

Title: Principles of Economics

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Until now, we looked at the entire market always and we studied property of the market solutions and we always took the market demand and market supply together. but let's look at a little bit more acted determinant of one side on market, the supply side.

We will ignore the demand side for now.

We will just take consumer preferences and consumer incomes to be given.

So you should think ability and willingness of consumers to participate in the market is somehow given.

Let's focus on the decisions that companies make about how much to produce, what prices to charge and the consequences of these decisions on companies' welfare.

So, we will talk about the efficiency and welfare, consequences on firms. In chapter 13, we will look at "The costs of Production" at companies.

So, as we will focus on competitive markets, we will assume everything on the demand side.

It's simple and given and we will study what happens as the company choose different output levels, how that translates into costs and revenues of the companies.

From chapters of four and five, we should remind ourselves of the law of supply which says that as the prices in the marketplace increase, producers are willing and able to produce more units of output.

On one hand, you should think that in term of intensives, it's more valuable for producers to produce output when prices are high.

So, you should think that willingness uh... to produce is increased when prices rise. and also because there are cost of production and maybe these additional cost of production are higher for greater output levels.

When prices level in the marketplace increase, producers are also more able to produce additional units of output.

Um, let's look at the underlying problem of uh...companies.

So, we think that companies un..one two maximize their profits.



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And profits are simple difference between total revenues that companies get from consumers and the total costs of production.

And in this expression I want you to think that total revenues are simple, uh simple, uh simple part.

Because we are assuming that prices are constant in the...uh...in a competitive market and so total revenues increase linearly in the output level produce.

So, you should think that every time the company produces one unit of output its revenues increased by prices.

On the other hand, total cost of production might increase nonlinearity.

There might be a complicated relationship in how the amount of inputs translates into the amount of outputs produced.

So, additional units of output might uh... increase total costs uh...at a faster rate or at a slower rate than previous units of output. ok?

When we discuss at this relationship, it's useful to distinguish uh... the profits and costs of that uh...economists recognize and those that accountant or finance uh...majors recognize.

The additional complication in this a profit expression is that some costs of production might not be explicit.

Companies don't have to payout cash to obtain some resources used in the production process.

but that doesn't mean that those resources are not being used.

So we will say that economists uh...distinguish between explicit and implicit costs of production

and depending whether implicit cost of production are included in the profit expression we will say that we distinguish economic profits which include both explicit and implicit costs of production and counting profits which only account for explicit cost of production.

And when we think of implicit costs of production uh... there are several examples uh...that uh...are easy to think off.

In most real world businesses, the owner of a small business, the entrepreneur doesn't pay him himself a salary and it just hopes that through the production process will obtain some profits or rents and that will be the compensation for this uh...effort.



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So, here we should think that when the owner of a company doesn't pay himself a salary, there is no explicit outlay of money.

But there are still resources used in the production process, the managerial efforts or entrepreneurial effort.

So, there are these simplicity resources used in the production process that economists recognize that they have to be compensated.

Another example is when the owner of the business he uses his own house to run of the business rather than rent an office uh...office building.

In that case there is no explicit payment for rent, but we should think that there are these resources implicitly used in the production process and they should be compensated for.

And so the profits that the accounting profits that the business generates should pay for both of the explicit and uh...implicit cost of production. Okay?

So here is a representation of the difference between economic variables and accounting variables

One thing that we should notice in this graph is that the revenues are the same for economists as for accountants.

Because revenues are simple, we assume that revenues are simple, cash obtained by companies from consumers and the only difference between these two graphs comes from the difference in total cost of production which would say that for any content.

Only explicit costs of productions are considered for any economists and indeed that there is additional cost the implicit costs.

And we should think that the some of the implicit and explicit costs is the total or the opportunity cost of production.

So from looking at his graph, we should think that the accounting profit is always higher than economic profit as long as there are some implicit costs of production.

And we should think that accountants generally overstate the profitability of businesses as long as there are some implicit costs of production.

So, as I said, total revenues of producers are simple function linearly increasing in the output produced and it's only the cost side which is more complicated.

And to understand the cost of production and a business, we should understand the conversion between the amount of inputs into the amount of outputs produced.

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And one implicit assumption is that the total number of inputs used.

We will multiply this amount of inputs by the wage rates or by the costs of inputs to obtain total cost of production.

And from uh...If we think that uh... the prices of inputs are given as simplifying assumption.

We just need to know this conversion rate between the amount of inputs and the amount of outputs.

So the production function gives us the relationship between the amount of inputs needed in production and the amount of outputs.

We usually draw the production function this way with inputs on the horizontal axis, outputs on the vertical axis.

And if we draw different bundles that can be observed and a business, it would say that his is the production function for a company.

Generally we observed this concave shape of the production function because of we say, diminishing marginal product of inputs used in the production process.

So as a side note on this, we will keep saying that we want the production function to be eventually concave.

We don't scare very much whether the relationship is convex or concave for the initial for the initial units of inputs used.

But for late units of inputs, we want this property.

We will discuss this uh... we will discuss this more in chapter 14. Ok?
and uh... and additional function that is useful to draw is the total cost per... total cost function which shows the relationship between the amount of output produced and the total cost of production. Ok?

Note is that when we drew production function we drew the amount of inputs on the horizontal axis the amount of output on the vertical axis.

Now we are growing the amount of output on the horizontal axis and total costs of production on the vertical axis.

Here I want you think that there's a direct analogy between production function and



the total cost function in the production process.

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What we have been on the vertical axis for production function now we have on the horizontal axis.

And we used to have a amount of inputs on the horizontal axis.

Now we have total costs on the vertical axis.

And you should think that total costs can be written as the amount of inputs used times, the wage rate or times the price per unit of input.

Right? total cost are simply the multiplication of the amounts of inputs used and uh...prices of inputs.

So if we...if we had concave strictly concave production function here we will have a strictly convex total cost function.

The additional difference is that the total cost function may not start at zero.

That's because there could be fixed costs of uh... production which we did not show in the...uh...in the graph of production function.

uh...and we can observe the same property on this graph as we observed with the production function.

As we increase, output, total cost will increase at a faster and faster rate.

But this should be intuitive it comes from the diminishing marginal product property that we discussed on the previous graph.

A little side note on the diminishing marginal product.

You should think that there are at least two reasons why we could observed diminishing productivity of inputs.

For example, suppose that we have the only one who worker working at a company.

And for some reasons we needed to hire this worker four more hours, maybe the demand in the marketplace increased.

We need to produce a greater amount of output and so we need to hire this worker for more hours.

What happens to the productivity of this worker?

Well, first of all, you should think that the longer the worker has to work, the less productive he will become because of the more tired he becomes.

So, the greater...uh... the number of hours that we hire him for, the less output per hour he will be able to produce.

The second property is that the more hours we want to hire worker for, the less willing he would be able, would be willing to stay in the factory.

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The more valuable his leisure and free time would be to the worker.

So you could think that for both the ability to produce and willingness to produce we could observe diminishing marginal productivity and uh increasing uh total cost.

Uh um, convex of total cost curve of uh production.

Uh, we should think that if we force the worker to stay an additional hour in the factory, he will demand greater wages of additional hours uh uh at work and so for these two reasons we might observe convex total cost curve.

Okay? An additional thing that I could mention here is that just like we draw total cost curve, we could also draw fixed cost curve.

If there are some fixed costs of production, of let's say 3 dollars, we would say that for any output level, we would have this same fixed costs.

So we could draw a perfectly horizontal fixed cost curve for the company.

And now if we think that total costs are the sum of fixed and variable costs of production, we could say that variable costs of production will have the same shape as the total cost function but they will be shifted down by the amount of the fixed costs.

Right, we said that fixed costs are horizontal line at 3 dollars, variable cost curve would be strictly convex three dollars below the total cost curve.

Okay? Umm, that becomes useful if we uh, start discussing average fixed costs, average variable costs, and average total cost of production.

We will say that there are some nice properties, some exact properties of this um uh average cost and some nice relationships among them.

One um, slightly more advanced measure of cost is the marginal cost of production, which is the change in the total costs when the amount of output increases by one unit.

And from what we said about total costs and variable costs of production you should also think that marginal cost is the change in the variable cost of production from increasing output by one unit.

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So we could, we could say that marginal cost is the change in total cost, for a change in output by one unit or also the change in variable cost of production for a change in output by one unit.

Okay, let's look at some more common graphs that economists draw for the production process.

So from the diminishing marginal product and increasing marginal cost of production, we know that eventually marginal cost of product has to be increasing.

All right. So far we, I said that it doesn't matter what happens for the initial unit of output.

We just need marginal cost to increase for greater units of output to represent the diminishing marginal productivity and the increasing unit costs of a marginal production.

So we will look at two graphs.

One where the marginal cost curve is strictly increasing, and the case when marginal costs are could be decreasing at first, and increasing later on.

As I said, we don't really care what happens for the initial units of the output, so these are just the two more common forms of the marginal cost curve that economist consider.

Okay, so let's start with this case.

So we are assuming that the company faces some fixed costs of production, and when we talk about fixed costs you should imagine some lump sum, amount of money that the company has to lay out to start the production process.

So when we talk about average fixed costs, we divide this fixed lump sum amount of money by ever greater output level.

So you should think that average fixed costs have to have this decreasing shape.

And average variable costs you should think that there is a nice relationship between marginal costs of production and variable costs of production.

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Umm, variable costs of production, just measure the additional costs of production from producing uh positive amounts of an output.

And if we start with some low per unit costs of production, here you should think that if marginal costs of production are increasing, that means that production per unit become small and more expensive.

So if we start with some average costs of production and we are adding higher and higher additional costs to this average, the average has to increase.

Right, so we would say that if marginal costs are strictly increasing than average variable costs should also be strictly increasing at a slower rate.

Right, the intuition is that we have some average number.

You should think of this as an algebraic property that we have some average number and we add a larger number to this average.

And the question is what will happen to the new average?

This the new average has to increase and it will not increase by as much as the additional costs increased.

So we have this property that when marginal cost curve is increasing, average variable cost curve will also be increasing at a slower rate.

And when we look at average total cost of production which looks at both the average fixed cost and average variable cost of production we will recognize that average total costs are decreasing and then start increasing.

When the fixed costs of production are important because average fixed cost is decreasing average total cost will also be decreasing.

But for greater output levels, when the average fixed cost become sufficiently small, it's the variable costs of production that become more important.

And because of that, average total cost will start increasing.

And so for the average total cost function, once again we have the same intuition that we have some average number and we increase total cost by the amount of marginal cost.

Right, the marginal cost is the additional cost that adds up that is added to total costs of production.

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So as long as we have some high average number and we are adding smaller



number to it, the average will be falling.

And as soon as the additional costs of production are greater than the average, the average will start increasing.

So you should notice that the marginal cost curve crosses the average total cost curve exactly at the minimum of the average total cost.

Um, let's look at the case when we have U shaped marginal cost curve.

In that case, we start with relatively high additional costs of production than these additional costs of production decrease and finally these additional costs of production will start increasing corresponding to the diminishing marginal productivity of inputs.

In that case, average variable costs of production are decreasing at first because we are adding smaller and smaller numbers to this average but at some point these additional costs of production start increasing.

And as soon as these additional costs become higher than the average, the average will also start increasing.

So with U shaped marginal cost curve, we have an additional nice property that the marginal cost curve crosses the average variable costs exactly at the minimum of average variable costs.

Right, the property that we had only for average total cost on the previous side here we would say that the property for both the average variable costs and average total cost curves.

Okay. So this is the situation that companies face um, you can think, in the real world in both the short run and the long run circumstances.

Um, as a side note, we distinguish uh short run and long run by the ability of firms to uh change the amount of inputs into production process.

We will say that short run is the situation when at least one input that the company is using is fixed.

Right? Here, we had some fixed costs of production even when the company was producing zero units of an output.

Uh, in the long run, we will say that no inputs are fixed.

The company can increase, decrease completely sell the units of a any input they used into production process.

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And in the long run, we will say that the production process can exhibit economies of scale, diseconomies of scale or constant returns to scale.

Um, here you should think that in the short run, suppose that the company is using two inputs in the production process.

Capital and labour.

Capital, let's imagine that it's a factory size used in production.

Labour is the amount of workers, a number of hours uh workers work in the factory.

Uh in a particular short run situation when the factory size is fixed suppose that the company has a small factory size and it's facing this average total cost curve in that short run.

In the long run, if the company can increase the factory size, it might choose a larger factory, a larger amount of capital use in the production process.

And maybe use fewer workers, less labour in the production process.

You can think that in the long run the company has more ability to substitute between uh between different inputs in the production process.

Uh, so the company could choose to increase its factory size to a medium size factory

And in that case, company could face this average total cost curve.

And finally if the company increases its factory size to large, maybe the company could move to this average total cost curve which is the case with uh, maybe a large amount of capital used in maybe relatively small amount of labour used in the production process.

We would say that if as the um, uh and the underlying idea is that depending on how much the company wants to produce, it will choose the size of its factory and the amount of labour used in production.

If uh, the company is expecting to produce relatively small amount of output it would choose to operate with a small factory size.

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If the company is expecting to produce relatively small amount of output.

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It will chose to operate with the small factory size.

On the other hand if the company wanted to produce greater amount of output it might chose larger factory size.

For one some particular company we might observe these different shot run situations.

At first for small output levels the average total cost curve may look like this.

For larger output levels the average total cost curve might be lower than the average total cost for smaller amount of output.

We will say that on this range of output the average total cost of production fall so we would say that corresponds economies of scale.

For some range of output levels the short run average total cost might be at the same height and we would say that corresponds to Constant returns to scale.

And finally for some output levels as the company chooses large factory sizes the average total cost curve might become higher and higher

And we would say that the long run average cost of production increase and we have diseconomies of scale.

So another thing to say about the difference between the long run and short run is that in the long run the company has more ability to adjust its inputs.

So it will choose the amount of factory size and the amount of labor that minimizes the cost of production.

For particular amount of output I want you to think that the revenues that the company earns are simple.

Revenues are simply quantity times price in the output market and under the assumptions of constant prices the company cannot do anything on the decision about the revenues of the company are fairly simple.

But on the cost side the company can chose how to substitute between its capital and labor.

And in this decision making you should think that for particular output level the company will chose the particular short run situation that minimizes total cost of production.

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And minimizes the average total cost of production for that particular output level.



So the company will always want to be on the lowest possible average total cost curve for any quantity that the company is considering.

We would say that the long run average total cost curve is the lower envelop of the all of the possible short run average total cost curves.

And kind of a sign note on this graph.

If these three factory sizes were the only factory sizes possible.

We would say that the lower envelop of these three average total cost would be a line that has three parts.

But if we draw this red line as the long run average total cost curve we are implicitly assuming that the company can chose any factory size possible.

Not only this, this or this

But the company could chose any short run average total cost in between and this red line would connect all the points on the lowest average total cost curves for any quantity.

So when we draw this long run average total cost curve you should think that that implies continuous factory size when the company can chose from infinitely many factory sizes.