UTILITY MAXIMIZATION

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The key to making Smart Choices

Understanding How Consumers Maximize Satisfaction with Limited Resources

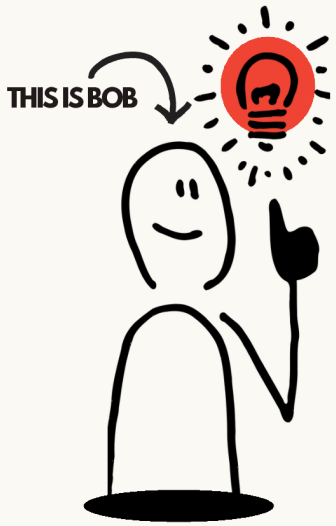


fig 1.1

THIS, IS BOB. BOB IS A CONSUMER, SO HE BUYS STUFF. HE GOES SHOPPING OFTEN. SOMETIMES HE'S SATISFIED WITH HIS PURCHASES, BUT OTHER TIMES, HE'S NOT QUITE SURE. SO BOB STARTS THINKING –

BOB: HOW CAN I MAKE SMART CHOICES TO GET THE MOST SATISFACTION OUT OF MY LIMITED BUDGET?

BOB: WAIT A MINUTE... I'M AN ECONOMIST! I CAN FIGURE THIS OUT! HMM, SO, HOW CAN I MAKE DECISIONS THAT WILL MAXIMIZE MY SATISFACTION FROM THE THINGS I BUY?

BOB: AS A CONSUMER, I CAN ALLOCATE MY INCOME TO PURCHASE GOODS AND SERVICES IN A WAY THAT MAXIMIZES THEIR UTILITY FOR ME, SUCH THAT I DON'T EXCEED MY BUDGET.

BUT HOLD ON... WHAT WAS UTILITY AGAIN?
LET'S SEE.

1.1 What is utility?

Utility refers to the want-satisfying power of a commodity.

For example, Bob here, loves pizza. When Bob spends money to buy and eat pizza, it gives him a sense of satisfaction. The amount of satisfaction Bob gets from eating that pizza is what we call as the utility of the pizza for Bob.

More formally, Utility can be defined as the amount of satisfaction derived from the consumption of a commodity.

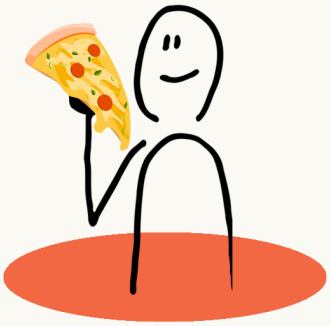


fig 1.2

1.2 Measuring utility

Primarily, there are two ways to interpret utility in economics: Cardinal Utility and Ordinal Utility. These approaches differ in how they treat utility and how consumers' preferences are analysed.

1.2.1 Cardinal Utility

Cardinal utility assumes that utility can be measured numerically in terms of "utils". So consumers can compare the utility of different goods numerically and state how much more utility one provides compared to another.
For example, let's say Bob gets 10 utils of utility from a pizza and 7 utils from a burger. This implies that pizza gives him 3 utils more of utility (or satisfaction) than the burger.

1.2.2 Ordinal Utility

Ordinal utility focuses on ranking preferences without assigning numerical values. Consumers can say they prefer one good over another but can't measure how much more they prefer it.
For example, Bob prefers pizza over a burger but doesn't assign exact values to his preferences.

1.2.3 The key differences between cardinal and ordinal utility are as shown in table 1.1

Aspect	Cardinal Utility	Ordinal Utility
Measurement	Utility is measured numerically (in utils)	Utility is ranked; no numerical measurement
Comparability	Utility differences can be quantified	Preferences are ranked, but intensity is unknown
Realism	Less realistic due to the need for measurement	More realistic as it reflects how people rank preferences
Example	"Pizza gives me 10 utils, burgers give 7 utils"	"I prefer pizza over burgers, but no exact value"

table 1.1

1.3 Features of Utility

Utility has the following features-

- Subjective: It varies from person to person. i.e the utility of pizza for Bob might not be the same as the utility of pizza for you.
- Measurability: Since satisfaction is more of a feeling than a numerical quantity, it is hard to quantify it. Thus as seen in 1.1.1, utility is measured in terms of cardinal utility and ordinal utility.
- Relative: Utility varies from place to place, time to time and person to person.
- Not the same as usefulness: Utility does not always mean that the commodity is useful. For example, a cigarette might give you satisfaction but it is in fact harmful to your health.

1.4 Total Utility and Marginal Utility

1.4.1 Total utility

Total utility is the total satisfaction derived by the consumer from the consumption of a specific quantity of a commodity

1.4.2 Marginal utility

The additional utility derived from the consumption of an additional unit of a commodity

1.4.3 Total utility V/S Marginal utility

Let's see this using an example. So let's say Bob goes to eat pizzas and suppose he gets 10 utils from the 1st pizza, 7 utils from the 2nd pizza and 5 utils from the 3rd pizza. (Note that, by using the measure 'util' we are considering the utility as the cardinal utility.)

Since total utility is essentially the sums of marginal utilities, the total utility of 1 pizza is 10, 2 pizzas is 17 and 3 pizzas is 22. This can be seen intuitively in fig 1.3 where MU_i represents the marginal utility of the i'th pizza and TU_j represents the total utility of j pizzas.

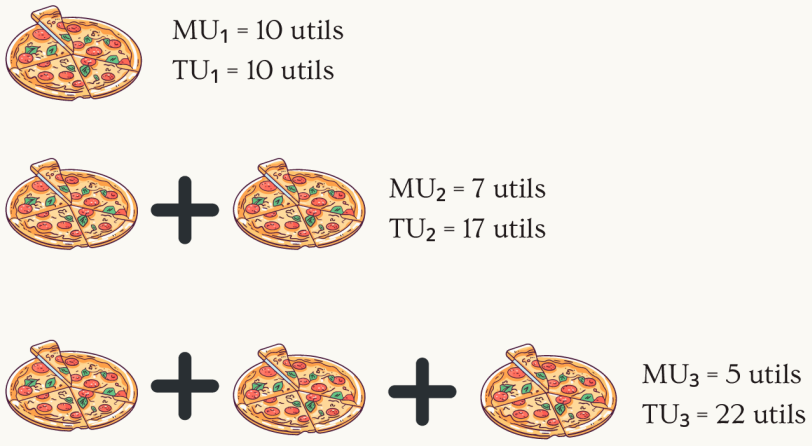


fig 1.3

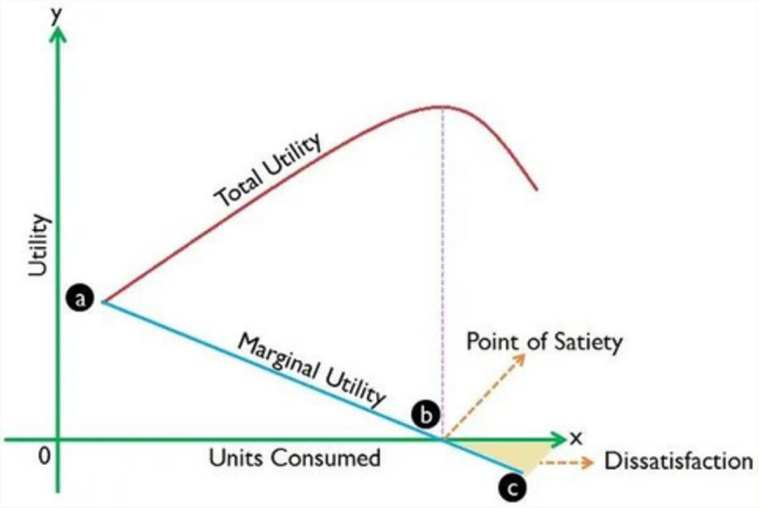
Thus it is easy to conclude that the total utility of n units of a commodity is

$TU_n = MU_1 + MU_2 + ... + MU_n$

and the marginal utility of the nth unit is

$MU_n = TU_n - TU_{(n-1)}$

1.4.5 Graphical representation of total and marginal utility



- TU increases as long as MU is positive
- TU is at max when MU is 0
- TU starts to decrease when MU becomes negative

fig 1.4

From point a to b in the fig 1.4, the marginal utility is positive. Therefore, in that range, the total utility is an increasing curve since it is the sum of positive marginal utilities, which means that even though the amount of satisfaction of each additional unit is decreasing, the total satisfaction of all the units combined is still increasing.
At point b, the marginal utility is 0. This is called the point of satiation.
The range beyond b has negative marginal utility which leads to a drop in the total utility. This implies that all the additional units purchased after b lead to a certain amount of dissatisfaction.

But why are the marginal utilities decreasing?
This can be answered using the Law of Diminishing marginal utilities.

1.5 Law of Diminishing Marginal Utilities

This law states that as more of a good is consumed, the additional satisfaction from consuming an extra unit decreases.
Let's understand this with an example-
Suppose Bob hasn't eaten since the previous day, and he is extremely hungry. He eats the first pizza, experiencing a great sense of joy and relief, deriving maximum satisfaction from it. When he eats the second pizza, since his hunger is not as intense, the satisfaction he gets is slightly less compared to the first slice. By the time he eats the third pizza, Bob is completely full and even starts to feel

uncomfortable or sick, as the satisfaction from consuming more has sharply diminished.
Since the marginal utility is going from positive to negative, there must be a point where it becomes 0. Thus the point b in fig 1.4 represents the point of satiation which is also the point at which total utility reaches it maximum.

Thus the marginal utility goes on diminishing with each additional unit consumed; or in other words, the more we have of something, the less we value each additional unit.

Now that we have learnt about utility, the ways of measuring utility, total and marginal utility, and the law of diminishing utility, let's finally answer Bob's question (fig 1.1) about how to maximize utility.

1.6 Law of Equi-Marginal Utilities

This law, also called the Utility maximization rule, states that - To maximize utility, consumers allocate their income where the marginal utility per unit money i.e MU/P spent is equal for all the goods.
Let's understand this with an example of consisting of two commodities -

fig 1.5

So Bob has 40Rs and wants to buy food.
Bob has two options- pizza and burger

fig 1.6

Let's see how Bob can maximize his utility.

Let the marginal utilities and prices of each product be as mentioned in fig 1.6, where MUi refers to the marginal utility of the i'th unit of that commodity and MUi/P refers to the marginal utility per unit rupee of the i'th unit of that commodity.
An important point to note is that, the consumers (Bob) must make choices and trade-offs between the goods/services in-order to stay within the budget constraints.

MU1 = 100 utils
MU2 = 50 utils
Price = 10Rs

MU1/P = 10
MU2/P = 5

MU1 = 100 utils
MU2 = 80 utils
Price = 20Rs

MU1/P = 5
MU2/p = 4

fig 1.7

According to the law of equi-marginal utility, Bob should allocate his income so that the marginal utility per unit of money spent is the same for both pizza and burgers.

In other words, Bob will continue to allocate his resources between different goods until the marginal utility gained from the last unit of money spent on each good is the same.

To do so, Bob will follow the following steps -

- The first pizza has a marginal utility per rupee of 10 utils, which is higher than the burger's 5 utils per rupee.
- Therefore, Bob will first purchase a pizza because it gives him more utility per rupee spent, maximizing his satisfaction.
- After buying the first pizza, the next unit of pizza provides 5 utils per rupee, which is now equal to the marginal utility per rupee of the first burger (also 5 utils per rupee).
- According to the Law of Equi-Marginal Utility, if Bob buys the 2nd pizza and the 1st burger, then the utility gained from the last unit of both the commodities will be the same.
- Thus Bob will buy 2 pizzas and 1 burger.

Since Bob spent all his available income (i.e 40Rs) on buying the 2 pizzas and 1 burger, he has reached the consumer's equilibrium.

The consumer's equilibrium is the point where the consumer attains the maximum possible utility with their budget.

The consumer's equilibrium is attained when

- MUx/Px = MUy/Py for commodity x and commodity y, and
- The consumer spends the entire income on the purchase of the two commodities

Let's look at another situation where we can utility maximization is done.

1.7 Deriving the Demand Curve

Utility maximization helps explain why consumers buy more of a good when its price decreases. This concept is illustrated by the Law of Demand.
For example:

- If the price of a pizza drops from 10Rs to 5Rs, the marginal utility per rupee spent increases. Thus if Bob was previously buying two pizzas for 20Rs, the price drop now allows him to buy four pizzas for the same amount of money, thereby increasing his total utility i.e Bob can derive more utility per rupee spent on pizza, which increases his demand for it. See fig 1.8.

This behavior reflects the standard downward-sloping demand curve in economics: as prices decrease, consumers tend to buy more because the utility they gain per rupee spent increases.

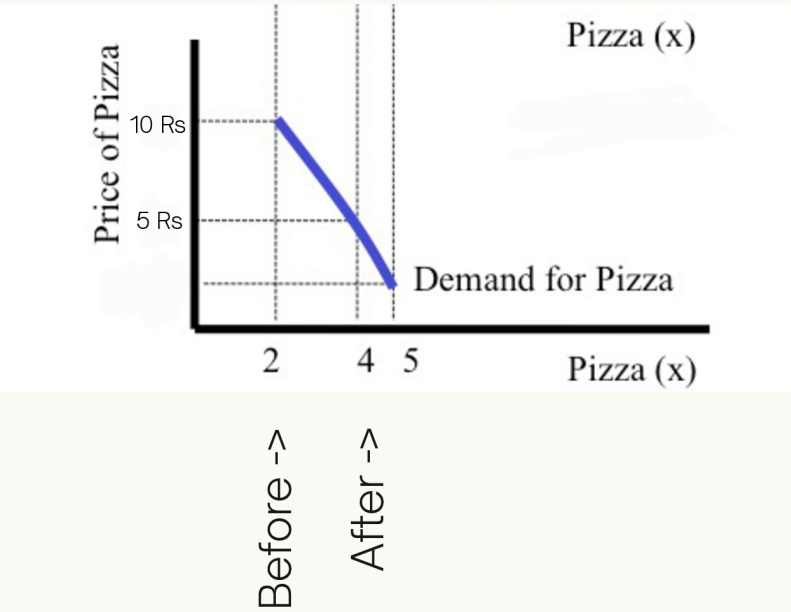


fig 1.8

1.8 Real-Life Examples of Utility Maximization

Utility maximization plays a crucial role in real-life decision-making. Let's consider two examples:

1. Vending Machines: Have you ever wondered why a newspaper vending machine allows you to take as many papers as you want after purchasing one, while a soda vending machine dispenses only one soda at a time? This is because the marginal utility of the second newspaper is almost zero—no one needs two of the same paper. In contrast, the marginal utility of a second soda is still relatively high, so vending machines only give one at a time.
2. Discount Offers: Retailers often use the concept of diminishing marginal utility to increase sales. For example, "buy one, get one free" promotions work because, even though the additional product provides less utility than the first, consumers are still motivated to buy more due to the perceived value.

1.9 Behavioral Economics and Utility Maximization

Traditional utility maximization assumes that consumers, like Bob, make fully rational decisions. However, behavioral economics suggests that real-life choices are often influenced by psychological and emotional factors, leading to deviations from purely rational behavior.

For instance, Bob might be swayed by framing effects when making his purchases. If one burger is labeled as "80% lean" and another as "20% fat," Bob may choose the first one because it sounds healthier, even though both are nutritionally identical. This phenomenon shows that consumers are not always maximizing their utility in the strictest sense, as psychological biases can influence their decision-making.

Another key insight from behavioral economics is loss aversion, which explains why consumers tend to fear losses more than they value gains of the same magnitude. For Bob, losing 10 rupees may feel more significant than gaining 10 rupees, influencing his consumption choices in ways that deviate from the classical utility maximization model.

1.10 The importance of Utility maximization

Utility maximization is a powerful tool for understanding how consumers like Bob make choices to maximize their satisfaction. By balancing the marginal utility per unit of money spent across different goods, individuals can achieve an optimal allocation of their limited resources.

However, real-world decision-making is more complex than traditional models suggest. Behavioral economics highlights how emotions, framing, and loss aversion can influence choices, leading to deviations from the rational utility maximization model. Nevertheless, the fundamental principles of utility maximization provide a solid foundation for analyzing and predicting economic behavior.

Through examples like Bob's pizza and burger dilemma, we gain a practical understanding of how utility maximization works and why it remains a key concept in economics.

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