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Economics 202

Production Possibilities Curves

Economists use a variety of models to explain or predict changes that occur within an economic system. One simple economic model that helps explain or predict changes in the output produced within an economic system is the production possibilities curve model (PPC). Below, we discuss this model and use it to explain or predict the effect of specific events on the nation's output.

Assumptions

In order to produce goods and service, we need factors of production. Factors of production include labor, capital, land and entrepreneurship, and the role of factors is to transform inputs into outputs. If we assume that we always have access to all the inputs we need, then we know that more factors allow us to produce more output (i.e. there's a positive relationship between the number of available factors and the output we are able to produce). Factors produce output at a certain rate, which we'll call productivity, and combined in a certain manner, something we'll refer to as a specific technology.

We create our model by making a set of assumption. Our first assumption is that we have a country that we'll call Country A, and that this country produces two different goods, swimming pools and gardens. That is, we can ask factors to dig a big hole in the ground, fill that hole with water, and call the finished product a swimming pool. Alternatively, we could dig smaller holes in the ground, throw some plants in those holes, add less water, and call the end result a garden.

Let's also assume we have access to all of the inputs we'd ever need (i.e. an infinite supply of available inputs), and a set amount of available factors. E.g., Country A has 100 units of available labor (e.g. 100 people), 100 units of available capital (e.g. 100 shovels) and 100 units of available land (e.g. 100 acres of land). All of our factors can be assumed to work at specific rates (i.e. our factors work at set rates of productivity) and are combined in a set manner (i.e. a pre-determined technology). These assumptions imply that the amount of available inputs and factors, our productivity and technology do not change in response to changes in output.

What do these assumptions give us? Note that by assuming we produce 2 different goods, we are ultimately assuming that we will work with graphs that have 2 axes. Our remaining assumptions determine the potential output of Country A (i.e. what Country A is capable of producing). In other words, we are helping determine where the PPC will exist on our graph.

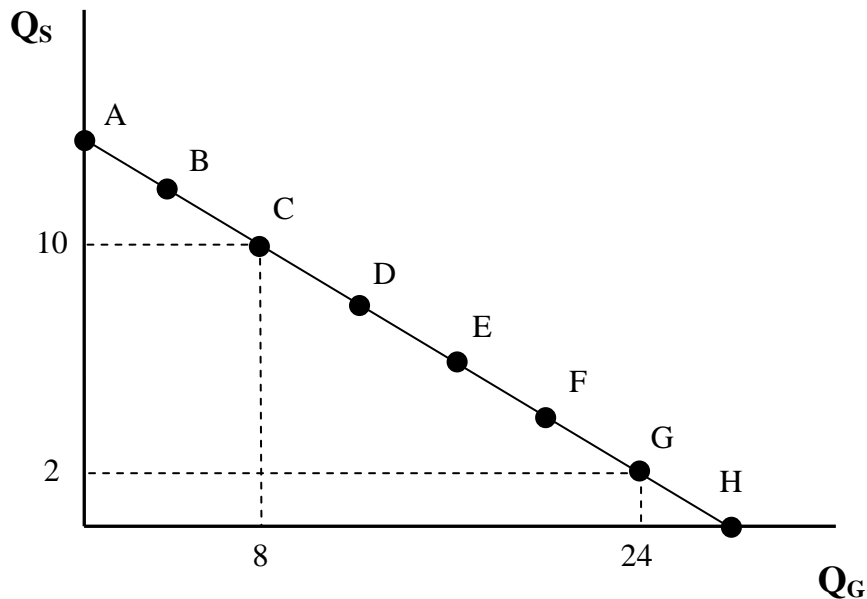
Production Possibilities

If all workers are employed, then let's say that Country A is capable of producing one of the combinations below. Let's assume that these are the combinations which are currently available to Country A. E.g., Country A could choose to produce 10 units of swimming pool with 8 units of garden (pt C), or switch to the opposite end of the table and choose to produce just 2 units of swimming pool with 24 units of garden (pt G).

Country A, Production Possibilities Curve for Swimming Pools and Gardens

	A	B	C	D	E	F	G	H
Quantity of Swimming Pools	14	12	10	8	6	4	2	0
Quantity of Gardens	0	4	8	12	16	20	24	28

If we represent these production possibilities on a graph, representing the quantity of swimming pools on the vertical axis as Q_S and the quantity of gardens on the horizontal axis as Q_G , then we have the graph below. Note that each of the columns in our table above represent a point on the graph below. To help demonstrate that, the coordinates mentioned above, pts C and G, are both reflected below as well.

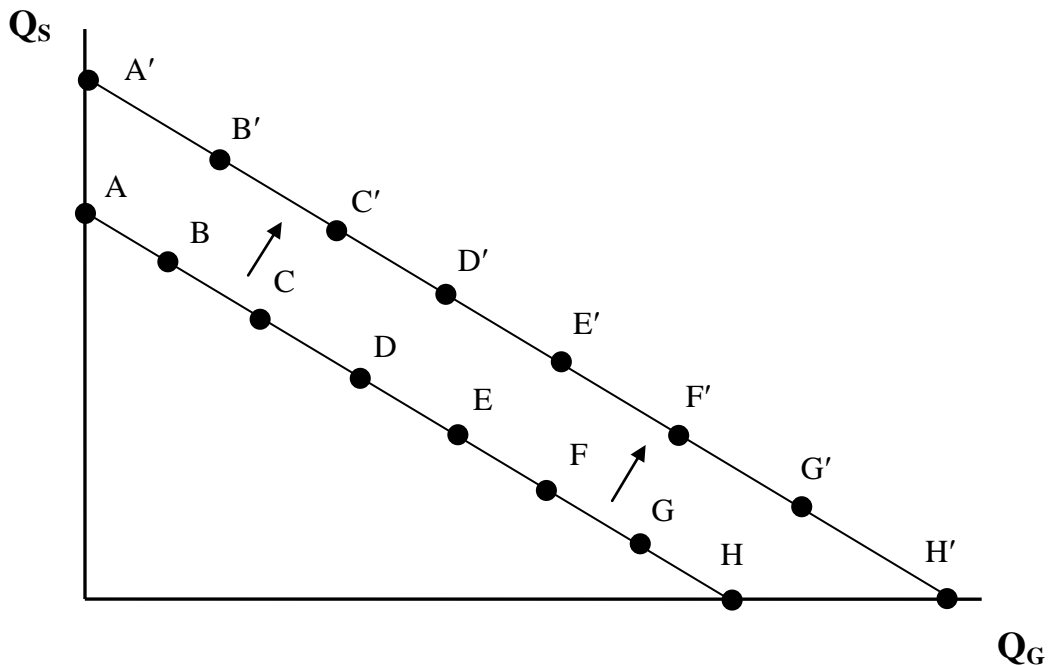


What does this tell us? The table and graph reflect what's possible within Country A when we utilize all available factors working at a certain rate of productivity in a specific (pre-determined) combination. That is, the table and graph reflect the potential of Country A. Of course, if Country A wanted to produce below their potential, they could operate at a point inside the curve, but Country A cannot operate at a point outside the curve, since we either don't have enough factors or our factors are not capable of producing that much output.

Can Country A's potential ever change?

To answer this question, we need only consider our comments above about the assumptions which go into the PPC model. Remember that assuming Country A produces 2 different goods is simply telling us how many axes we'll have on our PPC graph. I.e., if Country A produced 3 different goods, then our PPC graph would have to reflect potential output for 3 different goods and that means 3 different axes. Assuming 2 different goods is just a simplifying assumption. Likewise, assuming 8 different columns on our table above is telling us how many points we'll find on our PPC. If, when utilizing all available factors, Country A was capable of producing 10 different combinations of swimming pool and garden, we'd clearly have 10 different columns on our table and 10 different points on our graph. Again, this is another simplifying assumption.

Note that our remaining assumptions tell us where the PPC will be located on our graph, so if we change those assumptions (e.g. the number of available laborers in Country A increases from 100 units to 150 units), then we change where the PPC is located on the graph. In other words, changing one of those assumptions will lead to a change in potential output and a shift in our PPC (i.e. the PPC would move from where it currently exists and relocate further out on the graph). The effect of increasing the amount of available labor is reflected in the graph below.



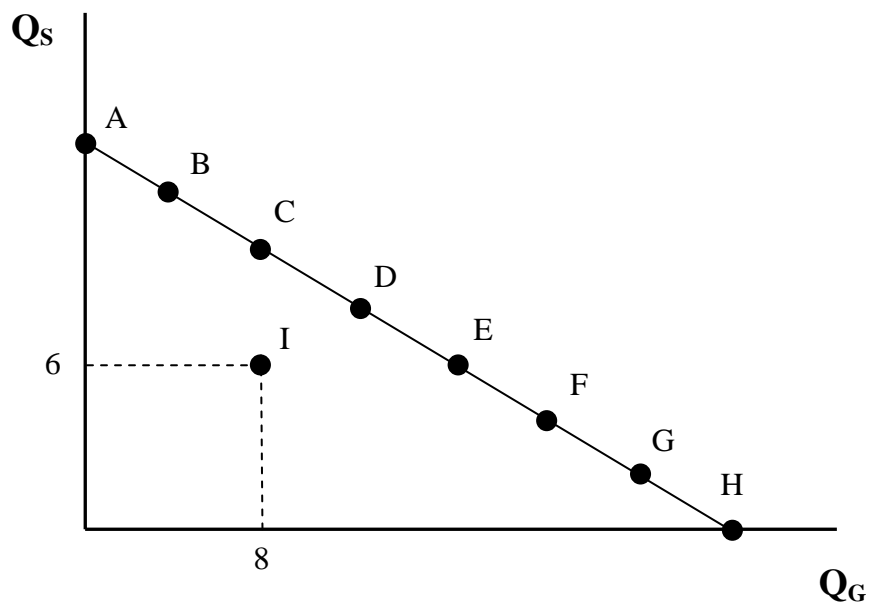
When the amount of available labor increases, or amount of available capital, land or entrepreneurship increases, we observe an outward shift in the PPC and an increase in Country A's potential output. A similar shift would occur if we observe an increase in the productivity associated with Country A's factors or an improvement in the technology associated with producing these two goods. Shifts in the PPC reflect a change in Country A's Potential Output.

How much should Country A produce?

Thus far, we've demonstrated the potential output of Country A, but have not yet addressed how much output Country A should actually produce. If the PPC itself reflects Country A's potential output, then the points on this PPC will ultimately reflect Country A's actual output. I.e., a country's potential output is what the country is capable of producing when using all available factors, but what actually gets produced is something that reflects both the demand for these goods within Country A and Country A's ability to produce (or supply) these goods, which is consistent with what we call actual output. This is also what we'll (later) call equilibrium output.

To note the difference between actual and potential output, let's refer to our graph above. The curve itself, the PPC, represents potential output, but Country A could produce at any of the points on the curve (i.e. at any point on the PPC). E.g., Country A could produce at pt C or pt G, or any other point, and that choice would be determined by the demand for these goods within Country A. If there was a higher demand for swimming pools, then maybe pt C is a more appropriate (actual) output point. If the demand for gardens is higher, then perhaps pt G is a more appropriate (actual) output point.

Of course, it's also possible that the demand for swimming pools and gardens is not high enough to sustain any of the production points on our table above. E.g., what if people within Country A only want 6 units of swimming pool and 8 units of garden, and Country A chooses to produce their actual output at pt I on the graph below.



Remember, as we relocate from a point like pt C to a point like pt I, we have a set amount of available factors, and so changing output does not automatically cause the number of available factors to change. The same applies to productivity, technology and the availability of inputs.

How would Country A move from producing at pt C to producing at pt I? The only possible explanation is that Country A must utilize fewer factors. The same number of factors are still available, but Country A would not use all of them when producing at pt I. As a result, the only explanation for operating at a point within the PPC is that we are experiencing some unemployment. Again, the same number of factors are still available, we simply use fewer of them. This represents a difference between what we call the availability of labor, which helps determine a country's potential output, and the utilization of labor, which is determined by a country's actual output. Therefore, changes in unemployment do not change the potential of Country A, which means we don't reflect the effect of changes in unemployment by shifting the PPC.

A similar argument could be made for any basic change in demand for the two goods produced within Country A. E.g., if we assume that the demand for swimming pools and gardens within Country A dictate that Country A produce at a point like pt C, but then the good people of Country A suddenly prefer to produce more gardens (correspondingly, they are willing to give up swimming pools in order to get more gardens) – we would see movement from pt C to a point like pt G. Once again, simply changing the output of a country does not lead to that country having more available factors, does not change the availability of inputs, does not affect the productivity of the factors producing these two goods and does not change the technology used to produce swimming pools and gardens. I.e., a change in demand does not change the potential output of Country A, but it does suggest that we will relocate from one point on the PPC to a different point on the PPC.