

Demand

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Consumer Demand

A consumer's optimal bundle depends on factors like income and prices.

The Marshallian demand function captures the optimal choice of quantity for each good given the consumer's income m and the price of the two goods p_x and p_y . It is given by $x(p_x, p_y, m)$ and $y(p_x, p_y, m)$.

We know that the demand for a good is a function of the prices and income. Now, we want to know what happens to demand when prices change or income changes.

Normal and inferior goods capture change in demand given a change in income. Ordinary and giffen goods capture change in demand given a change in prices.

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② Normal and Inferior Goods

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Normal and Inferior Goods

Definition

A good x is **normal** if the consumer's demand for that good rises when income increases.

Definition

A good x is **inferior** if the consumer's demand for that good falls when income increases.

Mathematical Definition

"A good x is **normal** if the consumer's demand for that good rises when income increases." This means that the first derivative of the demand for good x with respect to (w.r.t) income is positive.

$$\frac{\partial x(p_x, p_y, m)}{\partial m} > 0$$

"A good x is **inferior** if the consumer's demand for that good falls when income increases." This means that the first derivative of the demand for good x with respect to (w.r.t) income is negative.

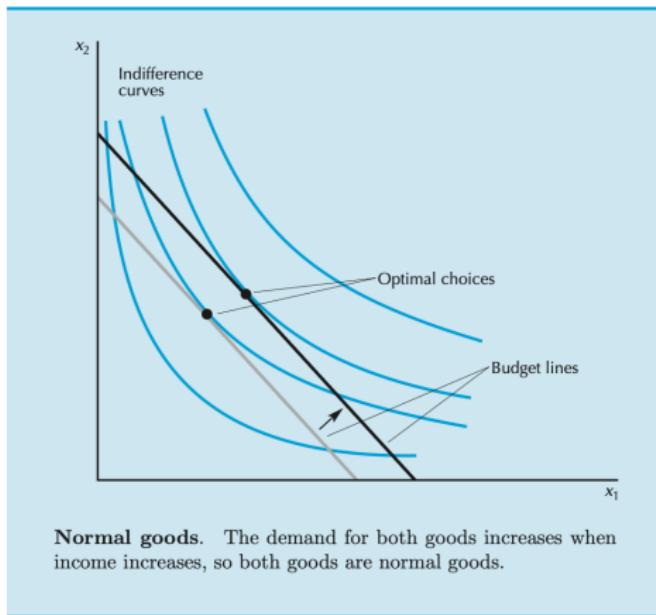
$$\frac{\partial x(p_x, p_y, m)}{\partial m} < 0$$

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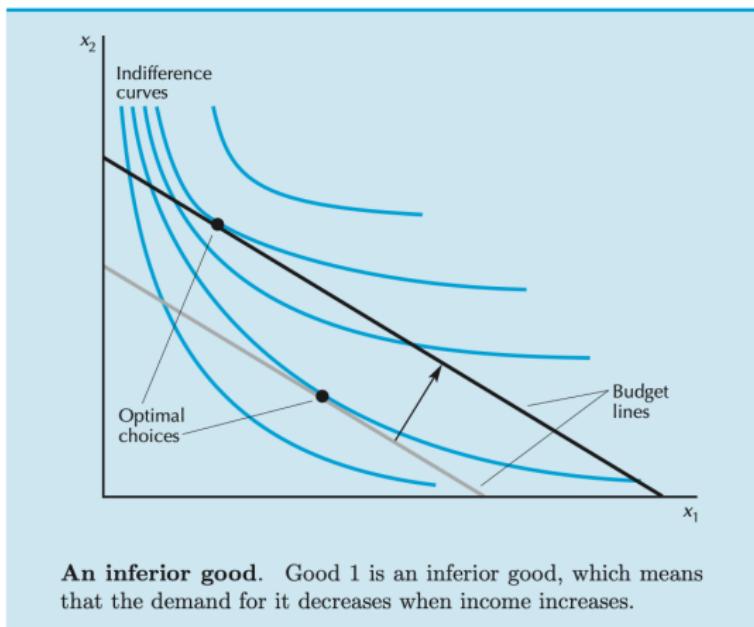
Both Goods are Normal

An increase in income when both goods are normal will cause the consumer's demand to rise for both goods.



Good x_1 is Inferior

An increase in income when good x_1 is inferior and good x_2 is normal will cause the consumer's demand to fall for x_1 and rise for x_2 .



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Cobb-Douglas and Change in Income

The Marshallian demand given a Cobb-Douglas utility function is:

$$x(p_x, p_y, m) = \frac{a}{a+b} \frac{m}{p_x}$$

$$y(p_x, p_y, m) = \frac{b}{a+b} \frac{m}{p_y}$$

From the equations, it should be evident that as m rises, so must x and y .

A consumer with preferences described by the Cobb-Douglas utility function regards both goods as normal.

Perfect Substitutes and Change in Income

The Marshallian demand given the utility function $u(x, y) = x + y$ is:

$$x = \begin{cases} \frac{m}{p_x} & \text{when } p_x < p_y \\ [0, \frac{m}{p_x}] & \text{when } p_x = p_y \\ 0 & \text{when } p_x = p_y. \end{cases}$$

When income increases, we have $\frac{\uparrow m}{p_x}$. Therefore, $x \uparrow$.

A consumer with preferences described by the Perfect Substitutes utility function regards both goods as normal.

Perfect Complements and Change in Income

The Marshallian demand given the utility function $u(x, y) = \min\{x, y\}$ is:

$$x(p_x, p_y, m) = y(p_x, p_y, m) = \frac{m}{p_x + p_y}$$

When income increases, we have $\frac{\uparrow m}{p_x + p_y}$. Therefore, $x \uparrow$ and $y \uparrow$.

A consumer with preferences described by the Perfect Complements utility function regards both goods as normal.

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Ordinary and Giffen Goods

Definition

A good x is **ordinary** if the consumer's demand for that good falls when the price of that good increases.

Definition

A good x is **Giffen** if the consumer's demand for that good rises when the price of that good increases.

Mathematical Definition

"A good x is **ordinary** if the consumer's demand for that good falls when the price of that good increases." This means that the first derivative of the demand for good x w.r.t its price is negative.

$$\frac{\partial x(p_x, p_y, m)}{\partial p_x} < 0$$

"A good x is **Giffen** if the consumer's demand for that good rises when the price of that good increases." This means that the first derivative of the demand for good x w.r.t its price is positive.

$$\frac{\partial x(p_x, p_y, m)}{\partial p_x} > 0$$

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Price of the Other Good

The price of the other good p_y can also affect the demand for good x . Mathematically, two goods x and y are substitutes if:

$$\frac{\partial x(p_x, p_y, m)}{\partial p_y} > 0.$$

The consumer desires more of good x when the price of good y increases.

Two goods x and y are complements if:

$$\frac{\partial x(p_x, p_y, m)}{\partial p_y} < 0.$$

The consumer desires less of good x when the price of good y increases.

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Cobb-Douglas and Change in Price

$$x(p_x, p_y, m) = \frac{a}{a+b} \frac{m}{p_x}$$

$$y(p_x, p_y, m) = \frac{b}{a+b} \frac{m}{p_y}$$

Here, we have:

$$\frac{\partial x(p_x, p_y, m)}{\partial p_x} = -\frac{a}{a+b} \frac{m}{p_x^2} < 0$$

$$\frac{\partial y(p_x, p_y, m)}{\partial p_y} = -\frac{b}{a+b} \frac{m}{p_y^2} < 0$$

So, both goods are ordinary.

Cobb-Douglas and Change in Price of Other Good

$$x(p_x, p_y, m) = \frac{a}{a+b} \frac{m}{p_x}$$

$$y(p_x, p_y, m) = \frac{b}{a+b} \frac{m}{p_y}$$

Here, we have:

$$\frac{\partial x(p_x, p_y, m)}{\partial p_y} = 0$$

$$\frac{\partial y(p_x, p_y, m)}{\partial p_x} = 0$$

So, the goods are neither substitutes nor complements.

Perfect Substitutes and Change in Price

$$x = \begin{cases} \frac{m}{p_x} & \text{when } p_x < p_y \\ [0, \frac{m}{p_x}] & \text{when } p_x = p_y \\ 0 & \text{when } p_x = p_y. \end{cases}$$

If the price of good x increases, we have $\frac{m}{\uparrow p_x}$. Therefore, $x \downarrow$.

If the price of good y increases, we have $\frac{m}{\uparrow p_y}$. Therefore, $y \downarrow$.

Therefore, both goods are ordinary and they are substitutes.

Perfect Complements and Change in Price

$$x(p_x, p_y, m) = y(p_x, p_y, m) = \frac{m}{p_x + p_y}$$

If the price of good x increases, we have $\frac{m}{\uparrow p_x + p_y}$. Therefore, $x \downarrow$ and $y \downarrow$.

If the price of good y increases, we have $\frac{m}{p_x + \uparrow p_y}$. Therefore, $x \downarrow$ and $y \downarrow$.

Therefore, both goods are ordinary and they are complements.

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References

Varian, H. R. (2014). Intermediate Microeconomics: A Modern Approach (9th ed.). W. W. Norton & Company.