Elasticity in areas other than price

Go to lesson page

Key points

- Elasticity is a general term, referring to percentage change of one variable divided by percentage change of a related variable that can be applied to many economic connections.
- Elasticity applies in labor markets and financial capital markets just as it does in markets for goods and services.
- **Cross-price elasticity of demand** is the percentage change in the quantity of good A that is demanded as a result of a percentage change in good B.

Elasticity in areas other than price

The basic idea of elasticity—how a percentage change in one variable causes a percentage change in another variable—does not just apply to the responsiveness of supply and demand to changes in the price of a product.

Quantity demanded, Q_d, depends on more than just price, it also depends on income, tastes, preferences, the prices of related goods, and so on. Similarly, quantity supplied, Q_s, depends on the cost of production and other factors, as well as on price.

Elasticity can be measured for any determinant of supply and demand, not just the price.

Income elasticity of demand

The **income elasticity of demand** is the percentage change in quantity demanded divided by the percentage change in income.

Income elasticity of demand=%change in income%change in quantity demanded

For most products most of the time, the income elasticity of demand is positive. In other words, a rise in income will cause an increase in the quantity demanded. This pattern is common enough that these goods are referred to as **normal goods**.

However, for a few goods, an increase in income might mean that a person will purchase less of the good; for example, those with a higher income might buy fewer hamburgers because they are buying more steak instead. Those with a higher income might buy less cheap wine and more imported beer. When the income elasticity of demand is negative, the good is called an **inferior good**.

A higher level of income for a normal good causes the demand curve to shift to the right, which means that the income elasticity of demand is positive. How far the demand shifts depends on the income elasticity of demand. A higher income elasticity means a larger shift.

For an inferior good, however, a higher level of income would cause the demand curve for that good to shift to the left. Again, how much it shifts depends on how large the negative income elasticity is.

Cross-price elasticity of demand

A change in the price of one good can shift the quantity demanded for another good.

If the two goods are complements, like bread and peanut butter, then a drop in the price of one good will lead to an increase in the quantity demanded of the other good. However, if the two goods are substitutes, like plane tickets and train tickets, then a drop in the price of one good will cause people to substitute toward that good, reducing consumption of the other good. Cheaper plane tickets lead to fewer train tickets and vice versa.

The *cross-price elasticity of demand* puts some meat on the bones of these ideas. The term cross-price refers to the idea that the price of one good affects the quantity demanded of a different good. Specifically, the cross-price elasticity of demand is the percentage change in the quantity of good A that is demanded as a result of a percentage change in the price of good B.
Cross-price elasticity of demand=% change in price of good B% change in Qd of good A
Substitute goods have positive cross-price elasticities of demand. If good A is a substitute for good B—like coffee and tea—then a higher price for B will mean a greater quantity consumed of A.
Complement goods have negative cross-price elasticities. If good A is a complement for good B—like coffee and sugar—then a higher price for B will mean a lower quantity consumed of A.
[Take a look at this case-study!]

That will be how much?

How did the 60% price increase in 2011 end up for Netflix? It has been a very bumpy ride.
Before the price increase, Netflix had about 24.6 million US subscribers. After the price increase, 810,000 infuriated US consumers canceled their Netflix subscriptions, dropping the total number of subscribers to 23.79 million. Fast forward to June 2013, when there were 36 million streaming Netflix subscribers in the United States. This was an increase of 11.4 million subscribers since the price increase—an average per quarter growth of about 1.6 million. This growth is less than the 2 million per quarter increases Netflix experienced in the fourth quarter of 2010 and the first quarter of 2011.
During the first year after the price increase, the firm's stock price—a measure of future expectations for the firm—fell from about $300 per share to just under $54. In 2015, however, the stock price is at $448 per share. Today, Netflix has 57 million subscribers in 50 countries.
What happened? Obviously, Netflix company officials understood the law of demand. Company officials reported, when announcing the price increase, this could result in the loss of about 600,000 existing subscribers. Using the elasticity of demand formula, it is easy to see company officials expected an inelastic response:
====$6/[($10 + $16)/2]−600,000/[(24 million + 24.6 million)/2]$6/$13−600,000/24.3 million0.46−0.025−0.05
In addition, Netflix officials had anticipated the price increase would have little impact on attracting new customers. Netflix anticipated adding up to 1.29 million new subscribers in the third quarter of 2011. It is true this was slower growth than the firm had experienced before—about 2 million per quarter.
Why was the estimate of customers leaving so far off? In the 18 years since Netflix had been founded, there was an increase in the number of close, but not perfect, substitutes. Consumers now had choices ranging from Vudu, Amazon Prime, Hulu, and Redbox to retail stores. Jaime Weinman reported in *Maclean's* that Redbox kiosks are "a five-minute drive for less from 68 percent of Americans, and it seems that many people still find a five-minute drive more convenient than loading up a movie online." It seems that in 2012, many consumers still preferred a physical DVD disk over streaming video.
What missteps did the Netflix management make? In addition to misjudging the elasticity of demand, by failing to account for close substitutes, it seems they may have also misjudged customers' preferences and tastes. Yet, as the population increases, the preference for streaming video may overtake physical DVD disks. Netflix, the source of numerous late night talk show laughs and jabs in 2011, may yet have the last laugh.

Elasticity in labor and financial capital markets

The concept of elasticity applies to any market, not just markets for goods and services. In the labor market, for example, the **wage elasticity of labor supply**—that is, the percentage change in hours worked divided by the percentage change in wages—determines the shape of the labor supply

curve.
Elasticity of labor supply=%change in wage%change in quantity of labor supplied
The wage elasticity of labor supply for teenage workers is generally thought to be fairly elastic—a certain percentage change in wages will lead to a larger percentage change in the quantity of hours worked. On the other hand, the wage elasticity of labor supply for adult workers in their 30s and 40s is thought to be fairly inelastic. When wages move up or down by a certain percentage amount, the quantity of hours that adults in their prime earning years are willing to supply changes, but by a lesser percentage amount.
In markets for financial capital, the **elasticity of savings**—the percentage change in the quantity of savings divided by the percentage change in interest rates—determines the shape of the supply curve for financial capital.
Elasticity of savings=%change in interest rate%change in quantity of financial savings
Sometimes laws are proposed that seek to increase the quantity of savings by offering tax breaks so that the return on savings is higher. Such a policy will increase the quantity if the supply curve for financial capital is elastic because then a given percentage increase in the return to savings will cause a higher percentage increase in the quantity of savings.
However, if the supply curve for financial capital is highly inelastic, then a percentage increase in the return on savings will cause only a small increase in the quantity of savings.
The evidence supporting the supply curve of financial capital is controversial but, at least in the short run, the elasticity of savings with respect to the interest rate appears fairly inelastic.

Expanding the concept of elasticity

We've already looked at a variety of factors we can examine using the concept of elasticity. Let's take it even further—the elasticity concept doesn't even need to relate to a typical supply or demand curve at all!
For example, imagine that you are studying whether the Internal Revenue Service should spend more money on auditing tax returns. The question can be framed in terms of the elasticity of tax collections with respect to spending on tax enforcement; in other words, what is the percentage change in tax collections derived from a percentage change in spending on tax enforcement?
With all of the elasticity concepts that have just been described—some of which are listed below—the possibility of confusion arises.
When you hear the phrases “elasticity of demand” or “elasticity of supply”, they refer to the elasticity with respect to price. Sometimes, either to be extremely clear or because a wide variety of elasticities are being discussed, the elasticity of demand or the demand elasticity will be called the price elasticity of demand or the “elasticity of demand with respect to price”.
Similarly, elasticity of supply or the supply elasticity is sometimes called—to avoid any possibility of confusion—the price elasticity of supply or “the elasticity of supply with respect to price”. But in whatever context elasticity is invoked, the idea always refers to percentage change in one variable—almost always a price or money variable—and how it causes a percentage change in another variable—typically a quantity variable of some kind.
Income elasticity of demand=% change in income% change in Qd
Cross-price elasticityofdemand=%changeinpriceofgoodB%changeinQdofgoodA
Wage elasticity of labor supply=%changeinwage%changeinquantityoflaborsupplied
Wage elasticity of labor demand=%changeinwage%changeinquantityoflabordemanded
Interest rate elasticity of savings=%changeininterestrate%changeinquantityofsavings
Interest rate elasticity of borrowing=%changeininterestrate%changeinquantityofborrowing

Summary

- Elasticity is a general term, referring to percentage change of one variable divided by percentage change of a related variable that can be applied to many economic connections.

- Elasticity applies in labor markets and financial capital markets just as it does in markets for goods and services.
- *Cross-price elasticity of demand* is the percentage change in the quantity of good A that is demanded as a result of a percentage change in good B.

Self-check questions

What would the gasoline price elasticity of supply mean to UPS or FedEx?
[Show solution.]
It would mean the percentage change in quantity supplied as a result of a given percentage change in the price of gasoline.
Assume the average annual income rises from $25,000 to $38,000 and the quantity of bread consumed in a year by the average person falls from 30 loaves to 22 loaves. What is the income elasticity of bread consumption? Is bread a normal or an inferior good?
[Show solution.]

$$\%\text{ change in quantity demanded}\%\text{ change in income}=\frac{[(\text{change in quantity})/(\text{original quantity})]\times 100}{[(\text{change in income})/(\text{original income})]\times 100}=\frac{[22-30]/[(22+30)/2]\times 100}{[38{,}000-25{,}000]/[(38{,}000+25{,}000)/2]\times 100}=\frac{-8/26\times 100}{13/31.5\times 100}=-30.77\%$$

In this example, bread is an inferior good because its consumption falls as income rises.
Suppose the cross-price elasticity of apples with respect to the price of oranges is 0.4, and the price of oranges falls by 3%. What will happen to the demand for apples?
[Show solution.]
The formula for cross-price elasticity is percentage change in Q_d for apples divided by percentage change in P of oranges. Multiplying both sides by percentage change in P of oranges yields:

$$\%\text{ change in }Q_d\text{ for apples}=\text{cross-price elasticity}\times\%\text{ change in }P\text{ of oranges}$$

$$\%\text{ change in }Q_d\text{ for apples}=0.4\times(-3\%)=-1.2\%$$

There is a 1.2% decrease in demand for apples.

Review Questions

- What is the formula for the income elasticity of demand?
- What is the formula for the cross-price elasticity of demand?
- What is the formula for the wage elasticity of labor supply?
- What is the formula for elasticity of savings with respect to interest rates?

Critical-thinking questions

- Normal goods are defined as having a positive income elasticity. We can divide normal goods into two types: those whose income elasticity is less than one and those whose income elasticity is greater than one. Think about products that would fall into each category. Can you come up with a name for each category?
- Suppose you could buy shoes one at a time, rather than in pairs. What do you predict the cross-price elasticity for left shoes and right shoes would be?

[Attribution and references]

Attribution

This article is a modified derivative of "Elasticity in Areas Other Than Price by OpenStaxCollege,

References

Abkowitz, A. “How Netflix got started: Netflix founder and CEO Reed Hastings tells Fortune how he got the idea for the DVD-by-mail service that now has more than eight million customers.” CNN Money. Last Modified January 28, 2009. http://archive.fortune.com/2009/01/27/news/newsmakers/hastings_netflix.fortune/index.htm.
Associated Press (a). "Analyst: Coinstar gains from Netflix pricing moves.” Boston Globe Media Partners, LLC. Accessed June 24, 2013. http://www.boston.com/business/articles/2011/10/12/analyst_coinstar_gains_from_netflix_pricing_moves/.
Associated Press (b). “Netflix loses 800,000 US subscribers in tough 3Q.” ABC Inc. Accessed June 24, 2013. http://abclocal.go.com/wpvi/story?section=news/business&id=8403368
Baumgardner, James. “Presentation on Raising the Excise Tax on Cigarettes: Effects on Health and the Federal Budget.” Congressional Budget Office. 2014. Accessed March 27, 2015. http://www.cbo.gov/sites/default/files/45214-ICA_Presentation.pdf.
“Netflix, Inc. History.” Funding Universe. 2015. Accessed March 11, 2015. http://www.fundinguniverse.com/company-histories/netflix-inc-history/.
Laporte, Nicole. “A tale of two Netflix.” Fast Company. Accessed December 3, 2013. http://www.fastcompany-digital.com/fastcompany/20130708?pg=33#pg33
Liedtke, Michael and The Associated Press. “Investors bash Netflix stock after slower growth forecast - fee hikes expected to take toll on subscribers most likely to shun costly bundled Net, DVD service.” *The Seattle Times*. Accessed June 24, 2013 from NewsBank on-line database (Access World News).
“A Quick Update On Our Streaming Plans And Prices.” Netflix. 2013. Accessed March 11, 2015. http://blog.netflix.com/2014/05/a-quick-update-on-our-streaming-plans.html.
Organization for Economic Co-Operation and Development (OECC). n.d. “Average annual hours actually worked per worker.” Accessed March 11, 2015. https://stats.oecd.org/Index.aspx?DataSetCode=ANHRS.
Savitz, Eric. “Netflix Warns DVD Subs Eroding; Q4 View Weak; Losses Ahead; Shrs Plunge.” Forbes.com. 2011. Accessed December 3, 2013. http://www.forbes.com/sites/ericsavitz/2011/10/24/netflix-q3-top-ests-but-shares-hit-by-weak-q4-outlook/.
“Coffee Export Volumes Worldwide in November 2014, by Leading Countries (in 60-kilo sacks).” Statistica.com. 2014. Accessed March 27, 2015. http://www.statista.com/statistics/268135/ranking-of-coffee-exporting-countries/.
Stone, Marcie. “Netflix responds to customers angry with price hike; Netflix stock falls 9%.” News & Politics Examiner. 2011. Accessed June 24, 2013. http://www.examiner.com/article/netflix-responds-to-customers-angry-with-price-hike-netflix-stock-falls-9.
Weinman, J. "Die Hard, Hardly Dying." Maclean's, 2011, 44.
“Gross Savings (% of GDP).” The World Bank Group. 2015. Accessed March 11, 2015. http://data.worldbank.org/indicator/NY.GNS.ICTR.ZS.
Yahoo Finance. http://finance.yahoo.com/q?s=NFLX.