

# Economics 101A

## (Lecture 19)

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## Outline

1. Response to Taxes II
2. Market Equilibrium in The Long-Run
3. Producer Surplus
4. Consumer Surplus

# 1 Response to taxes II

- Supply:  $Y_i^S(p_i - t, w, r)$ , Demand:  $X_i^D(p, M)$

$$Y_i^S(p_i - t, w, r) - X_i^D(p, M) = 0$$

- Comparative statics:

$$\begin{aligned} \frac{\partial p^*}{\partial t} &= -\frac{-\frac{\partial Y^S}{\partial p}}{\frac{\partial Y^S}{\partial p} - \frac{\partial X^D}{\partial p}} = \\ &= -\frac{-\frac{\partial Y^S}{\partial p} \frac{p}{X}}{\left(\frac{\partial Y^S}{\partial p} - \frac{\partial X^D}{\partial p}\right) \frac{p}{X}} = \frac{\varepsilon_{S,p}}{\varepsilon_{S,p} - \varepsilon_{D,p}} \end{aligned}$$

- How about price received by suppliers  $p^* - t$ ?

$$\begin{aligned} \frac{\partial (p^* - t)}{\partial t} &= \frac{\frac{\partial Y^S}{\partial p}}{\frac{\partial Y^S}{\partial p} - \frac{\partial X^D}{\partial p}} - 1 = \\ &= \frac{\varepsilon_{D,p}}{\varepsilon_{S,p} - \varepsilon_{D,p}} \end{aligned}$$

- *Inflexible Supply.* (Capacity is fixed) Supply curve vertical ( $\varepsilon_{S,p} = 0$ )

- Producers bear burden of tax

- *Flexible Supply.* (Constant Returns to Scale) Supply curve horizontal ( $\varepsilon_{S,p} \rightarrow \infty$ )

- Consumers bear burden of tax

- *Inflexible demand.* Demand curve vertical ( $\varepsilon_{D,p} = 0$ )?

- Consumers bear burden
- General lesson: Least elastic side bears larger part of burden
- What happens with a subsidy ( $t < 0$ )?
- What happens to quantity sold?
- Use demand curve:

$$\frac{\partial X^{D*}}{\partial t} = \frac{\partial X^{D*}}{\partial p^*} \frac{\partial p^*}{\partial t}$$

and use expression for  $\partial p^* / \partial t$  above.

## 2 Market Equilibrium in the Long-Run

- Nicholson, Ch. 10, pp. 295–306 [OLD: Ch. 14, pp. 382–394]
- So far, short-run analysis: no. of firms fixed to  $J$
- How about firm entry?
- Long-run: free entry of firms
- When do firms enter? When positive profits!
- This drives profits to zero.

- Entry of one firm on industry supply function  $Y^S(p, w, r)$  from period  $t - 1$  to period  $t$  :

$$Y_t^S(p, w, r) = Y_{t-1}^S(p, w, r) + y(p, w, r)$$

- Supply function shifts to right and flattens:

$$\begin{aligned} Y_t^S(p, w, r) &= Y_{t-1}^S(p, w, r) + y(p, w, r) \\ &> Y_{t-1}^S(p, w, r) \text{ for } p \text{ above } AC \end{aligned}$$

since  $y(p, w, r) > 0$  on the increasing part of the supply function.

- Also:

$$Y_t^S(p, w, r) = Y_{t-1}^S(p, w, r) \text{ for } p \text{ below } AC$$

since for  $p$  below  $AC$  the firm does not produce ( $y(p, w, r) = 0$ ).

- Flattening:

$$\begin{aligned} \frac{\partial Y_t^S(p, w, r)}{\partial p} &= \frac{\partial Y_{t-1}^S(p, w, r)}{\partial p} + \frac{\partial y(p, w, r)}{\partial p} \\ &> \frac{\partial Y_{t-1}^S(p, w, r)}{\partial p} \text{ for } p \text{ above } AC \end{aligned}$$

since  $\partial y(p, w, r) / \partial p > 0$ .

- Also:

$$\frac{\partial Y_t^S(p, w, r)}{\partial p} = \frac{\partial Y_{t-1}^S(p, w, r)}{\partial p} \text{ for } p \text{ below } AC$$

- Profits go down since demand curve downward-sloping

- In the long-run, price equals minimum of average cost
- Why? Entry of new firms as long as  $\pi > 0$
- ( $\pi > 0$  as long as  $p > AC$ )
- Entry of new firm until  $\pi = 0 \implies$  entry until  $p = AC$
- Also:

$$\text{If } C'(y) = \frac{C(y)}{y}, \text{ then } \frac{\partial C(y)}{\partial y} = 0$$

- Graphically,

- Special cases:
- **Constant cost industry**
- Cost function of each company does not depend on number of firms

- **Increasing cost industry**

- Cost function of each company increasing in no. of firms

- Ex.: congestion in labor markets

- **Decreasing cost industry**
- Cost function of each company decreasing in no. of firms
- Ex.: set up office to promote exports

### 3 Welfare: Producer Surplus

- Nicholson, Ch. 9, pp. 261–263 [OLD: Ch. 13, pp. 350–351]

- Producer Surplus is easier to define:

$$\pi(p, y_0) = py_0 - c(y_0).$$

- Can give two graphical interpretations:

1. Rewrite as

$$\pi(p, y_0) = y_0 \left[ p - \frac{c(y_0)}{y_0} \right].$$

Profit equals rectangle of quantity times (p - Av. Cost)

2. Remember:

$$f(x) = f(0) + \int_0^x f'(s) ds.$$

Rewrite profit as

$$\begin{aligned} & \left[ p * 0 + p \int_0^{y_0} 1 dy \right] - \left[ c(0) + \int_0^{y_0} c'_y(y) dy \right] = \\ & = \int_0^{y_0} (p - c'_y(y)) dy - c(0). \end{aligned}$$

Producer surplus is area between price and marginal cost (minus fixed cost)

## 4 Welfare: Consumer Surplus

- Nicholson, Ch. 5, pp. 145–149 [OLD: Ch. 5, pp. 139–143]
- Evaluate welfare effects of price change from  $p_0$  to  $p_1$
- Proposed measure:

$$e(p_0, u) - e(p_1, u)$$

- Can rewrite expression above as

$$\begin{aligned} e(p_0, u) - e(p_1, u) &= \left( e(0, u) + \int_0^{p_0} \frac{\partial e(p, u)}{\partial p} dp \right) - \\ &\quad - \left( e(0, u) + \int_0^{p_1} \frac{\partial e(p, u)}{\partial p} dp \right) \\ &= \int_{p_1}^{p_0} \frac{\partial e(p, u)}{\partial p} dp \end{aligned}$$

- What is  $\frac{\partial e(p,u)}{\partial p}$ ?

- Remember envelope theorem...

- Result:

$$\frac{\partial e(p, u)}{\partial p} = h(p, u)$$

- Welfare measure is integral of area to the side of Hicksian compensated demand
- Graphically,

# 5 Next Lecture

- Market Power
- Monopoly
- Price Discrimination
- Then... Game Theory