Consumer Choice & Demand

1. Affordable consumption bundles
2. Consumer choice
3. Price & Demand
4. Income & Demand

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AFFORDABLE CONSUMPTION BUNDLES

Before making choices, a consumer needs to understand his options. We study how those options depend on the consumer's *income* and the *prices* of the goods he desires.

Income, Prices, and the Budget Line

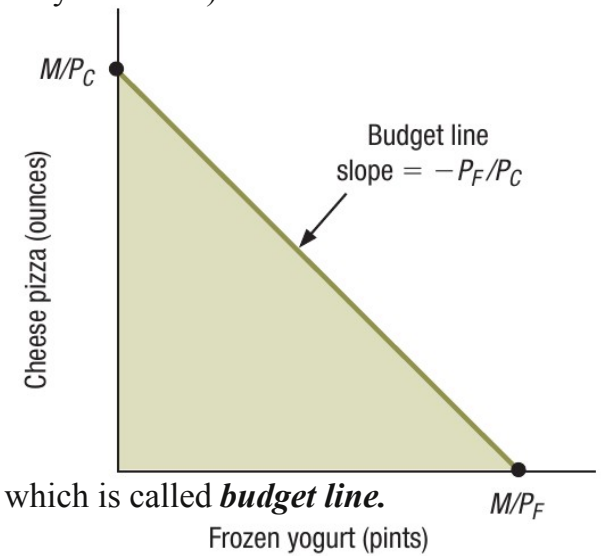
A consumer's **income** consists of the money he receives during some fixed period of time such as an hour, a day, a month, or a year.

Assumption: no borrowing & saving (consumers must spend their income during the period in which they receive it)

Cost of consumption bundle ≤ Income

Above inequality is called as the consumer's **budget constraint**.

To illustrate, let's assume that the consumer desires only two goods, frozen yogurt and cheese pizza. In market economies, each good is commonly associated with a price at which consumers can buy as much or as little as they like. We'll use P_F for the price per pint of frozen yogurt and P_C for the price per ounce of cheese pizza. So if a consumption bundle includes F pints of frozen yogurt and C ounces of cheese pizza, the consumer's budget constraint tells us that the bundle is affordable if its total cost does not exceed his income, M, i.e., $P_F F + P_C C \leq M$.



Affordable consumption bundles fall into two categories:

1. exhaust the income: $P_F F + P_C C = M$, i.e., cost equals income. Rearrange, we have $C = \frac{M}{P_C} - \frac{P_F}{P_C} F$, which is called ***budget line.***
   - The slope of the budget line equals the ratio of the price of frozen yogurt to the price of cheese pizza, times -1.
   - The budget line intersects the vertical axis at M/P_C ounces, and the horizontal axis at M/P_F pints.

2. *not* exhaust the income
   - The budget line is the boundary that separates all the affordable consumption bundles from the unaffordable ones. The green shading identifies affordable consumption bundles.

AFFORDABLE CONSUMPTION BUNDLES

Changes in Income & Prices

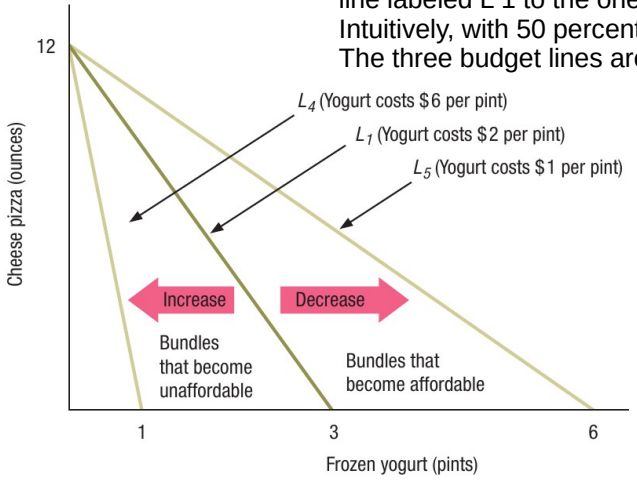
Changes in income & prices affect consumption b/c they move the budget line, altering the set of bundles from which the consumer can choose.

$$C = \frac{M}{P_C} - \frac{P_F}{P_C}F \quad \Longrightarrow$$

A change in income alters the vertical intercept of the budget line without changing its slope.

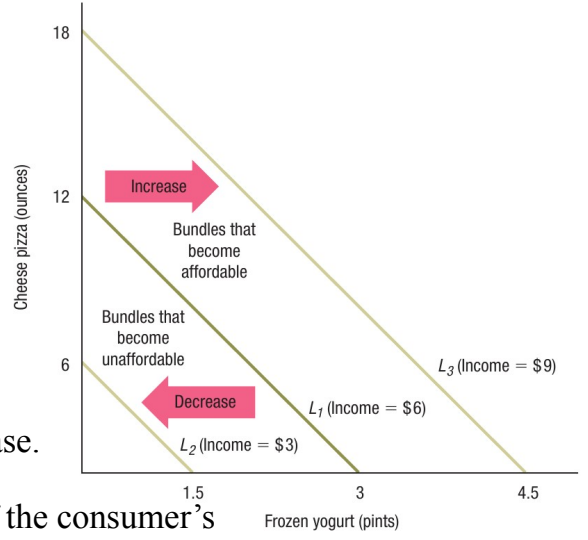
- A reduction in income shifts the budget line inward, shrinking the set of affordable bundles.
- An increase in income shifts it outward, expanding that set.

In the right Figure if yogurt costs $2 per pint and pizza costs $0.50 per ounce, a reduction in income from $6 to $3 shifts the budget line toward the origin, from the line labeled L1 to the one labeled L2. All the consumption bundles between L1 and L 2 become unaffordable. Intuitively, with half as much income, the consumer can only buy half as much. Likewise, an increase in income from $6 to $9 shifts the budget line away from the origin, from the line labeled L 1 to the one labeled L3, making all the bundles between L1 and L3 affordable. Intuitively, with 50 percent more income, the consumer can buy half again as many goods. The three budget lines are parallel because their slopes all equal the same price ratio, times -1.



In left Figure, if pizza costs $0.50 per ounce and income is $6, an increase in the price of yogurt from $2 to $6 per pint rotates the budget line toward the origin from the line labeled L1 to the one labeled L4. All the consumption bundles between L1 and L4 become unaffordable. Intuitively, if the consumer buys only pizza, the price change has no effect on what he can afford, but if he buys only yogurt, he can afford only one-third as much as before. A reduction in the price of yogurt from $2 to $1 per pint rotates the budget constraint in the opposite direction, from L1 to L5, making all the bundles between L1 and L5 affordable. In each case, the line pivots at the intercept for pizza.

If the price of yogurt doubles from $2 to $4 per pint and the price of pizza doubles from $0.50 to $1 per ounce while income remains fixed at $6, the budget line shifts from L1 to L2 in Figure below. We have already seen that cutting income in half from $6 to $3 with prices fixed has the same effect on the budget line. More generally, multiplying all prices by a single constant has the same effect on the budget line as dividing income by that constant.



A change in the price of a good rotates the budget line—outward for a decrease and inward for an increase.

- The line pivots at the intercept for the good with the unchanged price.
- Doubling all prices has the same effect on the budget line as cutting income in half: eliminate half of the consumer's purchasing power.

AFFORDABLE CONSUMPTION BUNDLES

Changes in Income & Prices (continued...)

If prices and income all change by the same proportion?

It would have no effect on the budget line, because income changes just enough to compensate for the changing cost of goods.

Suppose prices and income double. The horizontal intercept becomes $(2M)/(2P_F) = M/P_F$. Likewise, the vertical intercept becomes $(2M)/(2P_C) = M/P_C$, and the slope becomes $-(2P_F)/(2P_C) = -P_F/P_C$. Since the horizontal intercept, vertical intercept, and slope are unchanged, the budget line doesn't move.

Let's summarize what we've learned about budget lines:

Properties of Budget Lines

1. The budget line is the boundary that separates the affordable consumption bundles from all other bundles. Choices that do not exhaust the consumer's income lie to the southwest of the budget line.

2. The slope of the budget line equals the price ratio times negative one, with the price of the good measured on the horizontal axis appearing in the numerator, and the price of the good measured on the vertical axis appearing in the denominator.

3. The budget line intersects the axis that measures the amount of any particular good, X, at the quantity M/P_X , which is the amount of X the consumer can purchase by spending all his income on X.

4. A change in income shifts the budget line—outward for an increase and inward for a decrease—without changing its slope.

5. A change in the price of a good rotates the budget line—outward for a decrease and inward for an increase. The line pivots at the intercept for the good with the unchanged price.

6. Multiplying all prices by a single constant has the same effect on the budget line as dividing income by the same constant. Changing prices and income by the same proportion has no effect on the budget line.

CONSUMER CHOICE

The Choice Principle → a consumer selects the highest ranked bundle among the available options.

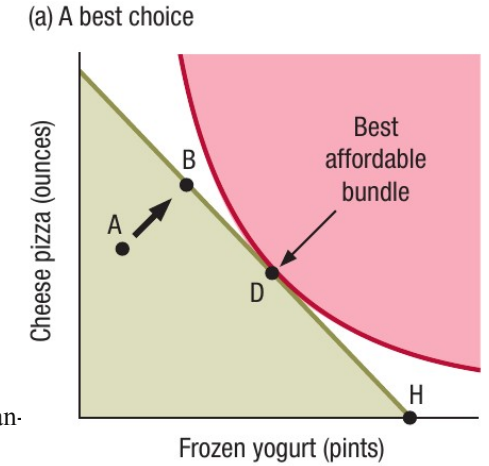
The More-Is-Better Principle → the consumer will pick a bundle on the budget line, rather than one below it.

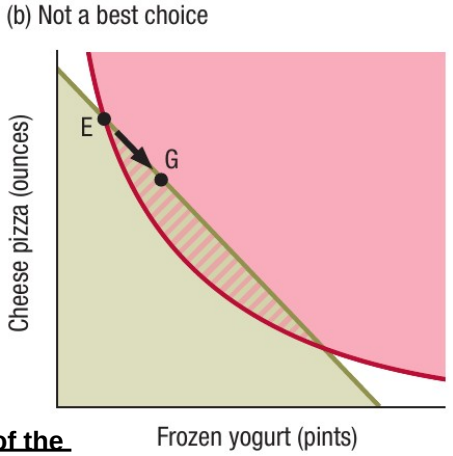
Why? A point below the budget line would leave him with unused cash, which he could spend on something he values. For example, in Figure (a) on the right, he would rather pick bundle B than bundle A, because bundle B contains more of everything than bundle A.

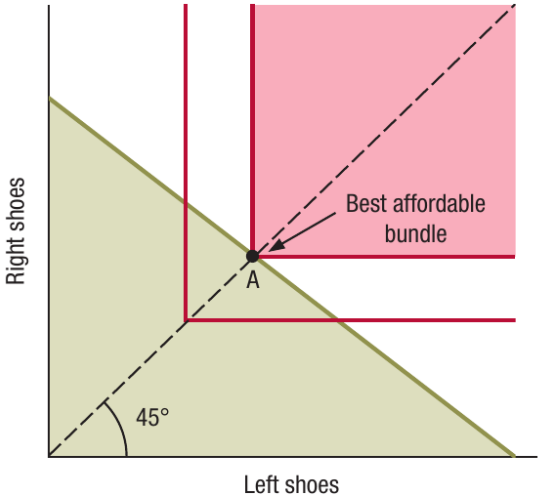
The consumer's choice must also lie on the highest indifference curve that touches the budget line.

Let us see why. Look at Figure (a). Since the red indifference curve that passes through bundle D does not cross the budget line, the areas above that indifference curve (shaded red) and below the budget line (shaded green) do not overlap, which means that none of the better-than-bundles are affordable. Therefore, bundle D is the best choice.

In contrast, since the red indifference curve that passes through bundle E in Figure (b) crosses the budget line, the areas above that indifference curve and below the budget line overlap. The overlapping area is striped red and green. Any consumption bundle that lies in the striped area is both affordable (it lies below the budget line) and better than E (it lies above the indifference curve that runs through E). The consumer can therefore do better than E, for example by choosing another bundle, such as G, that lies on the budget line to the southeast o







Purchases of Left and Right Shoes

Let's examine a case involving *perfect complements*. Suppose that Maria has a fixed sum of cash to spend on shoes, and that left and right shoes are sold separately. How many of each will she buy?

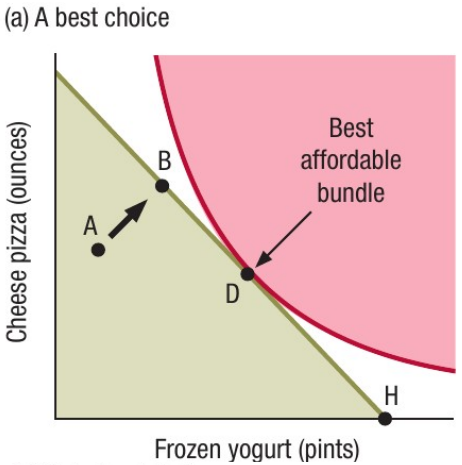
The left Figure shows her indifference curves for left and right shoes (in red), and her budget line (in green). Bundle A clearly is Maria's best choice because she can't afford any of the bundles she prefers to A. Since bundle A lies on the 45-degree line, Maria buys the same number of left and right shoes. **This conclusion doesn't depend on the slope of the budget line**. Even if the prices of left and right shoes differ, Maria will still buy the same number of each. For example, if left shoes cost $10 each, right shoes cost $20 each, and Maria can spend $90 on shoes, she will buy three pairs.

CONSUMER CHOICE

Interior Solutions

An affordable bundle is an **interior choice** if, for each good, there are affordable bundles containing a little bit more of that good and affordable bundles containing a little bit less of it. When the best affordable choice is an interior choice, we call it an **interior solution**.

In right Figure (a), bundles A, B, and D are all interior choices; bundle H is not. When the best affordable choice is an interior choice, we call it an interior solution. Bundle D in is an example.



The Tangency Condition

A bundle on the budget line satisfies the **tangency condition** if, at that bundle, the budget line lies tangent to the consumer's indifference curve.

Mathematically, the tangency condition is equivalent to: for any 2 goods X and Y, we have $MRS_{XY} = P_X/P_Y$, i.e., marginal rate of substitution between two goods equals their price ratio.

Let us see why, still use Figure (a). Because the interior solution (bundle D) satisfies the tangency condition, the indifference curve and the budget line share the same slope at that bundle. We know that the slope of the indifference curve is the negative of the MRS for frozen yogurt with cheese pizza. We also know that the slope of the budget line is the negative of the price ratio.

The interior solutions always satisfy the tangency condition.

Let us see why. The indifference curve running through any interior choice that does not satisfy the tangency condition, like bundle E in Figure (b), must cross the budget line, creating overlap between the areas below the budget line and above the indifference curve. Clearly, such bundles cannot be best choices.

Finding Interior Solutions

If the consumers' indifference curves have declining MRSs: find an interior choice satisfying $MRS_{XY} = P_X/P_Y$.

Consider any interior bundle that satisfies the tangency condition, like bundle D in Figure (a). Because the budget line and the indifference curve that runs through bundle D lie tangent to each other, they don't cross at D. Nor can they cross at any other point. With a declining MRS the indifference curve becomes steeper to the left of point D and flatter to the right. In either direction, it veers away from and remains above budget line. Thus, the areas below the budget line and above the indifference curve that runs through D cannot overlap, i.e., bundle D is the best choice.

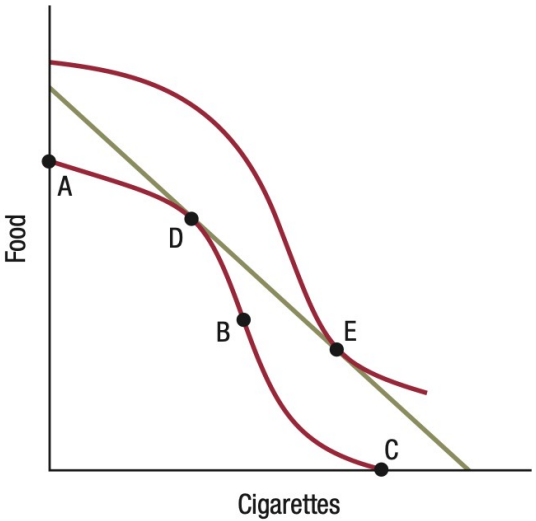
CONSUMER CHOICE

Interior Solutions (continued...)

What if the consumer's indifference curves do not have declining MRSs?

In those cases, *interior choices that satisfy the tangency condition are not necessarily the best affordable choices.*

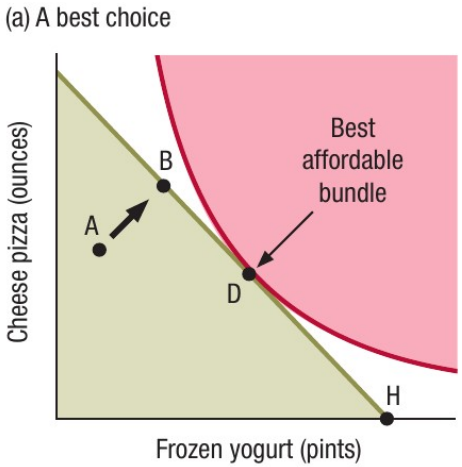
We'll examine a case involving cigarette addiction. Suppose Bill spends all of her money on food and cigarettes. Figure on the right shows his indifference curves. Consider the indifference curve that runs through bundle A. Notice that Bill's MRS for cigarettes with food increases as we move from bundle A to bundle B. Why? As Bill smokes more cigarettes, he becomes hooked, and his cravings for cigarettes grow more extreme. As a result, the amount of food she is willing to give up to obtain an additional cigarette grows larger. However, if food becomes sufficiently scarce, he grows extremely hungry and is no longer willing to give up as much food to obtain an additional cigarette. That is why his MRS for cigarettes with food declines as we move from bundle B to bundle C. In right Figure, bundles D and E both satisfy the tangency condition. However, bundle E is her best choice; bundle D is not.



The Problem Natasha's income is $300 per month. She spends all of it on tickets to concerts and films. A concert ticket costs $15 and a film ticket costs $10. Her marginal rate of substitution for films with concerts, MRS_{FC}, is C/F, where C stands for the number of concert tickets and F stands for the number of films. (Fractions are allowed—for example, if she buys half of a concert ticket, that means she goes to a concert every other month). How many film tickets will she purchase, and how many concert tickets?

CONSUMER CHOICE

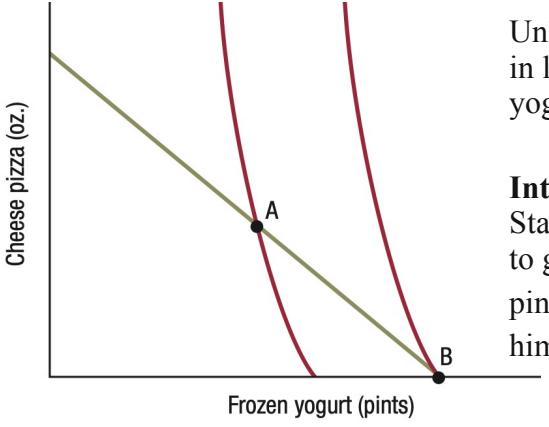
Boundary Solutions



In practice, virtually everyone chooses not to consume certain goods. There are many things that you never consume. A consumption bundle that does not contain at least a little bit of every good is called a **boundary choice**. In the right Figure (a), bundle H is an example. When the consumer's best choice is a boundary choice, we call it a **boundary solution**.

Boundary solutions often arise when a good provides a consumer with little value per dollar relative to other alternatives.

For an illustration, look at Figure below. Notice that the indifference curves (drawn in red) are quite steep. This means that it takes a great deal of pizza to compensate the consumer for losing an ounce of yogurt. Bundle B is the consumer's best choice on the green budget line. Because it contains no pizza, it's also a boundary solution. At any bundle that contains some pizza (like bundle A), the indifference curve is steeper than the budget line, so the consumer is better off buying more yogurt and less pizza.



Unlike interior solutions, boundary solutions usually do not satisfy the tangency condition. For instance, at bundle B in left Figure, the consumer's indifference curve is steeper than his budget line. As a result, at bundle B, his MRS for yogurt with pizza is *greater* than the price ratio, P_F / P_C :

$$MRS_{FC} \geq P_F / P_C$$

Intuition of above expression:
Starting at bundle B, the consumer has no pizza, so his only option is to buy less yogurt and more pizza. He is willing to give up one pint of yogurt for MRS_{FC} ounces of pizza, but able to buy only P_F / P_C ounces of pizza in place of one pint of yogurt. Since $MRS_{FC} \geq P_F / P_C$, buying more pizza and less yogurt makes him **no** better off (and indeed makes him worse off if $MRS_{FC} > P_F / P_C$), so he is content to spend all his income on yogurt.

The Problem Kate spends all her money on airtime for her mobile phone and gasoline for her car. We'll use the symbols W (for wireless) to stand for the number of minutes she spends talking on her mobile phone and G to stand for the number of gallons of gasoline she uses during a week. Her marginal rate of substitution for gasoline with mobile minutes, in minutes per gallon, is given by the formula $MRS_{GW} = 10\sqrt{G}$. The price of gasoline, P_G, is \$1 per gallon, the price of mobile minutes, P_W, is \$0.50 per minute, and Kate can spend up to \$20 per week. How many mobile phone minutes will she purchase, and how many gallons of gasoline?

CONSUMER CHOICE

Properties of Best Choices

1. The consumer's best choice lies on the budget line.

2. We can recognize best choices as follows: the indifference curves on which they lie touch but do not cross the budget line.

3. Assumes that indifference curves are not kinked, then the interior solutions always satisfy the tangency condition. Consequently, if a bundle that includes two goods, X and Y, is an interior solution, then $MRS_{XY} = P_X / P_Y$ at that bundle.

4. When indifference curves have declining MRSs, any interior choice that satisfies the tangency condition is a best affordable choice.

5. Whenever the consumer purchases good X but not good Y, then $MRS_{XY} \geq P_X / P_Y$ at the chosen bundle.

CONSUMER CHOICE

Utility Maximization

A utility function assigns a utility value to each consumption bundle. Because the consumer prefers bundles with higher utility values to bundles with lower utility values, the best bundle maximizes his utility function while respecting his budget constraint. For example, if he spends his income on frozen yogurt and cheese pizza, we write his problem as follows:

$$\text{Maximize } U(F, C) \text{ subject to } P_F F + P_C C \leq M$$

where U(F, C) is the utility value assigned to a bundle containing F pints of yogurt and C ounces of pizza, P_F is the price of a pint of yogurt, P_C is the price of an ounce of pizza, and M is income.

Claim:

The solution to above optimization must lie on the budget line

Proof: If it did not, then the cost of the chosen bundle would be less than M, and the consumer would be able to increase utility by choosing a more expensive bundle with larger amounts of both goods.

For interior solution, we have marginal benefit equal to marginal cost: $\frac{MU_F}{P_F} = \frac{MU_C}{P_C} \quad \Rightarrow \quad \frac{MU_F}{MU_C} = \frac{P_F}{P_C} = MRS_{FC}$

Let's start with the marginal benefit of shifting resources from yogurt to pizza. If the consumer spends one more dollar on cheese pizza, he will have $1/P_C$ additional ounces. If he adds one ounce of pizza, his utility will increase by approximately MU_C, the marginal utility of pizza. The gain in utility resulting from the additional dollar's worth of pizza: the number of ounces added, $1/P_C$, times increase in utility per ounce added, MU_C, i.e., MU_C/P_C. This is the marginal benefit of shifting resources to pizza.

For the marginal cost of shifting resources from yogurt to pizza, if the consumer spends a dollar less on frozen yogurt, he will buy $1/P_F$ fewer pints. The loss of 1 pint causes his utility to fall by approximately MU_F, the MU of yogurt. So his utility falls by MU_F/P_F with the loss of $1/P_F$ pints. This is the marginal cost of shifting resources to pizza. Setting marginal benefit equal to marginal cost, we have above result.

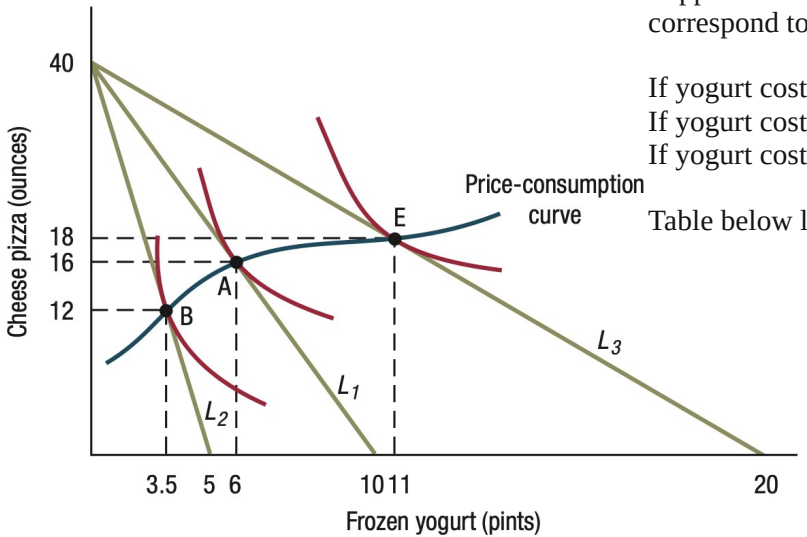
At the boundary solution: $\frac{MU_F}{P_F} \geqslant \frac{MU_C}{P_C}$

If the utility maximizing bundle contains no pizza then the marginal benefit of shifting resources from yogurt to pizza must not exceed the marginal cost, i.e., at the boundary solution, the consumer gains at least as much by spending money on yogurt rather than pizza on the margin.

PRICES AND DEMAND

We already learn that if a price changes, the theory of supply & demand tells us how the consumer's purchases will change, thereby providing a foundation for understanding demand curves. Now, we'll develop that foundation.

The Price-Consumption Curve



Suppose Oscar spends his income, $10 per day, on yogurt and pizza. Pizza costs $0.25 per ounce. If his preferences correspond to the red indifference curves shown in the left Figure, how will his best choice vary with the price of yogurt?

If yogurt costs $1 per pint, the green line labeled L_1 will be Oscar's budget line, and he will choose bundle A.
If yogurt costs $2 per pint, the green line labeled L_2 will be his budget line, and he will choose bundle B.
If yogurt costs $0.50 per pint, the green line labeled L_3 will be his budget line, and he will choose bundle E.

Table below lists his chosen bundle for each of these three yogurt prices.

Best Choices of Yogurt and Pizza at Selected Yogurt Prices

Assumes the price of pizza is $0.25 per ounce and Oscar's income is $10. Based on Figure 5.10.

Price of Yogurt (per pint)	Best Choice (from Fig. 5.10)	Yogurt (pints)	Pizza (ounces)
$0.50	E	11	18
1.00	A	6	16
2.00	B	3.5	12

If we plotted Oscar's best choices for many other yogurt prices in left Figure, the chosen bundles would trace out the blue curve, known as the price-consumption curve.

The **price-consumption curve** shows how the best affordable consumption bundle changes as the price of a good changes, holding everything else fixed (including the consumer's income and preferences, as well as all other prices).

PRICES AND DEMAND

Individual Demand Curves

An **individual demand curve** describes the relationship between the price of a good and the amount a particular consumer purchases, holding everything else fixed (including the consumer's income and preferences, as well as all other prices).

For an illustration, look at right Figure. The horizontal axis measures pints of yogurt and the vertical axis measures the price of yogurt. We've used this graph to plot the data on prices and yogurt consumption from previous Table. The figure shows that Oscar purchases 3.5 pints of yogurt when the price of yogurt is $2 per pint (point G), 6 pints when the price is $1 per pint (point H), and 11 pints when the price is $0.50 per pint (point J). If we plotted Oscar's choices for many other yogurt prices, the chosen bundles would trace out the blue curve.

The curve in the right Figure is an individual demand curve for yogurt. Movements along an individual demand curve—for example, from point G to point H—show the sensitivity of the amount purchased to the good's price. The price elasticity of demand, which we discussed in S & D, measures this sensitivity; it indicates the percentage change in demand resulting from a 1 percent change in price. When the price elasticity of demand is large in magnitude, a slight increase in price leads to a substantial reduction in the amount purchased, and the demand curve is relatively flat. When this elasticity is small in magnitude, a large increase in price leads to a slight reduction in the amount purchased, and the demand curve is relatively ste

For additional details, review S & D by yourselves.

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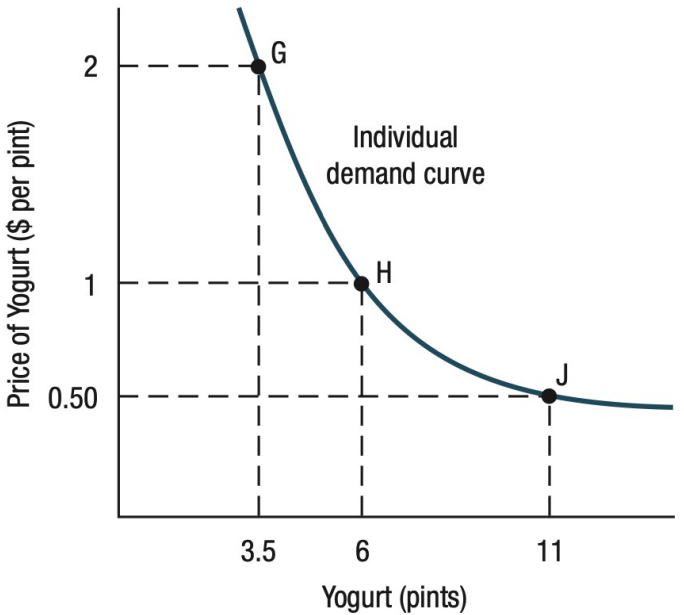


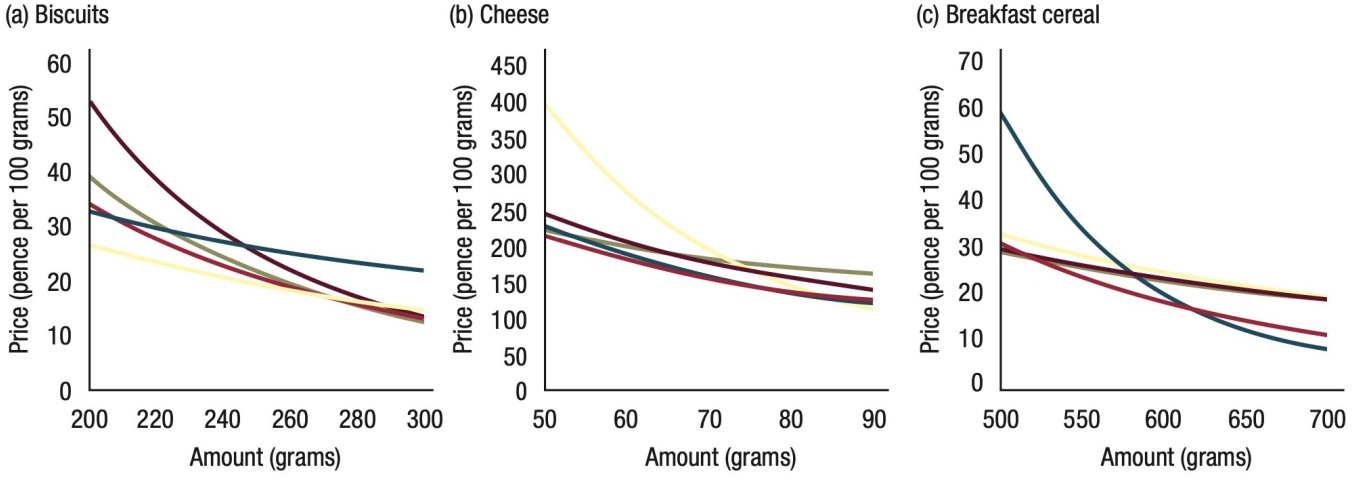
PRICES AND DEMAND

Individual Demand Curves (Example)

Individual Demand Curves for Groceries

What do individual demand curves actually look like?

One study carefully tracked the grocery purchases of 80 British consumers for 16 weeks, during which each consumer made multiple shopping trips. The prices of various products fluctuated from one trip to another, producing variation in the amounts purchased. Assuming the consumers' demand curves were stable over the 16-week study period, we can plot those curves using data on prices and the amounts purchased. The following figure shows the individual demand curves for five of the 80 consumers and three product categories (biscuits, cheese, and breakfast cereal). We use different colors to indicate different consumers, the same color belong to the same consumer. All of the individual demand curves in Figure below are downward sloping; these consumers buy less as prices rise. The sensitivity of purchases to prices varies across consumers and across goods. Among these five consumers, the price elasticity of the demand for biscuits ranges from 20.30 (the dark red curve) to 21.02 (the blue curve); the price elasticity of demand for cheese ranges from 20.47 (the yellow curve) to 22.11 (the green curve); and the price elasticity of demand for breakfast cereal ranges from 20.17 (the blue curve) to 20.78 (the green curve, which is almost indistinguishable from the dark red curve). The average demand elasticities for all 80 consumers in the study are 20.54 for biscuits, 21.01 for cheese, and 20.55 for breakfast cereal.



Source: Jorge Oliveira-Castro, Gordon Foxall, and Teresa Schrezenmaier, "Consumer Brand Choice: Individual and Group Analysis of Demand Elasticity," *Journal of the Experimental Analysis of Behavior* 85, March 2006, pp. 147–166.

PRICES AND DEMAND

Individual Demand Curves (Exercise)

The Problem

Natasha's preferences over concert tickets (C) and film tickets (F) correspond to the utility function $U(C, F) = C \times F$. (Remember, for that utility function, the marginal utility of concert tickets is F, and the marginal utility of film tickets is C.) Her income is $100 per month, and concert tickets cost $5 per ticket.

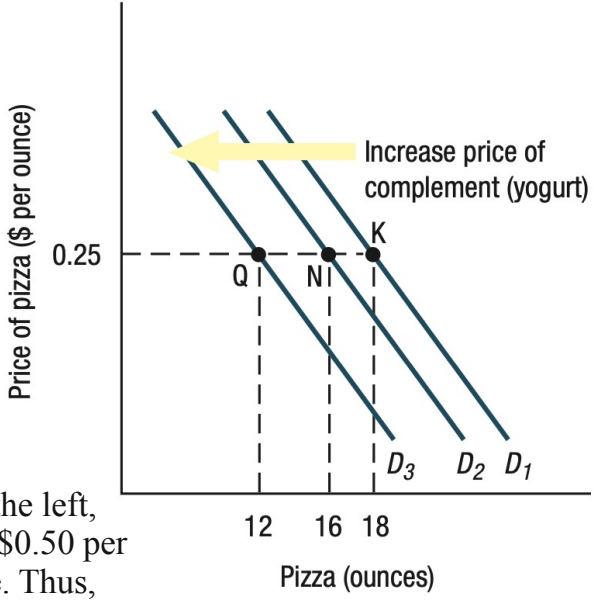
1) Draw her price-consumption curve (allowing the price of film tickets, P_F , to vary) and her demand curve for film tickets.
2) What is her elasticity of demand for film tickets?
3) What fraction of her income does she spend on film tickets, and how does that fraction depend on the price of film tickets?

PRICES AND DEMAND

Price Changes and Shifts in Demand

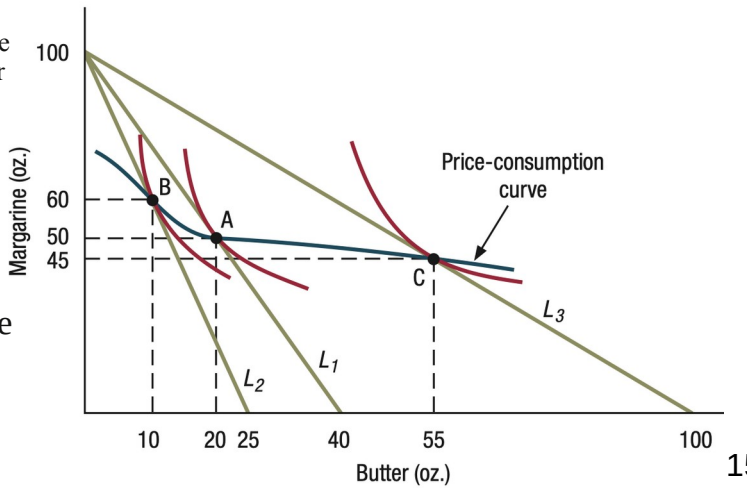
We already learn that a change in the price of one good can shift the demand curve for a second good. Recall the table we gave at the beginning of this slides.

> Pizza costs $0.25 per ounce and Oscar's income is $10. According to Table on page 11, Oscar purchases 18 ounces of pizza when the price of yogurt is $0.50 per pint (point K), 16 ounces of pizza when the price of yogurt is $1 per pint (point N), and 12 ounces of pizza when the price of yogurt is $2 per pint (point Q). Each of these points lies on a different demand curve for pizza—point K lies on D1, point N lies on D2, and point Q lies on D3. In this example, pizza and yogurt are complements: an increase in the price of yogurt shifts the demand curve for pizza to the left.



Notice that an increase in the price of yogurt from $1 to $2 per pint shifts the demand curve for pizza to the left, and the consumption of pizza falls at any fixed pizza price. A reduction in the price of yogurt from $1 to $0.50 per pint shifts the demand curve for pizza to the right; the consumption of pizza rises at any fixed pizza price. Thus, for Oscar, yogurt and pizza are complements. (Recall S-D that, when the price of a complement increases, a consumer buys less of the good.) Since the consumption of complementary goods tends to move together, the price-consumption curve is upward sloping, as in page 11.

> Look at right Figure. Daphne purchases butter and margarine. Her preferences correspond to the red indifference curves. Margarine costs 10 cents per ounce and she can spend $10 total over the course of a month. When butter costs 25 cents per ounce, her budget line is L_1, and she chooses bundle A. When butter costs 40 cents per ounce, her budget line is L_2, and she chooses bundle B. When butter costs 10 cents per ounce, her budget line is L_3, and she chooses bundle C.



Notice that an increase in the price of butter leads Daphne to purchase more margarine, and therefore shifts her margarine demand curve (not shown) to the right. A reduction in the price of butter leads her to purchase less margarine, which shifts her margarine demand curve to the left. For Daphne, butter and margarine are substitutes.

PRICES AND DEMAND

Price Changes and Shifts in Demand (continued...)

Unfortunately, *it isn't always possible to tell whether goods are complements or substitutes by thinking about whether they are used together or interchangeably*. For example, since people use gasoline and automobiles together, these products may seem to be complements. But the truth is not so simple. An increase in the price of gasoline encourages people to buy fuel-efficient cars, rather than gas-guzzling sport utility vehicles (SUVs). That means gasoline is a complement to SUVs but may be a substitute for fuel-efficient cars, even though fuel-efficient cars use gas.

INCOME AND DEMAND

While prices and preferences influence consumers' decisions, income is also an important consideration. Economists refer to a change in the consumption of a good that results from a change in income as an **income effect**.

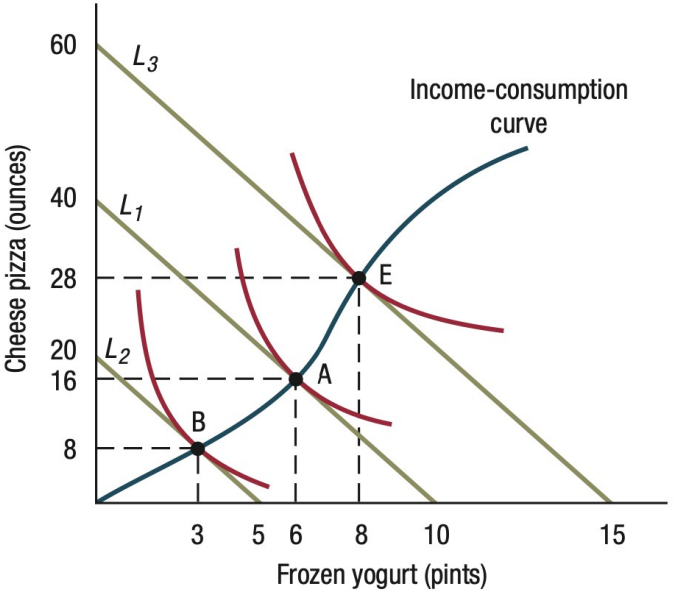
> *Were the Lexus driver to lose her high-paying job, she might forgo wine and start clipping coupons. Were the elderly man to win the lottery, he might regularly indulge in premium steaks and fine wine.*

The Income-Consumption Curve

Let's return to our discussion of Oscar's yogurt and pizza purchases. We'll assume that yogurt costs $1 per pint and pizza costs $0.25 per ounce, and that Oscar's preferences correspond to the red indifference curves in Figure below. How does his choice vary as we change his income? If his income is $10, his budget line is L_1, and he chooses bundle A. If his income is $5, his budget line is L_2, and he chooses bundle B. If his income is $15, his budget line is L_3, and he chooses bundle E. Table below summarizes these choices.

If we plotted Oscar's choices for many other income levels in Figure below, the chosen bundles would trace out the blue curve, known as the income-consumption curve. It shows how the best affordable consumption bundle changes as income changes, holding everything else fixed (including prices and the consumer's preferences).

Income	Best Choice (from Fig. 5.16)	Yogurt (pints)	Pizza (ounces)
$5	B	3	8
		Normal ↓	Normal ↓
10	A	6	16
		Normal ↓	Normal ↓
15	E	8	28

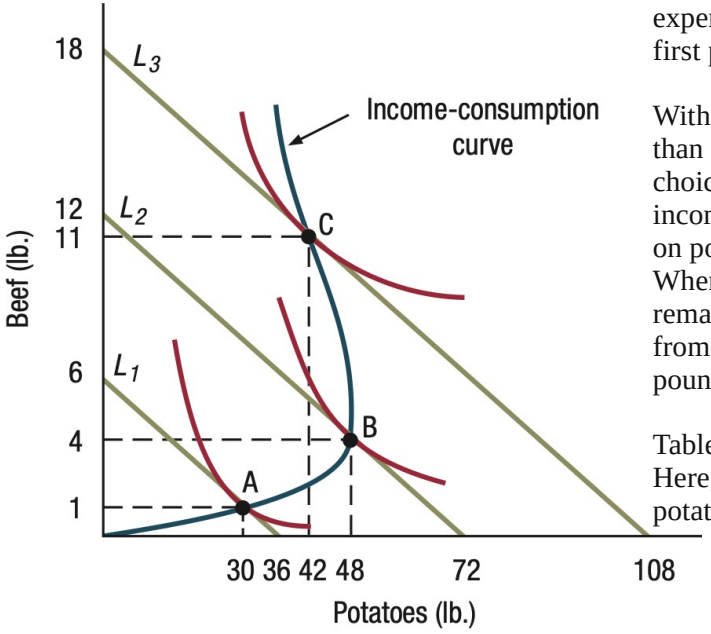


INCOME AND DEMAND

Normal versus Inferior Goods

Economists say that a good is **normal** if an increase in income raises the amount consumed. In Figure on the last page, yogurt and pizza are both normal goods. Why? As Oscar's income rises from $5 to $10 to $15, the best choice shifts from bundle B to bundle A to bundle E. The consumption of yogurt rises with income, as does the consumption of pizza—see Table on the last page.

Economists say that a good is **inferior** if an increase in income reduces the amount consumed. This term reflects the fact that the consumption of many goods declines as income rises because people shift toward higher-quality products that fill similar needs. For example, posters are popular among college students who typically have limited funds with which to decorate their rooms and apartments. As incomes rise, most people graduate from posters to prints and reproductions, and finally to original artwork. Few if any posters grace the walls of corporate CEOs.



For an illustration, look at Figure on the left. Erin's diet consists exclusively of beef and potatoes, and she has no other expenses. Her preferences correspond to the red indifference curves. She prefers the taste of meat to potatoes, but her first priority is to avoid hunger.

With meat priced at $3 per pound compared to $0.50 per pound for potatoes, a dollar spent on meat is much less filling than a dollar spent on potatoes. When Erin can spend only $18 per month, her budget line is L_1 and bundle A is her best choice. Since she can't afford filling meals, she buys 30 pounds of potatoes and only one pound of beef. When her income increases to $36, her budget line is L_2 and her best choice is bundle B. Though she spends much of the extra cash on potatoes, purchasing 48 pounds, she also buys more beef (4 pounds), because her meals are now reasonably filling. When her income increases beyond $36, she tries to make her meals as tasty as possible while making sure that they remain filling. With $54, her budget line is L_3. While she could purchase even more potatoes, she wouldn't benefit much from them—they aren't tasty, and she's already full. Instead, she chooses bundle C. Her beef consumption rises to 11 pounds, but her potato consumption falls to 42 pounds.

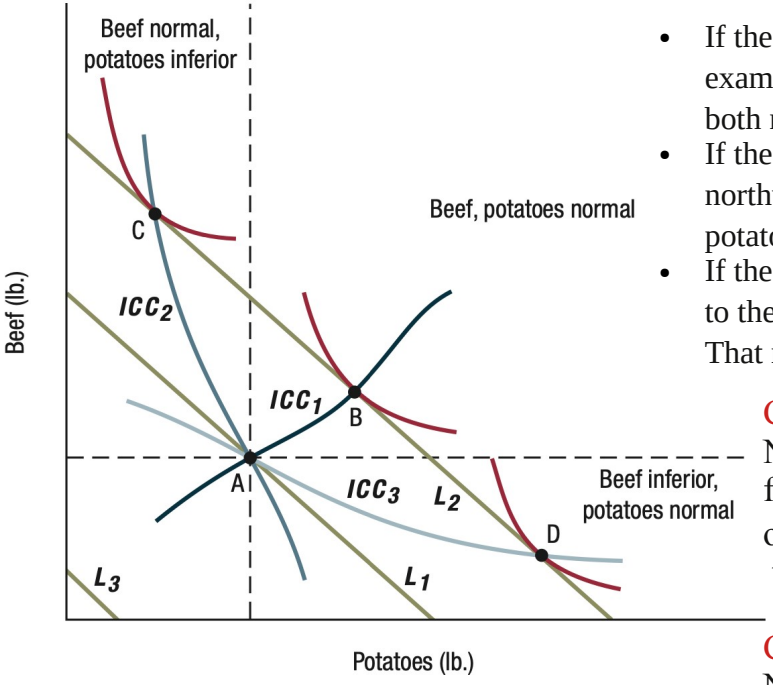
Table on the right summarizes these choices.
Here, beef is a normal good at all levels of income, but potatoes change from normal to inferior as income rises.

Income	Best Choice (from Fig. 5.17)	Potatoes (lb.)	Beef (lb.)
$18	A	30	1
		Normal ↓	Normal ↓
36	B	48	4
		Inferior ↓	Normal ↓
54	C	42	11

INCOME AND DEMAND

Normal versus Inferior Goods (continued)

It's easy to tell whether goods are normal or inferior by examining the income-consumption curve. Figure below illustrates this point. When the consumer's budget line is L_1, he selects point A. Budget line L_2 corresponds to a higher level of income.



- If the income-consumption curve slopes upward, the best choice on L_2 lies to the northeast of A (for example, the dark blue curve labeled ICC_1 runs through bundle B). That means potatoes and beef are both normal goods.
- If the income-consumption curve bends back toward the vertical axis, the best choice on L_2 lies to the northwest of A (for example, the medium blue curve labeled ICC_2 runs through bundle C). That means potatoes are inferior and beef is normal.
- If the income-consumption curve bends downward toward the horizontal axis, the best choice on L_2 lies to the southeast of A (for example, the light blue curve labeled ICC_3 runs through bundle D). That means potatoes are normal and beef is inferior.

Can all goods be inferior starting from any particular income level?

No. At least one good must be normal. Look at Figure on the left. When the consumer moves from bundle A on the budget line L_1 to a bundle on the new budget line, L_2 , the consumption of something must rise. If he purchased less of everything, the new bundle would have to lie to the southwest of A, which means it would not lie on the new budget line.

Can a good be inferior at all levels of income?

No. Every good must be normal over some income range. Suppose the consumer's income falls sharply, leaving him on budget line L_3. We know that his best choice must lie somewhere on this new budget line. But all the bundles on this line lie to the southwest of A, which means they contain both fewer potatoes and less beef. In general, if income declines sufficiently, the consumption of every good must fall.

INCOME AND DEMAND

Normal versus Inferior Goods (continued)

Let's summarize what we've learned about normal and inferior goods:

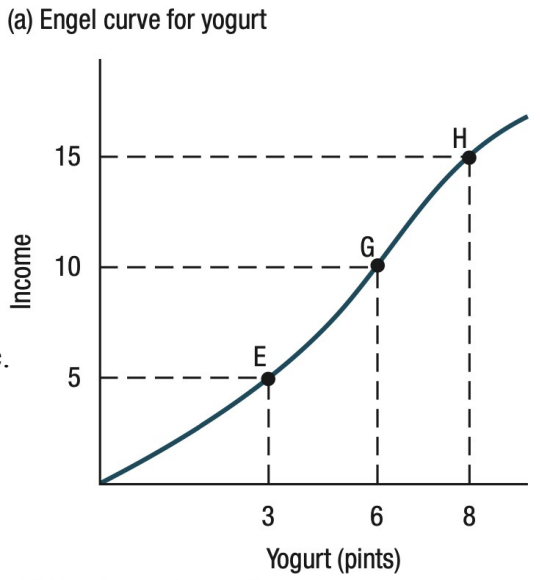
Properties of Normal and Inferior Goods

1. The income elasticity of demand is positive for normal goods and negative for inferior goods.
2. We can tell whether goods are normal or inferior by examining the slope of the income-consumption curve.
3. At least one good must be normal starting from any particular income level.
4. No good can be inferior at all levels of income.

Engel Curves

The **Engel curve** for a good describes the relationship between income and the amount consumed, holding everything else fixed (including prices and the consumer's preferences).

To graph an Engel curve, we measure income on the vertical axis and the amount consumed on the horizontal axis. For a normal good, an increase in income raises consumption, so the Engel curve slopes upward. For an inferior good, an increase in income reduces consumption, so the Engel curve slopes downward.



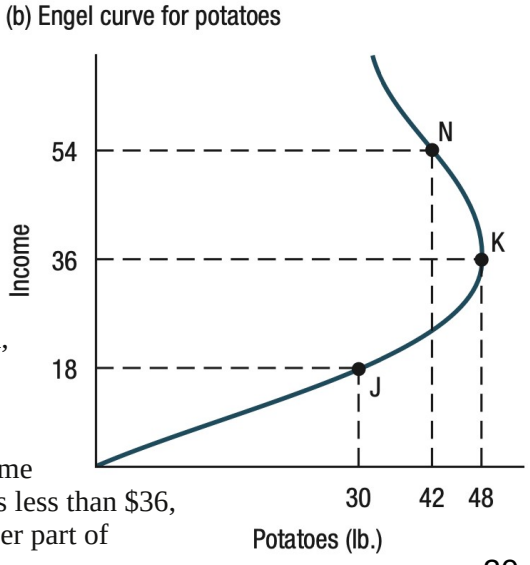


Figure (a) on the right uses the data from previous to plot three points (E, G, and H) on Oscar's Engel curve for yogurt (fixing the price of yogurt at $1 per pint and the price of pizza at $0.25 per ounce). If we plotted Oscar's choices for many other income levels, we would trace out his Engel curve for yogurt, shown in blue. In this example, yogurt is a normal good, so the Engel curve slopes upward.

Figure (b) uses the data in previous page to plot three points (J, K, and N) on Erin's Engel curve for potatoes (fixing the price of potatoes at $0.50 per pound and the price of beef at $3 per pound). If we plotted Erin's choices for many other income levels, we would trace out her Engel curve for potatoes, shown in blue. In this example, potatoes are normal when income is less than $36, so the lower part of the Engel curve slopes upward. However, since potatoes are inferior when income exceeds $36, the upper part of the Engel curve slopes downward.