. So, now, let me introduce this short run average cost curve and short run marginal cost curves here in this diagram for the sake of completeness. So, this is my SAC the minimum points are basically equal and we have to now draw the SMC which is going to be steeper line; it will pass through the minimum point of SAC as usual ok.

Now, just for no confusion I am adding this long run L in front of the previous average cost and marginal cost curves right ok. So, that completes our diagram. So, we have diagrammatically seen how to find the equilibrium number of firms in a competitive industry right; now let us going to look at a numerical example to see if the equations are given how to proceed to find the equilibrium value of N, N star. So, let us start with a cubic cost function so that we get this u shaped marginal and average cost curves.

So, I am going to give this illustration in a very general way so, one can write some alpha times q minus beta q square plus say some gamma q cube ok. So, where c is the total cost and q is the output quantity of a representative firm right. Now let me talk about the market demand function let me write that as; so Q equals A minus b P right; where capital Q is the total demand and P is the market price ok. So, now, a question can be asked; what is the equilibrium price and the equilibrium quantity bought and sold and equilibrium number of firms in the long run of this industry right ok.

So, we will first start with finding the long run average cost curve and that will be basically nothing by nothing, but dividing c by small q right. So, of course, you can figure out what you are going to get alpha minus beta q plus gamma q square. So, that will give rise to and U shaped average cost curve right ok. Now we have to minimize this long run average cost expression right so that we heat the minimum point of the long run average cost curve at the bottom of the long run average cost curve right. So, for that what to do? We need to differentiate long run average cost curve equation with respect to q said that equal to 0 right and then we get some q star; which is basically the solution to this equation.

The first order condition and as this is the minimized value of the long run average cost this q star gives me firms long run equilibrium output fine. Now we can plug this q star in LAC function and if we do, so we get what? We get the equilibrium price P star right ok. So, at this price the total demand in the market is known because we already know the demand function right. So, plug P star in aggregate demand function and you will come to know the market demand at that price Q star capital Q star right.

So, you know the long run industry or market clearing output level as well right. So, you do not require anything more to find out the optimal number of firms in the market; you have to just divide capital Q star by small q star ok. So, we are done with the firms and industries long run equilibrium; now we are going to move to the theory of market and we will start with perfect competition. So far we have talked about competitive firm competitive industry. So, now, we are going to lay out perfect competition model with the least of with the assumptions and we are going to discuss some more related topics; which will gradually lead us to the field called welfare economics. So, we are going to continue with these discussions in the next lecture.