

PROFESSOR WEINTRAUB

LECTURE I: THE PRODUCTION POSSIBILITIES CURVE

THE ECONOMIC PROBLEM

Two key elements in defining the nature of the economic problem are: (i) scarcity; and (ii) alternative wants. Scarcity is related to the word "alternatives" regardless of what produces the scarcity, whether imposed or natural. This is the scarcity of resources, resources meaning anything that satisfies wants (e.g., land, labor and capital). Thus, economics is essentially a study of human beings and how they behave when confronted with scarcity. Resources are scarce in that there is a limitation with respect to resources, in that those resources are not capable of satisfying all of the wants.

People confront scarcity all the time. The way to get scarcity allocated to you is that you express your willingness to give up something in order to get something. Therefore, anything that is not free is scarce.

Also, scarcity is often a product of the human mind. We generate more wants than we need and over and above our ability to satisfy those needs.

Scarcity and Its Treatment in Economics

Let's talk about the problem of scarcity in terms for which economists are famous. That is, using the aid of geometry to get our points across. I want to talk about the nature of the "economic problem" with a bit more precision.

Let's assume there is available to the economy now a bundle of resources and those resources are capable of satisfying wants, except that there are more wants than there are resources capable of satisfying them. Let's consider that those resources could produce any number of things and take one group of things in general, measure this all on a set of axis, label one axis "bushels of wheat" (a general commodity that refers to all agricultural commodities), and assume we took all of our resources and put them into the production of wheat. Can you conceive of the idea that there is some

maximum quantity of wheat that can be produced? At any moment in time, given all the economic resources, there is going to be some maximum quantity of wheat produced (not consumed, produced).

What is going to determine what that maximum is?

We are concerned with the transformation of resources into wheat. Regardless of how much people want or need, that is not the issue. The issue is how much wheat can we produce with this bushel of resources? The amount of resources is important but there is something else.

PRODUCTIVITY and EFFICIENCY refer to the amount of output we can get from the input. What determines the amount of the output?

Let's talk about the ability to produce. The output (i.e., the wheat) is going to be a function of the resource employed in producing that output. Input/output. More input, more output.

EJD. NOT ALWAYS. IF THE INPUT IS NOT EFFICIENTLY INPUTED YOU GET LESS OUTPUT.

Let's assume we are always operating as efficiently as we can possibly operate. But even if we are using the resources as efficiently as we can, there is a limit of what can be produced. What determines the limitation of the output given the most efficient use of the resources?

EJD. I HAVE A PROBLEM BECAUSE ANY SOCIETY USING ALL OF ITS RESOURCES IN THE PRODUCTION OF WHEAT IS GOING TO EXTERMINATE ITSELF. IN APPLYING ALL OF ITS RESOURCES IN THE PRODUCTION OF WHEAT IT IS NOT GOING TO PRODUCE OTHER COMMODITIES ESSENTIAL TO SURVIVAL, SO THAT THERE HAS TO BE A POINT ABOVE WHICH IT IS IMPOSSIBLE TO PRODUCE MORE WITHOUT CAUSING HARM TO ALL OTHER NEEDS.

Absolutely. And that is one of the points I am trying to make. But before I can make that point I have to raise the question: suppose the society was going to concentrate its productive efforts on the production of wheat, how much wheat can it produce? What determines the amount of wheat?

Let's talk about wheat per year. One thing is the

amount of resources available. But there is something else -- HOW TO PRODUCE. What is the technology of producing wheat? By technology I mean how are the resources combined to product the output? Given the same resources today as, say, 100 years ago, output per acre and output per worker, is much greater today. So, the technology has changed and with that changing technology the amount of wheat capable of being produced has increased.

(REFER TO GRAPH).

So, if I mark O to A, that distance describes the maximum quantity of wheat that can be produced given the technology of the time and the resources available.

Suppose an alternative to the production of wheat is the production of machines. Again, these resources which can be used to produce wheat could alternatively be used to produce machines. The technology of combining resources to produce machines is different from the technology of combining resources to produce wheat. Nevertheless, there are similarities: they all employ land, labor and capital. It is just a matter of applying a different technology, so that if all our resources were employed producing machines there is some maximum quantity of machines that could be produced.

(REFER TO GRAPH).

You have a set of alternatives here. You can either produce O-A amount of wheat or O-B amount of machines. Are these the only possibilities? No. There are an endless amount of possibilities that might exist between these two extremes. Let's assume for now that machines and wheat are the only possible items. (Obviously, that is an unrealistic assumption. We don't worry about unrealistic assumptions because we are concerned about principles, and the only way to do that is to make unrealistic assumptions.) We deal with abstractions for the simple purpose that it is easier than dealing with complex situations.

We can illustrate the principles of economic behavior with very simple abstract models of the economy which eliminate the complexities of the economy but maintain the essence of the principles of the problems. Thus,

let's assume we have only two possible alternatives, but there are any number of combinations of the alternatives which could be produced. An infinite number of combinations.

Combination B refers to O-F amount of machines, and O-G amount of wheat.

Whenever you identify a point where there are two axis, you are bringing two pieces of information together. Point B refers to O-F amount of machines or O-G bushels of wheat. If you are at point E that refers to O-H amount of machines and O-I amount of wheat. In other words, we can emulate all the production possibilities.

This relationship is called the production possibilities curve because it does just that, identifies all the production possibilities.

Notice that if you are at any one point (you can only be at one point at a time), if you want to increase your production of machines you must decrease your production of wheat. You cannot increase your production of everything all at once. In other words, if you want more wheat, the "cost", or what you must give up to get more wheat, is machines.

EJD. THIS IS MORE OF A QUESTION. IF YOU DEAL WITH THE SHORT TERM VERSUS THE LONG TERM MODEL DOES THE EXPLANATION CHANGE. CAN'T YOU ACHIEVE A LONGER RUN INCREASE IN THE PRODUCTION OF WHEAT BY GIVING UP A SHORTER RUN PRODUCTION OF WHEAT TODAY AND INCREASING THE CAPITAL?

That is a real possibility. But, this is drawn in a moment in time. Under given conditions of an existing amount of capital, labor and land and technology). If you change the conditions the results will change.

EJD. HOW, UNDER THAT KIND OF CHANGED ENVIRONMENT, DO YOU GRAPHICALLY CHANGE THE REPRESENTATION? IS THERE A DIFFERENT PRODUCTION POSSIBILITY CURVE?

Yes. Let me ask you. Suppose suddenly there was a breakthrough with respect to the ability to produce wheat. What would happen to the production possibilities curve?

EJD. IT WOULD SHIFT TO THE RIGHT BECAUSE IT WOULD HAVE A HIGHER PRODUCTION POSSIBILITY AT EVERY LEVEL.

Because the change is a technological change which increases the productivity of wheat but not effect machines, the curve would shift out. However, even though you are capable of producing more wheat with the new technology you may not want to for other reasons. Does this mean there is no benefit to this technological breakthrough? The answer is no.

Suppose you stay at O-G amount. Before you could produce only O-F amount of machines. Now that the new technology enables you to use your resources more efficiently in the production of wheat, you can free up resources for the production of machines, so that the existing technology combines with the desire to consume no more wheat, allowing you to move up to a higher production of machines. You can reflect the change in the condition by shifting the curve.

Suppose there was a general increase in the resource endowment. Suppose someone came up with a device which allowed us to capture the energy of the sun, to store it and convert it very inexpensively to energy. What would that do to the production possibilities curve? Instead of it shifting in favor of one commodity or the other it produces a general shift, increasing the ability to produce both wheat and machines.

EJD. MY ORIGINAL QUESTION WAS HOW TO GRAPHICALLY REPRESENT A NATURAL INCREASE IN PRODUCTION OF WHEAT IN THE LONG RUN.

What would cause a "natural" increase?

EJD. WITHOUT THE RESOURCE OR INPUT CHANGE.

Then you don't have any. Where would it come from? It could not happen. You have to have input in order to have output or a change in technology. I thought you might be referring to a natural increase in the resource endowment.

EJD. I WAS THINKING IN TERMS OF CHOICE. I WAS LOOKING AT A GIVEN INPUT OF RESOURCES, SAY WHERE YOU CAN PRODUCE "F" MACHINES AND "G" WHEAT. IF YOU MAKE A CONSCIOUS CHOICE NOT TO PRODUCE "D" WHEAT IN ORDER TO PRODUCE MORE MACHINES IN THE SHORT RUN AND LEAD TO A

LONGER RUN INCREASE IN WHEAT.

You are saying that in the longer run you are adding to the resource base, so you are changing the conditions.

EJD. I WAS THINKING THE AGGREGATE QUANTITY OF RESOURCES REMAINS THE SAME.

This is important. It does not. Because the machines and the wheat are output. The machines and the wheat are consumed.

EJD. OVER TIME.

The only different there is the nature of the commodity itself. In any particular year a portion of a machine is consumed, which is why we have in the tax laws depreciation. So, all of these things are consumed. If what you are saying, that we can reduce our consumption of wheat and put our resources into the production of machines so as to increase our stock of capital, which increases our ability to produce more wheat and machines, that is called INVESTMENT, as opposed to consuming. Investing involves the postponement of consumption in the future. It is adding to the resource base, adding to your stock of capital. When you do this you must realize that you are changing the basic conditions under which you draw a production possibilities curve.

It is only natural in the sense that it is natural for people to employ their resources in such a way as to expand their quantity of capital.

STUDENT. WHY IS THE PRODUCTION POSSIBILITIES CURVE A CURVE RATHER THAN A STRAIGHT LINE?

What is implied in a straight line? This implies a direct linear relationship. This means that as you reduce the number of machines by a unit you decrease the amount of wheat by a certain amount and that tradeoff is constant whether you are at point R, S, or T. You always know that sacrificing one machine will add the same amount of wheat regardless of where you are in the production of machines.

With the curve what happens is, suppose you were here, at \_\_\_\_\_. I will reduce machines by an equal amount. As you get closer to 0 what gets smaller are the

additions to the production of wheat. The number of machines are being reduced by equal amounts but as you get closer to the origin, for every machine you are giving up you are getting less and less additional wheat. Whereas, if it were a straight line for every machine you give up you get the same amount of additional wheat. this is the nature of a convex curve.

The idea is that the resources are capable of producing alternative models and that those alternatives are all on a curve as opposed to a straight line. The question is, what is it about the nature of resources that produces a convex production possibilities curve rather than a constant trade off, a straight line? It has to do with the nature of the resources.

If you are able to substitute one type of output for another the relationship will be a direct tradoff, or straight line. The less alike are the outputs the greater the differences in production possibilities and the greater the curve.

