purchasing additional goods and services, or they may lend the additional money to someone else by depositing it in a bank or using it to buy stocks or bonds. The extra supply of savings will cause interest rates to fall and will encourage businesses and consumers to increase their spending.

The injection of more money into the economy thus causes an increase in the demand for goods and services. But, the economy's supply of goods and services has not changed. We have seen that the ability of an economy to produce goods and services depends on the available technology and on the quantities of labor, capital, and natural resources available. None of these has been changed by the additional money, so the supply of goods and services should not change.

The combination of higher demand with a fixed supply will cause the price of goods and services to rise. And, this increase in prices will continue until prices have risen enough to cause the demand for money to once again equal the supply. Once the economy has adjusted, the new equilibrium occurs at the point labeled "B." At this point, the value of money has fallen by half (or equivalently the price level has doubled). In the long run, assuming nothing else changes, the increase in prices will be exactly proportional to the change in the supply of money.

This result—that in the long run, an increase in the supply of money leads to a proportional increase in the price level—reflects the long-run **neutrality of money**. The neutrality of money means that changes in the quantity of money have no effect on real quantities in the economy. Monetary changes only affect nominal quantities. *Real* quantities are things that are measured in physical units; for example, a bushel of wheat and a ton of steel are real quantities. Nominal quantities are things that are measured in monetary units; examples would include the price of a bushel of wheat or GDP in current prices.

Notice that the relative prices of different goods and services are real quantities. For example, if a bushel of wheat costs $6, and a ton of steel costs $600, then the cost of steel relative to wheat is

$$\frac{\dfrac{\$600}{\text{ton}}}{\dfrac{\$6}{\text{bushel}}} = 100\ \frac{\text{bushels}}{\text{ton}}.$$

Since dollars appear in both the top and bottom terms of this ratio, they cancel out of the equation, and we are left with a ratio of physical quantities. Similarly, if the wage rate is $10/hour and the price of an iPad is $500, then taking the ratio of the price of an iPad to the hourly wage, we can express the price of an iPad as 50 hours of work.

The neutrality of money gives rise to a very useful tool called the quantity equation. As a starting point, let us define the **velocity of money** as the average number of times a typical dollar bill is used during a year. If Y stands for real GDP and P is the price level, then the nominal GDP = P × Y measures the value of goods and services (and hence dollars) that change hands. To find the velocity of money, V, we divide P × Y by the number of dollars in circulation, M. That is: $\mathbf{V = (P \times Y)/M}$.

To see why this makes sense, let's consider a very simple economy that produces only t-shirts. If this economy produces 500 t-shirts and each sells for $5, then nominal GDP is $2,500. Suppose the supply of money is $250, then velocity in this economy is $2,500/250 = 10. For $2,500 in spending to occur using only $250 in cash, each dollar must change hands an average of ten times during the year.

Figure 50 graphs nominal GDP, M2, and the velocity of money that they imply. As you can see in this figure, between 1960 and 2019, the growth trajectories of nominal GDP and the stock of money have followed very similar paths, with the velocity of money remaining relatively stable. Using this stability of the velocity of money, we can rearrange the quantity equation to obtain the following expression: $\mathbf{V \times M = P \times Y}$.

This equation states that the velocity of money times the quantity of money will be equal to nominal GDP. So, any increase in the supply of money will be reflected in one of three ways: 1) as a fall in the velocity of money, 2) an increase in real GDP, or 3) an increase in the price level.

Why Worry about Inflation?
Inflation is unpopular. During the 1970s when inflation rates reached double digits, many consumers viewed inflation as the number one economic problem of the country. But, the neutrality of money suggests that changes in the aggregate price level should not matter because they do not affect real quantities. Despite the