Lecture 1: Supply and Demand

Fall 2025

University of British Columbia

ECON301 Intermediate Micro I

How does this lecture fit?

We begin with some familiar concepts from your ECON101: supply, demand, equilibrium, and elasticities. The same material will be studied with algebra and calculus in addition to graphs.

This serves as a motivation for the whole course. We will spend a lot of time in developing a theory to explain how demand and supply curves arise from individual decision making, from economic agents (firms and consumers) maximizing their objectives subject to certain constraints.

Outline

I. Consumer Theory

II. Producer Theory

III. Competitive Markets

III.0 Supply and Demand

IV. Market Failure

Motivation: Carbon Tax

In 2008, BC implemented North America's first broad-based carbon tax.

The federal government in Canada implemented a coordinated nation-wide carbon price in 2019. In BC, the rate is scheduled to increase to $50 per tonne on April 1, 2022. It was eliminated nationwide on April 1, 2025.

Revenues generated from increasing the carbon tax will be used to

- Provide carbon tax relief and protect affordability
- Maintain industry competitiveness
- Encourage new green initiatives

Did it make a difference? Can it make a difference?

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- disrupt feedback loops that fuel rising home prices;
- reduce inequalities, including between renters/owners and younger/older Canadians;
- attract savings and credit towards economic activity outside of the housing sector, and produce more jobs and innovation.

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How Do We Examine Such Issues?

We need to distinguish two types of questions.

Normative questions involve value judgments–"Should we raise taxes?" "Should we rely on sales or income taxes?" Economics alone cannot address such questions.

We will focus on positive questions–"What would happen if we do?"

Two types of answers to positive questions: qualitative (yes or no) and quantitative (how much).

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Why Is This Economics?

Traditional view of economics: the study of prices and markets, or more generally of resource allocation.

Modern view of economics: the study of human behavior, distinguished by its method rather than its subject of inquiry.

Consistent with this view, we always start with models of individual behavior.

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Microeconomic Modelling

Models are abstract from complexities of the real world trying to capture the "essentials."

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Example: Coase Theorem

Theorem

If transaction costs are sufficiently low, bargaining will lead to an efficient outcome, regardless of how the initial ownership is assigned and whether there is an externality.

- Coase himself admitted that real-world transaction costs are rarely low enough to allow for efficient bargaining.
- The theorem is nevertheless very influential among economists and lawyers in thinking about law and economics.

Example: Arrow-Debreu Model

> *"It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own self-interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages."*
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> — *Adam Smith, The Wealth of Nations*

Somehow an "invisible hand" brings coordination of selfish individuals.

Theorem (First Welfare Theorem)

Competitive equilibria are efficient.

Theorem (Second Welfare Theorem)

Any efficient outcome can be achieved as a competitive equilibrium by rearranging endowment.

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Variables, Parameters, and Comparative Statics

- Variables that have values that are determined as a result of the workings of the model are endogenous variables.
- Variables that have values that are taken as given in the model are exogenous variables. They are also called parameters.

Comparative statics analysis aims to understand how changes in parameter values affect conclusions from the model, including values of endogenous variables.

A Model of Choice

There's a choice that we have to make as people, as individuals. If you want to be great at something there is a choice you have to make. We can all be masters at our craft, but you have to make a choice. What I mean by that is, there are inherent sacrifices that come along with that — family time, hanging out with your friends, being a great friend. being a great son, nephew, whatever the case may be. There are sacrifices that come along with that.

— Kobe Bryant

Three Basic Ingredients of Economic Models

We rely throughout on a model of behavior built on three ingredients:

- Constraints: “what individuals have”
- Preferences: “what is the best for them”
- Optimization: “people doing the best with what they have”

An example of Comparative statics: examine how consumers/firms respond to changes in their opportunity sets (often due to changes in parameters values.

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Demand

The demand function for a good or service describes the mathematical correspondence between quantity demanded for the good or service, its price, the prices of substitutes and complements, consumers' income, and other factors that influence demand.

A demand curve describes how the demand for a good changes as its own price varies, holding all other factors fixed.

Move along demand curve vs shift of demand curve

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Example: Demand for Coffee

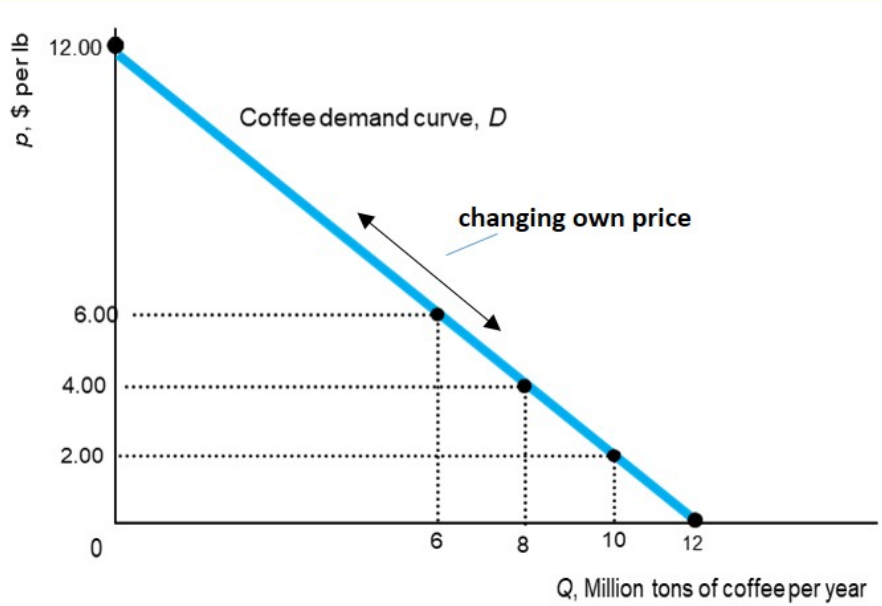
It varies with coffee price p, sugar price p_s, and consumers' income I:

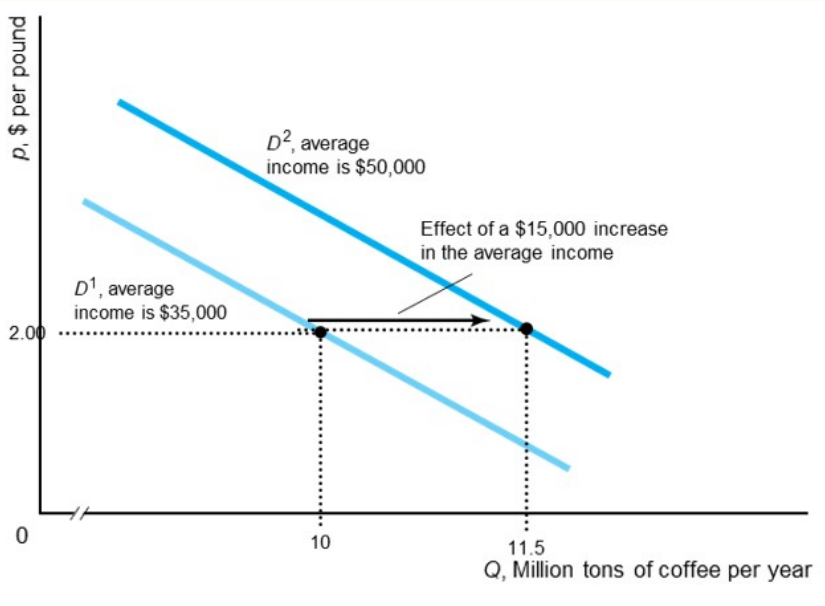
$$Q = D(p, p_s, I) = 8.56 - p - 0.3p_s + 0.1I$$

Demand curve for coffee

$$Q = 8.56 - p - 0.3 \times 0.2 + 0.1 \times 35 = 12 - p$$

But usually we draw the inverse demand curve:





Supply

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A supply curve describes how the quantity supplied varies with own price, holding all other factors fixed.

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Example: Coffee Supply

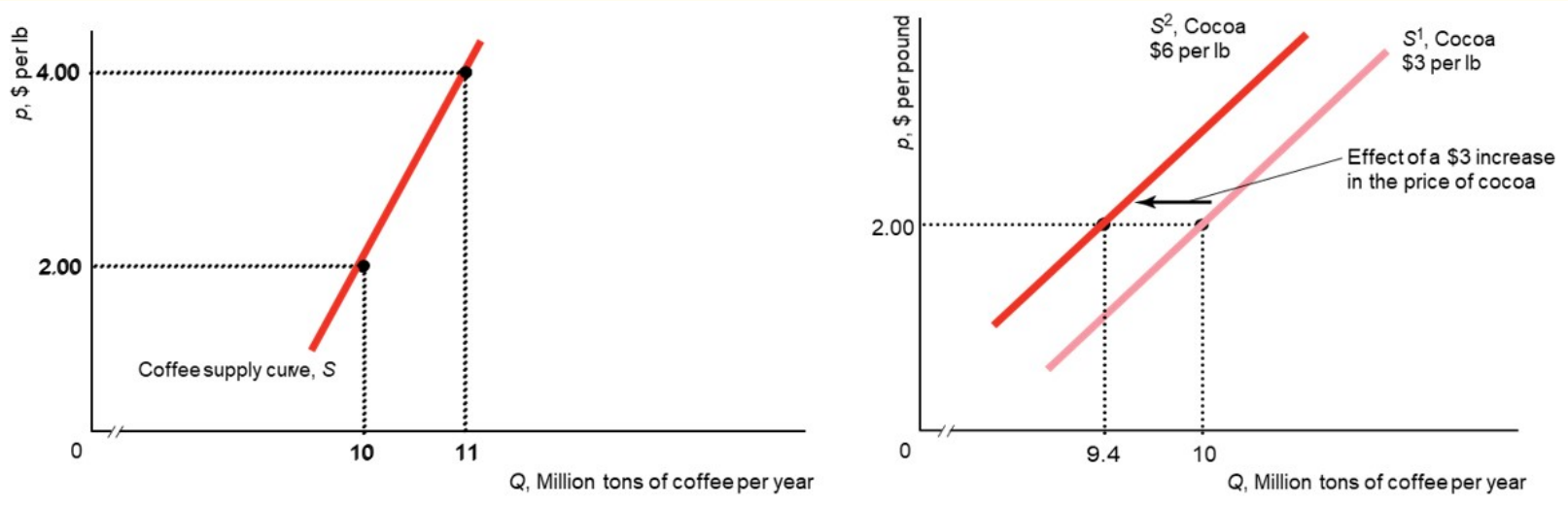
It depends on coffee price p and the price of cocoa p_c:

$$Q = S(p, p_c) = 9.6 + 0.5p - 0.2p_c$$

The supply curve for coffee is

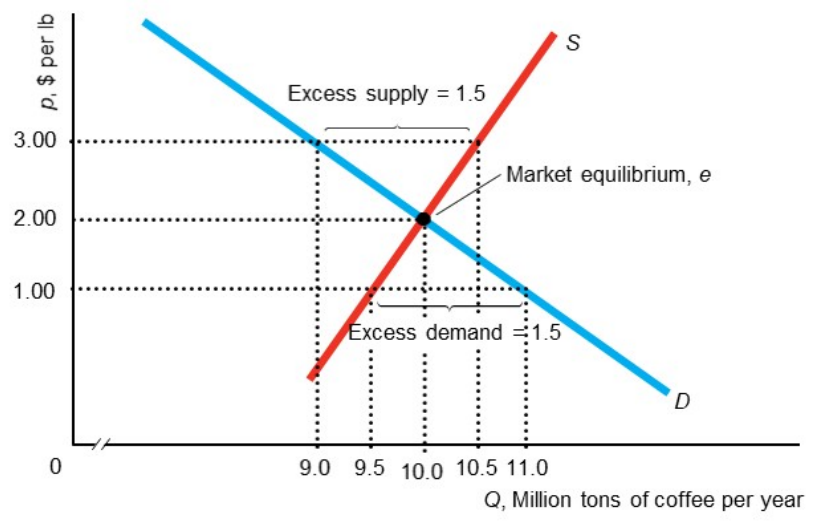
$$Q = 9.6 + 0.5p - 0.2 \times 3 = 9 + 0.5p$$

Similarly, we usually draw inverse supply curve:



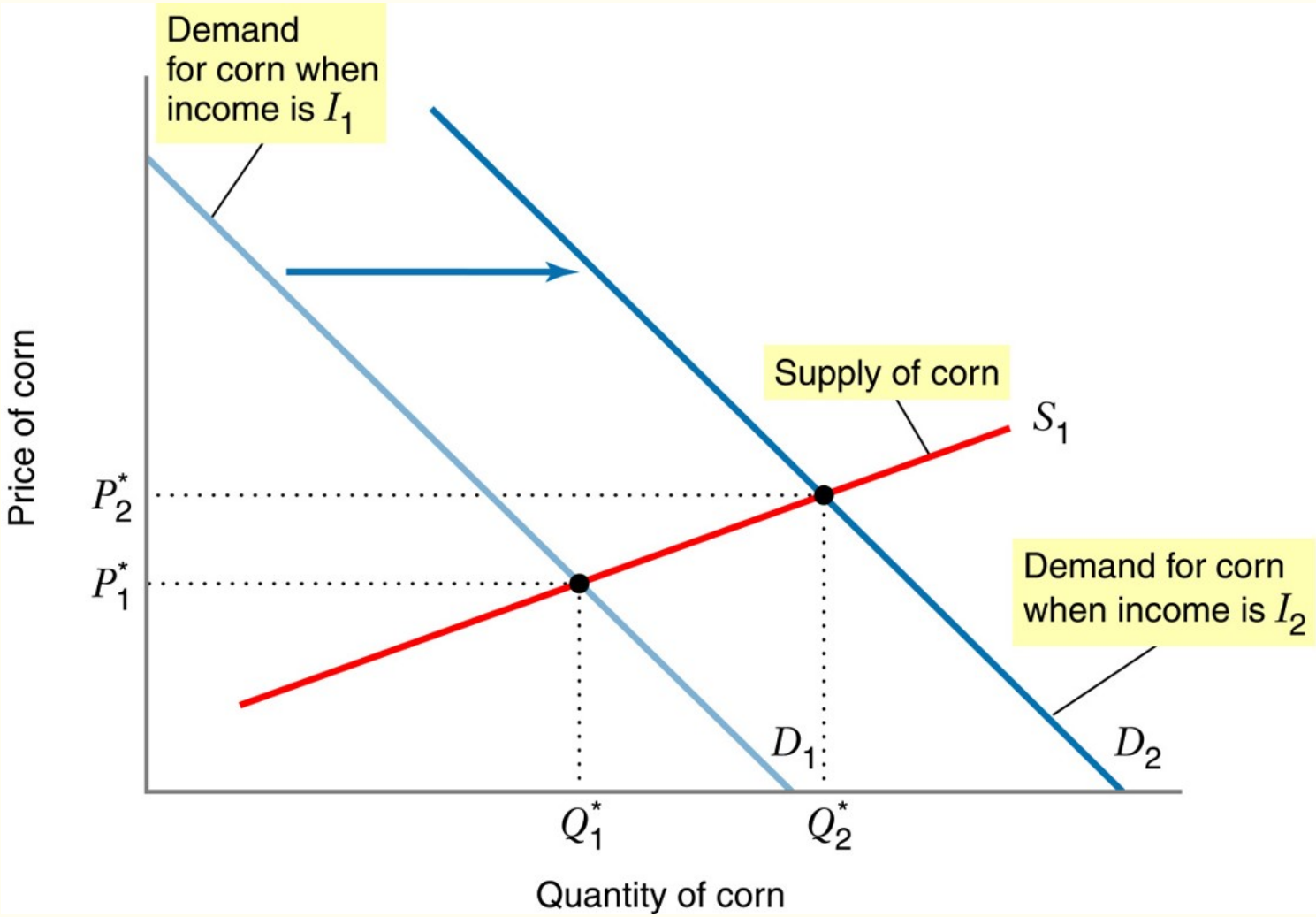
Competitive Market Equilibrium

Both consumers and producers are price-takers. The (aggregate) demand curve and the supply curve jointly determine equilibrium price and quantity:

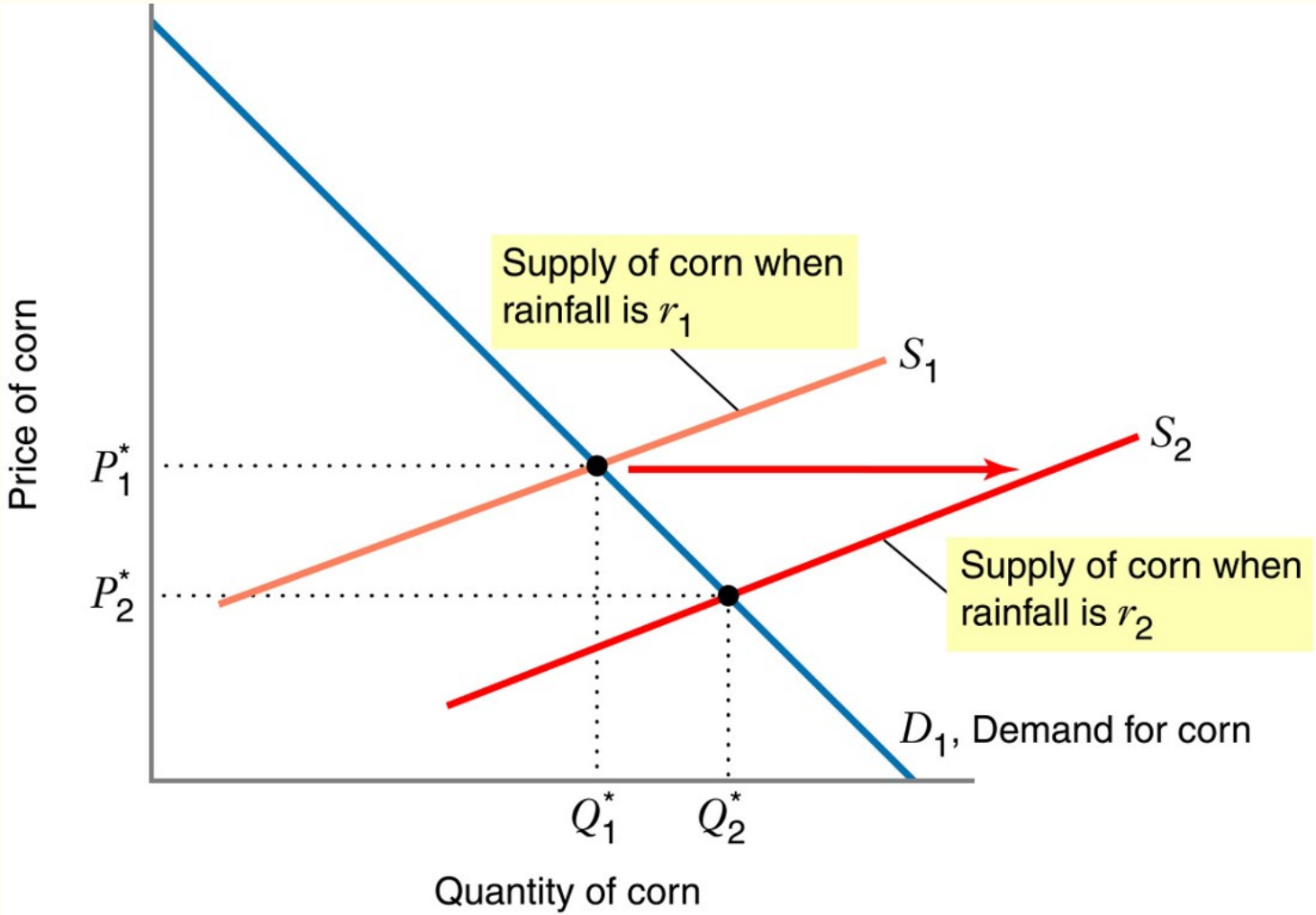


Price ceiling of $1 \Rightarrow$ excess demand; price floor of $3 \Rightarrow$ excess supply.

Comparative Statics: Increase in Income



Comparative Statics: Increase in Rainfall



Price Elasticities

Consider demand $D_1(p_1, p_2, I)$ for good 1.

Suppose we increase p_1.

- How does the demand change?
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Why Is This Important?

Consider the following example.

The United States has a relatively large fraction of its population in prison, partly as a result of the war on drugs. One possible policy response is to decriminalize or legalize drugs (e.g., the legalization of Marijuana in Canada).

The result is expected to be

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2. An increase in consumption.
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How Responsive Is Demand to Price Changes?

Is the slope $\partial D_1/\partial p_1$ of demand $D_1(p_1, p_2, I)$ a good measure?

The price elasticity of demand (ε) is defined as the percent change in quantity divided by the percent change in price.

It can be own price elasticity:

$$\varepsilon_{11} = \frac{\Delta D_1/D_1}{\Delta p_1/p_1} = \frac{\partial D_1}{\partial p_1}\frac{p_1}{D_1},$$

or cross price elasticity:

$$\varepsilon_{12} = \frac{\Delta D_1/D_1}{\Delta p_2/p_2} = \frac{\partial D_1}{\partial p_2}\frac{p_2}{D_1}.$$

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How Does Expenditure Respond to Price Change?

How to use elasticities? How does total expenditure depend on price?

$$\begin{aligned}\frac{\partial\left[p_1 D_1(p_1,p_2,I)\right]}{\partial p_1} &= D_1 + p_1\frac{\partial D_1}{\partial p_1}\\ &= D_1\left[1+\frac{p_1}{D_1}\frac{\partial D_1}{\partial p_1}\right]\\ &= D_1\left(1+\varepsilon\right)\end{aligned}$$

- $|\varepsilon| > 1$ (elastic): price and expenditure move in the opposite directions.
- $|\varepsilon| = 1$ (unit elastic): expenditure does not move as price changes.
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Table 7.2. Estimated elasticities (absolute values) for common products.[a]

Product	$\lvert\epsilon(p)\rvert$
Inelastic	
Salt	0.1
Matches	0.1
Toothpicks	0.1
Airline travel, short-run	0.1
Gasoline, short-run	0.2
Gasoline, long-run	0.7
Residential natural gas, short-run	0.1
Residential natural gas, long-run	0.5
Coffee	0.25
Fish (cod) consumed at home	0.5
Tobacco products, short-run	0.45
Legal services, short-run	0.4
Physician services	0.6
Taxi, short-run	0.6
Automobiles, long-run	0.2
Approximately unit elasticity	
Movies	0.9
Housing, owner occupied, long-run	1.2
Shellfish, consumed at home	0.9
Oysters, consumed at home	1.1
Private education	1.1
Tires, short-run	0.9
Tires, long-run	1.2
Radio and television receivers	1.2
Elastic	
Restaurant meals	2.3
Foreign travel, long-run	4
Airline travel, long-run	2.4
Fresh green peas	2.8
Automobiles, short-run	1.2–1.5
Chevrolet automobiles	4
Fresh tomatoes	4.6

What about the Market for Illegal Drugs?

From a study of a Dutch government monopoly in opium in the Dutch East Indies (van Ours, 1995, https://www.jstor.org/stable/2138640):

"... short-term price elasticities of opium consumption are about -0.7 and long-term price elasticities about -1.0."

From a study of drug use in the United States (https://doi.org/10.1111/j.1465-7295.1999.tb01439.x):

"The estimated price elasticities for alcohol, cocaine, and heroin are, respectively, $-.30$, $-.28$ and $-.94$."

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How Does Revenue Respond to Price Change?

Price elasticity of supply can be used to calculate the impact of a price increase on the revenue of a supplier.

$$\begin{aligned}\frac{\partial\left[p_1 S_1(p_1,p_2,I)\right]}{\partial p_1} &= S_1 + p_1\frac{\partial S_1}{\partial p_1} \\ &= S_1\left[1+\frac{p_1}{S_1}\frac{\partial S_1}{\partial p_1}\right] \\ &= S_1\left(1+\eta\right)\end{aligned}$$

- Since $\eta > 0$, price and revenue always move in the same direction.

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Tax Incidence: How Is Tax Burden Shared?

Suppose the government collects unit tax t from sellers.

- Equilibrium price p is a function of t, determined by

$$D\left(p\left(t\right)\right) = S\left(p\left(t\right) - t\right)$$

- Differentiating with respect to t yields

$$\frac{dD}{dp}\frac{dp}{dt} = \frac{dS}{dp}\left(\frac{dp}{dt} - 1\right)$$

- Thus (ε and η are demand and supply elasticity)

$$\frac{dp}{dt} = \frac{\frac{dS}{dp}}{\frac{dS}{dp} - \frac{dD}{dp}} = \frac{\frac{dS}{dp}\frac{p}{S}}{\frac{dS}{dp}\frac{p}{S} - \frac{dD}{dp}\frac{p}{S}} = \frac{\eta}{\eta - \varepsilon} > 0$$

- Share of tax burden is $\eta/(\eta - \varepsilon)$ on consumers and $-\epsilon/(\eta - \varepsilon)$ on sellers.

Does It Matter From Whom Tax Is Collected?

Suppose the government collects unit tax t from consumers.

- Equilibrium price p is a function of t, determined by

$$D\left(p\left(t\right)+t\right)=S\left(p\left(t\right)\right)$$

- Differentiating with respect to t yields

$$\frac{dD}{dp}\left(\frac{dp}{dt}+1\right)=\frac{dS}{dp}\frac{dp}{dt}$$

- Thus

$$\frac{dp}{dt}=\frac{\frac{dD}{dp}}{\frac{dS}{dp}-\frac{dD}{dp}}=\frac{\frac{dD}{dp}\frac{p}{D}}{\frac{dS}{dp}\frac{p}{S}-\frac{dD}{dp}\frac{p}{S}}=\frac{-\varepsilon}{\eta-\varepsilon}<0$$

- Share of tax burden is $\eta/(\eta-\varepsilon)$ on consumers and $-\epsilon/(\eta-\varepsilon)$ on sellers.