Module 2: The Basic Economic Model: PPC

Introduction

In this unit, you will expand your understanding of economics by introducing your first model in economics. We will start with the production possibilities curve (PPC). This model incorporates the fundamental economic problem: scarcity and concepts of choice and opportunity cost. Furthermore, we will integrate marginal analysis to discuss different types of efficiency. Next, we'll apply the PPC to illustrate critical economic concepts of growth. Next, we discuss comparative and absolute advantage and how these concepts apply to trade and the PPC. Then, we'll apply the PPC to illustrate important economic concepts of growth. Next, we will show which factors of production affect long-term economic growth. Finally, we will examine growth rates and economic growth. Here we go!

Learning objectives

When you are done with this lesson, you should be able to:

1. Illustrate and analyze scarcity and choice with the assumptions and two shapes of the production possibilities curve (PPC) and measure opportunity cost.
2. Compare opportunity cost to marginal cost, preferences to marginal benefit, and construct the marginal cost and benefit curves.
3. Distinguish between production and allocative efficiency.
4. Determine absolute and comparative advantages and how these apply to trade and economic growth.
5. Examine how the PPC illustrates choice, consumption, and economic growth.
6. Analyze and illustrate how the per-worker production function applies to economic growth.
7. Determine growth rates and explain the importance of economic growth.

Assigned as Review

Q 2.1

Should nations engage in trade? Why or why not?

Responses

Reply

Showing Only Professors and Mine

hidden, 18 days ago

Yes, nations should engage in trade because comparative advantage and specialization allow countries to produce more total output

Comments 0 1

Image 1: The three countries in NAFTA

2.1 Illustrate and analyze scarcity and choice with the assumptions and two shapes of the production possibilities curve (PPC) and measure opportunity cost.

Production Possibilities Curve: Choices, Trade-Offs & Opportunity Costs

Recall, whenever choosing resources for any activity, the user is ***trading off*** *the opportunity* to use those resources for other things. Let us use our first model of economics. This model will capture some of the basic terms of economics. This model is called the production possibilities curve or PPC. Let us set up the first model and see how this model illustrates **scarcity**, choice, and **opportunity cost**.

Image 3: So many possibilities

The production possibilities curve or PPC represents a mix of a set inputs to produce a set of outputs. This case will primarily look at two goods with a fixed number of resources or production factors.

Opportunity cost graphically:

- The production possibilities curve (PPC) represents all possible production combinations of total output.
- A fixed quantity of productive resources of a given quality is used efficiently along the production possibilities curve.

Before illustrating how the production possibilities curve represents some basic economic concepts, we must always start with some assumptions. Every model in this course will always begin with a set of simplifying assumptions. We make these assumptions to keep the model simple.

Production possibilities assumptions

- Resources are fully employed.
- Production is for a specific time.
- Resources are fixed for the time.
- Technology does not change over time.

These four assumptions will place us on the curve. We can now construct the two goods model for the production possibilities curve based on these assumptions. This model will make corn and beads. Now, I

know what you are thinking "that's not realistic." Who lives in a world of just corn and beads? But remember, this is a model. We simplify things.

Image 4: Corn

Image 5: Beads

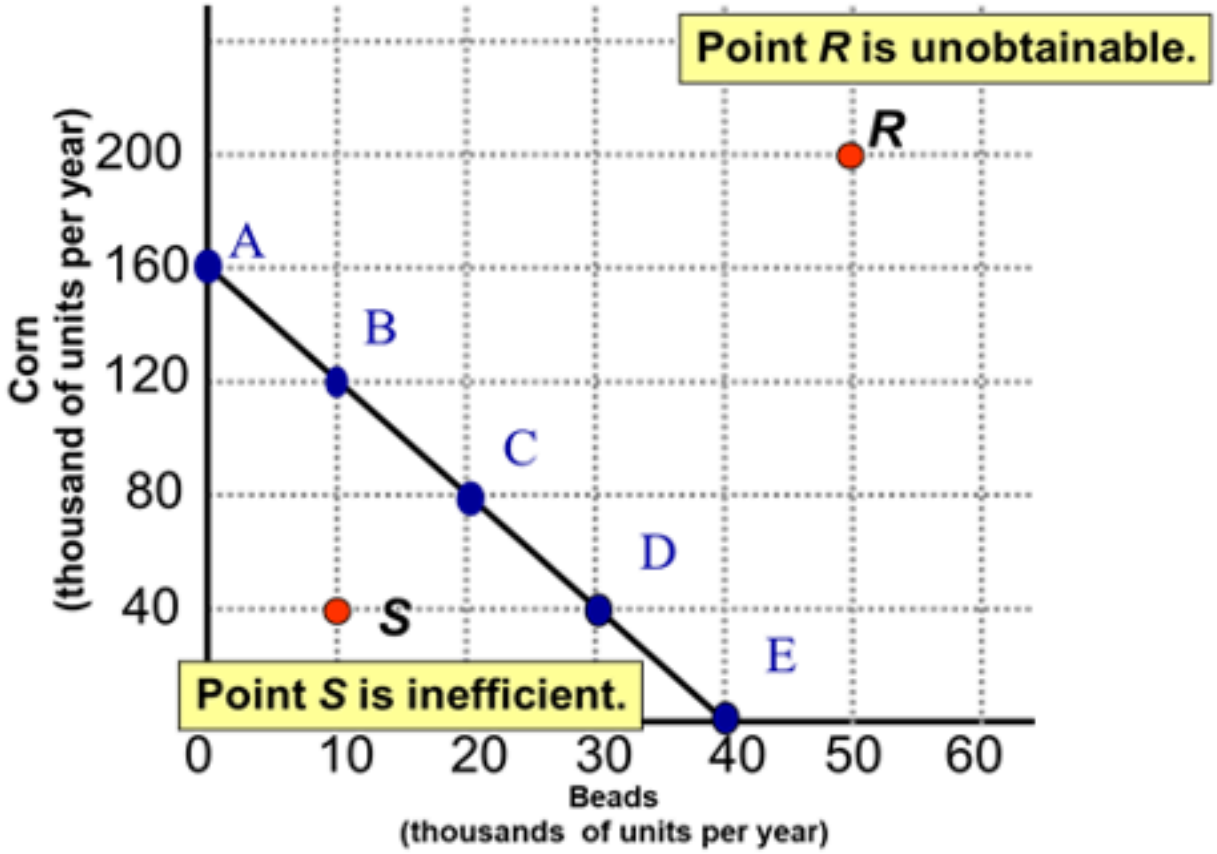
Let us look at five possible production combinations here A though E.

Choices between Corn and Beads

Combination	Corn	Beads
A	160	0
B	120	10
C	80	20
D	40	30
E	0	40

Note: the input mixtures are changing in each of these combinations. For example, we use all our inputs to produce corn at point A compared to point E, where we use all our inputs to make beads. Points B, C, and D are where inputs are divided between corn and beads. Also, we are holding all else constant, which includes technology and the number of resources. Finally, it would be best to determine the opportunity cost of one of the goods relative to the other.

Next, we want a graphical representation of this relationship, but before we plot points, it is worth noting the axes. The vertical axis is the amount of corn, while the horizontal axis represents beads. Now let us plot points from the previous table. We plot those five points, label them on our graph, connect these points with a line.



Low and behold, we have constructed our first model. Yup, it's just that simple. Recall, the four assumptions place us on the curve. Suppose one of these assumptions fails, such as not using resources fully or efficiently. In that case, we represent this as a point below the production possibilities curve, like point S. In contrast, points above the production possibilities curve represent our unlimited **wants**. So, looking at point R relative to the production possibilities curve, we've just illustrated the concept of scarcity: unlimited wants based on limited resources.

Constant Opportunity Cost

Q 2.2 Mark as: None

Based on the table above "Choices between Corn and Beads", as we move from Point A to Point B, what is the opportunity cost of 10 Beads in terms of corn?

Type your numeric answer and submit

You are correct

Show submitted answer | Show correct answer | Check My Answer

Q 2.3 Mark as: None

Based on the table above "Choices between Corn and Beads", as we move from Point A to Point B, what is the opportunity cost of 1 bead in terms of corn?

Type your numeric answer and submit

You are correct

Show submitted answer | Show correct answer | Check My Answer

Q 2.4 Mark as: None

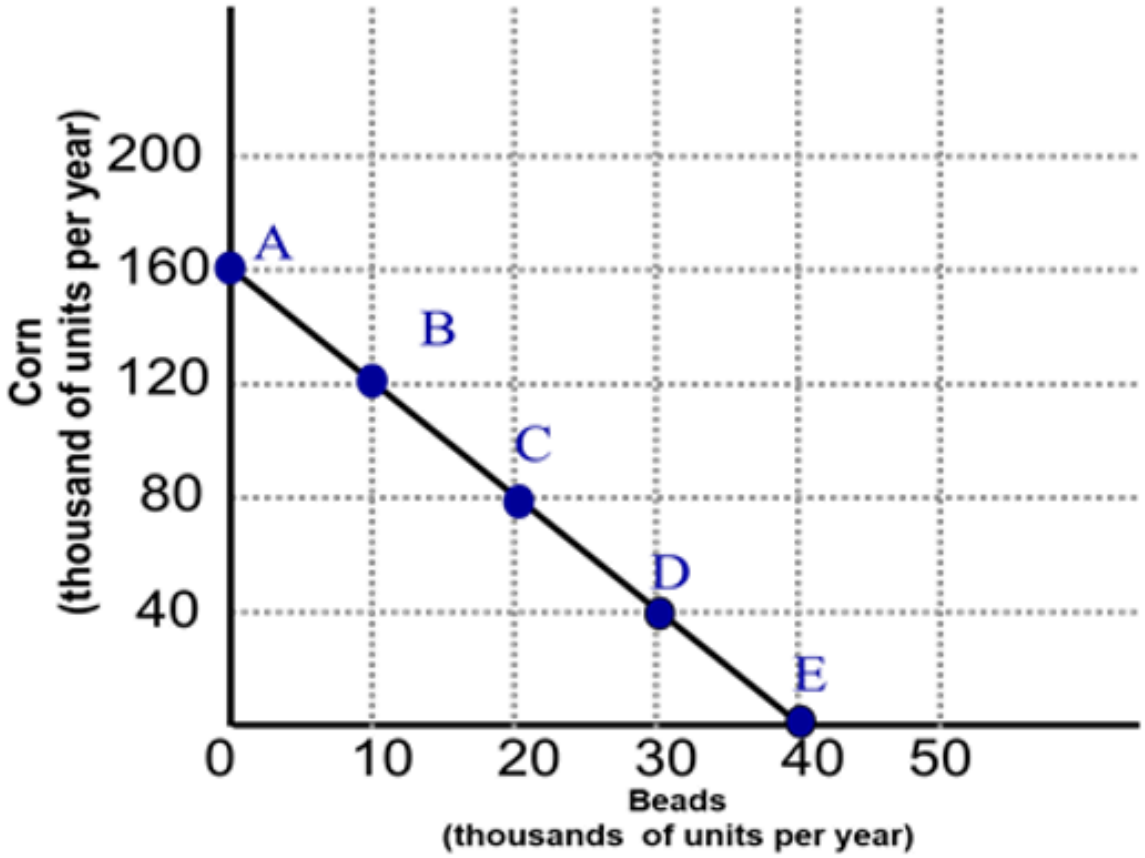
Based on the table above "Choices between Corn and Beads", as we move from Point C to Point B, what is the opportunity 1 corn in terms of beads? (Round to the nearest hundreth)

Type your numeric answer and submit

You are correct

Show submitted answer | Show correct answer | Check My Answer

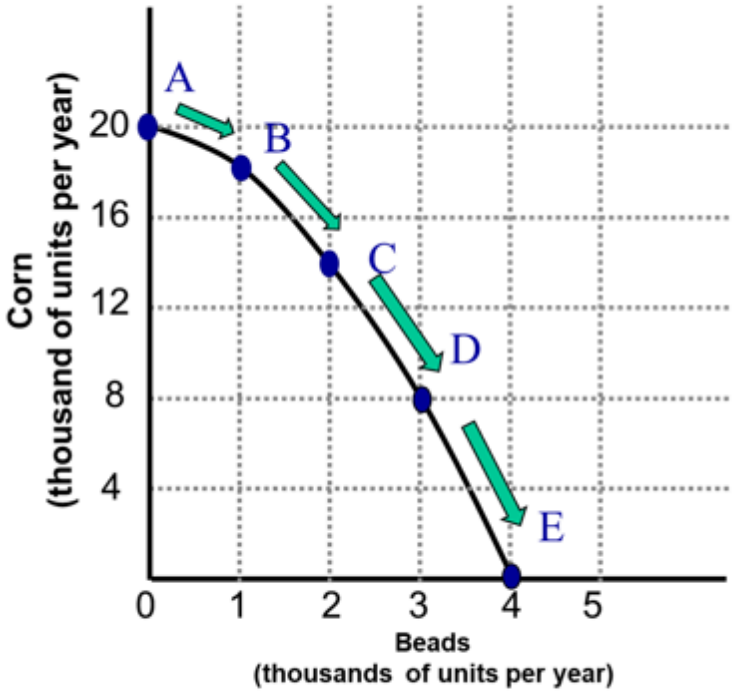
Points A, B, C, D, and E on the above table represent our choices or production possibilities. It is also worth noting we can measure opportunity cost with the production possibilities curve. Remember when we chose to go from point B to point A, we lost ten beads but gained 40 corn. So, the opportunity cost of one bead is four units of corn. Since this ratio is constant throughout the entire production possibilities curve, we describe the shape of this PPC as a constant relative or constant opportunity cost. However, a constant opportunity cost PPC is not very realistic.

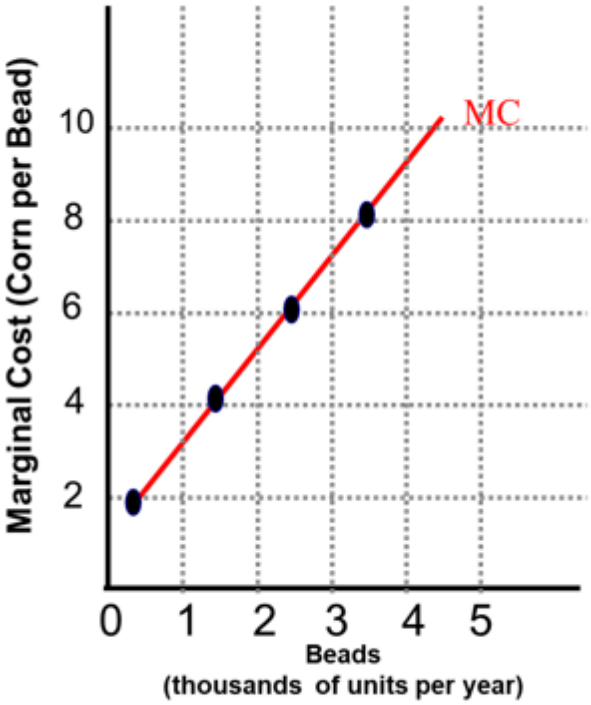


2.2 Compare opportunity cost to marginal cost, preferences to marginal benefit, and construct the marginal cost and benefit curves.

Increasing Opportunity Cost and Marginal Cost

A more realistic PPC incorporates increasing relative or increasing opportunity costs because not all inputs are equally good at producing goods, beads and corn. Some resources are better at producing corn, while others are better at producing beads. Using a resource better suited to produce beads and forcing it to make additional units of corn becomes increasingly costly. This increasing cost gives the PPC its bowed-out shape. Also, we can equate opportunity cost to **marginal cost**. Recall, marginal means additional. As we increase the production of beads by giving up additional units of corn, we can construct the marginal cost curve. It illustrates this increasing tradeoff from our production possibilities curve.





Preferences and Marginal Benefit

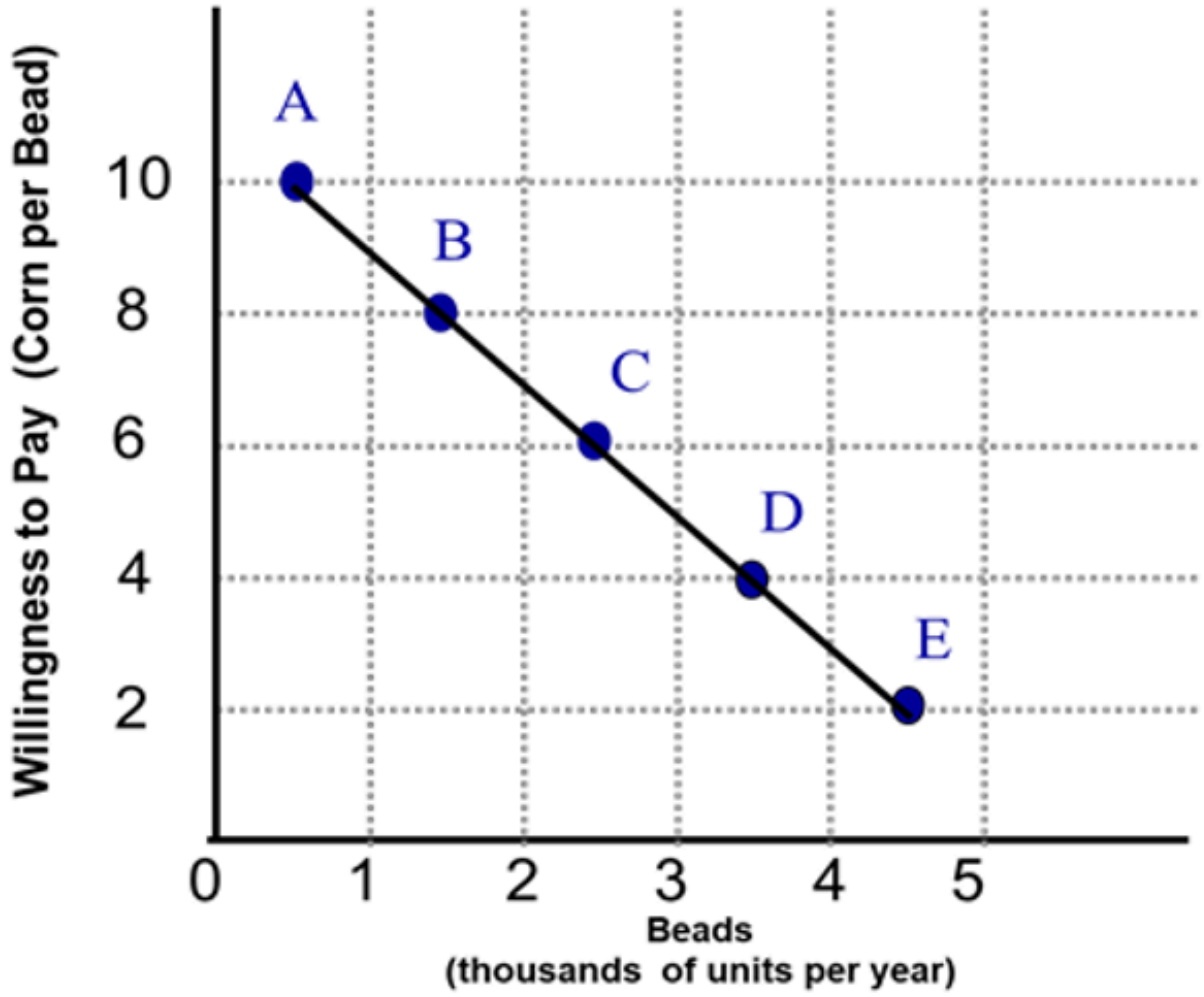
Now that we have covered the cost, we focus on the benefit. Recall the problem of scarcity relates to the concept of wants. If we want something, we prefer it. When we satisfy a want or a preference, we derive satisfaction, happiness, or benefit.

For example, say you're hungry and prefer to eat pizza to satisfy this want. What would you be willing to pay for the first slice of pizza? The amount you'd be willing to pay would reflect the benefit you assign each slice of pizza. So, let's say you would be willing to pay $5.00 for the first slice of pizza. This $5.00 is the marginal benefit you assign the first slice of pizza.

Image 6: Hungry for pizza?

After eating the first slice of pizza, maybe you did not satisfy your hunger entirely, and now you are thinking about a second slice. How much would you be willing to pay for the second slice of pizza? Chances are you would be willing to pay some price below the original $5.00 for the first slice. Your willingness to pay is now decreasing for the second slice of pizza. Also, your marginal benefit is declining from consuming the second slice of pizza. This continual decline is the **decreasing marginal benefit** principle.

Thus, we construct the benefit curve based on this principle of declining marginal benefit. How we specifically build this curve is somewhat arbitrary. For example, we asked what you would be willing to pay to consume 1.5 units of beads point W. In this case, we'd say eight units of corn. Next, we would ask, what would you be willing to pay to consume 2.5 units of beads and so on.

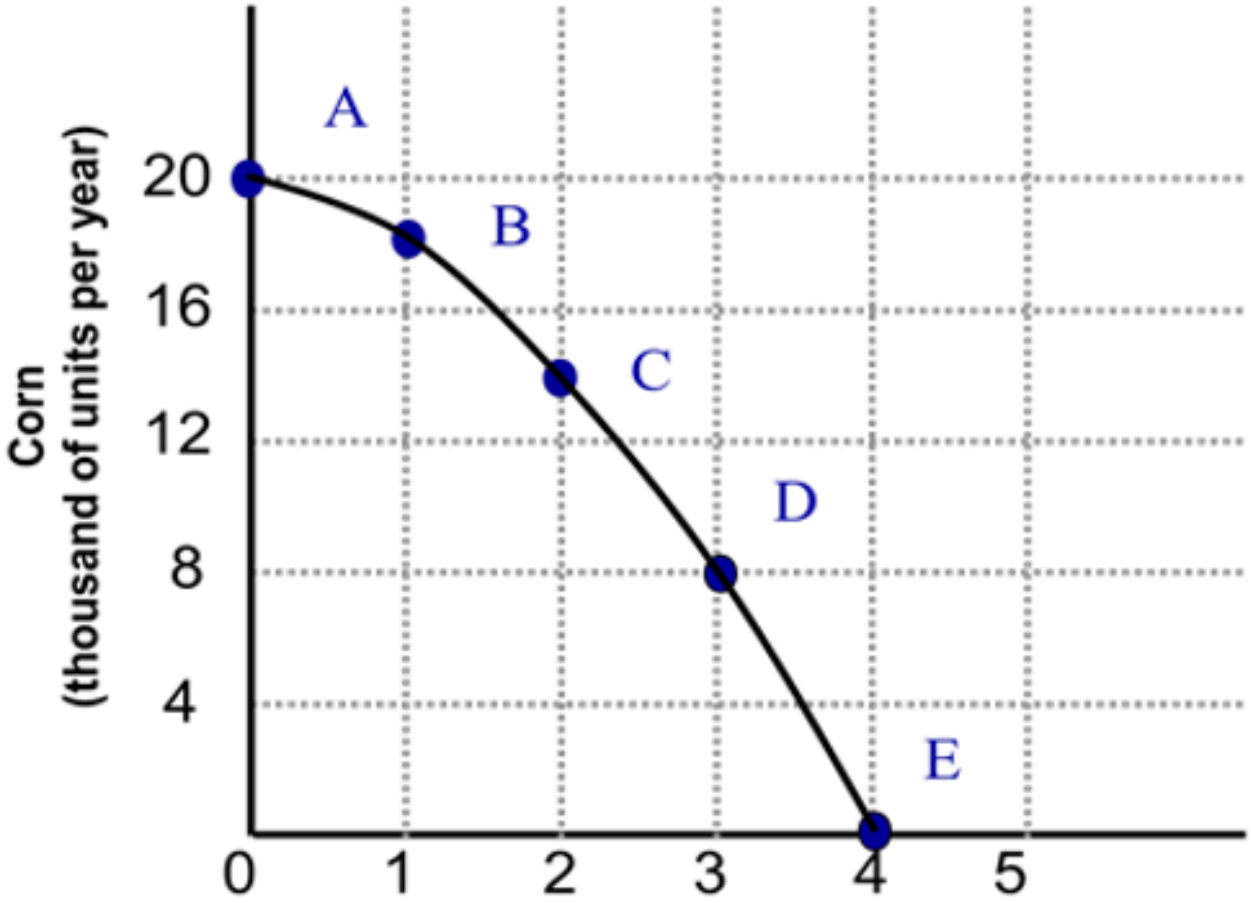


2.3 Distinguish between production and allocative efficiency.

Production efficiency

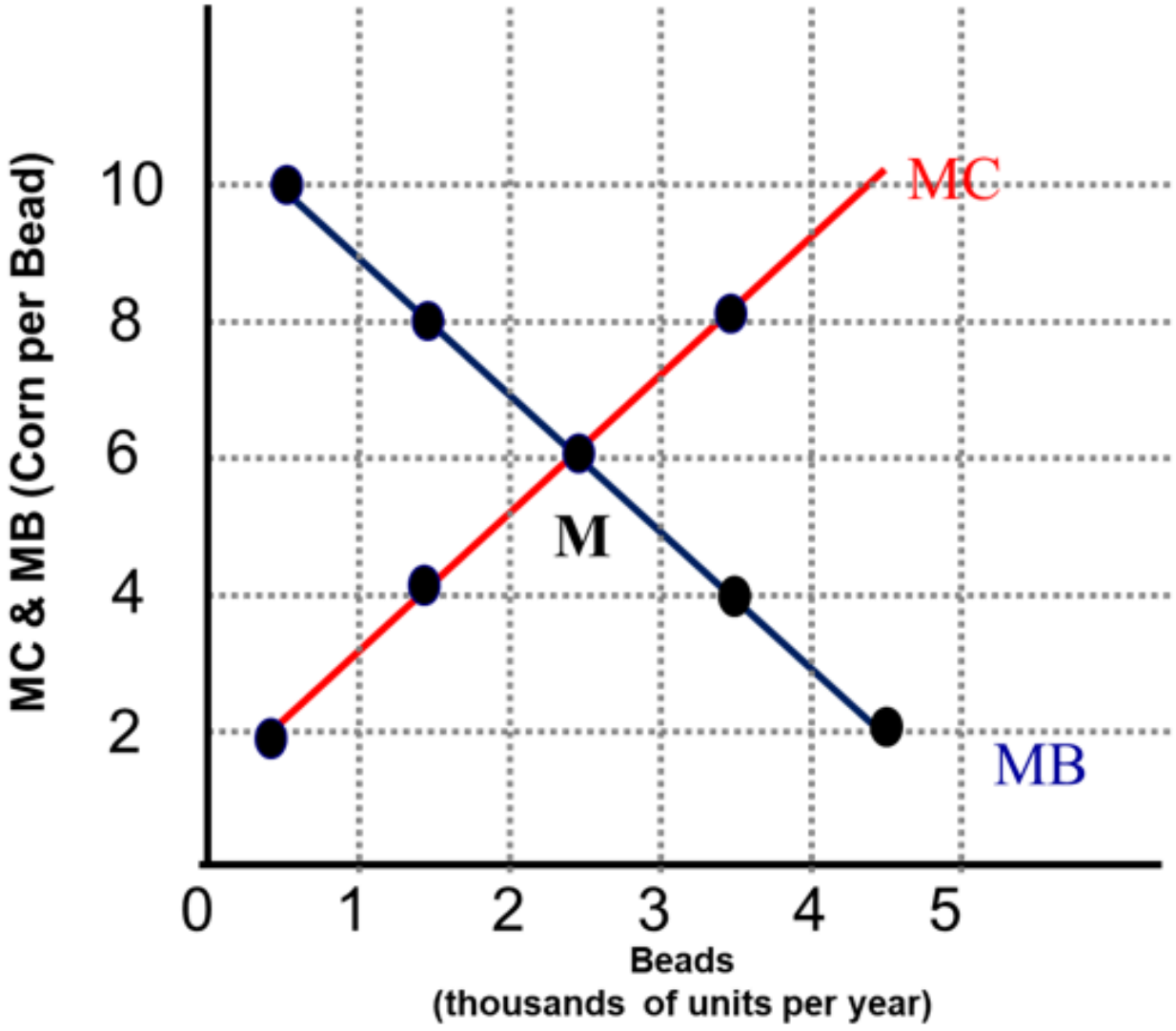
Now we are ready to discuss the topic of efficiency. First, let us talk about production efficiency. Recall, the assumptions of the PPC places us on the curve. So, all points on the PPC reflect **productive efficiency**. The only way we can choose to make more beads is at the cost of producing less corn.

In contrast, points inside the production possibilities curve represent **inefficiency**. When labor is unused, it's inefficient and is called unemployment. Starting from a point inside the production possibilities curve allows us to hire new workers and produce more corn and beads. All points on the PPC (points A – E) are productively efficient.



Allocative efficiency

All the points on the PPC represent production efficiency, but which one do we choose? To answer that question, we look **allocative efficiency**. The efficient allocative point is when the costs of producing the goods are at their lowest while the benefit of consuming those goods is at their highest. In other words, the **best** possible production or allocative efficient point is where marginal cost equals marginal benefit.



Let us look at this a bit more closely. At 0.5 beads, the marginal benefit is greater than the marginal cost. We can increase efficiency by allocating more resources and producing and consuming even more beads. At 1.5 beads again, marginal benefit exceeds marginal cost. This relationship is valid for up to 2.5 beads. At points greater than 2.5 beads, the opposite occurs. The marginal cost is greater than the marginal benefit. We improve efficiency if we allocate fewer resources to the production and consumption of beads. So, the optimal or allocated efficient point is the one point where the marginal benefit is equal to the marginal cost: point M.

Graphical Question 1

What happens to the production possibilities frontier curve (in the long run) if the restaurant remains open for longer (today), only to meet the new demand for pizza?

Slide the red points along each axis to draw the new curve.

Show Answer Check Answer

2.4 Determine absolute and comparative advantages and how these apply to trade and economic growth.

Many economists are advocates of **free trade**. Free trade is another factor that may influence economic growth. Trade revolves around the concept of **comparative advantage**. Comparative advantage is a relative term focusing on who has the lower opportunity cost. Also, comparative advantage helps determine specialization.

Comparative advantage differs from **absolute advantage**. Absolute advantage is simply making more goods with the same number of resources or producing the same amount of goods with fewer resources or inputs. So, absolute advantage focuses on productivity, while comparative advantage focuses on opportunity costs.

Dub/Chud Scenario

Image 7: Produce pizzas

Image 8: Produce computers

In this example, we have two players: Dub and Chud, producing two goods: pizzas and computers. We assume each player has the same number of resources, in this case, one hour. Now we can calculate or determine the absolute and comparative advantages.

Dub's PPC

Four pizzas/hour

One computer/hour

Chud's PPC

Five pizzas/hour

Ten computers/hour

This information can also help us determine the opportunity costs for each good for each player. If Dub is already spending 8 hours a day making pizza, he is currently making 32 pizzas a day. If Dub decided instead to spend 7 hours a day making pizza and 1 hour a day making computers, he would make 28 pizzas and 1 computer. In this way the "price" of computers is 4 pizzas, because that is what Dub gave up to produce a computer, making it his opportunity cost of producing a computer in terms of pizza. For an

individual to have a comparative advantage they need to have a lower "price" for one good in terms of another good.

Q2.5 Mark as: None

Who has the absolute advantage in producing pizzas?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	Dub
b	Chud

Correct Answer:

✓ **b** - Chud

Show submitted answer | Hide Correct Answer | Check My Answer

Q 2.6 Mark as: None

Who has the absolute advantage in producing computers?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	Dub
b	Chud

Correct Answer:

✓ **b** - Chud

Show submitted answer | Hide Correct Answer | Check My Answer

Q 2.7 Mark as: None

Who has the comparative advantage in producing pizzas?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	Dub
b	Chud

Show submitted answer | Hide Correct Answer | Check My Answer

Q 2.8 Mark as: None

Who has the comparative advantage in producing computers?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	Dub
b	Chud

Correct Answer:

✓ **b** - Chud

Show submitted answer | Hide Correct Answer | Check My Answer

Even if one producer has an absolute advantage in both pizzas and computers, that producer can't have a comparative advantage in both goods. He still has a comparative advantage in one of the goods: computers. But the other producer also has a comparative advantage in the other good: pizza. Thus, each player is relatively good at producing one good over the other, which helps determine the basis for trade.

Let us analyze this example further and explain why trade is one of the keys to economic growth. The actual mix of hours used for production is somewhat arbitrary. For instance, Dub and Chud decide not to trade, yet they arbitrarily spend 8 hours a day producing pizzas or computers. So, let us pick some: four and four hours for Dub and six and two hours for Chud. Their combined production of pizzas and computers is 26 and 64, respectively.

Without Trade
(8-hour day)

	Dub	Chud	Total
Pizzas	4 hrs x 4 = 16	2 hrs x 5 = 10	26
Computers	4 hrs x 1 = 4	6 hrs x 10 = 60	64

Image 9: Production without trade

Now let us see what happens when Dub and Chud begin to trade based on specialization and comparative advantage. Dub specializes in pizzas, while Chud specializes in computers due to their comparative advantages. After specialization, their combined production is 32 pizzas and 80 computers. Both players still want to consume both items. So now we must figure out what is known as the term of trade. We will assume Dub decides to trade 15 of his pizzas for five with Chud's computers, a ratio of one computer to three pizzas. That determined ratio is somewhat arbitrary. We will skip the explanation for now. However, here is a hint: comparative advantage helps determine the term of trade ratio.

With specialization & trade
Terms of trade: one computer for three pizzas
(8-hour day)

	Dub	Chud	Total
Pizzas	8 hrs x 4 = 32		32
Computers		8 hrs x 10 = 80	80

Dub trades 15 pizzas for five of Chud's computers

Image 10: Production with specialization

After determining the production level based on comparative advantage and specialization, let us focus on the consumption of both goods after the trade. Dub trades away 15 pizzas and is left 17 pizzas, but he receives five computers. So, his consumption bundle is 17 pizzas and five computers. On the other hand,

Chud receives those 15 pizzas but must give up five computers. Note the total production and consumption do not change. But both players can consume both goods after the trade.

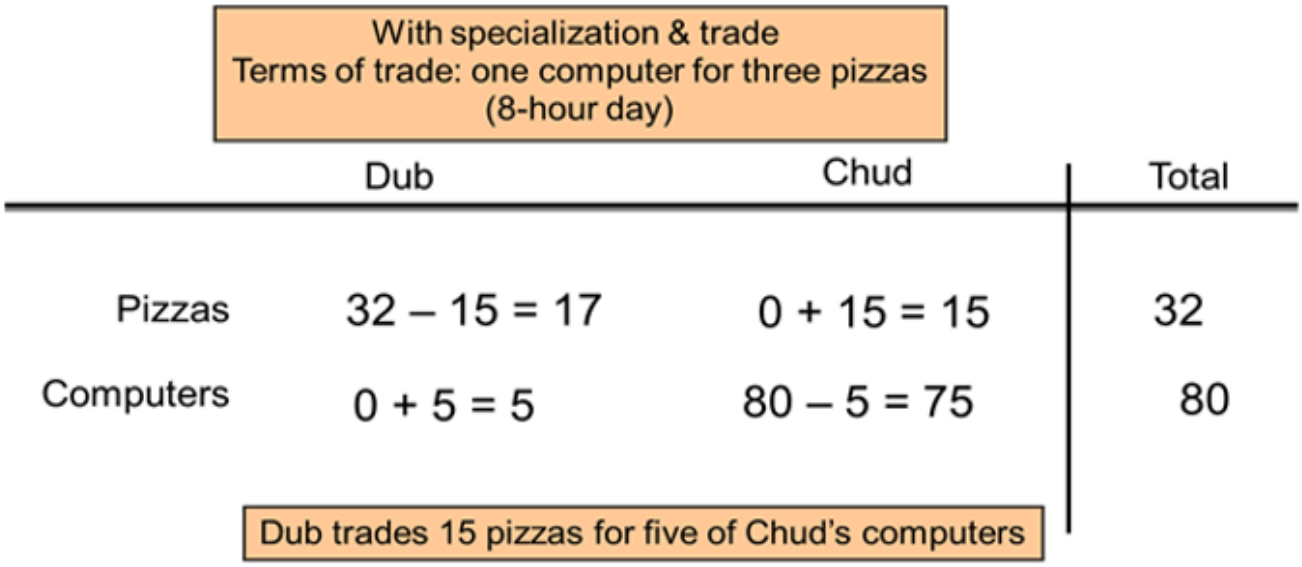


Image 11: Consumption after trade

So why trade? Because both players can consume larger bundles of both goods after specialization and trade. In other words, economic growth. Dub gains one more pizza and one more computer, while Chud gains 15 more computers and five pizzas than he originally produced. For a further illustration, let's look at Chud's PPC.

Point A represents Chud's production and consumption before specialization trade: 10 pizzas and 60 computers. Point B represents Chud's specialization based on comparative advantage. Finally, point C represents the consumption bundle after he trades with Dub. It's worth noting that point C is beyond Chud's original production possibilities curve. Thus Chud is better off since 75 computers and 15 pizzas are beyond his current production possibilities curve.

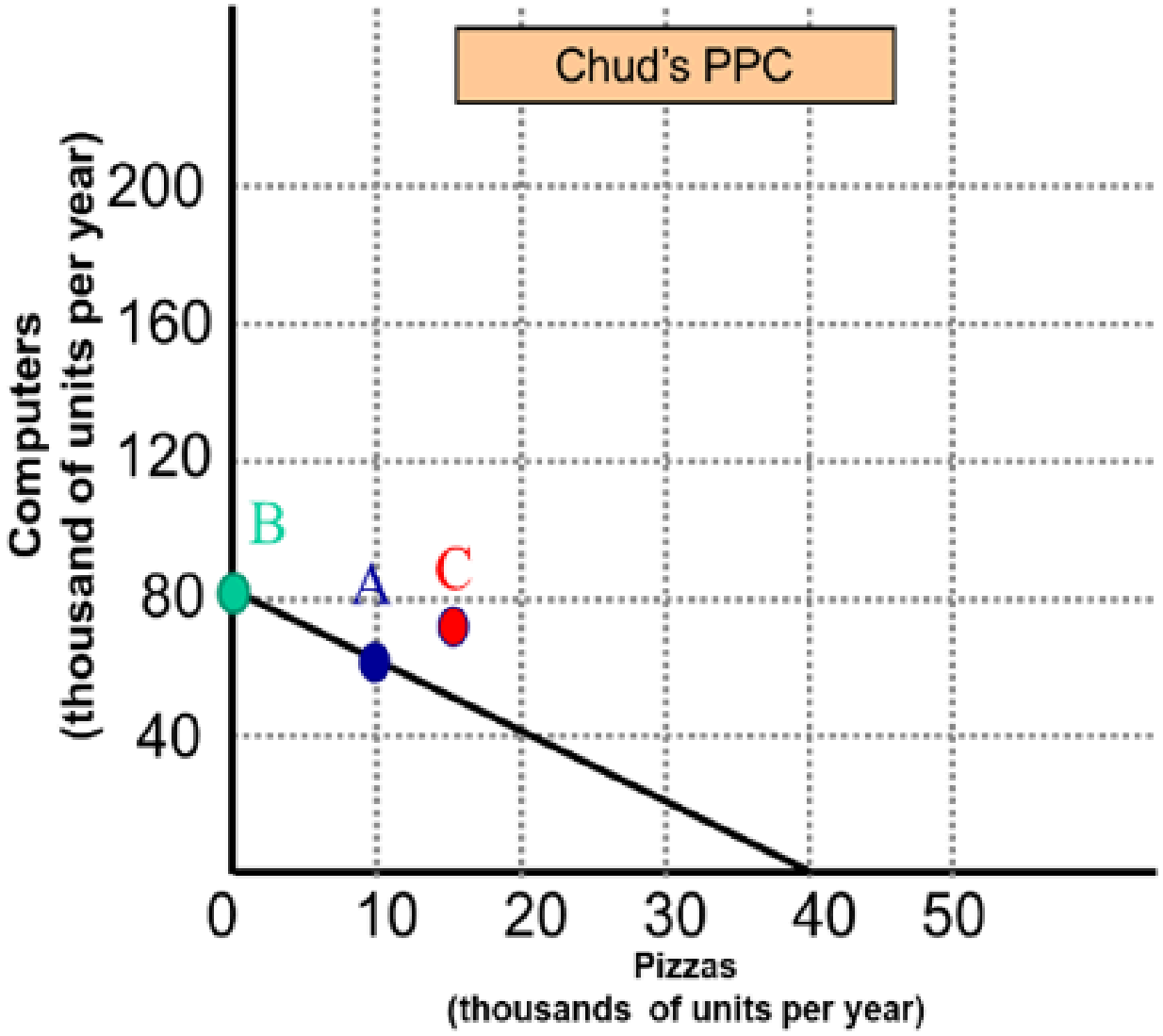


Image 12: Production (A), specialization (B), and consumption after trade (C)

So, why trade? Simple, comparative advantage and specialization help explain economic growth.

2.5 Examine how the PPC illustrates choice, consumption, and economic growth.

After covering what we need to know about points on the production possibilities curve, such as opportunity cost and efficiency, let us turn our attention back to the fundamental problem of economics: scarcity. How do we solve the problem of scarcity? Two words: **economic growth**. Economic growth allows us to reach that currently unattainable point. Remember point R from the original PPC? Economic growth will enable us to consume and possibly produce more of both corn and beans. Graphically this economic growth is illustrated as an outward shift of the PPC. So, what causes this outward shift? A break in the assumptions of the PPC, like an increase in technology or the number of resources (capital).

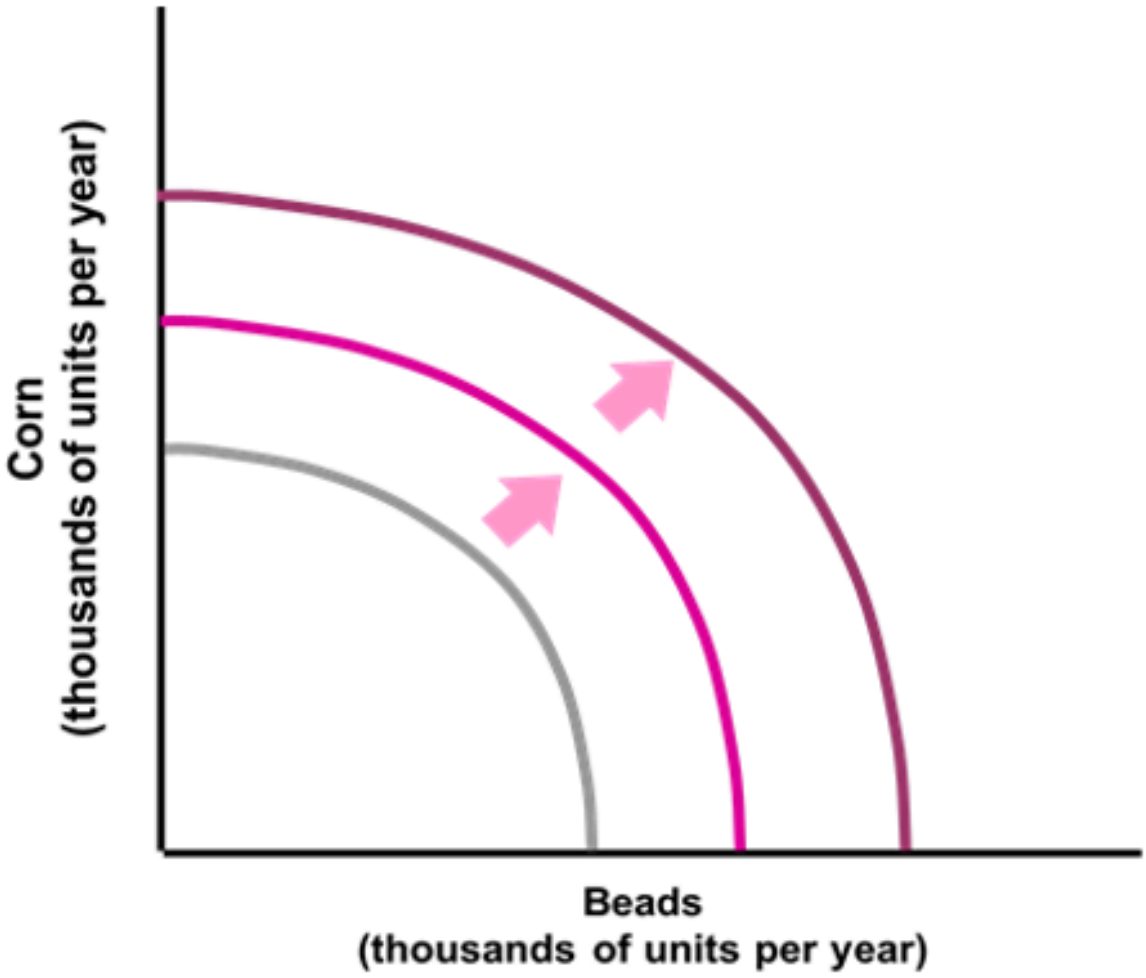


Image 13: Illustrating economic growth

We can also apply the basic concepts of the production possibility curve to a primary choice we all face: Spend or save. In other words, if we have $100, do we save that $100 for a rainy day with the expectation that the amount will grow so we can spend even more or consume more tomorrow? Or, do we carpe diem: seize the day, spend the $100 and enjoy the benefit it brings?

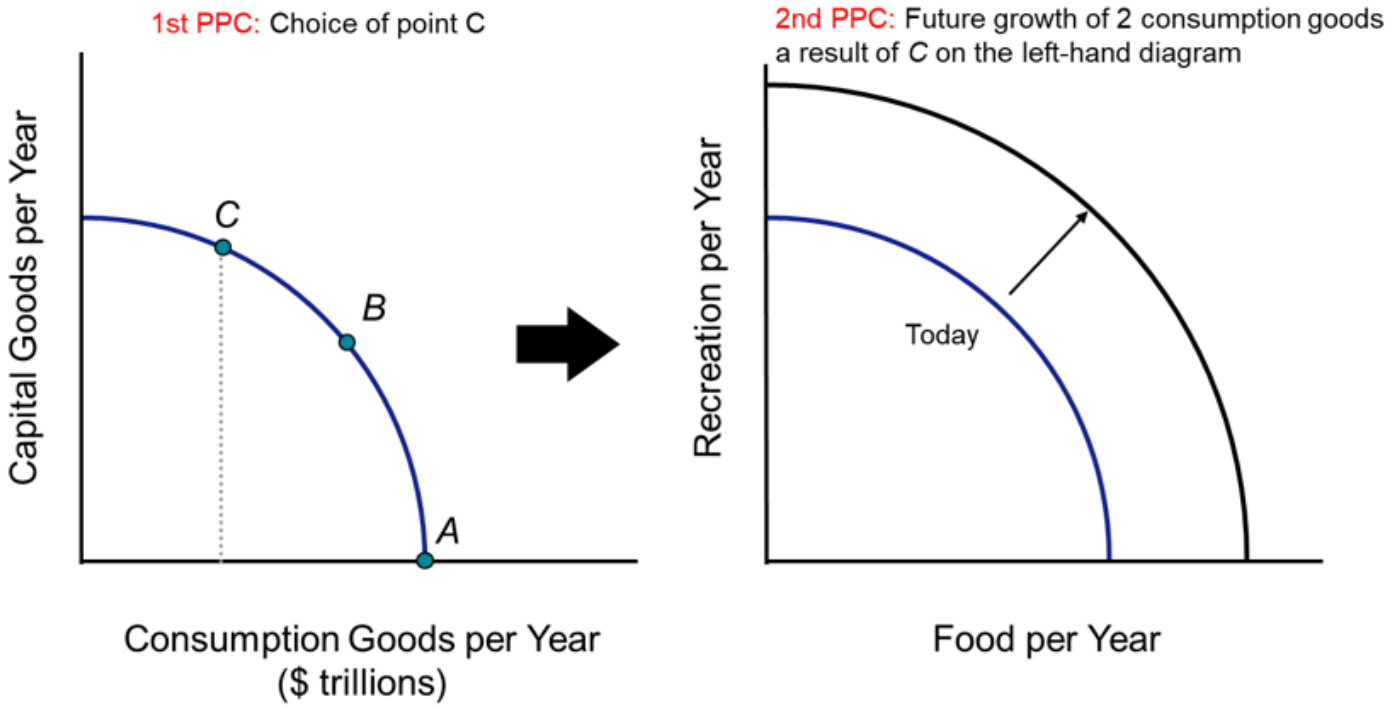


Image 14: Choosing point C Image 15: Future growth from choosing point C earlier

The PPC can help illustrate this tradeoff. First, note the axes are no longer just corn and beads. Instead, the axes represent **capital goods** and **consumption goods**. Second, we can use two PPCs together. Now, look at the effects of choosing less consumption. in other words, save more. Point B reflects the sacrificing of satisfying some of our immediate wants today. In other words, consume less today for the prospect of satisfying even more wants in the future. In other words, save.

Note that the second PPC represents the future effect of your choice from our first PPC. We end up getting more of both goods. So, we can achieve economic growth with a third option: saving. The more we save for that rainy day today, the more enormous economic growth potential tomorrow. Finally, we see the relationship between savings and investment and how the PPC can reflect these tough choices we must make.

2.6 Analyze and illustrate how the per-worker production function applies to economic growth.

Economists use the per-worker production function (Solow growth model) to illustrate long-run economic growth by measuring real GDP per capita changes, using the factors of production and other variables, such as technology. This version of the per-worker production function emphasizes labor productivity. It compares the effect of changes in the amount of capital versus technological change. Technological change includes more productive equipment, education and training, and management.

Like the production possibilities curve, the per-worker production function represents an amount of output based on the factors of production or inputs. But the per-worker production function is primarily

used to illustrate economic growth for the entire macroeconomy. Regardless, the actual production function or equation shows quantity, measured as real GDP per capita, is a function of the various inputs.

Output/time period = some function of capital, labor, human capital & natural resources inputs

or

$$Q = A*F(K,L,H,N)$$

Q = Real GDP per capita
A = available technology
K = capital
L = labor
H = human capital
N = natural resources

Image 16: The per-worker production function equation

We can think of the per-worker production function as a macroeconomic version of the microeconomic model of the Production Possibilities Curve (PPC).