Equilibrium

In this section we'll make our first attempt to put the consumer and producer 'sides' of the economy together

- This is be in the sense of partial equilibrium, meaning that we'll build a model of a single market, holding everything else fixed
- One way to view this section: what conditions do we have to impose such that trade through market prices gets us the most value out of our resources?
- This is quite similar to our motivation in the exchange economy model
  - Note though that there value is a subjective and personal thing: it's based on consumers' preferences
  - Here that's only true for consumers, since producers are by assumption profit driven
- We'll also have to think a little about what 'equilibrium' means in economics

Perfectly competitive markets

What makes a market perfectly competitive?

- Price-taking
  - Each player in the market is sufficiently small that its quantity choices don't influence the market price
  - Contrast with monopoly and other situations with market power, for later in our course
  - The auctioneer in our general equilibrium model called prices that consumers took as given; in our producer choice model we assumed (so far) that the firm faces fixed input and output prices
- Homogeneous goods
  - Firms sell identical products; this in a sense enforces the price taking condition
  - If consumers see my product as different than yours, I have carved out market power
  - The semantic question seems silly but can become quite important: Starbucks is not the only firm selling 'cups of coffee', but they're the only firm selling 'cups of Starbucks coffee'

We'll derive the implications of this set of conditions
The competitive firm’s supply curve

Recall that the competitive firm (taking $p$ as given) has $p = MC$ at the optimal choice, as long as $MC$ is increasing and $p > \min AC$.

Industry supply

What does supply in the whole industry look like?

- In the short run, we stitch the supply curves of each firm together
  - If firms have different costs, this will be a supply curves with ‘jumps’
  - When price hits a point above a firm’s minimum average cost, that firm will now choose to produce some stuff and so will get added to the supply curve
  - If firms have identical costs, this is just one big jump, since minimum average cost is at the same point for all of them
- In the long run the same is true, but with a twist
  - With free entry and exit, we might imagine that unprofitable firms shut down, but if profitable opportunities exist, new firms might choose to enter
  - If firms have different costs, this is like the short run story
  - But if firms have identical costs, long run supply is completely flat at $p = \min AC$

Short run, different costs for firms

For higher prices, firms with higher costs can exist and join the industry.

The competitive firm’s profit

If $p > AC$ at the firm’s optimal choice, it makes positive profit.
Short run, identical firms

At some threshold, all of the identical firms want to join

Reasoning here is similar to the short run version

Long run, different costs for firms

Why should we see the flat supply curve?
- If \( p < \min AC \), all firms would like to leave
- If \( p > \min AC \), arbitrarily many firms would like to enter, to enjoy the profit that they can make
- At \( p = \min AC \), any amount of production is consistent with the price, as long

Questions and implications:
- A dynamic story is sometimes attached to this feature of the model: “firms enter and price is driven down…”
- But that’s not the exercise yet, since we haven’t added the demand side that might motivate the statement, and in any case we’re still thinking of prices as given
- An implication is that in the long run of a competitive market with identical firms, profit is zero for all firms

Industry supply

Supply is the sum of all firm’s optimal output according to their (identical) MC curves

Supply is zero below this threshold \( p \) and infinitely large above

At some threshold, all of the identical firms want to join
One firm in the LR, identical firm case

In such a situation, \( p = MC = AC \)

Playing with our toys

We finally now have all the weaponry we need to try out a model of a whole market, production and consumption

- We're going to take with us two things:
  - The demand curve: how much of the good consumers are willing to buy at a given price; the result of a consumer choice problem for each consumer
  - The supply curve: how much of the good producers are willing to make and sell at a given price; the result of a producer choice problem for each producer
- We must continue to remember that every player in the market is a price taker
- If you liked the auctioneer from our general equilibrium model, you can keep him now
  - But this is partial equilibrium: the auctioneer calls a price for this market, and all players respond
  - But we aren't going to keep track of the changes this induces in any other market; that's for later

Finding an equilibrium price

Price is ‘too low’: there is excess demand

Finding an equilibrium price

Price is ‘too high’: there is excess supply
Finding an equilibrium price

Finding an equilibrium price is a price that implements market equilibrium.

In the long run case with identical firms, equilibrium price is pinned by technology (i.e. the cost functions).

Measuring benefits

We can think of this equilibrium price and quantity as exhausting mutually beneficial trades.

- Each unit traded was one that a producer was willing to make and sell and a consumer was willing to purchase at the price $p^*$
  - Notice that marginal valuations by the two sides are equal at $p^*$
  - So some ‘social value’ is being created by these trades
- But how much social value? And do producers or consumers get it?
  - **Consumers’ surplus** is how much consumers value the goods they get over and above the price they had to pay to get them
    - Graphically: the area between the demand curve and price
    - Willingness to pay minus price, summed across all units traded
  - **Producers’ surplus** is how much the producers value the sales they made over and above the price they received for them
    - Graphically: the area between the supply curve and price
    - Price minus willingness to accept, summed across all units traded

Consumers’ and producers’ surplus

CS and PS in equilibrium are given by these shaded areas.
Deadweight loss

Away from the equilibrium $p^*$, the sum of surpluses is lower: we have *deadweight loss*. This means social surplus is not maximized; some mutually beneficial trades go unmade.

Reaching equilibrium

We have to now acknowledge the sleight-of-hand involved when we take this equilibrium concept as the output of our model.

- A fuzzy argument says that if there is excess supply or demand there is ‘pressure’ on the price to tend toward the equilibrium $p^*$.
- If we believe this dynamic story, then our perfectly competitive partial equilibrium model has a nice feature: all socially beneficial trades are made when markets are ‘free’ to operate in this way.
- We saw this too in our exchange economy: the First Welfare Theorem.
- But here, as there, we will be forced to confront a reality which is more complicated than we have assumed here.
  - We’ll study *market failure* later in the course.
  - And in any case, the auctioneer doesn’t exist; does the analogy between price dynamics and the auctioneer hold up?

Tax

We will close with an analysis of what happens in the perfectly competitive model when a per-unit tax is levied on the good.

- This means that the price a consumer pays is not the same as the price a producer receives:
  \[ p_D = p_S + t \] (1)
- It doesn’t really matter whether consumers or producers are physically responsible for paying the tax; the ‘wedge’ between the prices is the same either way.
- And which party suffers more from the tax depends on the shape of supply and demand rather than who physically pays.
Adding a tax

Here we will think of a tax that says ‘suppliers have to pay $t$ in tax for every unit they sell’... but for consumers to pay it would be equivalent.

Adding a tax

The tax opens a deadweight loss by prying apart the prices paid and received by the amount $t$.

Adding a tax

Elasticity of supply and demand matters to determine on which side the DWL will be felt; here supply is perfectly elastic and consumers bear the whole thing.

Adding a tax

Here demand is quite elastic, and the suppliers bear more of the burden.
**Tax**

- More elastic demand or supply means less surplus to that side of the market in equilibrium
  - For example, if demand is elastic, consumers were willing to pay about the same for early units as later ones, so there isn’t much ‘bonus’ value on the early units
- But then the other side must bear more deadweight loss when it appears
- There are good reasons why we might want taxes even if this story was true—can you think of some?
- And as we’ll see later in the course, there are sometimes good efficiency arguments for taxing things
- But for now, note the parallel with the Second Welfare Theorem—let prices do their thing, and try to do redistribution or revenue raising some other way than by manipulating prices

**On deck**

- Next time we will put together a very elegant model of general equilibrium in an economy with production
- This will be our last word on competitive markets
- After that we’ll drop the price taking and free entry and exit assumptions to study monopoly and other situations with *market power*
- And after that we study *market failure*, including special kinds of goods that we think might require special attention from researchers and policymakers