

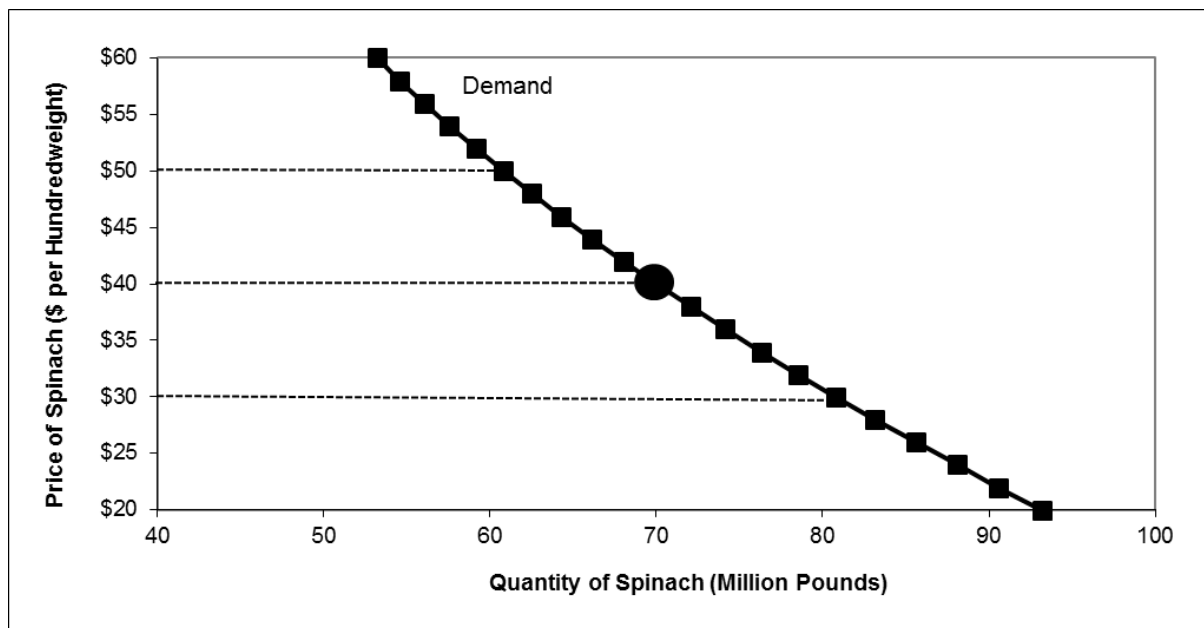
## Appendix S2.1      The Economics of Demand and Supply at the Market Level

It matters in food and nutrition policy how people respond to prices. This appendix provides background on the economic concepts of demand, supply, and equilibrium.

This material is designed to be useful no matter what your basic economic or political philosophy. For economics students, the motivation for this appendix is obvious. For readers whose political orientation rejects neoclassical economic perspectives and their neoliberal political corollaries, I nonetheless encourage patience with at least this much of the basic economic perspective on prices and quantities. My view is that this small amount of microeconomics is common ground, offering insight for people of all political orientations.

### Demand

Let us use the market for spinach as an example. Suppose the U.S. price of spinach currently is \$40 per hundredweight (a measure of 100 pounds; 45.4 kg), and the quantity consumed is 70 million pounds per year (Figure S2.1).



*Figure S2.1* The U.S. demand function for spinach (hypothetical)

I sometimes ask my students (in a school of nutrition science and policy) the direction in which they wish prices would change to increase spinach intake for good health. Usually, they suggest prices should decrease, because they are familiar with spinach as buyers and as consumers, and therefore can readily envision a demand function.

A function is a mathematical relationship that takes numerical inputs and gives a single numerical output. The demand function takes the spinach price as the input and shows the spinach quantity demanded as the output. Notice that prices and quantities are both shown explicitly in the two-dimensional chart in Figure S2.1. For example, if the price is \$50 per hundredweight (on the vertical axis), Americans might choose to buy 61 million pounds of spinach (on the horizontal axis). If the price were lower, \$30 per hundredweight, they might choose to buy much more, 81 million pounds. This change in prices and quantities is called a movement along the demand function. We do not need to shift the demand function to show the response, because the demand function already illustrates the story about how quantities

demanders respond to prices.

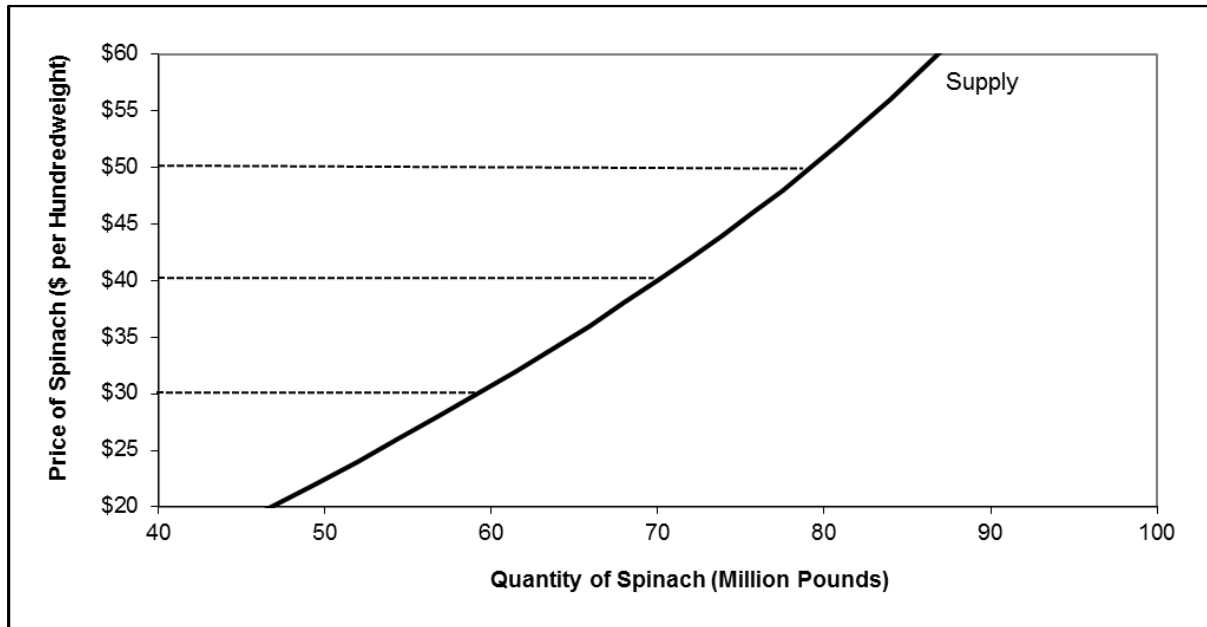
If spinach became more popular (perhaps due to nutrition education, an advertising campaign, or rising household incomes), then, at any given price, Americans would buy more spinach, and the demand curve would shift rightward. If spinach became less popular (perhaps due to a food safety scare induced by an E. coli outbreak), the demand function would shift leftward, such that Americans would buy less spinach at any given price. These responses are called shifts in the demand function. We need to shift the whole demand function, because advertising, food safety scares, and incomes are not already illustrated in the two-dimensional chart in Figure S2.1.

It is also possible to think of Figure S2.1 as illustrating how prices respond to quantities. Suppose producers had 81 million pounds of spinach to sell nationwide, and wondered, “What price do we need to offer, to persuade people to buy this much spinach?” The answer would be \$30 per hundredweight. However, most of the time, when in doubt, it will be most useful to follow the approach we used previously and think of the demand function as an illustration of how the quantity demanded (on the horizontal axis) responds to changes in the price (on the vertical axis).

## Supply

In direct contradiction to the answer my (predominantly non-agricultural) students gave in the previous section, one could instead argue that a higher price would be more helpful to increase spinach intake for good health. If you live in a spinach growing region of the country, such as the Central Valley or Salinas Valley in California, your mind may focus on

the many economic pressures that spinach growers face. You may feel that a higher price is what is needed to encourage more spinach production, so you can readily imagine an upward sloping supply function (Figure S2.2).



*Figure S2.2* The U.S. supply function for spinach (hypothetical)

The supply function takes the spinach price as the input and shows the spinach quantity supplied as the output. Again, prices and quantities are both shown explicitly in the two-dimensional chart. For example, if the price is \$50 per hundredweight (on the vertical axis), American farmers might choose to produce 79 million pounds of spinach (on the horizontal axis). If the price were lower, \$30 per hundredweight, farmers might choose to produce much less, 59 million pounds. This change in prices and quantities is called a movement along the supply function. We do not need to shift the supply function when prices change, because the function already illustrates the story about how quantities supplied respond to prices.

If production conditions become more favorable (perhaps due to good weather or low prices for inputs such as gasoline for tractors and wages for laborers), then, at any given price,

American farmers would produce more spinach, and the supply curve would shift rightward. If farmers face reduced prices for other crops, they likewise might favor more spinach production at any given price. These responses are called shifts in the supply function. We need to shift the whole supply function, because input prices, farmworker wages, and prices of alternate crops are not already illustrated in the two-dimensional chart in Figure S2.2.

## Equilibrium

We have already told two tales: one about lower prices leading to a larger quantity demanded, and the other about lower prices leading to a smaller quantity supplied. To reconcile the tension between them, we use the economic concept of equilibrium, putting demand and supply in to the same chart (Figure S2.3).

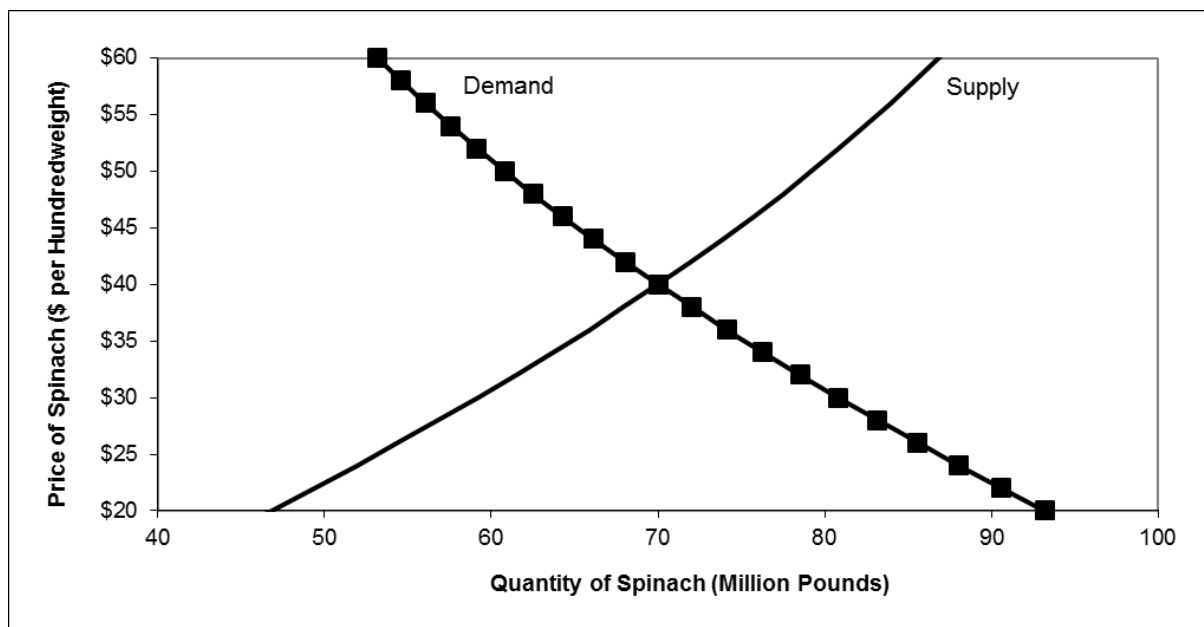


Figure S2.3 Equilibrium in the U.S. market for spinach (hypothetical)

If the price were as high as \$50 per hundredweight, we have seen that consumers would want to buy only 61 million pounds, but farmers would want to produce 79 million pounds, so there would be a **surplus** on the market. This puts downward pressure on prices, because no producer wants to be the loser holding unsold spinach.

Alternatively, if the price were as low as \$30 per hundredweight, we have seen that consumers would want to buy 81 million pounds, but farmers would want to produce only 59 million pounds, so there would be a **shortage** on the market. This puts upward pressure on prices, because producers notice that buyers are eager to snap up any spinach they can find.

An **equilibrium** is a combination of prices and quantities where the quantities are in balance with neither surplus nor shortage conditions. For example, in Figure S2.3, a price of \$40 per hundredweight generates a quantity supplied that exactly equals the quantity demanded (70 million pounds), so there is neither surplus nor shortage. In theory, an equilibrium is expected to be stable and self-sustaining, with no upward or downward pressure on prices, so long as the underlying conditions of supply and demand are stable. Figure S2.3 ignores international trade, which requires an extension of this theory (see Chapter 4). That extension to encompass trade still preserves the basic concept of an equilibrium in which supply balances demand.

Throughout our study of U.S. food policy, we will pay attention to how prices affect important outcomes, from the humble example of spinach to the massive economic markets for corn, meat, and manufactured food. Whenever we seek to change outcomes in a desirable direction, such as promoting spinach intake for good health, we will pay attention to methods

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for doing so that avoid generating surplus and shortage.

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