

Econ 200 Lecture Notes
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Preface

These notes are intended to help students follow in-class lectures, to organize readings, and to anticipate questions to ask in class. They mention but do not develop crucial material. They are not a substitute for reading the text!

1. Competitive Markets

The Economic Environment

- I. Simplifying assumptions are essential in economic analysis. They clear the underbrush so that we can see the essential forces clearly.
- II. Traditional assumptions of competitive markets:
 - A. Lots of small buyers and sellers
 - B. with a whole lot of information about one another
 - C. all selling the same product
 - D. with no barriers to their participation.

We don't actually need assumptions B or C or even much of A, as you will soon see.

Behavioral assumption: everyone takes price as given, and doesn't try to change it.

Competitive markets \iff price-taking.

Exercise: Which of the above assumptions seem reasonable for the Santa Cruz apartment rental market? For mobile data plans? ...

Q: But then who sets price?

A: “impersonal forces” of supply and demand....whatever that means....

Demo: Double Auction Market. Buyers’ values and Seller’s costs randomly assigned for single indivisible units. Compute market demand.

III. Market Demand Curve

A. A schedule showing the number of units buyers are willing and able to purchase as a function of the unit price.

1. This in turn is just the sum of the individual demand curves from everyone in the market.
2. Controls for “everything else” that might shift the curve...

B. Usually we assume there are lots of units demanded and so we represent demand as a continuous function.

Ex: Linear Demand:

$$q^d = a - bp \tag{1}$$

where $a, b > 0$ and equation (1) is valid for $p \in [0, a/b]$.

Ex: Log-linear demand:

$$\ln(q^d) = \ln(a) + \epsilon_d \ln(p), \quad \text{or} \quad q^d = e^a p^{\epsilon_d}. \tag{2}$$

The curve is hyperbolic and downward sloping if $\epsilon_d < 0$.

Ex: Stair step demand for indivisible units.

Ex: Inverse demand (linear):

$$p^d = \alpha - \beta q, \tag{3}$$

where, in terms of the parameters in equation (1), we have $\alpha = a/b, \beta = 1/b$.

IV. Market Supply Curve

A. A schedule showing the number of units offered by the market for sale as a function of the price charged.

1. This in turns is just the sum of the individual supply curves from everyone in the market.
2. Individual supply curves are actually the marginal cost curve of a firm (later we will see that no firm will supply at prices below their average variable cost).

Ex: Supply in the Discrete [or indivisible] Goods Model

B. We usually end up assuming lots of firms and represent supply as a continuous function as well.

Ex: Linear Supply: $q^s = A + Bp$

Ex: Log-linear supply: $\ln(q^s) = \gamma + \epsilon_s \ln(p)$.

Curves slope upward if the slope coefficient (B or ϵ_s) is positive.

The intercept (A or γ) can be negative.

Competitive Equilibrium

I. The next task of economic analysis is to find the consequences of the assumptions, to make predictions and draw insights. This called **positive theory**.

II. Competitive equilibrium theory predicts the quantity traded and the price in a market.

III. Intuition:

A. If prices were too high, then there would be more units offered than demanded ($q^s > q^d$). Unsatisfied suppliers lower their asking price, and other suppliers have to match.

B. prices too low \implies more units demanded than offered, ($q^d > q^s$). Unsatisfied demanders bid the price up.

Ex: Equilibrating forces in the Double Auction Market

IV. The market hopefully will quickly settle down so that there is neither excess supply nor excess demand, and equilibrium is achieved (or approximated).

V. A **competitive equilibrium** (CE) is a price p^* and resulting quantity traded q^* such that $q^s(p^*) = q^d(p^*) = q^*$.

Ex: Linear S, D.

Existence and Uniqueness

I. Is there a CE? If so, is it unique?

If not, the prediction is less useful !

Theorem. If

A. q^d is continuous and (strictly) decreasing in p ,

B. q^s is continuous and (strictly) increasing in p ,

C. $q^d(0) \geq q^s(0)$ and $q^d(\infty) \leq q^s(\infty)$,

then there is a CE (p^*, q^*) (and it is unique).

proof sketch: Apply the intermediate value theorem to excess demand function $Z(p) = q^d(p) - q^s(p)$, to find (unique) root $p^* = Z^{-1}(0)$.

Ex: Equilibrium in discrete unit model: increasing not strict, and often p^* is unique but not q^* , or vice versa.

Ex: Non-existent markets, when C fails.

Welfare Economics

I. Another task in economic analysis is judging an outcome as (relatively) good or bad. This is called **normative theory**, in contrast to positive theory. It also is referred to as **welfare economics**.

II. Economists main criterion is efficiency.

A. So what is efficiency, exactly?

B. Several versions (see Varian Ch 10 for a start) but here we'll focus on a vanilla version, Kaldor-Hicks efficiency or cost benefit analysis.

1. Producer surplus (PS): The amount a producer is paid that is in excess of [variable] cost.
2. Consumer surplus (CS): The amount a consumer would have paid [WTP, on the demand curve] in excess of the amount she actually had to pay.
3. Total surplus: $TS = CS + PS$
4. Efficiency = [normalized] TS.

Ex: Surplus in the Discrete Goods Model

III. Efficiency sounds cold and clinical but economists absolutely love it, as our highest virtue. And rightly so: increasing efficiency means either directly making more people happier, or conserving resources (which then can be used to increase happiness.)

IV. Economists sometimes call TS the gains from trade

A. It is a measure of the amount of happiness generated purely by the act of trading.

- V. On typical supply and demand graphs, total surplus is the area to the left of the number of units produced which is under the demand curve but above the supply curve.
- A. You can use integral calculus
 - B. If supply or demand are linear you can get it with geometry (and you can often approximate with geometry even if it isn't).
 - C. Our supply and demand charts actually show inverse demand and supply so it might be conceptually easier to use these when calculating surplus.

Ex: Using integration to find surpluses in with linear demand and supply

Now for one of the most celebrated results in economics:

The Invisible Hand Theorem: Absent externalities, CE maximizes efficiency.

- A. That's right: if producers and consumers compete on price and achieve CE, then the market will:
 - 1. produce just the right amount of goods
 - 2. at lowest cost, and
 - 3. give them to the people who value them most.
 - 4. Even better, if anything changes, the CE outcome responds perfectly.
- B. What's the qualification? **Externalities** refer to costs and benefits not captured or paid by the buyer and seller; we'll discuss examples later, like broadcast TV or water pollution.
- C. Any other qualifications? Well, the market might not reach CE due to monopoly power, or info problems, or agency problems. Again, we'll discuss examples later.
- D. Editorial remark: Some markets work quite well if left alone to self organize (e.g., rice). Others work well if engineered properly (e.g., electricity). A few seem problematic (e.g., police protection). What about personal data?

Deadweight Loss

I. The theory of competitive markets reveals the strength of markets but also the unintended downsides of some popular policy choices.

A. Market interventions typically lead to **deadweight loss**: reductions in TS.

II. Price Controls. When binding, they prevent price from rising or falling to competitive equilibrium, resulting in underproduction.

Ex: Rent control; min wage.

III. Taxes

A. Similar (but subtler) cause of deadweight loss

B. Taxes drive a wedge between the price consumers pay and the price suppliers receive.

1. No tax: $p_d = p_s$

2. Quantity tax (tax per unit): $p_d = p_s + t$

3. Value tax (tax on percentage spent): $p_d = (1 + t)p_s$

4. The equilibrium price $p^*(t)$ deviates from the efficient price $p^*(0)$.

5. DWL is quadratic in the deviation: negligible when small, but grows rapidly as deviation increases.

Ex: A quantity tax. Set $p = p_s$, and differentiate the equilibrium expression $S(p(t) = D(p(t) + t)$, solve for p' and integrate to obtain tax incidence formula

$$p_s(t) = p^* - \frac{t|D'|}{S' + |D'|}, \quad p_d(t) = p^* + \frac{tS'}{S' + |D'|}. \quad (4)$$

Also graph PS, CS, $T = tq^*(t)$, and DWL.

IV. Tariffs and Quotas

A. A tariff is just a tax on a subset of sellers.

B. Although tariffs can be effective in aiding the untaxed subset, they cause an overall deadweight loss.

- C. Quota truncates the S curve of the sellers to which it applies: S goes vertical at the quota limit \bar{Q} .
- D. Quotas give almost the same diagram as tariffs, except that the rectangle representing tariff revenue goes to the quota holders. (Govt can capture that revenue if it auctions off quota rights.)

V. Subsidies

- A. A subsidy to consumers for buying some product causes $p_d = p_s - t$.
- B. Subsidies also cause a DWL, here due to overproduction, so some units have cost exceeding their value.

Elasticity

I. Demand and supply curves are often best described in terms of **elasticity**,

- A. the proportional sensitivity to price.
- B. Elasticity of Demand: $\epsilon_d = \frac{\partial \ln D}{\partial \ln p} = \frac{\partial D}{\partial p} \frac{p}{D}$
- C. Elasticity of Supply: $\epsilon_s = \frac{\partial \ln S}{\partial \ln p} = \frac{\partial S}{\partial p} \frac{p}{S}$.

II. Is it Elastic?

- A. If $|\epsilon| > 1$ we say the supply or demand curve is elastic.
- B. If $|\epsilon| < 1$ we say the supply or demand curve is inelastic.
- C. If $|\epsilon| = 0$ we say that supply or demand is completely inelastic
- D. If $|\epsilon| = \infty$ we say that supply or demand is perfectly elastic

Ex: Perfectly elastic and inelastic curves.

III. Elasticity and Curves

- A. Note that elasticity varies along a linear demand curves.
- B. However log-linear supply and demand curves (described earlier) have constant elasticity (they are often called constant elasticity curves)

IV. Taxes and Elasticity

- A. When a tax gets levied on a producer, how much of that tax ends up being "paid" by the consumer?
- B. Turns out it depends on the elasticities.
 1. Extreme cases:
 - Supply perfectly inelastic: None of it gets passed on to consumers
 - Supply perfectly elastic: All of it gets passed on to consumers
 2. In non-extreme cases it depends on the relative elasticity of the supply and demand curves.
 3. In constant elasticity of demand markets you can find the effect of a tax on the price faced by consumers by applying a simple formula. Begin with intermediate step in derivation of equation (4):

$$\frac{\partial p_d}{\partial t} = \frac{S'}{|D'| + S'}. \quad (5)$$

Multiply numerator and denominator by $\frac{p}{Q}$ to obtain the very tidy and useful expression:

$$\frac{\partial p_d}{\partial t} = \frac{\epsilon_s}{|\epsilon_d| + \epsilon_s} \quad (6)$$

- The greater the elasticity of supply relative to the elasticity of demand, the greater the portion of taxes passed onto consumers.
- You can also verify (from a diagram) that the DWL for a given tax rate t and Q^* is larger the more elastic are supply and demand.

V. The Communicative Role of Prices (Hayek, ...).

The insight is that participants need only know their personal situation and the price to maximize TS in a competitive market. That is, **CE price is a sufficient statistic** for the detailed circumstances that affect all other participants' willingness and ability to produce or consume.

A planner needs to know a lot about individual participants' personal situations to achieve efficient outcomes, and such information is difficult to obtain and process, even in the 21st century. That is why many large organizations try to decentralize via price-like systems. Examples:

- Large commercial banks let regional managers and branch managers make decisions on loans and deposits based on the profitability the managers perceive relative to the central price signal called "cost of funds."
- Uber sets a base price that responds to local demand (e.g., playoff game is over) and supply (e.g., drivers expected to be scarce) conditions.
- What other examples can you think of for internal markets?