

Business Data Management
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Production Decisions

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Production Decisions



Professor M Suresh Babu: So, as we saw the cost items as well as the cost curve will give us an idea in terms of production decisions. Now, we also saw that the firm has control over two important variables depending on the type of market in which the firm operates: the quantitative or the price variable. So, production decisions relate to this price and quantity variable because pricing is also a function of cost and the quantity you produce.

In some commodities, you do not want to produce more and bring the prices down. Because extra supply will bring the prices down. In some commodities, the prices are very low, but you want to have large volumes of production. And then you want to increase your revenues. So, production decisions then are intertwined in terms of quantity and price.

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Production Function



- **Production function:** defines the relationship between inputs and the maximum amount that can be produced within a given period of time with a given level of technology

$$Q = f(X_1, X_2, \dots, X_k)$$

Q = level of output

X_1, X_2, \dots, X_k = inputs used in production



Professor M Suresh Babu: So, analyzing production decisions then can be with a very simple concept called the production function. The production function is the relationship between inputs and the maximum amount that can be produced in a given period of time with a given technology.

Professor G Venkatesh: So, the time is fixed, and the technology is fixed.

Professor M Suresh Babu: The technology we are assuming that the individual firm cannot vary it immediately. And they do not have the resources to invest in new technology, so it is a long-run decision: the technology decision. And the time we have to have some definite interval of time. So, in a given period of time with the given inputs available to you, what is the maximum output you can produce?

Now, we can easily relate to our regular concept of cost then. And this relationship is nothing in terms of the quantity produced is a function of X_1, X_2, X_k where quantity is the level of output. And this X_1, X_2 is the inputs that are used in production in our earlier examples X_1 and X_2 were capital and labor. It could be material or it could be energy. So, the initial production functions were Y or Q , which is a function of K and L .

Then later we expanded that production function to K (Capital), L (Labour), E (Energy), then M (Material). So, now we use the standard claim $K L E M$ production function.

Professor G Venkatesh: Capital, labor, energy, materials.

Professor M Suresh Babu: These are the major kind of things in a typical industry.

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Production Function



- For simplicity we will often consider a production function of two inputs:

$$Q=f(X, Y)$$

Q = output

X = labor

Y = capital



Professor M Suresh Babu: Now, for simplicity, we consider two inputs that are capital and labor.

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Production Function



- **Short-run production function:** the maximum quantity of output that can be produced by a set of inputs
 - Assumption: the amount of at least one of the inputs used remains unchanged
- **Long-run production function:** the maximum quantity of output that can be produced by a set of inputs
 - Assumption: the firm is free to vary the amount of all the inputs being used



Professor M Suresh Babu: And then we see a production function in either the short run or in the long run. So, short run is when at least one input remains unchanged. So, capital cannot be varied in the short run. In the long run what we find is that everything can be varied. So, now we have short-run production function long-run production function. So, why are we distinguishing in this?

We are distinguishing in this because there are certain short term decisions that a firm would like to take and the long run decisions.

This we can tie up with our earlier discussions about demand, for example. If we see that from our demand estimation, if we see that the demand is growing or is expected to grow in the next 5 years at this rate, then perhaps we can think of a long-run decision to enhance our capacity by having additional plans. So, two important kind of concepts the short-run production function and the long run production function.

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Short-run Analysis of Total, Average, and Marginal Product



- **Marginal product (MP)** = change in output (Total Product) resulting from a unit change in a variable input

$$MP_X = \frac{\Delta Q}{\Delta X}$$

- **Average product (AP)** = Total Product per unit of input used

$$AP_X = \frac{Q}{X}$$



Professor M Suresh Babu: Now, here we find that we use the concept of marginal cost like in the cost concept. But here, we use the concept of a marginal product, and a marginal product is nothing but what is the unit change in total product with a unit change in the variable input. And in our example, labor is the variable input. So, if I change labor.

Professor G Venkatesh: If I add one more person.

Professor M Suresh Babu: One more person, how much is that person...

Professor G Venkatesh: Cement can make?

Professor M Suresh Babu: Contribute into total output. And then there is an average product like our average costs. That is the change in quantity or the total quantity by the total inputs that are used. So, average on average, what is the factor of...

Professor G Venkatesh: Cement produced by one person.

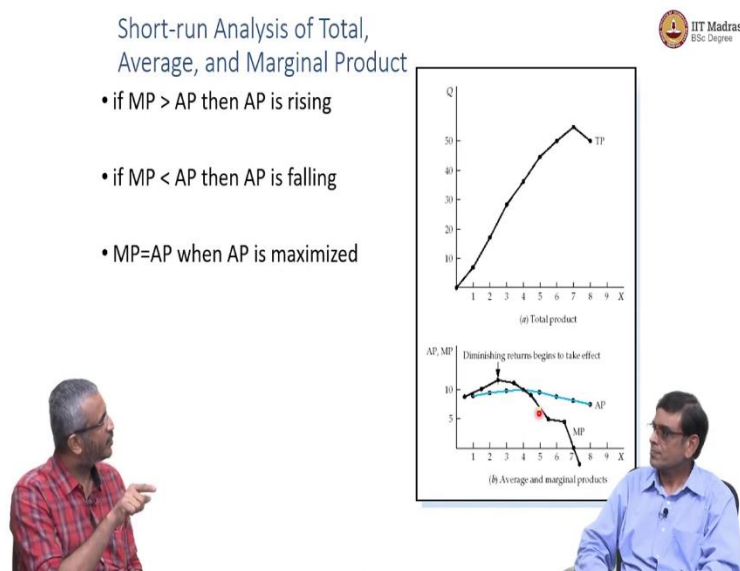
Professor M Suresh Babu: One person is a very important kind of data to assess the efficiency of production.

Professor G Venkatesh: In IT, we use the building rate. The number is the amount of money you can build per person—something like that.

Professor M Suresh Babu: This means that if your marginal product of having one more person, if it is not going to increase, then I should think twice whether I should hire a person or not. There is also an underlying assumption somewhere that your wages will be related to a marginal product. In some industries, there might not be a correlation. But generally, if your marginal product is very low.

Then of course, your wages just might not be very high. Because you are not contributing to production that much, then why should you be paid that much? So, these two concepts of marginal product and average product are very important in terms of the production decisions of a firm.

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Professor M Suresh Babu: Now again, we draw parallels from the consumers or demand theory that we find that when you increase your production keeping one factor constant and varying the other factor, we find that the marginal product initially increases and then it starts to decrease

exactly like our utility of the consumer. And that is what we see here, initially, the total product is increasing and then it starts falling after a point.

Now, that is because this MP curve, after an increase, then it starts falling. And then if you keep on expanding production, it becomes actually negative. Now, negative I want to highlight that with an example here. Let us take agriculture production. I have 1-acre land, in this 1 acre land 5 people are the optimum kind of workers that are required to produce paddy rice cultivation. Now, so I thought that if I have one more person, I can actually increase.

But remember, this 1-acre land is fixed. So, these five workers I increased to 6 shows a slight increase in output. Then an increase to 7, slight increase in output but not as much as I thought that is just declining marginal product. If I keep on hiring like that when it reaches 10, then actually the additional contribution that this guy or this person whom I am adding might become negative because he might go and chitchat with others in departments and pull down everybody's productivity in the industries.

Professor G Venkatesh: They do not have much work, right?

Professor M Suresh Babu: They do not have much work. In industries, in the earlier times, we used to worry about unionization meets and these kinds of activities because they think that if you increase the scale of operations beyond a point, there is a possibility that marginal product might become negative. Now, this agriculture example is very important. Because if you keep on adding people like that their marginal product is less and if their incomes are related to the marginal product, they will only have low incomes.

Once when they have low incomes, they are in poverty. Then the question for any development in a developing economy is how we can pull the excess people out of agriculture. Because our land area is fixed, too many people are dependent on agriculture. And that is because they do not have options.

Professor G Venkatesh: Any other options.

Professor M Suresh Babu: Outside. So, if we suck these people out of agriculture and deploy them elsewhere perhaps...

Professor G Venkatesh: Overall, the marginal product will go up.

Professor M Suresh Babu: It Will go up and the economy's growth will be very high. And that is these whole theories of structural transformation. That is, if your production structure changes from agriculture to manufacturing into services and all people might end up in higher productive activities, which means their incomes go up and the overall economy also grows

Professor G Venkatesh: We are value additions.

Professor M Suresh Babu: We are not, we are not talking about value addition.

Professor G Venkatesh: They are doing more productive work.

Professor M Suresh Babu: And you are equating that they produce more then there is more value addition then that's a simplifying assumption we are making there. So, very important then to understand this whole diminishing returns and locate your production accordingly. So, if the marginal product is greater than average product, then the average product is rising. If marginal product is less than average product, then the average product is falling because the marginal product is pulled down.

Professor M Suresh Babu: Marginal product pulls down the average product. Now, if the marginal product is equal to the average product, then the average product is maximum.

Professor M Suresh Babu: The marginal product is equal to the average product. After that, I should not keep hiring.

Professor G Venkatesh: Similar to other curves, right?

Professor M Suresh Babu: See similar to the cross curve.

Professor G Venkatesh: Total cross curve and the marginal cost cross the total cost curve that is the diminishing part stop there.

Professor M Suresh Babu: So, for a decision-maker, then, if I have this cost data and if I have this production data in front of me, I will make the decision, where should I locate my production? When should I stop hiring? And that is where these variables become very, very important.

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Short-run Analysis of Total, Average, and Marginal Product



- **Law of diminishing returns:** as additional units of a variable input are combined with a fixed input, after some point the additional output (i.e., marginal product) starts to diminish
- nothing says *when* diminishing returns will start to take effect
- all inputs added to the production process *have* the same productivity



Professor M Suresh Babu: So, this is the point we talked about this law of diminishing marginal returns. So, as additional units of variable inputs are combined with fixed input. Then after some point, the additional output starts to diminish. We do not know when the diminishing will take place. So, we have to keep watching and locating that, and that is the decision maker's challenge.

And we are assuming that productivity is the same for every additional unit. If you have workers, some of these workers will have high productivity and so that is where the decision-making becomes very important.

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Short-run Analysis of Total, Average, and Marginal Product

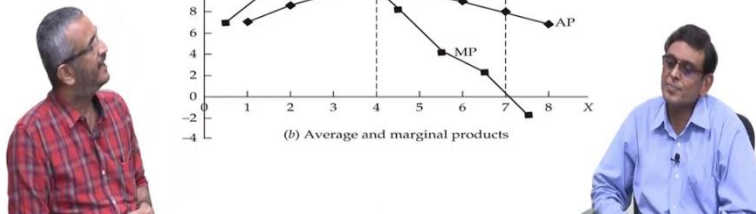
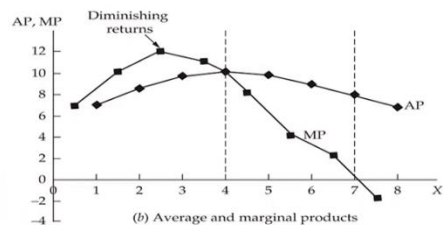
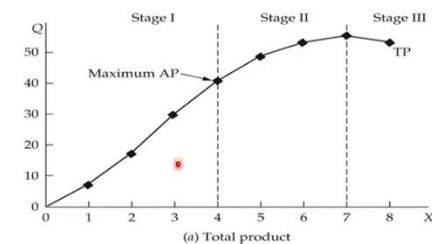


- The **Three Stages of Production** in the short run:
 - Stage I: from zero units of the variable input to where AP is maximized (where $MP=AP$)
 - Stage II: from the maximum AP to where $MP=0$
 - Stage III: from where $MP=0$ on



Professor M Suresh Babu: So, then combining this cost curve and this production we have three stages in production. So production functions cost curve we combine this. Then we have three stages of production. In stage 1, we have the 0 units of variable inputs to where the average product is maximized where $AP = MP$ average product is equal to marginal. In stage 2, maximum AP where MP marginal product is 0. And in stage 3, from their own MPs equal to 0 and then it keeps falling.

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Professor M Suresh Babu: Let me let me put it in terms of a graph.

Professor G Venkatesh: I think that is easy to understand.

Professor M Suresh Babu: So, in this example, we have total products, and we have the stages here. At this stage, maximum average product.

Professor M Suresh Babu: That is, marginal product is equal to average product. Stage 2, we find that well it is increasing but the rate of increase is not very high. And in stage 3 it actually...


Professor G Venkatesh: Decreasing marginal become negative.

Professor M Suresh Babu: And that is mapped here in terms of diminishing returns.

Professor G Venkatesh: The Average became equal to the marginal product. It is a point then from that to 0 and then negative.


Professor M Suresh Babu: A firm would like to operate either in stage 1 or stage 2. When it enters Stage 3, it has to do some decision-making to come back to this. So, now what are we doing? We are using the cost curves, and we are using the production function, and we can arrive at this decision as to where we should locate.

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Long-run Production Function

- In the long run, a firm has enough time to change the amount of *all* its inputs
- The long run production process is described by the concept of **returns to scale**
- Returns to scale = the resulting increase in total output as all inputs increase



Professor M Suresh Babu: So, long run, it is the same as what we talked about now. But the fixed cost is also variable in the long run. So, everything is variable in the long run. But we should also see that the returns to scale or we should be able to keep getting the economies of scale, in the long

run, to locate yourself in this stage where you want to. Otherwise, you might enter into the trap of getting into stage 3.

Now, this has very important implications in terms of certain firms. For example, mergers and acquisition decision sometimes are related to some of this. If I am in stage 1 and if I can move to stage 2, then perhaps a merger might be easy for me. So, a lot of these kinds of takeover amalgamation decisions and all are this kind of a trimming and right-sizing of the firm, which is very important for the firm to operate efficiently.

Professor G Venkatesh: Because presumably when you do mergers, the productivity per employee goes up. Because some overhead costs are disappearing.

Professor M Suresh Babu: And also we have what we call as synergic effects.

Professor G Venkatesh: There are synergy effects plus you get benefit of volume. So, you remove some overheads and that overhead basically will then improve your productivity.

Professor M Suresh Babu: And that will give you economies of scale. So, the expectation is that but we also know from examples that some of the merges have; not really for me personally, varieties of issues.

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Long-run Production Function



- If all inputs into the production process are doubled, three things can happen:
 - output can more than double
 - 'increasing returns to scale' (IRTS)
 - output can exactly double
 - 'constant returns to scale' (CRTS)
 - output can less than double
 - 'decreasing returns to scale' (DRTS)



Professor M Suresh Babu: So, in the long run, there are three possibilities: increasing returns to scale that is output doubles or the increase in output is much more than the increase in inputs. So, a 2 % increase in input might lead to 6 % or 7 % increase in output. Then there is the constant returns to scale that is output can exactly double as the input. So, 2 % increase in input will give me 2 % increase in output.

Professor G Venkatesh: That is constant returns.

Professor M Suresh Babu: Constant returns in scale and then the decreasing returns to scale where the output actually increases, less than the increase in input.

Professor G Venkatesh: I have 1 Asian guy, but I have double the number of employees, but what is the amount of product I am producing?

Professor M Suresh Babu: Is not doubling it is less than that. So, firms would like to generate this economies of scale increasing returns to scale and maximum...

Professor G Venkatesh: They will operate at the constant returns to scale.

Professor M Suresh Babu: So, now this is very important for a firm because if you are already operating at the constant returns to scale. If you want to expand production, you have to decide if I should start another plant or keep adding workers to this plant. Sometimes, you can reap a little more from adding some more workers, but it does not work beyond a point.


Professor G Venkatesh: It has diminishing returns.

Professor M Suresh Babu: So then you start operating in another unit another. So, you have fresh fixed costs because I am buying a new missionary land and everything else. So, very important in terms of automakers who ask, already I have plant should I also own 1 plant in Chennai, should I have another plant in Pune?


Professor M Suresh Babu: And then Chennai and Pune should produce identical products or some products produced in Pune can be brought to Chennai. Hence it's very important in terms of this kind of planning.

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Estimation of Production Functions



- Production function examples
 - Cobb-Douglas function: exponential for two inputs
$$Q = aL^bK^c$$
 - if $b + c > 1$, IRTS
 - if $b + c = 1$, CRTS
 - if $b + c < 1$, DRTS



Professor M Suresh Babu: Now, empirically how will you estimate it? A straightforward concept using what we call a production function and the simplest of that is the Cobb-Douglas production function. Two economists called Cobb and Douglas came up with this production function. It is very simple, two-input production functions and there is output a function of capital and labor.

And depending on the coefficients of b and c which we estimate in this production function in this exponential production function two input exponential production functions depending on the values of that we can locate where we are operating. Whether it is increasing returns, constant returns or decreasing. Now, I am not going to the technicalities of this further. This is just to show how we can estimate this.

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Estimation of Production Functions



Statistical estimation of production functions

- inputs should be measured as 'flow' rather than 'stock' variables, which is not always possible
- usually, the most important input is labor
- most difficult input variable is capital
- must choose between time series and cross-sectional analysis



Professor G Venkatesh: It is there. If you do log, it will become linear.

Professor M Suresh Babu: If you convert the log, it becomes linear. Now, statistical estimation, a couple of things we need to keep from our data point of view. One, we should also distinguish between the concepts of a stock and the flow here. That is inputs are a flow; it is not a stock because material input is coming in. Now, capital is a stock.

Professor M Suresh Babu: So, we need to be very careful in distinguish like that one.

Professor G Venkatesh: Suggested flow is variable and stock is capital.

Professor M Suresh Babu: Stock is fixed kind of thing. So, we need to distinguish between that when we look at the data. The second most important input is labor in most of the industries that we are talking about. And capital measurement is a very difficult thing. Because to convert into money the value of a machine is a very difficult job. Why? There is this replacement cost, there is this historical costs, which cost do you use?

But we need to have some approximations of capital and using that, we will estimate the production functions, so we need to be very careful in that. Then there are two kinds of data that are available there is cross-sectional data and there is time-series data over time and across.

Professor G Venkatesh: Cross-sectional snapshot.

Professor M Suresh Babu: Snapshot what we showed before in the context of cement industry with 14 firms is a cross-section of 14 firms for 2021.

Professor G Venkatesh: Snapshot one time period.

Professor M Suresh Babu: One, time series will give us whether one firm has like ultra tech, have data for the last 15 years. We can see whether their efficiency has increased over time or not. So, basically both are important in terms of assessing efficiency, once compared to firm A, how is firm B performing. To know that you need cross-sectional analysis. Compared to firm A 15 years back and firm A now if you want a comparison, you need to have time-series data. So, both are very important. And these are the two kinds of analysis that we do.

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Estimation of Production Functions



Aggregate production functions: whole industries or an economy

Gathering data for aggregate functions can be difficult:

- for an economy: GDP could be used
- for an industry: data from Annual Survey of Industries , CMIE etc
- for labor: data from Labor Bureau, CMIE etc



Professor M Suresh Babu: Now we can do this kind of data analysis for industries. From firms we can aggregate to industries and there are studies that show production functions for the economy as a whole. Aggregate economy, so if you want to have cross country comparisons India versus some other country and things of that sort. Then perhaps the output we will use GDP and input we will take be?

Professor G Venkatesh: We take aggregation of all the produce of the entire country.

Professor M Suresh Babu: Entire produce of the country. So, the idea is to use it in micro-analysis and macro-analysis production functions with certain limitations. And we know for a macro

analysis data we get GDP data, the government of India publishes GDP data. So, at an industry level, if you want to do this, there is this annual survey of industries, and then there is CMIE data that is available.

And for labor data, we get the labor Bureau CMIE surveys and all these things. So, one can do this analysis at different levels.

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Importance of Production Functions in Managerial Decision Making



- Careful planning can help a firm to use its resources in a rational manner.
- Production levels do not depend on how much a company wants to produce, but on *how much its customers want to buy*.
- There must be careful planning regarding the amount of fixed inputs that will be used along with the variable ones.



As I keep repeating, in decision making, it depends on how much the consumers want to buy. So, given the demand, we can locate our production and plan our capacity.

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Importance of Production Functions in Managerial Decision Making



- **Capacity planning:** planning the amount of fixed inputs that will be used along with the variable inputs

Good capacity planning requires:

- accurate forecasts of demand
- effective communication between the production and marketing functions



Professor M Suresh Babu: But one important point that I want to bring is basically it is used for capacity planning. Because there is this very important issue in terms of capacity utilization for a firm.

Professor M Suresh Babu: Capital intensive firms. For example, I have already invested in huge capital. If I am not utilizing my capacity well, my capital is underutilized.

Professor G Venkatesh: So, you measure that as a percentage typically.

Professor M Suresh Babu: Yes.

Professor G Venkatesh: Its says 80 % utilized. So, that is recently okay.

Professor M Suresh Babu: So, 20 % is underutilized.

Professor G Venkatesh: But still I would like to operate it at let's say 95.

Professor M Suresh Babu: 95 %.

Professor G Venkatesh: But at 80 % I might still break, it might even be 75-80.

Professor M Suresh Babu: I will be well off with that. Still, I would like to push but if I am operating at 50 % or then 50 % is idle capacity.

Professor G Venkatesh: But if you are operating at 97, then you may say, oh I am too close to maximum capacity. So, is this dangerous? It breaks down than (21:55)

Professor M Suresh Babu: So then, at that point in time I will start looking at another plant

Professor G Venkatesh: If we are operating at 60, then I am losing money. So, then I would say there is a problem. I do something to build the capacity.

Professor M Suresh Babu: Either the demand from a product is not there or there is something else.

Professor G Venkatesh: Something wrong with my right?

Professor M Suresh Babu: Yeah.

Professor G Venkatesh: So, capacity utilization you are saying.

Professor M Suresh Babu: Is a very, very important concept. Now, for capacity utilization too we need accurate forecasts of demand.

Professor M Suresh Babu: And there is a need for effective communication between the production and marketing functions of a firm. So, we want to highlight here that our discussions in the first part, in terms of consumer and demand and all, we use this kind of decision-making.

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Firms in Competitive Markets



Now, let me just highlight a very important decision for a firm in a competitive market.

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Total, Average, and Marginal Revenue for a Competitive Firm



Quantity	Price	Total revenue	Average revenue	Marginal revenue
(Q)	(P)	$(TR = P \times Q)$	$(AR = TR/Q)$	$(MR = \Delta TR / \Delta Q)$
1 litre	€6	€6	€6	€6
2	6	12	6	6
3	6	18	6	6
4	6	24	6	6
5	6	30	6	6
6	6	36	6	6
7	6	42	6	6
8	6	48	6	6



Professor M Suresh Babu: Well, in a competitive market.

Professor G Venkatesh: Like FMCG.

Professor M Suresh Babu: FMCG and total revenue is very important for a firm. If your revenues are very less than why should you operate. Now, there is a concept of average revenue and there is also a concept of marginal revenue. That is, average revenue is nothing but your total revenue

by the quantity that you are selling. Marginal revenue is what you are getting by the sale of an additional unit. So, in a competitive market you cannot vary price because prices are given.

Professor G Venkatesh: Prices are controlled by the market.

Professor M Suresh Babu: And there's cutthroat competition. So when I sell more, my total revenue increases my average revenue remains the same, my marginal revenues also remains the same. So, here my variable, which I can vary is only the quantity. I can be at this level or that level and then keep quiet. So, that is why competitive markets are very difficult to operate.

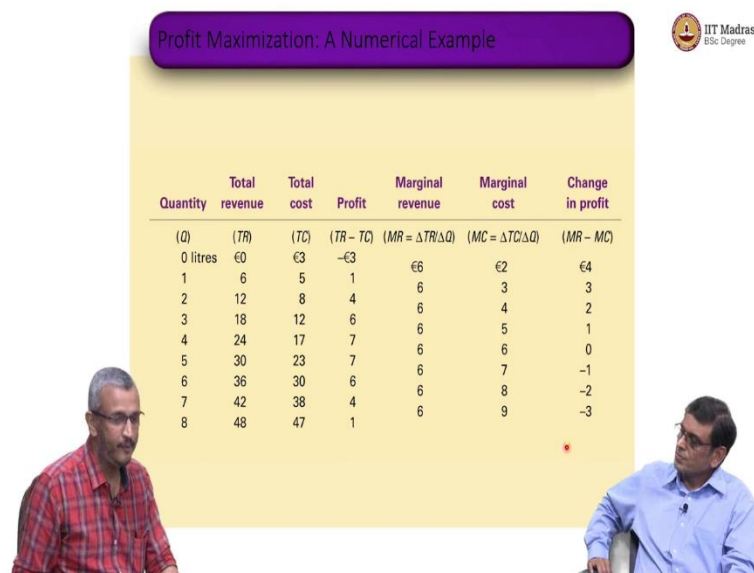
Professor G Venkatesh: If I changed my quantity, it will not affect price because there are so many players.

Professor M Suresh Babu: There are other players in the market.

Professor G Venkatesh: So, my quantity effect will be only having a small impact on the amount of.

Professor M Suresh Babu: Total markets. So, this is an example where only quantity decision can be taken.

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Profit Maximization: A Numerical Example

Quantity	Total revenue	Total cost	Profit	Marginal revenue	Marginal cost	Change in profit
(Q)	(TR)	(TC)	(TR - TC)	(MR = $\Delta TR / \Delta Q$)	(MC = $\Delta TC / \Delta Q$)	(MR - MC)
0 litres	€0	€3	-€3	€6	€2	€4
1	6	5	1	6	3	3
2	12	8	4	6	4	2
3	18	12	6	6	5	1
4	24	17	7	6	6	0
5	30	23	7	6	7	-1
6	36	30	6	6	8	-2
7	42	38	4	6	9	-3
8	48	47	1			

Now, let us see this a little more in terms of total revenue and bring in total cost here. Total cost is nothing but fixed cost plus variable costs. Total revenue minus total cost is the profit. And then you have marginal revenue.

Professor G Venkatesh: Which is constant.

Professor M Suresh Babu: Which is constant but marginal cost keep varying.

Professor G Venkatesh: Marginal cost will vary.

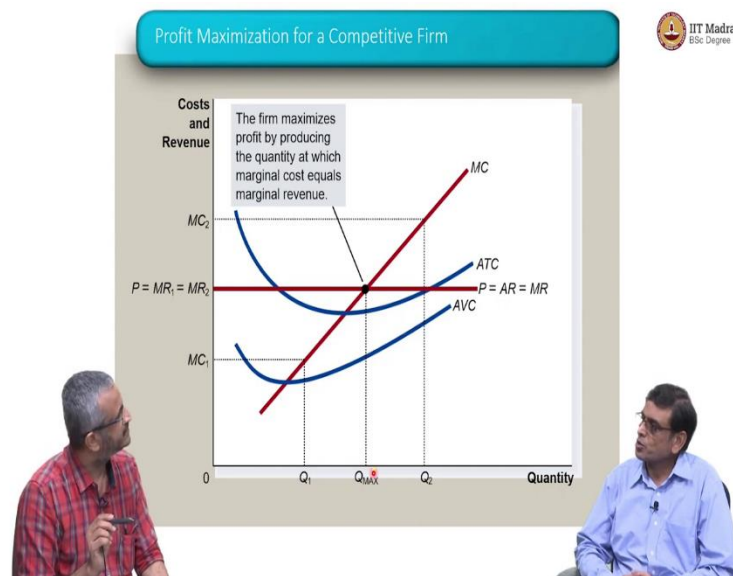
Professor M Suresh Babu: Because you are having additional workers if you want to expand. Now, depending on this variation in marginal cost there will be variation in profit. So initially, the profits will be actually high, then it keeps falling and then it is negative. So, we should stop production at this point 0.

Professor G Venkatesh: Certainly higher in that.

Professor M Suresh Babu: Higher in that is better, but we would like to get more profit as a supplier.

Professor M Suresh Babu: Profit. So, we keep expanding but if you keep pushing you will enter into the negative, in terms of profit and you should locate production there and stop production.

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Professor M Suresh Babu: Now, so let me make it a little more clumsy adding some co-workers, we have this from earlier our cost curves this average variable costs. Then there is the average total cost that we saw a U shaped cost curved. Marginal cost is just a rising curve.

Professor G Venkatesh: Why did the average variable cost come down in the beginning here, in the varying curve, it should always be increasingly.

Professor M Suresh Babu: No, initially, when the output is expanding, you have cost benefits that are accruing after that.

Professor G Venkatesh: Number of scale for varying cost.

Professor M Suresh Babu: Yes, after that it is increasing that is why this is slightly a kind of not a perfect U like this.

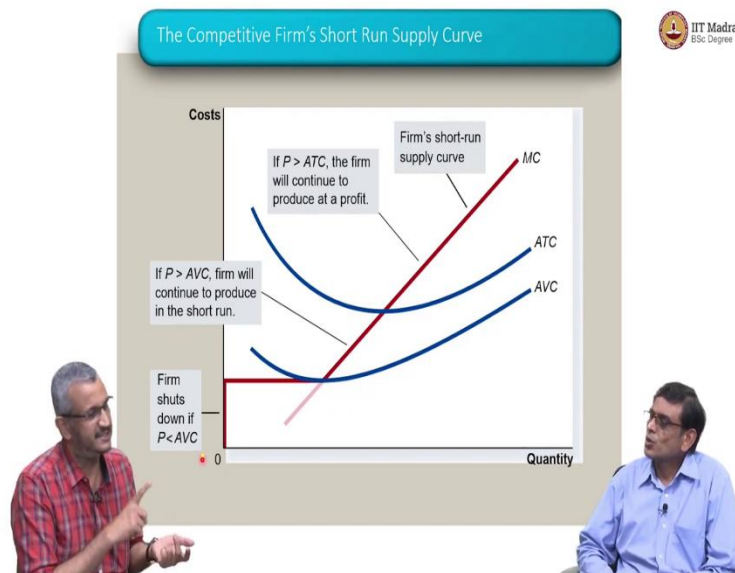
Professor G Venkatesh: You have a labor for U but what you cannot labor against this step function. You cannot have half a labor.

Professor M Suresh Babu: So, then we have an equilibrium that is the point where the firm maximizes profits by producing quantities at which marginal cost is equal to marginal revenue. Beyond this point the firm should not produce. Less than this point well it can actually increase his production. So, that is related to our capacity utilization question also a very important analysis which we can have.

Professor G Venkatesh: Very competitive market will try and make your marginal, you would go to that operating point where your marginal revenue is equal to marginal cost.

Professor M Suresh Babu: $MR = MC$.

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Professor M Suresh Babu: Now, one more decision we want to highlight suppose you are operating in this market. And if your price is actually greater than the average total costs. Price is greater than average total costs, then firm will continue to make a profit. And then the firm will continue to produce, suppose your price is actually less than the average variable costs.

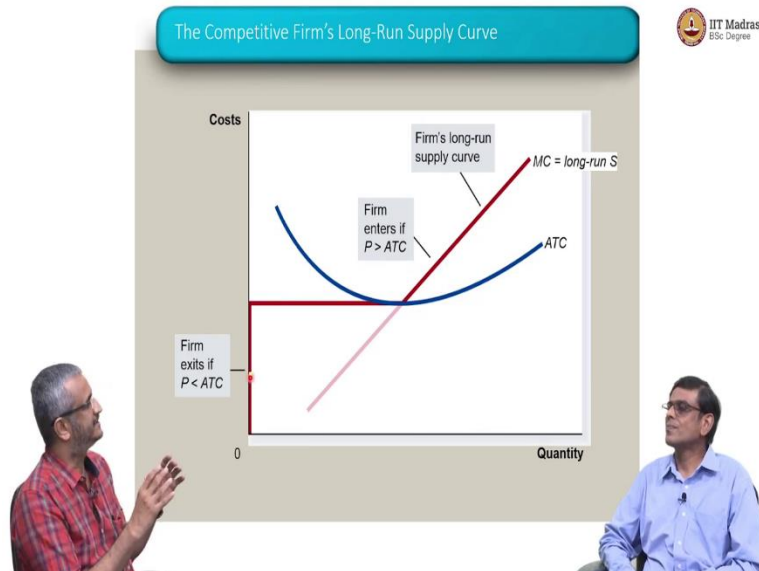
Professor G Venkatesh: But not more than average total costs.

Professor M Suresh Babu: Total costs at least the variable cost I can cover that the labor and material.

Professor G Venkatesh: Say you are losing money for some time.

Professor M Suresh Babu: But your fixed cost, you are not able to cover nothing towards fixed cost. So, I might actually shut down temporarily. And if the price is actually less than the average variable costs, then I cannot continue production for a long time. For a short time, I will see whether things improve. So, there is a decision of shutting down there is a decision of exiting.

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Professor G Venkatesh: So, you can decide the price is between variable cost average variable cost and average total cost you can say that I will not serve the market for some time till the price improves right?

Professor M Suresh Babu: Yeah.

Professor G Venkatesh: The other choice? The capital is not going anywhere.

Professor M Suresh Babu: You have already invested and you have kept there

Professor G Venkatesh: It is kept there. You just need some time and then when the price is becoming favorable you again start a plant.

Professor M Suresh Babu: In a competitive market, if the price is greater than the average total costs, the other firms will also start entering. Because there is a profit possibility. So, that again pushes the price.

Professor M Suresh Babu: But if the price is actually less than the average total cost the firm exits. So, there are three decisions now for a firm. For a new firm to enter the entry decision. For an existing firm when to shut down.

Professor G Venkatesh: Temporary or permanent?

Professor M Suresh Babu: It is in terms of this relation between price and the...

Professor G Venkatesh: If you cannot serve the market at the cost. The average variable cost price point is set then somebody like China comes in and starts setting the price point at their average variable cost. You cannot get your average variable cost to their level then shut down.

Professor M Suresh Babu: Then you are hit.

Professor G Venkatesh: But if your average variable cost is still okay. You are still your price point, above your average variable cost, but you cannot get your return on your fixed costs. Then at that point in time, you can say okay I will wait for some time.

Professor M Suresh Babu: Some more time. So, that is a temporary separation.

Professor G Venkatesh: If you are operating above-average total costs, you are making money then you can continue.

Professor M Suresh Babu: Then you can continue. So, this whole decision of firms then in terms of entry exit and shutdown and also the decision in terms of how much quantity to produce. Then is arrived by examining the costs as well as the production functions. And that is the empirical value of this analysis there.

Professor G Venkatesh: And the data for all this is within the firm only, mostly cost function because some of the material costs and now they are coming from outside.

Professor M Suresh Babu: But it is a firm level data.

Professor G Venkatesh: Firm level data.

Professor M Suresh Babu: So, it is a microeconomic phenomenon like an individual household locating resources

Professor M Suresh Babu: Now, the pressure for the firm here is to actually bring down its cost and keep its costs at the lowest possible level. So, then now we have a fairly comprehensive story in terms of the supply side. The story in terms of the supply side is in terms of one cost functions, where the firm stands in terms of costs, depending on that the firm decides to locate its production. Equally important is the market conditions in which the firm operates.