

# Understanding and Using Demand and Supply Curves

price determination in perfectly competitive markets

**Miles Corak**

Department of Economics, and Stone Center on Socio-Economic Inequality  
The Graduate Center, City University of New York

[MilesCorak.com](http://MilesCorak.com) [@MilesCorak](https://twitter.com/MilesCorak)

**Block 2**

Economics for Everyone

Lecture 6

# Motivation

# Price determination in perfectly competitive markets

## The Theory of Value

What determines the rate at which one good will exchange for another, or in other words, the price of one good in terms of another?

- Prices are determined in an institution called “the market”, which brings buyers and sellers of goods and services together to determine how much is traded and at what rate goods exchange.
- a “relative” price
- buyers and sellers have conflicting interests
  - how do markets work?
  - can they be manipulated for the benefit of some, and to the detriment of others?

## Objectives for this block of classes

1. Understand the neoclassical theory of value
  - in a perfectly competitive market
  - only hint at other market structures
2. Apply our understanding
  - commodity markets
  - public policy directed to producers in these markets
3. Market failure as a rationale for public policy
  - “efficient” outcomes in perfectly competitive markets
  - public policy directed to externalities and other market failures

# Objectives for this block of classes

1. Understand the neoclassical theory of value
  - in a perfectly competitive market
  - In *Principles of Economics*, first published in 1890, Alfred Marshall wrote:

*We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether value is governed by utility or cost of production.*

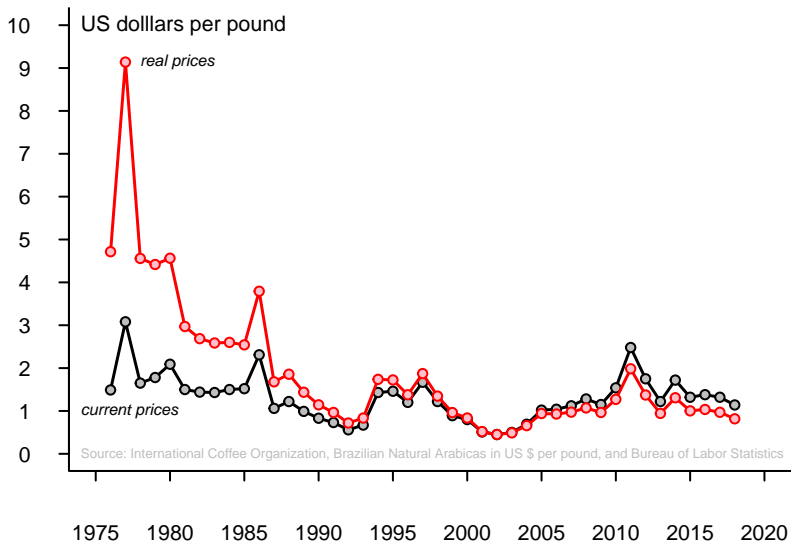
Source: Alfred Marshall (1920), *Principles of Economics*, Eighth Edition. London: MacMillan and Co., Book V, Chapter III, page 348.

## A couple of motivating examples

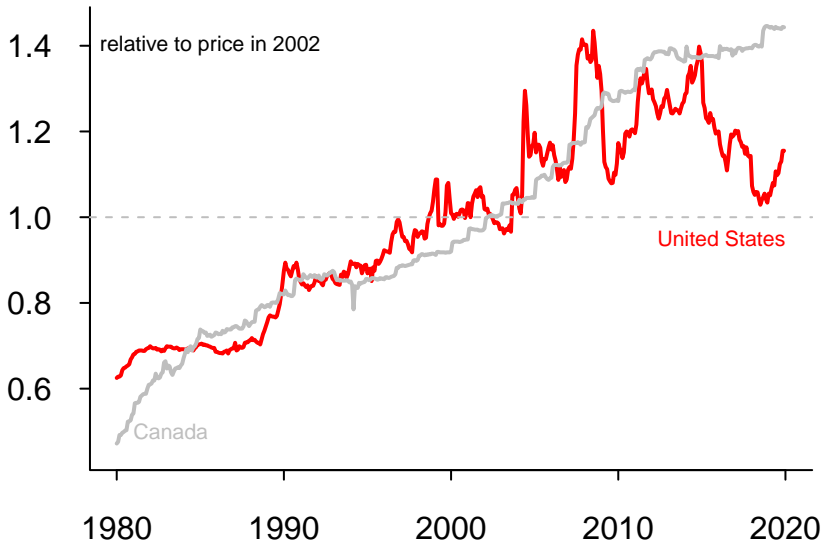
Two goods that go together to make up my favourite drink

1. Is coffee traded at a “fair” price
  - prices are highly variable over short periods of time
  - prices tended to trend downward over longer periods of time
2. Is milk?
  - prices are not that variable
  - prices trend upward through time
  - though both these patterns are different across countries

## Coffee prices on the international market: current and real



## Milk prices: domestic consumer prices (monthly since 1980)





# Elasticity

## A definition of 'Elasticity'

“Elasticity” refers to the relationship between a **dependent** variable and an **independent** variable

- if we are talking about the demand curve, then from the consumer's perspective, price is the independent variable, and the quantity demanded is the dependent variable
- but this is a general concept between any two dependent and independent variables
- a synonym of elasticity would be “responsiveness”, but elasticity carries a more specific meaning

## A definition of 'Elasticity'

In *Principles of Economics*, Alfred Marshall also wrote:

*We have seen that the only universal law as to a person's desire for a commodity is that it diminishes, other things being equal, with every increase in his supply of that commodity. But this diminution may be slow or rapid. If it is slow the price that he will give for the commodity will not fall much in consequence of a considerable increase in his supply of it; and a small fall in price will cause a comparatively large increase in his purchases. But if it is rapid, a small fall in price will cause only a very small increase in his purchases. In the former case his willingness to purchase the thing stretches itself out a great deal under the action of a small inducement: the elasticity of his wants, we may say, is great. In the latter case the extra inducement given by the fall in price causes hardly any extension of his desire to purchase: the elasticity of his demand is small.*

Source: Alfred Marshall (1920), *Principles of Economics*, Eighth Edition. London: MacMillan and Co., Book III, Chapter IV, page 102.

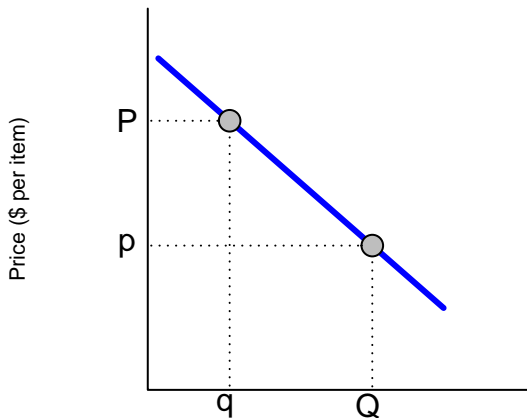
## A definition of 'Elasticity'

“Elasticity” refers to the relationship between a **dependent** variable and an **independent** variable

**definition:** the percentage change in the dependent variable for a given percentage change in the independent variable

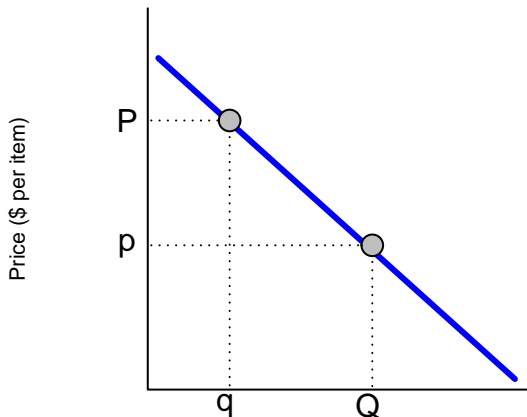
- alternatively, the relative difference in the dependent variable divided by the relative difference in the independent variable
- the reason we focus on percentage (or relative) differences is because our measure of “responsiveness” will not be influenced by the units we use to measure the variables

The slope of the demand curve depends on the unit of measurement



Quantity (number of items consumed per time period)

The elasticity varies along a straight line demand curve even if slope stays the same



Quantity (number of items consumed per time period)

## A definition of 'Elasticity'

using the notation in the previous picture for an decrease in price from  $P$  to  $p$  that is associated with an increase in quantity from  $q$  to  $Q$

$$\text{slope} = \frac{(q - Q)}{(P - p)}$$

$$\text{elasticity} = \frac{(q - Q)/q}{(P - p)/P}$$

*Note the peculiar way that economics in the Anglo-British tradition depicts the demand and supply curves, with the independent variable, price, on the vertical axis rather than following the usual mathematical convention of placing it on the horizontal axis. This is also Alfred Marshall's legacy!*

# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of demand for a good or service? What are the factors that determine the price elasticity of supply?



# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of demand for a good or service?

1. “degree of commodity classification”
  - the more narrowly defined the commodity, the higher the elasticity
  - the classification will depend upon the purpose of our analysis
  - the price elasticity of:
    - Brazilian Natural Arabica coffee beans will be higher
    - than the price elasticity of coffee beans,
    - which will be higher than the price elasticity of caffeinated beverage products,
    - which will be higher than beverage products

# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of demand for a good or service?

1. “degree of commodity classification”
2. nature of the commodity
  - if there are no close substitutes, the price elasticity of demand will be low
  - the quantities demanded of necessities of life, for example, are relatively constant not withstanding changes in price

# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of demand for a good or service?

1. “degree of commodity classification”
2. nature of the commodity
3. proportion of the consumers’ budget accounted for by the commodity
  - the higher this proportion, the higher the impact of the price change on the ability to purchase as the change can influence the purchasing power

# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of demand for a good or service?

1. “degree of commodity classification”
2. nature of the commodity
3. proportion of the consumers' budget accounted for by the commodity
4. length of time
  - the longer the time period to adjust to price differences, the larger the price elasticity of demand
    - time is needed change habits, get information about alternatives
    - but also to make necessary physical changes

# What determines the elasticity of demand and of supply?

## Question 1 of the assignment

What are the factors that determine the price elasticity of supply?

1. short periods of time imply a small elasticity
  - in the limit the supply might be limited to the existing stocks of the good, and the current rate of production
2. perishable commodities will be inelastic over short time frames, but commodities that can be stored will be more elastic and influenced by expectations of future prices
3. the longer the period of time, the greater the price elasticity of supply
  - changes in the rate of production from the existing production facilities are associated with “short period” supply curves, capital is fixed over this period
  - changes in the production facilities are associated with “long period” supply curves, capital is variable over this period

## Some examples by way of explanation

## Characterizing the elasticity of demand

### Question 2 of the assignment

2. You are told that when the price of a commodity is reduced from \$20 to \$19, the total expenditure per week is increased from \$200,000 to \$228,000. Is the demand for this commodity in this price range, elastic or inelastic? Give a reason for your answer and calculate the price elasticity of demand from the provided information.

## Characterizing the elasticity of demand

### Question 2 of the assignment

1. We speak of a price “elastic” or a price “inelastic” demand depending upon the impact a change in price has on total expenditures
  - the dividing line between them is “unit elasticity,” when the price elasticity equals one

Price elasticity	Change in total expenditures
	<i>(for a price fall)</i>
less than 1	decrease
equal to 1	stay the same
greater than 1	increase



# Characterizing the elasticity of demand

## Question 2 of the assignment

1. We speak of a price “elastic” or a price “inelastic” demand depending upon the impact a change in price has on total expenditures
2. So we know immediately that the demand for the commodity is “elastic” as opposed to “inelastic”: prices went down, but total expenditures went up
  - a fall in prices would imply that total expenditures would fall for the same amount purchased
  - but the quantity purchased not only increases, it increases proportionately more than the decrease in prices
  - sidebar: this is why I end up spending more money on groceries when I shop at Trader Joe's. I find the prices reasonable, and buy so much more of everything that my weekly grocery expenditures are higher.

## Characterizing the elasticity of demand

### Question 2 of the assignment

The final part of the question asks us to calculate the price elasticity of demand.

The formula is:

$$\text{elasticity} = \frac{(q - Q)/q}{(P - p)/P}$$

We know the bottom part of this:  $\frac{(20-19)}{20} = \frac{1}{20}$ .

## Characterizing the elasticity of demand

### Question 2 of the assignment

The final part of the question asks us to calculate the price elasticity of demand.

The top part we can derive from expenditures. Total expenditure is just  $Price \times Quantity$  and from this we can find the initial and new quantity, and then find the relative change

- initial quantity is 10,000

$$\begin{aligned} \text{expenditures} &= P \times q \\ q &= \frac{\text{expenditures}}{P} \\ &= \frac{200,000}{20} \\ &= 10,000 \end{aligned}$$

## Characterizing the elasticity of demand

### Question 2 of the assignment

The final part of the question asks us to calculate the price elasticity of demand.

- initial quantity is 10,000
- final quantity is 12,000, calculated as

$$\begin{aligned} \text{expenditures} &= p \times Q \\ Q &= \frac{\text{expenditures}}{p} \\ &= \frac{228,000}{19} \\ &= 12,000 \end{aligned}$$

## Characterizing the elasticity of demand

### Question 2 of the assignment

The final part of the question asks us to calculate the price elasticity of demand.

$$\begin{aligned} \text{elasticity} &= \frac{(q - Q)/q}{(P - p)/P} \\ &= \frac{(10,000 - 12,000)/10,000}{(20 - 19)/20} \\ &= \frac{-2,000/10,000}{1/20} \\ &= -\frac{1/5}{1/20} \\ &= -\frac{0.2}{0.05} \\ &= -4 \end{aligned}$$

# Characterizing the elasticity of demand

## Other important elasticities

Since an elasticity is a relationship between a dependent and an independent variable, we can also address other causes of the quantity demanded

1. Cross-price elasticities of demand
2. Income elasticities of demand

# Characterizing the elasticity of demand

## Other important elasticities

### 1. Cross-price elasticities of demand

- used to characterize the relationship between the prices of other goods or services and the quantity demanded of a particular good
- substitutes
  - a positive cross-price elasticity
  - two goods are said to be substitutes if an increase in the price of one leads to an increase in the demand for the other
- complements
  - a negative cross-price elasticity
  - two goods are said to be substitutes if an increase in the price of one leads to a decrease in the demand for the other

# Characterizing the elasticity of demand

## Other important elasticities

1. Cross-price elasticities of demand
2. Income elasticities of demand
  - used to characterize the relationship between income and the quantity demanded of a particular good
  - inferior goods
    - a negative income elasticity of demand
    - a good or service is said to be inferior if an increase in the consumer's income lowers the quantity demanded



# Characterizing the elasticity of demand

## Other important elasticities

1. Cross-price elasticities of demand
2. Income elasticities of demand
  - used to characterize the relationship between income and the quantity demanded of a particular good
  - inferior goods
  - normal goods
    - a positive income elasticity
    - a good or service is said to be normal if an increase in the consumer's income increases the quantity demanded
    - a good or service is said to be a luxury if its income elasticity of demand is greater than one, and a necessary good if it is positive but less than one

# Explaining price fluctuations in the coffee market

## Question 3 of the assignment

3. Per capita coffee consumption during the first three months of a particular year was reported to have dropped to 3 pounds from 3.6 pounds during the same period in the previous year. Retail prices of coffee were 81 per cent higher than they had been in the previous year.
  - Calculate the price elasticity of demand on the basis of this information.
  - Why might this not be a good estimate of the price elasticity of demand for coffee?
  - Use demand and supply curves to explain why the price of coffee tends to be so variable, sometimes rising sharply and falling just as sharply within short periods of time, and why it has trended downward over the decades.

## Explaining price fluctuations in the coffee market

### Question 3 of the assignment

- Calculate the price elasticity of demand - Using the formula for the elasticity:

$$\begin{aligned} \text{elasticity} &= \frac{(q - Q)/q}{(P - p)/P} \\ &= \frac{(3 - 3.6)/3}{0.81} \\ &= \frac{-0.6/3}{0.81} \\ &= -\frac{0.2}{0.81} \\ &= -0.25 \end{aligned}$$

imply that the demand for this commodity is rather inelastic

# Explaining price fluctuations in the coffee market

## Question 3 of the assignment

- Why might this not be a good estimate of the price elasticity of demand for coffee?

# Explaining price fluctuations in the coffee market

## Question 3 of the assignment

- Why might this not be a good estimate of the price elasticity of demand for coffee?
  - think about the determinants of the elasticity of demand
  - the time frame is three months + this may not be long enough to allow habits to change + if this is expected to be a permanent increase in price, then over longer periods of time we might expect consumers to be more responsive as they break their habits, use less coffee, or seek out and get accustomed to alternatives

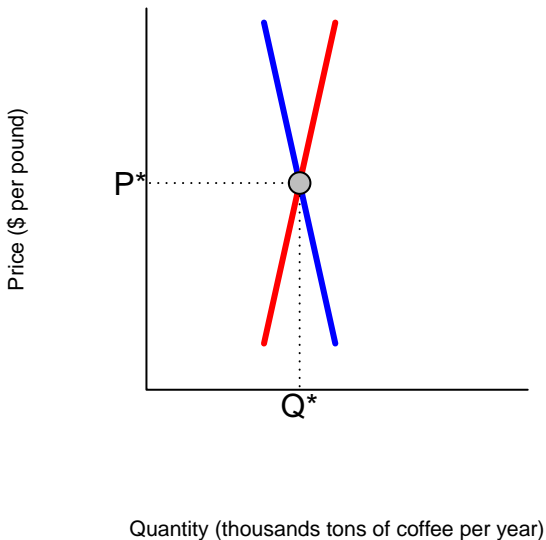
# Explaining price fluctuations in the coffee market

## Question 3 of the assignment

- Use demand and supply curves to explain why the price of coffee tends to be so variable, sometimes rising sharply and falling just as sharply within short periods of time, and why it has trended downward over the decades.
  - okay, we've practiced riding our bicycle, we have all the vocabulary, and now the grammar to tell a story
  - so let's use our model to explain price movements in the data
  - given our understanding of the coffee market we can expect + consumer demand to be relatively inelastic over a short period + producer supply to also be relatively inelastic + so when a temporary shock hits this market, the adjustment will mostly be on prices rather than on quantities, prices will have a lot of short term variability in response to changes in exogenous factors

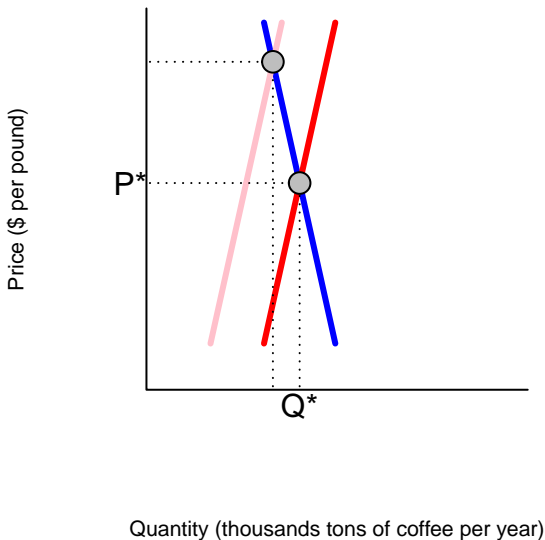
# Explaining price fluctuations in the coffee market

## Question 3 of the assignment



# Explaining price fluctuations in the coffee market

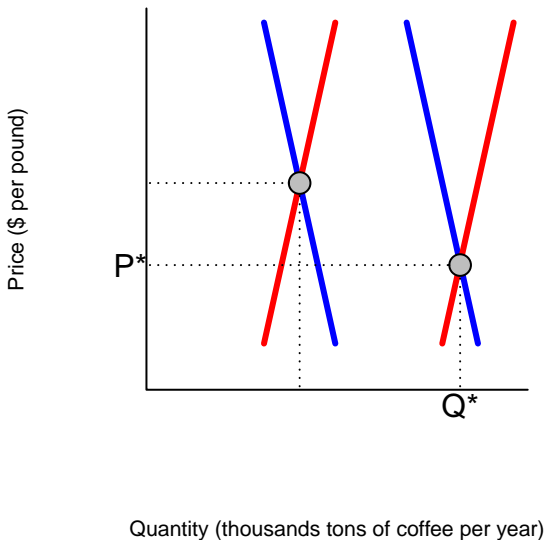
Question 3 of the assignment, with a negative supply shock





# Explaining price fluctuations in the coffee market

## Question 3 of the assignment, with trends



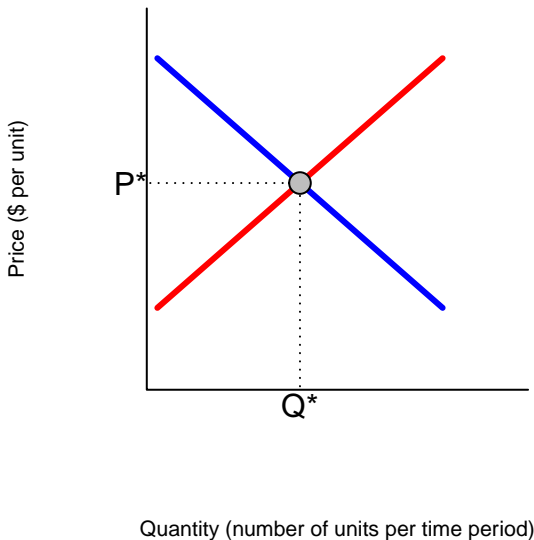
# The incidence of a specific tax

## Question 4 of the assignment

4. Use demand and supply curves to analyse the impact of a specific tax of say  $\$t$  per unit of a commodity sold in a perfectly competitive market.
  - Explain the impact on the price and quantity exchanged in the new equilibrium.
  - Explain the difference between the legal and the economic incidence of the tax.
  - Illustrate a situation in which price would not change in the new equilibrium; illustrate a situation in which quantity would not change. Offer an explanation in each case and illustrate whether it is consumers or producers who pay the tax.

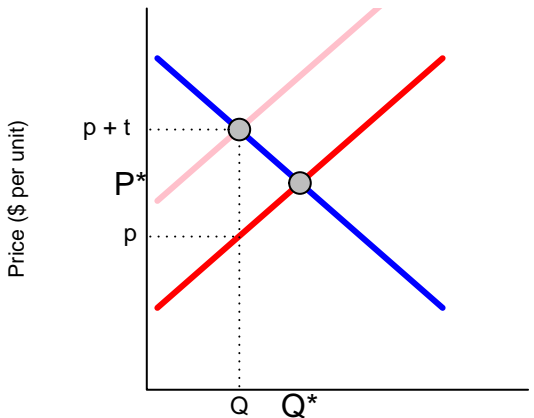
## The incidence of a specific tax

Question 4 of the assignment, impact of a specific tax



## The incidence of a specific tax

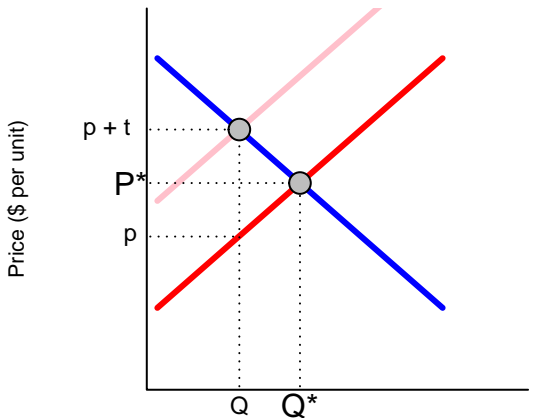
Question 4 of the assignment, impact of a specific tax



Quantity (number of units per time period)

## The incidence of a specific tax

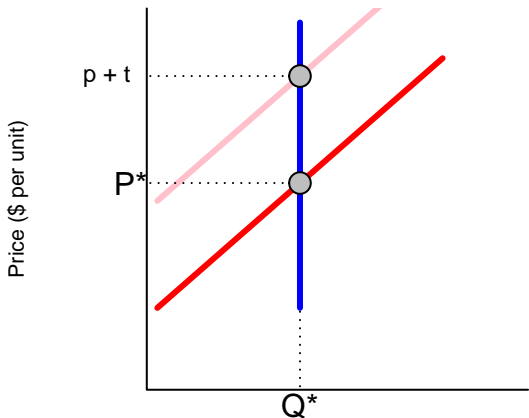
Question 4 of the assignment, impact of a specific tax



Quantity (number of units per time period)

## The incidence of a specific tax

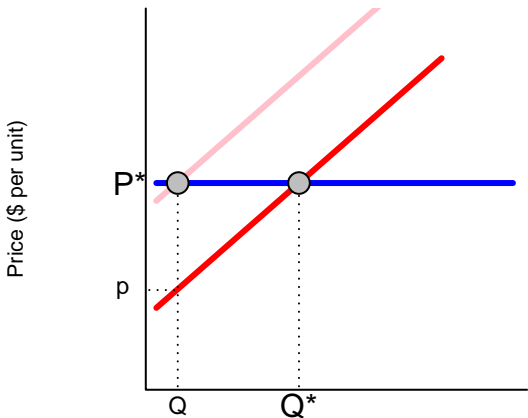
Question 4 of the assignment, perfectly inelastic demand



Quantity (number of units per time period)

## The incidence of a specific tax

Question 4 of the assignment, perfectly elastic demand



Quantity (number of units per time period)

# Influencing price in perfectly competitive markets



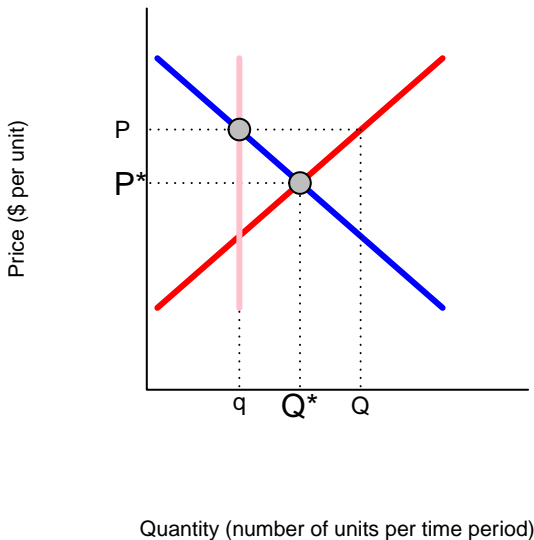
## Agriculture support programs

### Question 5 of the assignment

5. Compare the outcome of a perfectly competitive market to three alternative agricultural support programs: (i) quotas; (ii) a price-support program; (iii) deficiency payments.
  - Compare the effects of each of these programs on:
    - price;
    - quantity purchased by consumers;
    - gross incomes of suppliers;
    - financial cost to the government. (Assume that the goods purchased by the government under the price-support program are disposed of at zero cost.)
  - Explain which program, if any, you would recommend to the following constituents:
    - producers of the commodity;
    - consumers of the commodity;
    - a social planner interested the well being of all citizens.

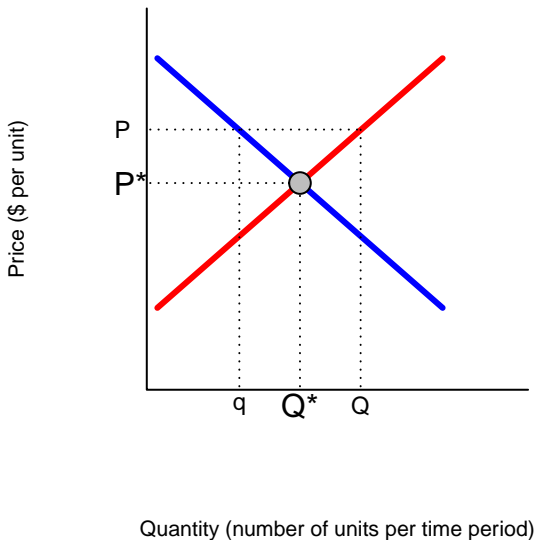
# Depicting quotas with demand and supply curves

an enforceable limit placed on the amount each supplier can sell



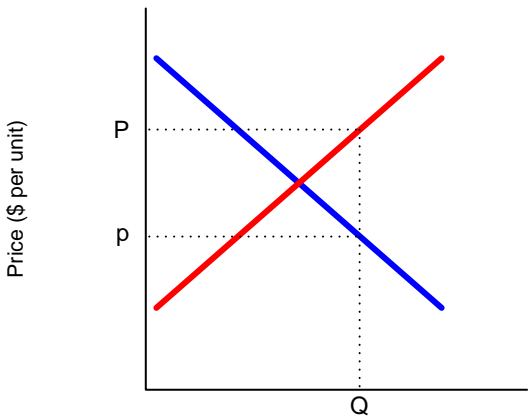
# Depicting price supports with demand and supply curves

government purchases to support a particular price



## Depicting deficiency payments

government subsidies offering suppliers a price guarantee



Quantity (number of units per time period)

Next class

## Class on April 1<sup>st</sup> completes Block II

1. Complete our discussion of influencing price in perfectly competitive markets
  - understand who benefits from each program and the social costs
  - use our models to understand the price of milk
  - possibly examine other examples, like the price of oil
2. Market failures and government intervention
  - “externalities,” “public goods,” and the design of policy
3. Class assignment
  - distributed by email, so a confirmation of receipt is needed
  - due by return email to arrive by noon on April 22nd
4. Notice of book review topics due by April 21st