

The Science of Economics

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The total amount of production in an economy is called the gross domestic product, GDP. If we add net income from abroad, the total is called gross national product, GNP. Some of this production goes to repair and maintain machinery and structures that depreciate; they deteriorate and wear down every year. This annual depreciation reduces the net income we get from the production, so another measurement is the **net national product, or NNP, which is GNP minus depreciation.** We can also compute the net domestic product, NDP. The most common measurement of national output is now the GDP.

There are many ways to divide up the GDP. One is by industry sectors, normally with three: the primary sector, made up of agriculture, forestry, fishing, and mining; the manufacturing sector, including construction; and the service sector.

The classical division was by the factors or **resources that produce wealth:**

- land,
- labor, and
- capital goods.

An economy can also be divided into the **three abstract types of agents: households, firms, and government.**

- Households (in this simplified abstraction) own all the assets, the capital goods and land, and provide labor to firms; they also buy the goods produced by firms.
- Firms hire input factors and produce goods.
- Government obtains revenue from both firms and households, and provides services to both.

There are **two opposite flows:** goods flow in one direction (such as from firms to households), while money flows in the opposite direction (from households to firms). Income is earned by households and government; the income of firms is ultimately paid to factors, to the government, and to the owners.

There are three types of expenditure categories. Income may be used for

- consumption,
- for investment, and
- it can be wasted. Waste is defined as the destruction of goods value other than that planned by the person who earned the funds used. When a fire burns down a building, for example, that is waste, and when a government builds some project that few people find

useful or desirable, that is also a waste, a destruction of the utility that could have been gained from alternative spending.

Investment is the creation of capital goods. Net investment is gross investment minus depreciation. In common language, people say they invest in land or in bonds, which can yield financial returns. But in economic terminology, **only the creation of new capital goods is investment.** When someone buys a bond or land, money simply changes hands, since no new land is created, and a bond is simply a debt.

These categories can now be put together as follows. First, the factors of land, labor, and capital goods are hired from households by firms, which create wealth in the three sectors, primary, manufacturing, and service. This wealth goes to their owners as factor payments by firms in the form of rent, wages, and capital yields, all of which constitute income. Governments obtain some of this income either from rent or from taxes. This income is spent in the three categories, consumption, investment, and waste.

2. Economic models

Simple models of an economy usually involve household consumption and investment and the government sector. Waste is not usually included in these macroeconomic models. The symbol Y is usually used for national income. The most common equation is:

$$Y = C + G + I$$

or

income = consumption + government spending + investment.

The total output of an economy can also be abstractly formulated by an aggregate production function, with output as a function of the factors of production. This assumes, for simplicity, that all firms are identical, so that the aggregate or total production function is just the sum of the functions of the individual firms. Economists usually simplify the function with two factors, labor and capital, but it is more accurate to include land as a separate factor:

$$Y = f(N, K, L),$$

where N stands for the number of workers, K for capital, and L for land.

Workers are hired until their marginal product is equal to the prevailing wage. The real wage consists of nominal wages, the money amount of wages, divided by some price index. The real

wage is thus set equal to the marginal product of labor, which is the extra output generated by the aggregate production function when the number of workers increases by one (mathematically, the derivative of the function with respect to N).

In actuality, there is no single aggregate production function, since land is divided into zones of differing productivity. A more realistic production function would consist of the sum of the functions within each zone. The wage level is set at the marginal zone where land rent is zero, as described in [Chapter 2](#).

Models also have some labor supply curve, with wages usually regarded as increasing with greater N . But in actuality, the labor supply curve can be horizontal so long as there is unemployment.

The models usually include some consumption function, where consumption depends on income, taxes, the interest rate, and other variables.

Investment is a function of the amount of capital goods, the interest rate, the depreciation rate, the number of workers, and other variables.

The above constitutes the real side of an economy, with real goods. There is also a money side, with the money supply a function of income, interest rates, and other variables, including monetary policy. In a classical model, the amount of money does not matter, since real output is determined independently of money; the price level will adjust to whatever the money supply is. In other models, especially of the Keynesian school, money does influence the real output. Both are right. In the short run, money can indeed influence output, but over the long run, inflation will simply increase prices, distorting relative prices in the process.