

Diminishing marginal utility

Consumers derive utility from their consumption of goods and services. Initially, consider a simple economy producing just one good, X , from which consumers derive utility. For the typical consumer, there is some relationship between the amount of X consumed and the utility derived from its consumption. In symbols, we can write $U = f(X)$ where U is utility and X is the amount of good X being consumed. It is reasonable to assume that for this good, $f'(X) > 0$: that is, total utility is positive for all reasonable amounts.

Marginal utility is the change in utility from consuming one more unit of the good: $MU_X = \Delta U / \Delta X = f'(X)$. It is also reasonable to assume that marginal utility is positive, so that increased consumption results in increased utility. We also make the assumption that there is diminishing marginal utility, implying that $f'(X)$ is declining in X . These two assumptions can be written symbolically as: $f'(X) > 0, f''(X) < 0$.

More generally, utility depends on consumption of all goods and services. If there are N goods and services, we could list them as $X_1, X_2, X_3, \dots, X_N$. Then our typical consumer has utility equal to $U = f(X_1, X_2, X_3, \dots)$ where X_i represents the amount of good X_i consumed. In this more general specification, there is positive but diminishing marginal utility for each good if the utility function satisfies $\partial f / \partial X_i > 0$ and $\partial^2 f / \partial X_i^2 < 0$ for each good.