Microeconomics: Theory & Applications
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Lecture – 37
Short-run Equilibrium of Firm and Supply Function

Hello, welcome back to the lecture series on Microeconomics. Earlier we have seen how a competitive firm finds it short run equilibrium. During the discussion to find Short run Equilibrium of Firm, we have also came across 2 different concepts; shutdown point and breakeven point. Now, let us continue with the discussion to find firms short run supply function.

So, in this lecture we are going to find out that one particular part of upward raising marginal cost curve basically generates firm's short run supply function and we are going to take a digression, we are going to also discuss a concept called elasticity of supply.

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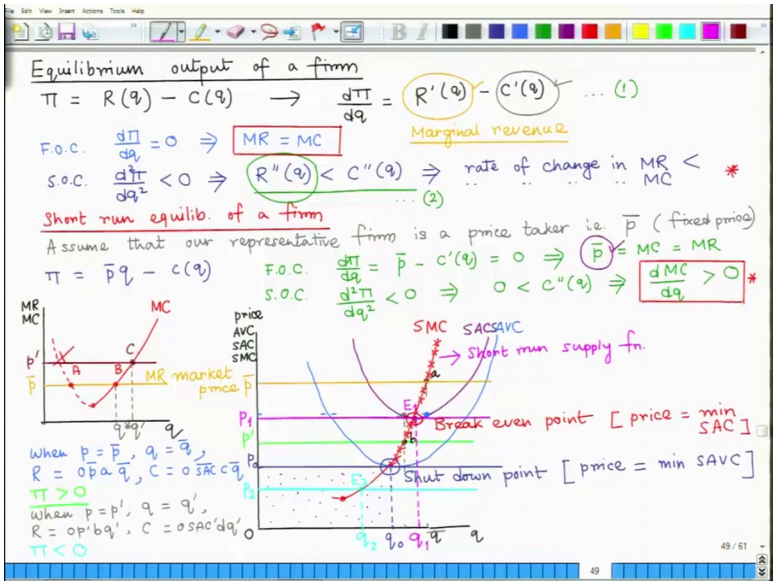

Now, why this is called shutdown to check that lets try with another market price, this time lower than p naught or the minimum of SAVC.

So, suppose we talk about a market price p 2 ok. So, it makes this intersection with this positively slope part of the short run marginal cost. So, no problem it meets the first order and second order condition. So, if you ask a mathematician, the mathematician will

say that no problem you produce here some output level say q 2, but the firm will not produce here. Because it is even covering the variable cost that it incurs. So, not only it loses its fix cost that it has already incurred, but it is enable to cover the variable cost as well. So, in this condition the firm will not stay in the business and leave industry ok. So, now, we are in a position to find out a firms short run supply curve from the analysis we have done so far.

So, basically we can see that the firm we will supply only if the market is price is above the minimum point of the short run average variable cost. So, the cost the average variable cost dictated by the minimum point of the SAVC curve right. So, it is only a portion of the upward sloping segment of the marginal cost curve that is the supply curve of the firm.

So, let us mark that in the diagram. So, now, I am going to mark the upward the short run supply curve of the firm by putting crosses along the relevant portion of the upward sloping short run marginal cost right. So, this marked part is basically the firm's short run supply function, by revisiting by diagram again.

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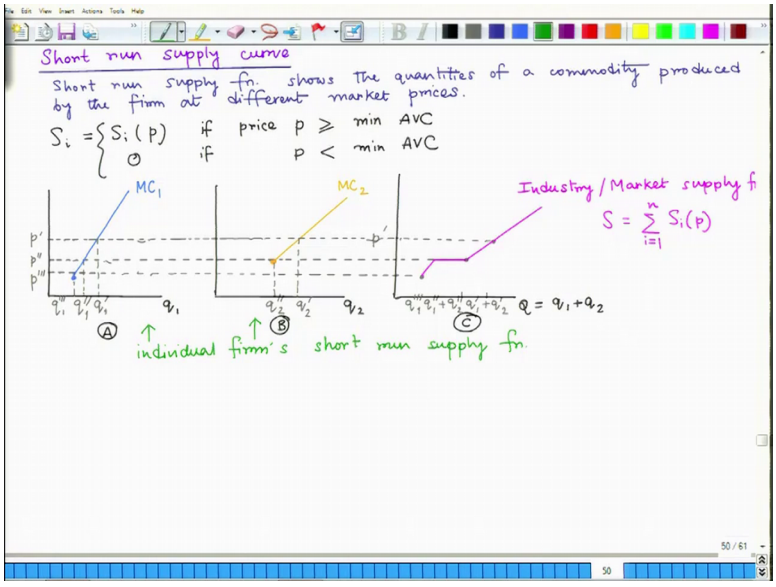

Now, what do we mean by the short run supply curve of a firm in a nutshell? So, if I want to define I define it as a short run supply function shows the quantities of a commodity produced by the firm at different market prices right. So, if I want to express

this concept mathematically then I can write S i, suppose I am talking about the ith firm in the competitive industry.

So, this is if my price p is greater than or equal to minimum of average variable cost or it produces nothing, if p is less than minimum of average variable cost. Now, we focus on the industry supply curve in the short run. So, an industry is sum of many small competitive firms. Now, we do not assume that each of these constituting firms have access to the same technology their cost can be different.

So, if their cost functions are different that will lead to different shapes of short run marginal cost curves and the inflection points right. So, basically now, we are going to how we can derive each firms supply function to the market and how we can aggregate them in order to get a market supply function in short run. So, now I am going to draw simple diagram first to explain you the concept. So, here there can be there will be 3 panels of diagram right.

So, in panel A, I talk about my firm number 1; its output is q 1 and then of course, I measure my cost and my prices along the vertical axis as usual. Then in panel B, I have another firm whose production level is denoted by q 2 and in panel C, I talk about the competitive industry. I assume that there are only 2 competitive firms in the industry they are you know I talk about you know market supply or total output as Q which is basically sum of q 1 plus q 2 right. So, now let us look at the diagrammatic approach to find out the industries or market supply function.

So, I will first start with the firm 1's supply, individual supply function. So, there will be some shutdown point right. So, let that price be given somewhere here. So, supply function would start above that shutdown point right ok. Now, note that as I am assuming that my firm 2 has access to different sort of technology and it is shutdown point is different from it can be theoretically. So, then I assume that it shutdown point is somewhere here which is at a higher level and the firm also has a marginal cost curve whose slope is different from firm 1's marginal cost curve right.

So, here you can see that I have drawn straight line marginal cost curves that can be done at no expense theoretically speaking. So, I am just making this assumption to make our life simpler and to show you that no marginal costs can be straight lines right. So, here now let us find out how the individual firms decide to produce and supply to the market

at various price levels and then if I aggregate then you know I will get the market supply. So, I will start with market price level. So, let me start with a market price level.

So, I assume that my market price is p prime ok. Now, at this market price, the firm 1 decides to produce this many units of the output. The firm 2 decides to produce q 2 prime units of the output. Now, we need to sum them up and if we sum them up we can get a higher level of quantity at the market. So, this is basically q 1 prime plus q 2 prime and although it is hand so, this is a hand drawn diagram. So, we may not get that exact point.

But note that this is a point on the market supply function. Now, if the market price changes, suppose it drops to p double prime then we have to follow the same procedure, now note that I am dropping the market price in such a way that it passes through the shutdown point of my firm 2 ok. So, here the firm 1 will produce a lesser amount of the commodity. As the price has fallen, it will produce q double prime 1 units of output and firm 2 will also reduce its output level it will produce q double prime 2 units of output which is dictated by its shutdown point.

Now, I need to add these 2 and if I do so, then I will get another point on this diagram and this will now give me a lesser volume of market output q double prime 1 and q double prime 2 right. Now, if I reduce my price further that will be very interesting to study what happens then. So, suppose I now reduced price further to a level which is just above the shutdown point of the firm 1's cost curve. Now, it can be equal to the shutdown point of the firm 1 as well, but you know that does not matter. Let us have a look at this point p triple prime.

So, if I have this market price then there is no problem for firm 1 to produce q triple prime 1 units of output and supply to the market, but there is a problem for the firm 2, it will cease to produce at this market price p triple prime. So, now, in the market only firm 1 will produce and supply. So, there will be a point somewhere here and that point will have this coordinate on Q axis which has the value q triple prime 1.

So, here at p triple prime price the only firm 1 contributes to the market supply. So, here we can see that we will get a kinked supply function in the market. So, if I join, so, I can join them with straight lines here right. So, basically when my market price is less than the shutdown price of firm 2, then I do not get any contribution for the from the firm 2.

So, then the firm 1's supply function, individual supply function becomes the market supply function.

So, basically there is a kink there is a break down, there is a break in the market supply function in this case. So, this is basically my industry or market supply function right ok. So, now, we can quickly write down that mathematically as S equals summation of i equal to 1 to n S i p right. So, basically the industry supply function is the horizontal summation of the supply curves of all firms in the industry.

So, we can say that these individual short run marginal cost curves are basically the individual firm's short run supply function. Now, we have finished our discussion on the firm's short run supply function, let us make a digression. Now, we are going to discuss price elasticity of supply.

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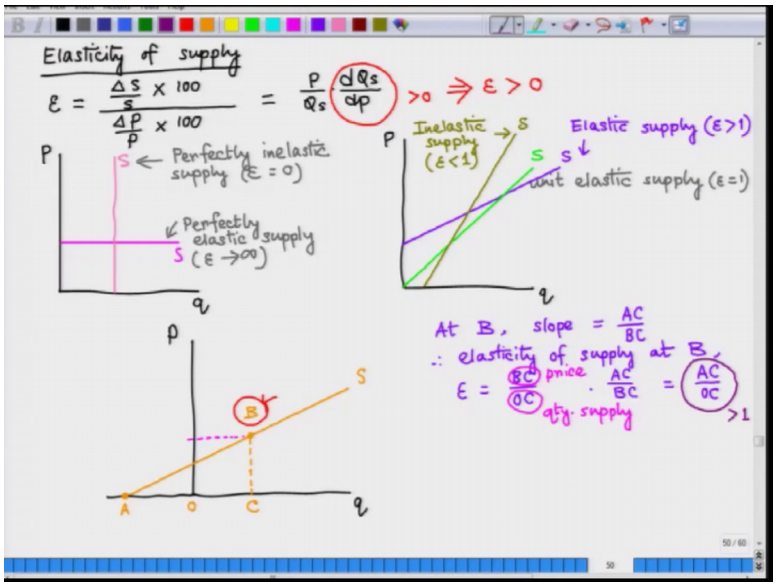

So, by now, we know the definition of elasticity. So, the elasticity of supply means, in a nutshell the percentage change in quantity supplied by firm due to 1 percent change in the market price.

So, we can write, we can express this elasticity as some discrete change in supply divided by some discrete change in market price. Now, we can express the same thing using the notion of derivative as P divided by Q s quantity supplied times d of Q s quantity supplied function right ok. So, now, note that this slope of supply function is

positive right. So that means, that we have positive elasticity of supply, but epsilon or elasticity of supply can take value greater than 1 and less than 1 right.

So, now we are going to study different shapes of supply function corresponding to different values of epsilon. So, now, I am going to draw a graph where I am going to first show 2 extreme cases, these are not very normal cases ok. So, one extreme case is basically the case of perfectly elastic supply curve and that means that our elasticity value epsilon tends to infinity ok.

So, in that case we draw a straight line supply function parallel to the output axis right. Now, let us move to the other extreme which is basically the case of; now let us move to the other extreme which is the case of perfectly inelastic supply which is characterized by the epsilon value equals to 0 and in that case the supply function is given by straight line parallel to the price axis right.

Now, we are going to have another panel of diagram where, we are going to show other possibilities. Again we measure quantity produced by the firm along the horizontal axis and price along the vertical axis. Now, we are going to study the case of unit elastic supply. So, the case of unit elastic supply is given by the epsilon value equal to 1.

So, in that case the supply function shall start from origin and there are 2 other cases of course; inelastic and elastic supply. So, let us first talk about the case of elastic supply. So, in the case of elastic supply, the supply function will have a positive intercept along the price axis. So, this is the case of elastic supply. So, that is given by elasticity value greater than 1. Now, for the case of inelastic supply, the supply curve has a positive intercept on the quantity axis.

So, we get this kind of a shape and this is basically the case of inelastic supply which is characterized by epsilon value less than 1. So, we have seen different shapes of supply curve corresponding to different value of elasticity of supply. Note that elasticity of supply is a function of price also right, because at different prices elasticity values change.

Now, we are going to reconsider the case of elastic supply which has a positive intercept on the price axis. Remember that we have said that individual firms supply function will have a shutdown point. So, there will be some price. If the market price falls below that

price then the firm will cease production and it will not supply to the market. So, basically you know we are talking about a positively sloped supply function with a positive intercept along the price axis and that intercept basically indicates the presence of a shutdown point for the firm.

Now, we are going to see now, we are going to diagrammatically prove that in this case the elasticity will take value greater than 1. So, now, we are going to focus on the case of elastic supply in this diagram to prove that a supply function which has a positive intercept on the price axis has epsilon value greater than 1. So, now, we are going to have a supply function like this ok. Now, we are going to extend this x axis, the quantity axis ok.

Now, we are going to take some points. So, this point I can name it A, this is my origin point right and there I can take some point on the supply function say B. And then from point B, let me draw a perpendicular on the quantity axis and let me call this C. This perpendicular I am drawing to measure the slope graphically right. So, suppose my intention is to find out the slope at slope and elasticity at this point B right, this is arbitrarily chosen.

So, now I am going to write the expressions at point B, the slope is basically given by AC over BC right. So, elasticity of supply at B will be epsilon equal to BC divided by OC. Now, what is BC? BC is basically the price and OC is basically my supply at that price. So, at point B, BC is the price and OC is basically the quantity supply at price BC. Now, this has to be multiplied with the slope value and that is AC divided by BC right.

So, finally, we land with is we get AC divided by OC. Now, note that as AC is greater than OC, we get a number more than 1. So, with this graphical exercise to prove that in normal case, where a supply function has a positive intercept along the price axis is elastic in nature. We are going to continue with this discussion in the next lecture.