

Chapter 1: Introduction to Economics

"Economics is extremely useful as a form of employment for economists."
-John Kenneth Galbraith, Harvard Professor of Economics (1949-2006), Medal of Freedom (1946) and Presidential Medal of Freedom (2000) Recipient.

When you hear the term **economics**, what word or term comes to mind?

Economics

When you hear the term economics, what one or two words come to mind?

In my courses, the most popular answer to question above is always: money. Unfortunately for those looking for a way to get rich quick, economics is *not* the study of how to make money. Instead, economics broadly explores how individuals, households, firms and governments make decisions. Fortunately, making good decisions will lead to more satisfaction in life, whether this is because one has more money, a more fulfilling job or more time to spend with friends and family.

Your favorite option...

If money was no object, what type of car would you purchase?

A

Luxury Car: Lamborghini, Ferrari, Bentley, Ferrari, Aston Martin, Maserati or Rolls Royce

B

High-End Car: Porsche, Mercedes, BMW, Jaguar or Tesla

C

Luxury SUV: Land Rover, Cadillac Escalade, Lexus LX or Lincoln Navigator

D

Solid Sedan: Toyota Camry, Honda Accord, Subaru Legacy, Ford Fusion or Chevy Malibu

E

Solid Cross-Over SUV: Honda Pilot, Toyota RAV4, Hyundai Santa Fe, Ford Escape, Chevy Traverse or Nissan Rogue

F

Hybrid or Electric Car: Toyota Prius, Chevy Volt, Volkswagen e-Golf or Honda Clarity

G

Pick-Up Truck: Ford F-150, Chevy Silverado, Dodge Ram, GMC Sierra or Ram 1500

H

Value Car: Kia Forte, Toyota Yaris, Ford Fiesta, Chevy Aveo, Smart Car or Nissan Versa

In the question above, many of you probably choose (A), (B) or (C). Some of you may have chosen the Pick-Up Truck if you like to haul things around. Not many people are likely to choose a solid sedan (D) when a high-end car (B) is available. Unless you place a high value on fitting into small parking spots, you probably did not choose the value car (H).

The best decision...

Considering the average cost of the cars in each group and how much income you expect to have after you graduate, what car do you envision purchasing in say, 5 years from now?

A

Luxury Car: Lamborghini, Ferrari, Bentley, Ferarri, Aston Martin, Maserati or Rolls Royce (average price = \$200,000+)

B

High-End Car: Porsche, Mercedes, BMW, Jaguar or Tesla (average price = \$100,000)

C

Luxury SUV: Land Rover, Cadillac Escalade, Lexus LX or Lincoln Navigator (average price = \$75,000)

D

Solid Sedan: Toyota Camry, Honda Accord, Volkswagen Jetta, Ford Fusion, Volvo S60 or Chevy Malibu (average price = \$30,000)

E

Solid Cross-Over SUV: Honda Pilot, Toyota CR-V, Hyundai Santa Fe, Ford Escape, Chevy Traverse or Nissan Rogue (average price = \$50,000)

F

Hybrid or Electric Car: Toyota Prius, Chevy Volt, Volkswagen e-Golf or Honda Clarity (average price = \$30,000)

G

Pick-Up Truck: Ford F-150, Chevy Silverado, Dodge Ram, GMC Sierra or Ram 1500 (average price = \$35,000)

H

Value Car: Kia Forte, Toyota Yaris, Ford Fiesta, Chevy Aveo, Smart Car or Nissan Versa (average price = \$15,000)

Your answer to the second question was probably different than your answer to the first question. (Unless you really want a value car or you are lucky enough to be able to afford a luxury car in 5 years!)

The likely change in your answers between the previous two questions illustrates that the best decision is different than choosing the option that sounds the best. Potential car buyers do not say to themselves, "I will buy the best car on the market!" In that world, we would see a lot more cars on the road built by Lamborghini, Rolls Royce, Bentley and Tesla. In reality, new car buyers consider factors such as the price of the car, what the car will be used for, miles per gallon of gas, the cost of maintenance and insurance and the local weather, in addition to the quality of the car. After potential buyers consider all of the factors that come with the purchase of a car, pick-up trucks (G) and solid sedans (D) make up the majority of the best selling automobiles in the United States in 2016.

Regardless of what your answers were, the previous two questions introduce what **economics is: the study of how choices are made given that decision makers face constraints.**

In the first question, money was no object. This situation may be fun to think about, but it is not realistic for the average person and learning about how people would behave with an unlimited pool of money is not very useful for policy makers.

In the second question, the constraints of income, job security and wants and needs in general, were considered before making a decision. Whenever **scarcity** is involved, economists are interested in how decisions are made. **Scarcity is the concept that the wants and needs of decision makers are greater than the limited resources available to fulfill those wants and needs.**

Scarcity

Think about scarcity in your life. What goods or services do you associate with scarcity?

It may be hard to think of just one thing that you would like to have more of. Consequently, many of you may have put down money. This is something that most of us associate with scarcity since we would like more of it. However, we

should remember that money on its own does not make us better off. Unless you enjoy swimming in a pool of coins (which is less enjoyable the more you think about it), money is only valuable in that it allows us to purchase things that fulfill our wants and needs.

It is possible for some people to get to the point where money does not play a role in their decision and he or she can buy anything they want. But even these lucky individuals still face scarcity in their lives. No matter who you are, you face a **time constraint**.

Imagine that Bill Gates, who is worth about \$85 billion, is trying to figure out where to go on vacation. He has narrowed down his options to (1) a week on a private island in Fiji or (2) a week skiing in the mountains of Switzerland. Mr. Gates is the richest person in the world, but he cannot be in both places at the same time. If he chooses Fiji, he is not going to Switzerland. If he goes to Switzerland, he is not going to Fiji. In making a choice, Mr. Gates is forgoing his next best option.

When considering the best decision, economists incorporate not just the direct cost of an activity, but the **opportunity cost**. **Opportunity cost is what is given up when a choice is made**. This may seem like a simple definition, but there is a lot to it. The opportunity cost of Mr. Gates going to Fiji is his trip to Switzerland. If the opportunity cost of Switzerland is too high, then Mr. Gates would change his plans.

Opportunity Cost of School

What is the opportunity cost of spending a year (or 4 years) in school (choose all that apply)?

A

Tuition

B

Room & Board (Housing & Food)

C

Forgone Wages

D

Leisure Time

Unsurprisingly, economists are not very interested in the struggle that Bill Gates faces when it comes to choosing a vacation spot. A more interesting question is whether going to college is worth it. In the question above, you were asked to consider the opportunity cost of going to a college or university yourself. In other words, what are you giving up to go to college?

The most direct cost of college is tuition (answer A). If you pay \$15,000 per year in tuition, that is money that you cannot use for something else. Economists call the direct payment associated with a choice, the **explicit cost**. Imagine that you live on campus and have a meal plan that costs \$12,000 per year (\$1,000 per month). If you were going to spend \$1,000 housing and food, regardless of whether or not you went to school, you *would not consider room and board* in your calculation of opportunity cost.

In contrast to explicit costs, **implicit costs** are non-financial costs of a decision. To fully understand the concept of the opportunity cost of education, ask yourself, what would I be doing if I was not working towards a degree? Some of you would be working (answer C). Assume that your best available job paid \$30,000 per year. The \$15,000 in tuition (explicit costs), plus the \$30,000 in forgone wages (implicit costs) means that after a year of school, you have \$45,000 less than if you would have worked!

Many of you may have answered D instead of C. Leisure time is also an implicit cost of going to college. Had you not attended college, you may have spent more time with friends or family, playing on your smart phone, exercising, learning to cook or reading a book. It is important to recognize that there are many activities you cannot do at the same time. When determining the opportunity cost of a decision, the implicit cost is the value of the next best option. Imagine that if you were not going to college, you would either learn to cook or train for a marathon. You are unlikely to learn how to cook while simultaneously training. The implicit cost is then the activity you would do.

Opportunity Cost of Studying

Show Correct Answer

Show Responses

You have two exams tomorrow: one in economics and one in biology. You are going to spend the next four hours studying. What is the opportunity cost of studying economics for one hour?

A

an hour of leisure time

B

an hour of eating

C

an hour of studying for biology

D

an hour of working

In order to correctly answer the question, you have to recognize that the decision has been narrowed down to two options: studying for economics or studying for biology. Because there are only two possible activities that you are deciding on, the opportunity cost of studying for a particular subject is the time spent not studying for the other subject. This is the same type of cost that Bill Gates faces when deciding where to go on vacation!

We have only been focusing on individuals making decisions: What car should you buy? Should Bill Gates vacation in Fiji or Switzerland? What is the opportunity cost of studying for economics? The principles used in individual decision making can apply to producers, firms and governments. Firms that use their capital and labor to produce one good implies that the capital and labor are not being used to produce a different good. A government that decides to build a new school means that the money for education cannot be used to fix roads. Because economics studies choices in general, the concepts and principles you will learn in this course applies to a wide-range of situations. Embrace these situations and make sure to let your professor know when you see the connection between what you learn in class and real-life!

Solving Problems Like an Economist: The Case of Milk for Cereal

One way to learn how economists analyze problems and decisions is to see how an everyday decision is examined by a couple of economists. Here is a true story about how a couple of economists used economic principles to make their breakfast as good as possible.

There was once a married couple. Both of them were economists. Everyday, the couple had cereal in the morning. Usually the cereal consisted of some grains and dried fruit, topped with skim milk.

One day the milk came out "thick". I know what you are thinking...it's gone bad. But it was a brand new carton. Furthermore, the milk was smooth and did not smell rotten. It just happened to be thicker. The two economists decided to cautiously give the thicker milk a try. It turned out that this new milk was delicious! Somehow, 2% milk had been put in the skim milk carton and this made breakfast for the next week a lot tastier!

When the milk ran out, the economists had a decision to make. What type of milk should they purchase next?

The economists, like most people, were probably **rational** decision makers. This means that **they used all the information at their disposal to achieve their goals**. (Assuming people are rational is sometimes thought of as controversial, but oftentimes, this is because we do not fully understand an individual's goals or the information available to them. Once we understand what someone's goals are, seemingly odd behavior may be more rational than we previously thought.)

There were three options for milk at the grocery store: skim milk, 2% milk and whole milk. The improvement in taste from skim milk to 2% had been so big, they decided to give whole milk a try on their cereal. There was a **marginal benefit** of drinking whole milk, compared to 2% milk. The **marginal benefit is the additional value you receive from making a small or marginal change**.

Marginal Benefit of Whole Milk

What is the marginal benefit of consuming whole milk instead of 2% milk?

The whole milk tasted better than the 2% to the economists. This improved taste was the marginal benefit of the whole milk. Despite tasting better, the economists only bought the whole milk once. This is because the **marginal cost, or additional cost from making a marginal change**, was too high.

Opportunity Cost of Whole Milk

Assuming that the price of milk is the same, regardless of the type of milk, what is the opportunity cost of whole milk, relative to 2% milk?

When the marginal cost of a choice is greater than the marginal benefit, that choice should not be made. That would be a bad economic decision. The economists did not know it initially, but the marginal benefit of better tasting whole milk was not worth marginal cost of more calories. Even though the economists did not buy whole milk again, they always bought 2% milk instead of skim milk. The marginal benefit of better tasting 2% milk was worth the marginal costs of more calories. If there were more kinds of milk between 2% and whole milk, the economists would have likely tried 3%, 4% and 5% milk. They would continue to increase the calories until the marginal benefit was equal to marginal cost.

This principle can be applied to all economic decisions. After considering the opportunity cost and benefits of a decision, an **action should be taken only if the marginal benefit is greater than or equal to the marginal cost**. We will see later in this book that this basic principle will help guide policy makers that are hoping to improve the well-being of society in the middle of an economy-wide recession.

Microeconomics vs. Macroeconomics

This class focuses on macroeconomics, but we will begin by understanding the foundations of the economy. This means spending some time learning about microeconomics. **Microeconomics** studies how specific individuals and firms interact with one another and make decisions. This includes studying

whether education increases wages, why firms set prices at the level they do and if requiring employer-sponsored health insurance leads to job loss.

Macroeconomics examines the economy as a whole and focuses on the total output, employment level and inflation rate in the economy. This book will explore why the level of production in an economy is at a particular amount, what causes fluctuations in the unemployment rate and whether or not inflation is healthy for an economy.

The way that microeconomists and macroeconomists go about answering economic questions is tricky. Economics is a social science, which means that the scientific method is applied to social behavior. Hard sciences such as chemistry and physics can use a theory to construct a hypothesis. The hypothesis can be tested in a lab over and over again. Conclusions drawn from the study are likely to apply to all similar situations.

Social behavior is not as easy to test. It is unreasonable (and unethical in many cases) to formally test how people respond to an event such as job loss. Therefore, economists construct theories to make predictions about the real world. These predictions are tested using naturally occurring events and many times it is difficult to determine whether the findings are applicable in other settings. The uncertainty of human behavior is what makes economics so interesting and working towards finding the answer to a complex economic problem can be very satisfying!

Regardless of whether you study microeconomics or macroeconomics, you will be faced with information that may elicit an emotional response. You may hear that a policy instituted by the government leads to job loss and your response to the policy is, "I do not think we should institute that policy". In this case, you are making a **normative statement**. **A normative statement is a statement about how we think things should be.**

A normative statement differs from a **positive statement**. A **positive statement is a statement about how things objectively are**. "The policy led to job loss," is a positive statement since it does not weigh in on whether the policy is good or not.

Positive or Normative Statement

Is the following statement: "The Affordable Care Act required all individuals to enroll in a health insurance program and the rate of uninsured individuals decreased as a result."

A

A positive statement

B

A normative statement

Positive or Normative Statement

Is the following statement, "The Affordable Care Act was not good for employers and should be repealed."

A

A positive statement

B

A normative statement

Notice the difference between the two, politically motivated statements. The first statement simply states what the Affordable Care Act was and the consequences of the program. Because the statement simply says what happened, it is a positive statement. The second statement weighs in on whether or not the Affordable Care Act made employers better off. Because the statement is talking about how things should be, it is a normative statement.

Making a normative statement positive.

Can you turn the statement, "The Affordable Care Act was not good for employers and should be repealed," into a positive statement?

Economics, and macroeconomics in particular, is driven largely by political decisions. It is the job of the economist to perform positive analysis to support any normative statements. So let's get started!

Chapter 1A: A Quick Mathematics Review

One of the values of economics is that the discipline as a whole confronts real-world problems, but very often, economics uses mathematical tools to solve problems. It is important to think about all the qualitative (non-numerical) issues surrounding a question. But it is hard to find a definitive answer when working with terms like, "good" and "bad". By framing our questions in the form of a math problem, we will be able to find solutions to our questions. After finding a numerical answer, we will complete the loop and turn our numbers back into words that we can use to help guide decision makers.

For those of you who are mathematically-inclined, you will see mathematics embedded in many of the topics we cover and start to go beyond what is covered in the book. For those who have a bad reaction to the thought of math, do not worry, math is easier to process when you see a reason for it. In the past, you may have "solved for X " and then been done with the question. In economics, solving for X may tell you how much the government needs to reduce taxes in order to bring the economy out of a recession.

This short chapter is a review of the math concepts you will want to know to do well in this course. The more that you practice these exercises, the easier the mathematical exercises become and you may even start looking for ways to turn word problems into math problems.

Graphing a Linear Relationship

Let's start with something that you learned about in the past: the slope and intercept of a straight line. However, instead of looking at the relationship between X and Y , consider the relationship between a worker's hourly wage

and years of experience on the job. Before graphically depicting wage and experience, we need to think about how the two variables may be related.

Dependent and Independent Variables

Consider the potential relationship between hourly wage and years of experience. Which of the following is most likely to be correct?

A

Your hourly wage depends on the number of years of experience you have.

B

The number of years of experience you have depends on your hourly wage.

C

There is not a relationship between years of experience and hourly wage.

In the question above, you probably thought, "it makes sense that when a worker has more experience at a job, their wage will increase." That means that the wage is **dependent** on the number of years of experience. This makes wage a **dependent variable: a variable for which the value depends on the value of other variables being considered**. The years of experience do not depend on the wage. This makes the years of experience an **independent variable: a variable for which the value does not depend on the other variables being considered**.

After you have defined which variable is your independent variable and which variable is your dependent variable, you can begin constructing your graph. In a graph, there are two axes that represent the values of your variables. The horizontal or X-axis, is the axis for the independent variable. The vertical or Y-axis, is the axis for the dependent variable. Because hourly wage is our dependent variable, it is placed on the vertical axis. Years of experiences is placed on the horizontal axis.

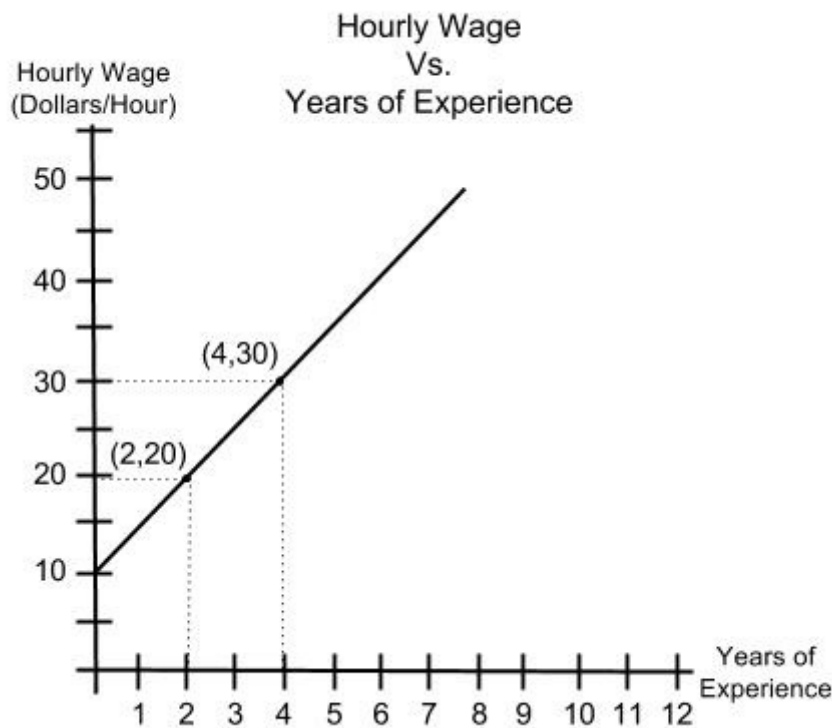


Figure 1A.1

In the graph above, you are given two points. Think about what these points mean. The first point says that when an individual has two years of experience, their hourly wage is \$20. A worker with four years of experience will see their wage increase to \$30 per hour. Because the line is straight, the increase in the wage is the same every year. Assuming the line is straight makes our life easier since we only need two points to derive the curve. In the case where a worker has no years of experience, their starting wage is \$10 per hour.

Slope of a Straight Line

What is the slope in the graph above relating hourly wage and years of experience?

A

1

B

5

C

10

D

20

When calculating the slope of a line, you are figuring out how much your dependent variable (hourly wage) changes when your independent variable (years of experience) increases by 1. In order to calculate this, recall that the slope is the rise of the line, divided by the run. More specifically,

Slope of a linear curve = Change in Y/Change in X

As you analyzed the graph above, you may have noticed that with every year of experience, hourly wage increases by \$5. This is the slope of the line!

It was also noted above that the hourly wage when experience is zero is \$10. **The value of the Y-variable when X is zero is called the Y-intercept.**

After we find the slope and Y-intercept of a linear curve, we can write out an equation for the line:

Hourly Wage = $10 + 5 * \text{Years of Experience}$ (where * means multiply).

The hourly wage can now be calculated for any years of experience we are interested in by plugging in the appropriate number of years in the equation above.

The linear curve we derived is specifically for the graph above. The curve can be generalized to any two variables:

$$Y = b + mX$$

where b is the Y-intercept and m is the slope.

Deriving a Linear Curve

You are given information about the amount that households consume based on their level of income. When the level of income is \$100, households consume \$150 worth of goods and services. When the level of income is \$200, households consume \$225 worth of goods and services. Which variable is the INDEPENDENT variable in this situation?

A

Income

B

Consumption

C

Neither

In the setting above, it is safe to assume that the level of consumption in a household will change because income changes. That means that consumption depends on income, making consumption the dependent variable and income the independent variable.

Deriving a Linear Curve

You are given information about the amount that households consume based on their level of income. When the level of income is \$100, households consume \$150 worth of goods and services. When the level of income is \$200, households consume \$225 worth of goods and services. Assume that the relationship between income and consumption is linear. What is the slope of the line relating income and consumption?

A

0.75

B

1.5

C

75

D

150

In the previous question, it was noted that income is the X-variable and consumption is the Y-variable. In order to calculate the slope, we need to look at how much consumption has changed (change in Y) and divide it by how much income has changed (change in X). Consumption increased by \$75 (\$225-150) while income has increased by \$100 (\$200-\$100). This yields a slope of $75/100 = 0.75$.

Take a moment and interpret this slope. For every dollar increase in income, a household increases consumption by \$0.75, or 75 cents. The slope tells us the fraction of income a household puts towards consumption.

Deriving a Linear Curve

You are given information about the amount that households consume based on their level of income. When the level of income is \$100, households consume \$150 worth of goods and services. When the level of income is \$200, households consume \$225 worth of goods and services. Assume that the relationship between income and consumption is linear. What is the intercept of the line relating income and consumption?

A

25

B

50

C

75

D

100

This question is more difficult than the previous questions since it involves a little bit of algebra, but answering it helps us fully understand the linear function. You calculated that the slope of the function is 0.75. In order to figure out the intercept of the line, plug in set of values for income and consumption into a linear function and solve for the intercept value.

Start with $Y = b + mX$.

The independent variable (X) is income and the dependent variable (Y) is consumption. A combination of income and consumption in the question is (100, 150). Plug these values and the slope into the linear function. (You could also use (200, 225) and get the same answer.)

$$150 = b + 0.75 \cdot 100$$

$$150 = b + 75$$

Now, solve for the intercept (b) by subtracting 75 from both sides and finding that $b = 75$. Again, take a moment to think about what the intercept means. In this case, it is saying that when income is zero, households will consume \$75 worth of goods and services. Does this make sense? Possibly. People without income may find ways to continue consuming goods and services by relying on savings, family and friends. The lack of income does not necessarily mean that there is not any consumption.

The line relating consumption and income then becomes:

$$\text{Consumption (Y)} = 75 + 0.75 \cdot \text{Income}$$

The amount of consumption can be determined by plugging in any value of income into the function. Try drawing out the function yourself. It should look like:

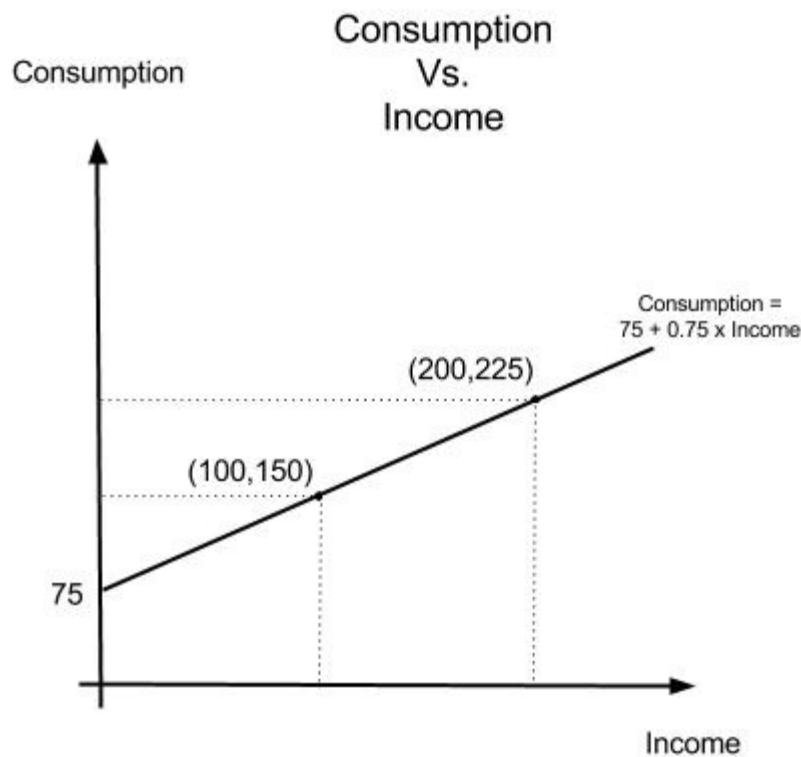


Figure 1A.2

Solving a System of Equations

Another important mathematical technique that you should brush up on is solving a system of equations. This term sounds fancier than it actually is. In economics, we are given two or more equations and need to figure out the values of the variables that make the equations equal to one another.

Let's start with a simple example:

Solving for X

You are told that the relationship between consumption (Y-variable) and income (X-variable) is:
 $\text{Consumption} = 75 + 0.75 \times \text{Income}$.

What is the value of income that makes consumption 825?

A

750

B

825

C

900

D

1000

Continuing with the equation we derived above, you are asked to figure out what value of income yields a level of consumption of \$825. To solve for the appropriate income, plug in \$825 for consumption:

$$825 = 75 + 0.75 * \text{Income}$$

From there, we need to isolate income. Start by subtracting 75 from both sides of the equation:

$$750 = 0.75 * \text{Income}$$

Divide both sides by 0.75, which will isolate income:

$$750 / 0.75 = \text{Income}$$

$$\text{Income} = 1000$$

When income is \$1000, then consumption is \$825. You can confirm this by plugging \$1000 into the original equation and you will find that consumption is \$825.

But the economy is complicated, and consequently, more advanced mathematical techniques are needed. Instead of setting consumption equal to a fixed number, imagine that you are interested in what the income of two unique households need to be in order to have the same level of consumption.

Finding the Common Value

There are two households in the economy. Household 1 consumes based on the function:

$$\text{Consumption} = 75 + 0.75 * \text{Income}$$

Household 2 consumes based on the function:

$$\text{Consumption} = 50 + 0.8 * \text{Income}$$

What level of income makes the consumption of these two households the same?

A

25

B

250

C

500

D

750

Take a minute to compare these two equations. We are comfortable with the equation in the first household. The second household consumes \$50 when their level of income is zero, but for every dollar they earn, \$0.80 is spent on consumption.

In order to find the level of income where the levels of consumption are equal, we need to set the equations equal to one another.

$$\text{Household 1 Consumption} = 75 + 0.75 * \text{Income} = 50 + 0.8 * \text{Income} = \text{Household 2 Consumption}$$

From there, we need to isolate income. To do this, subtract $0.75 * \text{Income}$ from both sides. Then subtract 50 from both sides. This will leave you with:

$$25 = 0.05 * \text{Income}$$

From here, we can divide both sides by 0.05 and $\text{Income} = 25/0.05 = \500 . Take another moment to think about the interpretation of this outcome. When the income in each household is \$500, both households consume the same amount.

Intersection

There are two households in the economy.

Household 1 consumes based on the function:

$$\text{Consumption} = 75 + 0.75 * \text{Income}$$

Household 2 consumes based on the function:

$$\text{Consumption} = 50 + 0.8 * \text{Income}$$

What is the level of consumption in the households when they are consuming the same amount?

A

350

B

450

C

550

D

650

To figure out the value of consumption when the households consume the same amount, plug in \$500 into income for either function and you will get:

$$\text{Household 1 Consumption} = 75 + 0.75 * 500 = 450$$

$$\text{Household 2 Consumption} = 50 + 0.8 * 500 = 450$$

It does not matter which function you use, you should get the same level of consumption since the \$500 income level was found by setting the consumption levels equal to one another.

The point where consumption is the same between both households can also be seen graphically. The figure below accurately depicts the two functions. The intersection of the lines occurs at the income level of 500 and consumption of 450.

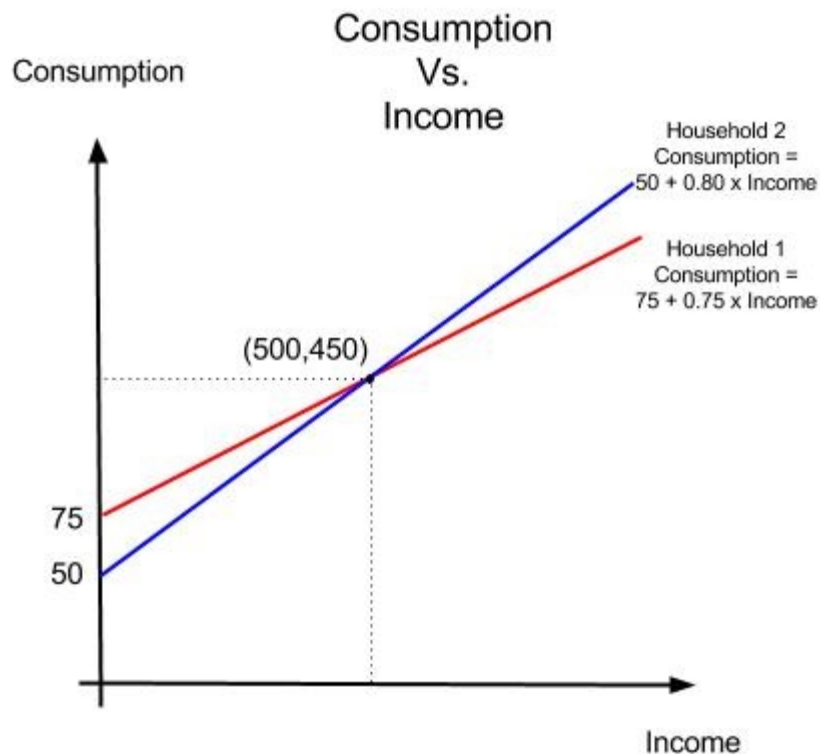


Figure 1A.3

Graphically, we see the household that spends more of each dollar they earn in blue. This line is steeper, and even though household 2 does not spend as much on consumption as household 1 when their income is low, household 2 spends more on consumption at high levels of income. Work to understand how the slope and intercept of the lines tell a story that is possible to see in a graph. Making the connection between the graph and the algebra will help you understand the concepts we work on in the economy in a few chapters down the line.

Working with more than Two Variables

There will be many situations in this class where we are faced with multiple variables in an equation. For example, the level of consumption in a household depends on more than just the level of income. For example, households consider the interest rate (the return from saving or investing money) when deciding on how much to consume.

We can incorporate the interest rate into our analysis by adding it to our existing equation relating consumption and income. For example, the function determining consumption for household 1 is:

$$\text{Consumption} = 75 + 0.75 * \text{Income} - 25 * \text{Interest Rate (\%)}$$

The interpretation of the slope is determined in a similar way as income. When the interest rate increases by one percent, household consumption decreases by \$25. A mathematical way to show this is to set the level of income at a fixed level and change the interest rate.

Imagine that the income level is \$500. When the interest rate is 0%, we revert to our equation from before and $\text{Consumption} = 75 + 0.75 * 500 - 25 * 0 = 450$.

As the interest rate increases from 0% to 1%, household consumption changes and now, $\text{Consumption} = 75 + 0.75 * 500 - 25 * 1 = 425$.

The same process takes place when the interest rate increase to 2% and consumption becomes, $\text{Consumption} = 75 + 0.75 * 500 - 25 * 2 = 400$.

This concept is more difficult to show graphically since there are 3 variables. It is unreasonable to have anything other than a computer create a 3-Dimensional Graph. A more practical way to see how the interest rate influences consumption is to graph the relationship between consumption and income at different interest rates.

The figure below shows the graph of consumption and income when the interest rate is 0%, 1% and 3%. Notice that as the interest rate increases, the level of consumption falls by 25 at all incomes.

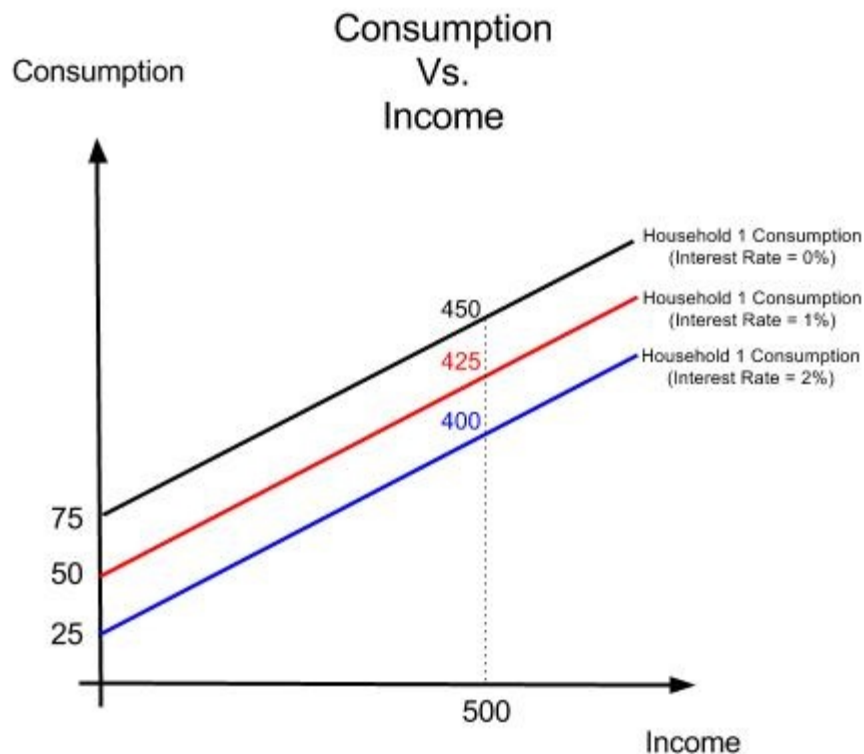


Figure 1A.4

Moving forward, we will be focusing on the entire economy and more than two variables will determine the value of our outcome. It is important to understand how to depict multiple variables in a 2-dimensional graph. Spend some time thinking about how you would draw the consumption line if it depended on income, the interest rate and the number of children in the household. We will see graphs with similar complexity when we model the entire economy in a few chapters.