PAGE ONE ECONOMICS NEWSLETTER
the back story on front page economics

"Higher Gasoline Prices: Temporary or Time to Buy a Hybrid?"

September 2012

Classroom Edition

An informative and accessible economic essay with a classroom application.

Includes the full version of the Page One Economics Newsletter, *plus questions for students and an answer key for classroom use.*

Common Core Standards (see page 12)

ECONOMIC EDUCATION

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Higher Gasoline Prices: Temporary or Time to Buy a Hybrid?

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"The days of persistently cheap oil are over. The good news is that, in the longer run, we have options."
—Ben S. Bernanke, then-Governor of the Federal Reserve Board, October 21, 2004

Consumers may not remember the prices of many of the goods and services they buy, but few forget what they pay for gasoline. This spring, U.S. consumers first celebrated the continual decline in gasoline prices in May and June but bemoaned another surge in prices in July. Why do gasoline prices grab so much attention? The answer is simple: Gasoline is purchased on a regular basis and its consumption accounts for a significant part of U.S. daily spending. Between 2002 and 2011, U.S. consumers spent an average of $972 per capita per year, or $19 per week, on fuel energy consumption—mostly gasoline—which accounts for 3.3 percent of total personal consumption expenditures.[1]

As they budget for expenses, individual drivers may begin to wonder if the most recent spike in gasoline prices is temporary or whether it will be longer lasting. Are prices expected to eventually decline, perhaps to the days when gasoline prices were still below $3 per gallon? Or is it time for drivers to alter their behavior, say by buying a hybrid car?

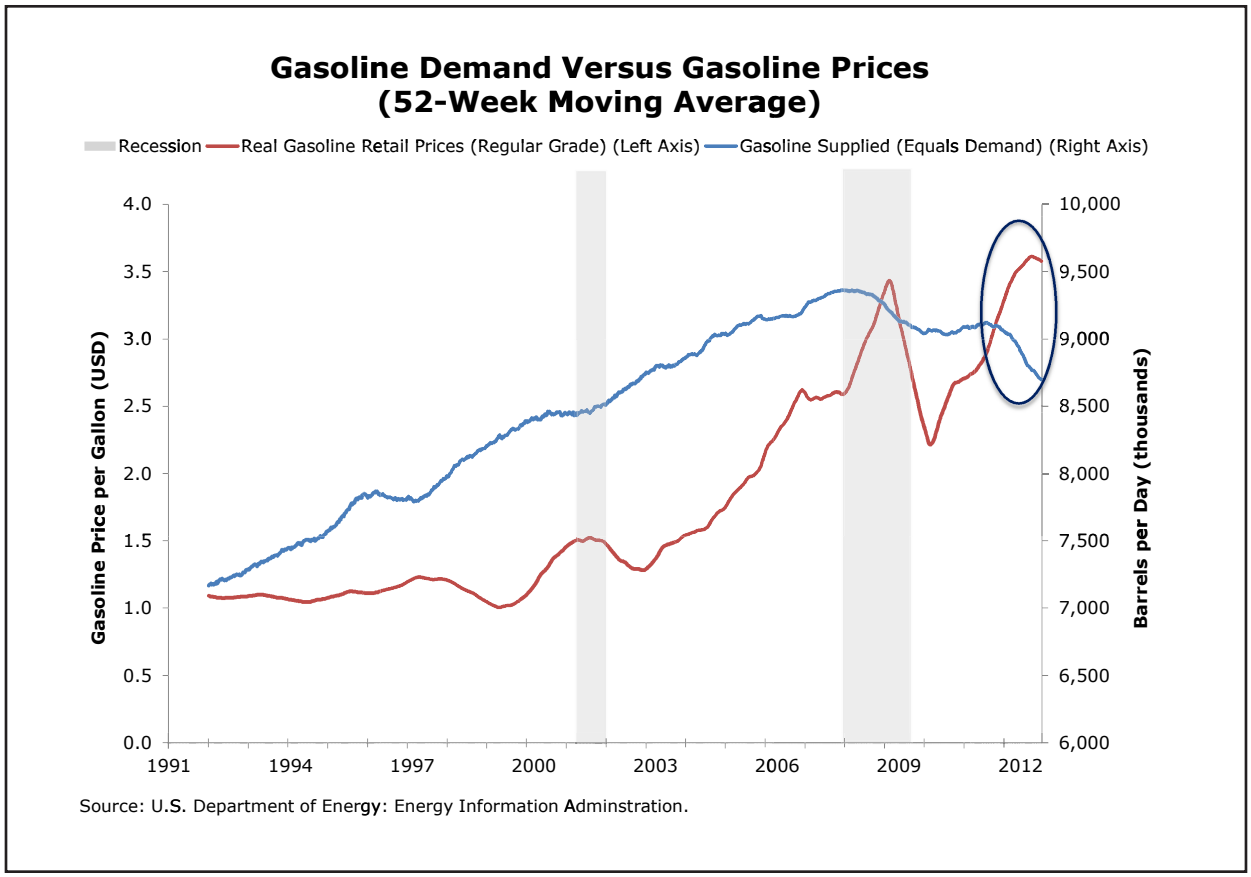
Typically, consumers buy less of a good when the price increases. In economics, this is referred to as the **law of demand**. However, the magnitude of the change is not necessarily the same for all goods. **Elasticity of demand** is a measure of how responsive consumers are to a change in the price of a good or service (see the glossary for more details). For example, it is not always easy for consumers to adjust gasoline consumption when the price of gasoline jumps unexpectedly. As a result, they continue to purchase almost the same amount of gasoline as before the price jump; this is referred to as **inelastic demand**. In contrast, it is easier for consumers to adjust the quantity of other goods consumed in the short run, such as hot dogs, when the prices of such goods increase because there are close **substitutes** for goods like hot dogs available, say cheeseburgers; this is referred to as **elastic demand**. In short, when the demand for a good or service is elastic (inelastic), a change in its price results in a proportionately larger (smaller) change in its quantity demanded.

Historically, the demand for gasoline has been relatively inelastic in the short run. For instance, as gasoline prices doubled from 2002 to 2011, the expenditures per capita on gasoline also increased by 91 percent.[2] The fact that people still need to commute to work or travel to other places and that there is no readily available alternative energy source for gasoline makes it difficult to reduce the quantity demanded of gasoline in the short run, even when gas prices are high. Given that consumers' budgets stay the same, this means consumers will have less to

spend on other goods. Fuel-consuming businesses (e.g., manufacturers and service delivery companies) will also find it is more costly to operate. When costs increase by a certain margin, firms tend to increase their prices or reduce production. Then, the contraction in consumer spending and production both directly and indirectly endangers the growth of the broader economy as measured by gross domestic product. As the chart shows, spikes in gasoline prices are often followed by a recession.[3] Moreover, if consumers or firms expect the increases to be temporary, they may not have any incentive to change their investment decisions (e.g., buying a more fuel-efficient car) or lifestyle choices (e.g., driving less).

However, once consumers and firms realize that higher gasoline prices may not decline and are likely to continue to increase, they begin to make those changes. The chart shows that since 2008, total gasoline consumption has fallen. Most notably, gasoline consumption moved downward during the latest spike in gasoline prices (circled on the graph). This evidence suggests that consumers are finding it easier to vary their gasoline consumption when prices change.

Two possible reasons may explain the decline in gasoline consumption. First, consumers are able to adjust their gasoline consumption habits over time in response to continually rising gasoline prices. For example, instead of driving alone, more people may share rides or use public transportation. Some people may consider commuting costs when they choose where to live and thus move closer to work.[4] In addition, household preferences have gradually shifted toward more fuel-efficient cars. A study from the University of Michigan finds that gasoline engines gained an average of 2.3 mpg in fuel economy from 2008 to 2012.[5] Large companies and government agencies are also seeking ways to cut transportation fuel use. For instance,



FedEx plans to cut its fuel consumption by 20 percent by 2020 by adding more hybrid vehicles to its fleet.[6]

Second, the expectation of higher gasoline prices spurs incentives to develop alternative energy sources. One example is the boom in natural gas production: From 1990 to 2011, the demand for natural gas increased by about 33 percent. More school buses, trash trucks, tractor-trailers, and public transit buses are making the transition to natural gas engines.[7] Moreover, automakers are actively designing and improving hybrid vehicles that run on both electricity and gasoline. Over the longer term, the greater the availability of substitutes in the market, the more elastic the demand for gasoline will become.

Gasoline is vital to the U.S. economy because of its widespread use by individuals and industries—it helps keep our economy moving. In turn, this strong dependence on gasoline can have a negative impact on consumers' daily lives and the economy when gasoline prices continually rise over time. Although a deep recession and a weak economic recovery have played a part, energy conservation and new technologies that have increased energy efficiency and spurred the development of new energy sources seem to be the primary reasons that consumers and businesses have changed their demand for gasoline in recent years. How consumers and businesses will continue to modify their gasoline consumption largely depends on what they expect gasoline prices to do. It is also a factor to consider when thinking about buying a hybrid. So, is it time for a hybrid? ■

NOTES

[1] Figures are adjusted for inflation.

[2] Figures are adjusted for inflation.

[3] This does not necessarily imply that gasoline prices have caused the recessions but they may have been a contributing factor. See Hamilton (1985).

[4] See Molloy and Shan (2010).

[5] See Schoettle and Sivak (2012).

[6] See Mufson (2012).

[7] See Krauss and Lipton (2012).

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GLOSSARY

Elasticity of demand: The ratio of the percentage change in quantity demanded of a good or service to the percentage change in its price; a measure of the responsiveness of buyers to a change in the price of a good or service. Many factors influence demand elasticity. The typical ones are the availability of close substitutes, whether the good is a necessity or a luxury, the definition of a market, the relative purchase size, and the time horizon.

Elastic demand: The type of demand that exists when the percentage change in quantity demanded is greater than the percentage change in price.

Inelastic demand: The type of demand that exists when the percentage change in quantity demanded is less than the percentage change in price.

Law of demand: As the price of a good or service rises, the quantity demanded of that good or service falls. Likewise, as the price of a good or service falls, the quantity demanded of that good or service rises.

Substitute: A similar good. With substitutes, the price of one and the demand for the other tend to move in the same direction.

Page One Economics Newsletter from the Federal Reserve Bank of St. Louis continues the *Liber8 Newsletter* and provides an informative, accessible economic essay written by our research analysts. A classroom edition is also available and includes a lesson plan written by our economic education specialists. The newsletter is published 9 times per year, January through May and August through November.

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Name_____ Period_____

Federal Reserve Bank of St. Louis *Page One Economics Newsletter*: **"Higher Gasoline Prices: Temporary or Time to Buy a Hybrid?"**

After reading the article, answer the following questions.

1. **Why does the price of gasoline attract so much attention?**

2. **The essay states that "the demand for gasoline has been relatively inelastic in the short run." What does it mean to say that the demand for gasoline is inelastic?**

3. **What factors make it difficult for consumers to respond to the increase in the price of gasoline?**

4. **How do higher fuel prices affect firms?**

5. **What possible impact do higher gasoline prices have on the economy?**

6. **What are some of the strategies consumers have used to adjust their gasoline consumption over time in response to continually rising gasoline prices?**

7. **How do the expectations of higher gasoline prices spur innovation in the energy and automotive industries?**

Teacher's Guide

Federal Reserve Bank of St. Louis *Page One Economics Newsletter*: "Higher Gasoline Prices: Temporary or Time to Buy a Hybrid?"

After reading the article, answer the following questions.

1. **Why does the price of gasoline attract so much attention?**

   Gasoline is purchased on a regular basis and its consumption accounts for a significant part of U.S. daily spending. Between 2002 and 2011, U.S. consumers spent an average of $972 per capita per year, or $19 per week, on fuel energy consumption—mostly gasoline—which accounts for 3.3 percent of total personal consumption expenditures.

2. **The essay states that "the demand for gasoline has been relatively inelastic in the short run." What does it mean to say that the demand for gasoline is inelastic?**

   It is not easy for consumers to quickly adjust to increases in gasoline prices. So when prices increase, they make very little change in the amount of gasoline that they purchase.

3. **What factors make it difficult for consumers to respond to the increase in the price of gasoline?**

   When the price of gasoline increases, consumers still need to commute to work or travel to other places, and there is no readily available alternative energy source for gasoline.

4. **How do higher fuel prices affect firms?**

   Firms find it more costly to operate. When costs increase, firms tend to increase their prices or reduce production.

5. **What possible impact do higher gasoline prices have on the economy?**

   The contraction in spending and production can endanger the growth of the economy as measured by gross domestic product.

6. **What are some of the strategies consumers have used to adjust their gasoline consumption over time in response to continually rising gasoline prices?**

   Instead of driving alone, more people may share rides or use public transportation. Some people may consider commuting costs when they choose where to live and thus move closer to work. In addition, household preferences have gradually shifted toward more fuel-efficient cars.

7. **How have expectations of higher gasoline prices spurred innovation in the energy and automotive industries?**

   As gasoline prices have risen relative to the price of natural gas, more school buses, trash trucks, tractor-trailers, and public transport buses are making the transition from gasoline to natural gas engines. Also, automakers are actively designing and improving hybrid vehicles that run on both electricity and gasoline.

For Further Discussion

Read or distribute the following to your students and then use the visual and activity that follow to lead a classroom discussion on price elasticity of demand.

The law of demand states that as the price of a good or service rises, the quantity demanded of that good or service falls. Likewise, as the price of a good or service falls, the quantity demanded of that good or service rises. This is a straightforward (but inverse) relationship—when the price of an item goes up, consumers tend to buy fewer of that item. However, it is important to realize that consumers are more responsive to changes in the price of some goods than others. For example, consumers will respond differently to a 20 percent increase in the price of gasoline than a 20 percent increase in the price of ice cream cones.

Economists measure this price sensitivity as the elasticity of demand, which measures how much consumers change the quantity they demand of a good or service when the price of that good or service changes. Demand for a good is elastic if consumers are very responsive to a change in price—that is, consumers greatly adjust the amount they buy. For these goods, when the price increases, the percentage change decrease in the quantity demanded is greater than the percentage change increase in the price. So, for example, if a firm increases its price by 10 percent, the quantity that consumers buy may decrease by 15 percent. Demand for a good is inelastic if the quantity demanded is less responsive to a change in price. For these goods, the percentage change in quantity demanded is less than the percentage change in price. In this case, if a firm increases its price by 10 percent, the quantity that consumers buy may decrease by only 5 percent.

Elasticity of demand has a very practical application for business—it helps answer a very important question: How will a change in price affect revenue? Revenue is the money a business receives from customers who buy its goods and services. Note that revenue is the total money received, before a firm pays its production costs, so it is not equal to profit. Revenue is calculated as the price per unit multiplied by the quantity of units sold. So, a firm's revenue for selling Good A might look like this (*show Visual 1*):

Price per unit	×	**Quantity sold**	=	**Revenue**
$10	×	**1,000**	=	**$10,000**

Notice that when a business decides to increase the price of a good it sells, it will receive a higher price per item sold, but it will sell fewer items. So, will the total amount received from selling those items (revenue) increase or decrease as a result of the price increase? Well, it depends on the elasticity of demand.

Let's look at two examples.

Case 1. If the firm raises the price of Good A, the law of demand states that consumers will buy a smaller quantity of that item. But how much smaller? If the demand for the good is elastic, the percentage decrease in quantity sold will be greater than the percentage increase in price. The firm raises the price of Good A by 10 percent, from $10 to $11. Consumers respond by reducing the quantity they purchase by 20 percent, from 1,000 units to 800 units (*show Visual 1*):

Price per unit	×	**Quantity sold**	=	**Total revenue**
$11	×	**800**	=	**$8,800**

What is the result? Because the demand for the good is elastic, the increase in price will result in a $1,200 decrease in revenue for the firm. So, an increase in the price of a good with elastic demand will result in a decrease in revenue. Likewise, a decrease in the price of a good with elastic demand will result in an increase in revenue. When demand is elastic, changes in price and total revenue move in opposite directions.

Case 2. Now let's assume that the elasticity of demand for Good A is inelastic. Again, the firm raises the price of Good A 10 percent, from $10 to $11. The law of demand states that consumers will purchase a smaller quantity of that item. If the demand for the good is inelastic, the percentage decrease in quantity will be less than the percentage increase in price. In this case, consumers respond to the 10 percent increase in price by reducing the quantity they purchase by 5 percent, from 1,000 units to 950 units (*show Visual 1*):

Price per unit	×	**Quantity sold**	=	**Total revenue**
$11	×	**950**	=	**$10,450**

What is the result? Because the demand for the good is inelastic, the increase in price will result in a $450 increase in revenue for the firm. So, an increase in the price of a good for which demand is inelastic will result in an increase in revenue. Likewise, a decrease in the price of a good for which demand is inelastic will result in a decrease in revenue. When demand is inelastic, changes in price and total revenue move in the same direction.

A third situation is "unit elastic." In this case, a change in price is offset by a change in the quantity purchased by consumers, and revenue remains unchanged.

Distribute Activity 1 to students. Allow time for students to work. Use the answer key to correct or debrief the activity.

Name_____ Period_____

Activity 1

Use the information you have learned to determine whether the demand for the good is relatively elastic or inelastic. An example has been provided.

Example. When the price of Good B increased from $30 to $40, the quantity consumers purchased decreased from 1,200 to 1,100.

$30 (original price) × **1,200** (original quantity) = **$36,000** (original revenue)

$40 (new price) × **1,100** (new quantity) = **$44,000** (new revenue)

Price (circle one): (up) **or** down **Revenue (circle one):** (up) **or** down

Result: **The demand for this good is relatively inelastic because an increase in price resulted in an increase in revenue.**

1. When the price of Good C increased from $5 to $6, the quantity consumers purchased decreased from 1,000 to 600.

_____ (original price) × _____ (original quantity) = _____ (original revenue)

_____ (new price) × _____ (new quantity) = _____ (new revenue)

Price (circle one): up **or** down **Revenue (circle one):** up **or** down

Result:

2. When the price of Good D increased from $2 to $4, the quantity consumers purchased decreased from 1,200 to 700.

_____ (original price) × _____ (original quantity) = _____ (original revenue)

_____ (new price) × _____ (new quantity) = _____ (new revenue)

Price (circle one): up **or** down **Revenue (circle one):** up **or** down

Result:

Activity 1 (Answer Key)

Use the information you have learned to determine whether the demand for the good is relatively elastic or inelastic. An example has been provided.

Example. When the price of Good B increased from $30 to $40, the quantity consumers purchased decreased from 1,200 to 1,100.

$30 (original price) × 1,200 (original quantity) = $36,000 (original revenue)

$40 (new price) × 1,100 (new quantity) = $44,000 (new revenue)

Price (circle one): (up) **or** down **Revenue (circle one):** (up) **or** down

Result: The demand for this good is relatively inelastic because an increase in price resulted in an increase in revenue.

1. When the price of Good C increased from $5 to $6, the quantity consumers purchased decreased from 1,000 to 600.

$5 (original price) × 1,000 (original quantity) = $5,000 (original revenue)

$6 (new price) × 600 (new quantity) = $3,600 (new revenue)

Price (circle one): (up) **or** down **Revenue (circle one):** up **or** (down)

Result: The demand for this good is relatively elastic because an increase in price resulted in a decrease in revenue.

2. When the price of Good D increased from $2 to $4, the quantity consumers purchased decreased from 1,200 to 700.

$2 (original price) × 1,200 (original quantity) = $2,400 (original revenue)

$4 (new price) × 700 (new quantity) = $2,800 (new revenue)

Price (circle one): (up) **or** down **Revenue (circle one):** (up) **or** down

Result: The demand for this good is relatively inelastic because an increase in price resulted in an increase in revenue.

Visual 1

Case 1: Elastic

The firm raises the price of Good A by 10 percent, from $10 to $11. Consumers respond by reducing the quantity they purchase by 20 percent, from 1,000 units to 800 units.

Price per unit	×	Quantity sold	=	Revenue
$10	×	1,000	=	$10,000

Price per unit	×	Quantity sold	=	Total revenue
$11	×	800	=	$8,800

The increase in price results in a $1,200 decrease in revenue for the firm. An increase in the price of a good for which demand is elastic will result in a decrease in revenue. Likewise, a decrease in the price of a good for which demand is elastic will result in an increase in revenue.

Tip: When demand is elastic, changes in price and total revenue move in opposite directions.

Case 2: Inelastic

The firm raises the price 10 percent, from $10 to $11. Consumers respond to the 10 percent increase in price by reducing the quantity they purchase by 5 percent, from 1,000 units to 950 units.

Price per unit	×	Quantity sold	=	Revenue
$10	×	1,000	=	$10,000

Price per unit	×	Quantity sold	=	Total revenue
$11	×	950	=	$10,450

The increase in price results in a $450 increase in revenue for the firm. An increase in the price of a good for which demand is inelastic will result in an increase in revenue. Likewise, a decrease in the price of a good for which demand is inelastic good will result in a decrease in revenue.

Tip: When demand is inelastic, changes in price and total revenue move in the same direction.

Common Core Standards

Grades 6-12 Literacy in History/Social Studies and Technical Subjects

- **Key Ideas and Details**

  RH.11-12.1. Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.

  RH.11-12.2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.

- **Craft and Structure**

  RH.11-12.4. Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).