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## Lecture - 46 Theory of Cost (Contd...)

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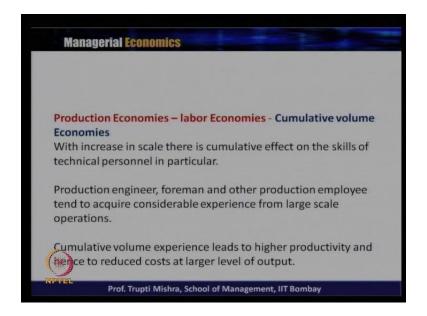
Then we will talk about the automation of production process, how it generates the how it generates the advantage to the firm, so division of labor promotes the invention of tools and machines, which facilitate the supplement, supplement the worker. So, if it is they are working a working on a project which fits to their skill, that fit to their expertise, generally that again promotes the invention of tools and machine which facilitate the supplement of worker

So, mechanization of the production method in large plant increases the labor productivity, a leads to decreasing cost as the scale of output increases. So, whether it is a automation of production process, whether it is mechanization of the process itself that take that reduces the time, that that increases the labor productivity, because they are not doing it manually, and now their production process is become automated. And what is the final outcome, final outcome leads to the decreasing cost as the scale of output increases.

And if there is a decreasing cost that is nothing but the economies of scale what the firm is enjoying. Then in case of production economies of scale in the sub category of labor

economies of scale, we have one more one more point or may be one more focal points, where which brings some advantage to the firm, that is cumulative volume economy.

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So, with the increase in the scale, there is a cumulative effect on the scale of the technical personnel in particular; so there is a increase in the scale, and which leads to a, which brings a cumulative effect on the scale of technical personnel in particular. So, production engineer, foreman, and other production employee tend to acquire considerable experience from the large scale operation. So, cumulative volume experience leads to higher productivity, and hence to reduce cost at a larger level of output.

Now, what is this cumulative volume economy suppose, you are working on a specific assignment, specific task in a smaller smaller way, when the production operation increases, when the size increases you are contributing to a larger scale. And that again increases the higher productivity, and that again leads to the higher productivity of the labor, and that is the reason if you look at that again leads again leads to decrease in the cost, and improve the efficiency and productivity of the firm. And that is how we can conclude that the cumulative always leads to higher productivity, and hence to reduce cost at a larger level of output.

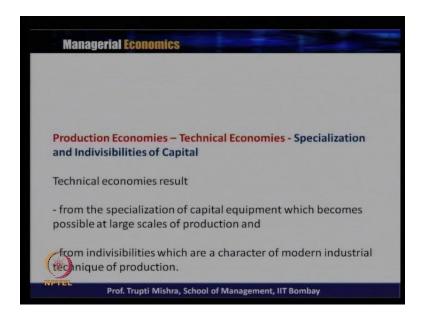
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So, then we will come to the second type of production economies that is the technical economy. So, if you remember when we discussed about the production economies of scale, it is started with a fact that production economies of scale, either come from labor or comes from the fixed capital or from the inventory. So, in the first case we discussed about the labor economies of scale, where we discuss about the specialization, where we discuss about the time saving, where we discuss about the automation of production process, and where we discuss about the cumulative volume economy.

Now, will see that there is one more point that is the technically economies, that is the sub category of the producing economy, where the economies are associated with the fixed capital, which includes all type of machinery and other equipment. So, specifically technical is one, where the producer gets the advantage, the cost advantage from the fixed input that is all type of machinery and other equipment or we can call it as fixed capital. So, it arise either from specialization, and indivisibilities of capital or from the setup cost or from the initial fixed cost or technical volume input relationship, or reserve capacity requirement; so these are the factors from which generally with the firm or the producer get the technical economies of scale.

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So, let us analyze all these factor one by one, so what is the first factor comes the first factor comes here is the specialization and indivisibilities of capital. So, technical economies result from the specialization of capital equipment which becomes the possible at the large scale of production, and from indivisibilities which are a character of the modern industrial technique of production.

So, one if you look at the machine it is specific, the assignment is specific by the machine, so the it is like the specialization of the labor similarly, the specialization of the capital equipment or machine which becomes possible at the large scale of production not at the small scale of production. And when it is possible at the large scale of production, obviously it leads to the productivity, it is from the technical economies also comes from the individuality which are a character of the modern industrial technique of production. Because if you look at the machine as such a large that, you cannot make them or you cannot divide them for a, in a small small way for the smaller level of output.

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Like typically the assembly line, if you look at fixed for a size, you cannot make it a sub part of it, modern technology is as I said it is a higher degree of mechanization, mainly it is a capital intensive production method, because it is a large scale of production. We talk about the automation of production process, we talk about the high high high end capital equipment, we talk about the mechanization, we talk about the we talk about the high end technology that leads to the, if you look at that is the part of the modern technology. And if you look at these are high overhead cost, but when it comes to the average cost it has to be the lowest average cost, because that is in term of the productivity, and in term of the performance.

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So, when it is the case of low level of output, higher average fixed cost is more than offset the lower level cost. So, initially when such a high end technology, high end machinery, high end may be the automation as a whole or high end about the capital equipment, this is the fixed cost is more specifically at a lower level of output. And the higher average fixed cost more than off set the lower level cost, but once the scale is reached, once there is a large scale, once the scale is reached, and we can call it is a appropriate scale.

The highly mechanizing specialized technique becomes profitable, because why it is profitable because the in the large scale generally the fixed cost gets spread over the larger level of output. And in general the unit cost comes down, which leads to the economies of scale or the cost advantage for the firm, then will take out the second factor that is setup cost how it brings the technical economy.

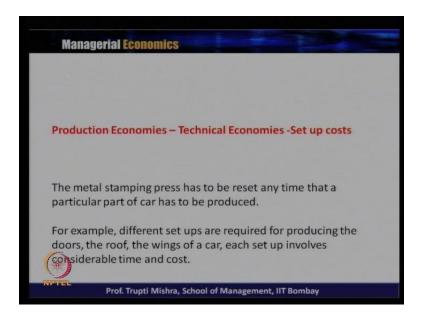
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So, cost involve in the preparation of multi-purpose machinery for performing the particular job or product that is generally the set up cost, so cost involve in the preparation of the multi-purpose machinery for performing a particular job or product. And typically if you look at the example of a motor car industry, or a firm producing the electrical household equipment in the use of general purpose machine, is quite common because the set up cost is very high.

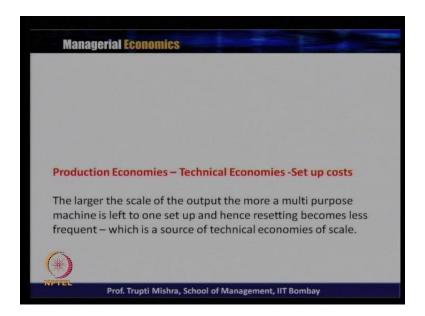
So, if you look at, if you again come down to a specific case like a metal stamping press which produces frames, and the various component of the final product. And the metal stamping press has to be reset, any time that a particular car has to be produce, so set up cost is one which is generally requires for the high end equipments.

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And if you look at the typical example of a metal stamping press, it has to be reset at any time the particular part of car has to be produced. For example, different setup are required for producing the doors, the roof, the wings of a car, and each set up involves a considerable time and cost. So, when it comes to setup cost, if the if it is a case of only one car, then again the average cost or the total cost is on a higher side.

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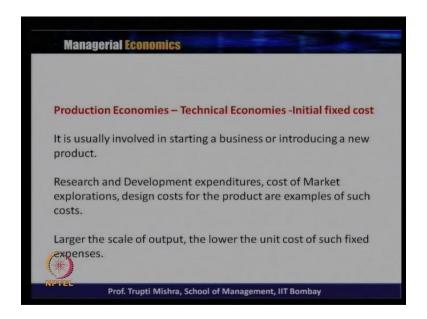


But, if it is case of the large scale output, maybe it is the case of the number of cars the larger the scale of the output, the more a multipurpose machine is left to one set of, and hence resetting become less frequent which are the source of technical economies of scale. So, the understanding is that, set up cost is required for any the high end cost or the high end capital equipment or high end machine, but even if it requires a set up for the different process, different even intermediate product, and the cost is on a higher side.

But, once the scale of operation increases the larger the scale of the output, the more a multipurpose machine is a left is to is one set of, and has resetting become less frequent. So, one set of all door will get produced, another set of wing will get produced or maybe the another set of the frame will get produced, so if it is large scale in one set up, if the units are more, the average set of cost goes down with each unit of output.

But, if it is a small small plant or the small company, where the unit of output is less in that case generally the set up cost cannot be spread over a larger amount of output. And that is the reason the overhead cost for each unit of output generally on a higher side for a small scale, but larger scale they get a cost advantage, because for one set of they produce a number of unit of output, and which is a source of the technical economies of scale.

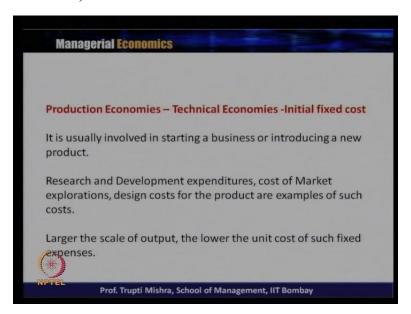
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Then we will talk about the next factor that is the initial fixed cost, how initial fixed cost also we can, we also can get a cost advantage from the initial fixed cost of a large scale operation, so it is usually involved in starting of a business or introducing a new product. So, if you look at what is the initial fixed cost, fixed cost when either when you are starting a business, you need you need a fixed cost, you need a maybe the start up money or startup equipment, or

introducing a new product where the where the technicalities are different, you need to get may be new type of capital equipment, you need to get a new set of man power, you need to use a new technology.

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So, research and development expenditure, the so typical example of fixed cost is research and development expenditure, cost of market exploration, design cost of the products is generally it comes under the initial fixed cost. So, these are all how it can be taken in case of a large scale operation, larger the scale of output, the lower the unit cost of such fixed expenses, because it spread over the different unit of output; so larger the scale of the output, lower the unit cost for such fixed expenses.

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Then we will take out one more factor under technical economies of scale, that is technical volume and input relationship. So, technical economy also arise from some technical geometric relationship, between the particular equipment and the inputs requires to produce and install it. So, there are few important in the process industry like includes special equipments, such as storage tanks, reaction chambers, and connecting pipes.

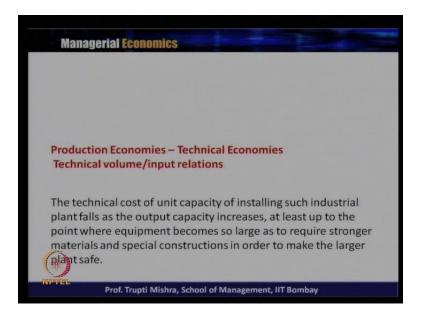
And in what context we are discussing this, we are discussing this that what is the volume of output and what is the input relationship, whether it is being cost advantage to the firm or not. So, if you look at there are few factors that is important in the process industry, it includes special equipment such as storage tanks, reaction chambers or the connecting pipes; the material and labor cost for each this type of the inputs, you can call it inputs.

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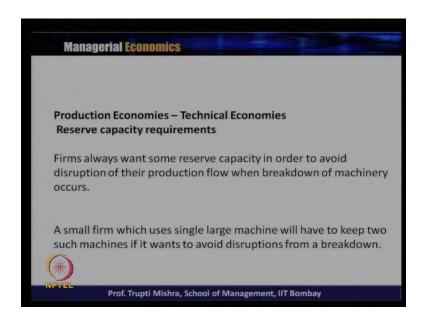
The materials and the labor cost of the constructing such plants are proportional to the surface area they occupy, so it is proportionally the cost is proportional to the surface area, and the volume capacity which determines the level of output of the plant increases, more than proportionately as the area increases. So, material and labor cost they are proportionately related to the surface area of the plant they occupy; and the volume capacity which determines the level of output of the plant, generally increases more than the proportionately as the area increases.

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Now, the technical cost of the unit capacity like, whether you talk about the storage tank whether you talk about any other reaction chamber, the technical cost of unit capacity of installing such industrial plant falls as the output capacity increases. At least up to the point where the equipment becomes, so large as to require stronger material and special construction, in order to make the large plant safe. So, the larger the scale maybe the equipment whatever comes, they also requires stronger material and special construction, in order to make the larger plant safe, and there they get their constant advantage, because the scale of operation increases.

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Then the we will come to the last factor under the technical economy, and this is the reserve capacity requirement, so firm always wants some reserve capacity in order to avoid the disruption of their production flow, when break down of machinery occurs. Now, what is the need of this reserve capacity requirement? The reserve capacity is generally is kept, because if in case of machine break down in case of maybe labor force strike, in case of any eventuality, at least the flow of goods and services should go to the market.

And that is how the all the firms keeps some amount of the capacity as reserve, and will see that from the reserve capacity requirement, how the economies of scale is generated. Firms always want some reserve capacity, in order to avoid disruption of their production, when break down of their machinery occurs. So, there may be a possibility of disruption of their production flow, maybe because of failure of raw material, failure of of technology, failure of machine, where the breakdown of machinery generally occurs.

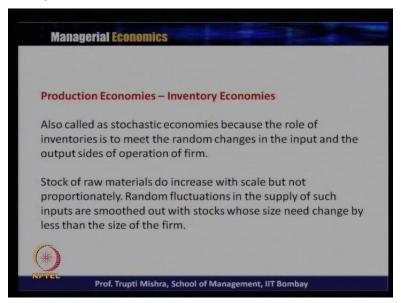
A small firm which uses the sink in large machine will have to kept keep two such machine if you wants to avoid disruption from the breakdown, because there is only one large machine, which produces the entire requirement of the small firm. Now, for the reserve capacity requirement what we have to do, they have to keep the another large machine as the backup, but in case of but in case of large scale, in case of large scale anyway there are number of machines, so if there is a break down in one, the production flow never stops there, generally it goes, because the other machines or the maybe the other machine they are still producing the product.

So, in this case the reserve capacity requirement is comes from all the machine not from a single machine, so in order to keep the reserve capacity requirement a small firm has to invest more, in order to keep one large machine again as the backup, in case of the breakdown of the machinery. But in case of large firm since, there are number of largeness already in place, if there is no need to keep the reserve capacity requirement, or there is no requirement for the reserve capacity.

Because, if one machine break down the, whatever the production comes from that machine can be, taken from the other machine either by over producing it or may be increasing the quantity whatever there producing. And in this case if you look at, the cost of production decreases, because it is not that you need to do again it is a initial fixed cost, variable cost to run that machine or maybe you are not getting a loss, because there is a decrease in the

output, rather that is getting cover in the other machine. And that is why there is, that is another source of technical economies; that comes from the reserve capacity requirement to the real economies of scale.

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Then we will talk about the third source of production economies of scale, and what is the third source of production of economies of scale, if you remember production economies of scale comes either from labor or from the capital or from the or from the inventory. So, we can call that, now will check that the third one that is the inventory economy, and this inventory economy also called as the stochastic economy, and why it is called as stochastic economy? Because the role of inventory is to meet the random changes in the input, and the output side of the operation of firm; this is called as stochastic economy.

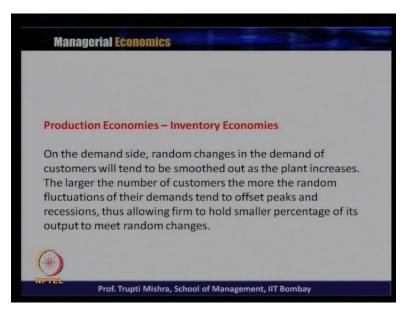
Because, what is the role of inventory? The role of inventory is to meet or the capture the random change in the input and output side of the operations firm, it is not maybe the regular, maybe it is a random kind of thing. So, stock of raw materials do not increase with scale, but not proportionately; stock of raw material increases with scale means, if you are producing 100 units you keep 10 units as the stock of the raw materials, if you produce 1000 units obviously you need to keep some amount which is more than 10 units as the stock of the raw materials, by if your production capacity or if the production level is 1000 units. So, the point here is the stocks of raw materials do increase with the plant size, but not proportionately.

So, ideally what would have been the situation, if 10 units has the stock for 100 units of output, then 100 units would be stock for 1000 units of output, but in reality that does not happen it increases from more than 10, but it never reach 10, because it is not proportional increase in

the with the scale with the scale of the output. So, random fluctuation in the supply of such input are generally smooth out with the stocks, which side need to change less than the size of the firm, and when it is possible this is possible in case of a large scale operation.

So, stock of raw materials increases, but not proportionately, but if there is a random fluctuation in the supply of such inputs, supply of such raw materials that smooth out with stock size need change less than size of the firm. And this is only possible in case of large scale, and that is how we get a economies of scale, or we get the advantage of economies of scale in case of the inventory economy.

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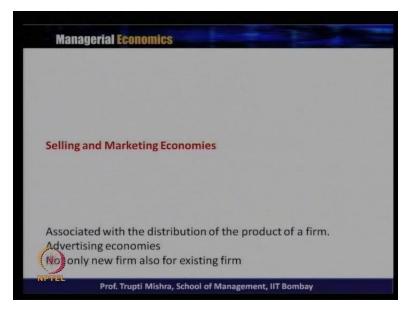


Now, what happens in the demand side, random changes in the demand of customer will tend to be smooth out as the plant increases, so random changes in the supply can be taken from the stock of the raw materials. And on the demand side, random change in the demand of the customer will tend to be smooth out as the plant increases, the larger the number of customer, the more random fluctuation of the demand tends to offset the peaks and recession, thus allowing the firm to hold a smaller percentage of its output to meet the random changes.

So, if you look at when it comes to the demand side, it is not either at the peak or at the low, so when you when you average out the peak and low random fluctuation from the demand side, ideally firm should not keep the stock on the basis of either peak or the from the boom. An in this case it generally average out the fluctuation on the higher side, and fluctuation on the lower side; and that leads to or align the firms to hold a smaller percentage of its output to

meet the random changes. Because the random changes can go in the positive direction, and also can go in the negative direction.

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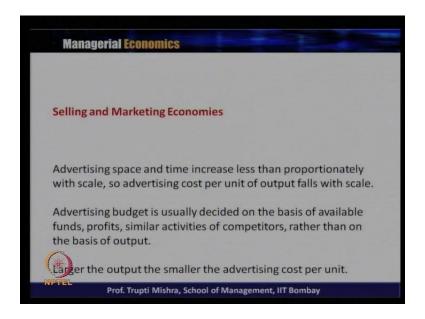
Then we will talk about the second kind of economies of scale, that is selling and marketing economy. So, the under real if you remember that types of economies, one is real economies, second one is the pecuniary economy, and under real economies we talked about the production economies, we talk about the we will talk about the selling and marketing economy. And in case of production economies, we talk about the technical labor economies of scale, technical economies of scale, and inventory economies of scale, because production economies of scale generally come from the labor, capital equipment or the inventory of the firm.

So, in case of second case of the economies of scale under real economies of scale, this is selling and marketing economy; selling and marketing economy generally associated with the distribution of the product of a firm, it comes from the advertising economies of scale not only new firm, also existing firm. So, when talk about advertising, it is not about only for the new firm, but also for the existing firm.

Why advertising advertising is also for the existing firm? Because when the existing firm either they launch a new product or for their existing product to keep fresh in the memory of the consumer, at least to certain point of the certain level of advertisement. So, this advertisement cost is also applicable to the existing firm who are launching a new product, or

for the for the existing product, if there is some of the updates or just to keep fresh in the memory of the consumer.

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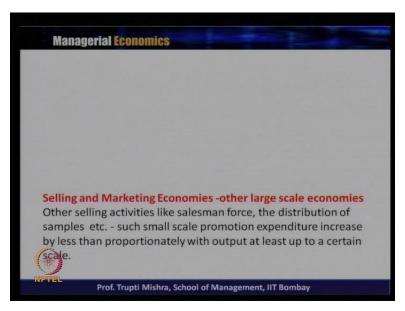


So, advertising space and time increases less than proportionately with scale, so advertising cost per unit of output falls with the scale, and advertising budget is usually decided on the basis of available fund, profit, similar activities of competitor, rather than on the basis of output. So, advertising space and time increase less than proportionately with scale, so that leads to the per unit cost of average advertising cost generally falls with the scale, and larger the output smaller the advertising cost per unit.

Because, whether it is for one product maybe the advertising cost is on a higher side, but when it is more more kind of product it comes from one company, they just one company may be campaigning kind of thing, and that takes care of the product whatever is getting produced by the company. Or the other way, if the advertising cost is for the lower unit of output, even if it gets spread till the average cost is on a higher side, but when it gets spread over a longer spread over a longer or the larger level of output, generally that average cost comes down.

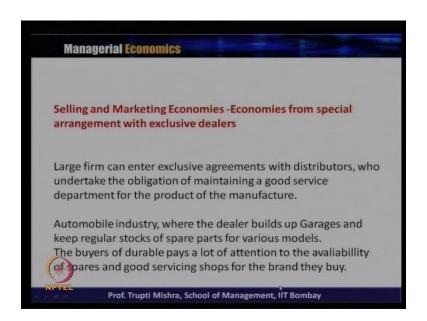
Because, the advertising cost remains same irrespective of whether it is 100 units or whether it is for the 1000 unit. But when it comes to benefit always the economies of scale comes from the 1000 units of output, not from the 100 units of output.

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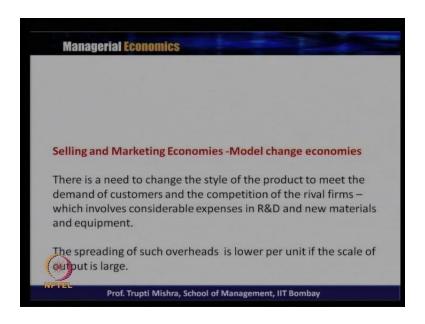
Similarly, if you look at there are some other activity like other selling activity like, salesman force, the distribution of sample etcetera, the such small scale promotion expenditure increases by less than proportionality with output, at least up to a certain scale in case of the large scale output.

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Then there is a third factor that is selling and marketing economy, that is the economics from special arrangement with exclusive dealer. So, large firm can enter the exclusive agreement with distribution, who undertake the obligation of maintaining a good service department, for the product of manufacture. So, automobile industry where the dealer builds up the garages, and they keep regular stock of the spare parts of various models, the buyers of durable pays lots of attention to the availability of spares and good servicing shop for the brand they buy.

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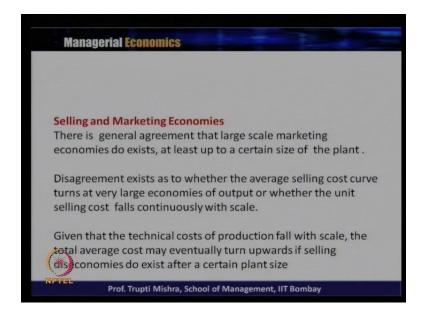


So, if you look at in case of exclusive arrangement with dealer, that leads to some reduction in the cost of production, because the dealer is taking care of the some what has to be taken care of the by the firm itself. Then we talk about one more factor, that is model changing economy. And if you look at there is a need to change the style of the product to meet the demand of customer, which is ever increasing and the completion competition with the rival firms, which involves considerable expense of R and D.

And then new materials and equipment we need to change the model unit to change the style. The spreading of such over head load per unit, if the scale of output is larger, even if the initial fixed cost is high, even if the capital equipment, even if the raw material, even if the

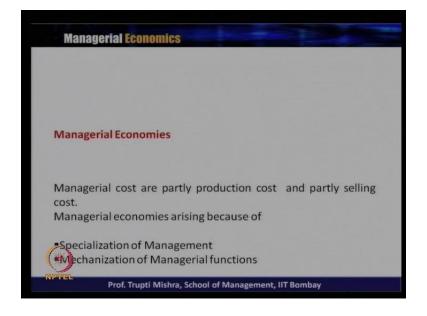
labor required is high. But the cost gets spread for a large unit of output and that brings some economies of scale to the some economies of scale to the firm.

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If you look at there is a general agreement that large scale marketing in case of generally the large scale marketing economy do exist, but at least up to a certain size of land. But there is some amount of disagreement exist as to whether the average selling cost curve turns at very large economies of output or whether the units selling cost will continuously with scale. So, given the technical cost of production falls with the scale the total average cost may eventually turn upward, if it is a selling economy do exist after a certain plant size.

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So, we will stop here today and we will discuss in the next session about two more type of economies of scale, that is managerial economies of scale and transport and storage economies of scale. Then we will spend some time on the pecuniary economies of scale and we will check that whether diseconomies exist at any point of time for a specific plant. And if it exist and if diseconomies exist maybe what are the factors or what is the reason behind this. Then we can continue our discussion in the next session the whatever the part left in the economies of scale.