Chapter 15 – Market Demand

From Individual to market demand

→ To get from individual's demand to market demand, simply sum up the individual demands:

$$\underbrace{X^1(p_1, p_2, m_1, m_2, \ldots, m_n)}_{\text{Mkt demand for good 1}} = \sum_{i=1}^{n} \underbrace{X_i^1(p_1, p_2, m_i)}_{\text{individual demands for good 1}}$$

→ this will yield the market demand curve $D(p)$

→ To get the inverse demand function for the market, we solve $D(p)$ for price to get a ~~fun~~ price as a function of quantity: $P(X)$

Example:

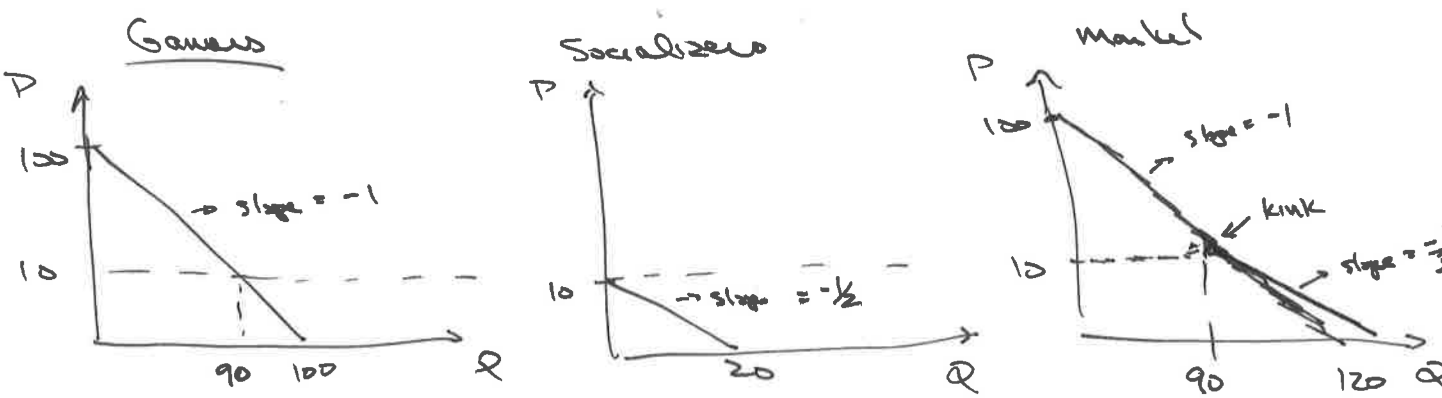
→ 2 types of consumers:

Gamers and socializers

→ Gamers have demand for ~~[illegible]~~ broadband consumption of $D_G(p) = 100 - p$ for $p \le 100$ and $D_G(p) = 0$ if $p > 100$.

→ Socializers have demand for broadband of $D_S(p) = 20 - 2p$ for $p \le 10$ and $D_S(p) = 0$ for $p > 10$.

→ Suppose these 2 types are equal parts of the market



Mkt demand:

$p > 100 = 0$

$100 \ge p > 10, = 100 - p$

$10 \ge p = 100 - p + 20 - 2p = 120 - 3p$

→ sum across on graphs

Elasticities

→ We might want to have a measure of how "responsive" a consumer's demand is to changes in prices or income

→ why not use the slope?

→ It depends on units

→ we want something independent of units

→ Elasticities use percentage changes

→ The price elasticity of demand is the percentage change in demand for a percentage change in price

→ denoted ε_p or just ε

→ $$\varepsilon_p = \frac{\%\Delta q}{\%\Delta p}$$

→ $\varepsilon_p < 0$ (usually - exception are Giffen goods)

~~→ [illegible] and thus~~

→ $$\varepsilon_p = \frac{\%\Delta q}{\%\Delta p} = \frac{\Delta q}{q} \Big/ \frac{\Delta p}{p} = \frac{\Delta q}{q} \cdot \frac{p}{\Delta p} = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q}$$

$$= \frac{\partial q}{\partial p} \cdot \frac{p}{q}$$

Example: calculating elasticities

$$D(p) = q = 30 - 3p$$

$$\varepsilon_p = \frac{\partial q}{\partial p} \cdot \frac{p}{q} = -3 \cdot \frac{p}{30-3p} = \frac{-3p}{30-3p}$$

$$= \frac{-p}{10-p}$$

$$D(p) = q = \frac{10}{4p} = \frac{2.5}{p}$$

$$\varepsilon_p = \frac{\partial q}{\partial p} \cdot \frac{p}{q} = \frac{-2.5}{p^2} \cdot \frac{\cancel{p}}{2.5/p} = = \frac{-2\cancel{.5}}{\cancel{p}} \cdot \frac{\cancel{p}}{2\cancel{.5}}$$

$$= -1$$

→ We say demand is:

- inelastic if $\varepsilon_p < 1$ (really > -1)
- elastic if $\varepsilon_p > 1$ (really < -1)

→ unit elastic if $\varepsilon_p = 1$ (really $= -1$)

→ note above, ε_p may depend on price so the elasticities may vary along the demand curve.

→ the income elasticity of demand is the percentage change in demand for a percentage change in price

$$\rightarrow \varepsilon_p = \frac{\%\Delta q}{\%\Delta m} = \frac{\Delta q}{q} \Big/ \frac{\Delta m}{m} = \frac{\Delta q}{q} \cdot \frac{m}{\Delta m}$$

$$= \frac{\Delta q}{\Delta m} \cdot \frac{m}{q}$$

$$= \frac{\partial q}{\partial m} \cdot \frac{m}{q}$$

~~Dem~~ Price Elasticities and Marginal Revenue

$$R = p\,q(p)$$

$$\Delta R = p\,\Delta q + q\,\Delta p$$

$$MR = \frac{\Delta R}{\Delta q} = \frac{p\,\cancel{\Delta q}}{\cancel{\Delta q}} + q\,\frac{\Delta p}{\Delta q}$$

$$= p + q\,\frac{\Delta p}{\Delta q}$$

$$\Rightarrow \quad = p\left(1 + \frac{q}{p}\,\frac{\Delta p}{\Delta q}\right)$$

$$= p\left(1 + \frac{1}{\varepsilon_p}\right)$$

→ Thus if $\varepsilon_p = -1$, $MR = p(1 + \frac{1}{-1}) = p(1-1) = 0$

→ why? ↑ price 1% and demand falls 1%.

→ exactly offset, so no change in revenue

→ if $|\varepsilon_p| > 1$, then $MR = p(1 + \frac{1}{\varepsilon_p}) = p(1 - \frac{1}{|\varepsilon_p|})$
< 0

→ MR declines if ~~demand~~ increase price and demand is ~~inelastic~~ elastic

→ why? ↑ prices but demand ↓ by greater percentage so $R = pq$ falls

→ if $|\varepsilon_p| < 1$, then $MR = p(1 + \frac{1}{\varepsilon_p}) = p(1 - \frac{1}{|\varepsilon_p|}) > 0$

→ MR increases if increase price and demand inelastic

→ why p↑, but demand not fall much so pq↑

→ what does this say about optimal pricing by a firm?

→ set prices so that not on inelastic part of demand curve

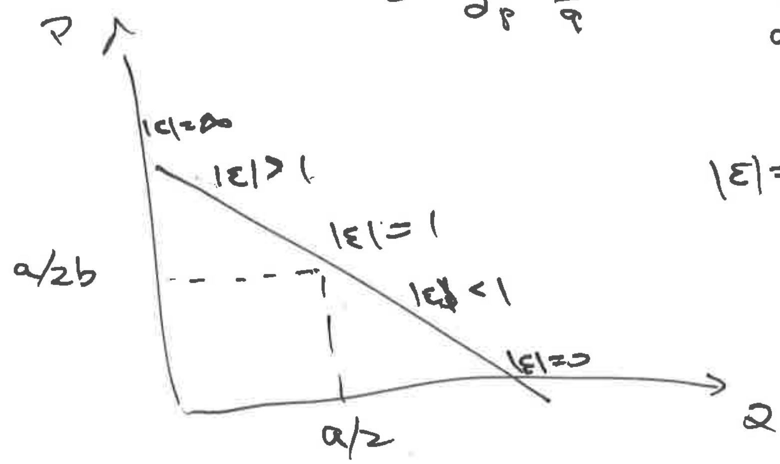
→ if MR > 0, this not optimal

why not?

→ could raise price and ↑ Revenue

Elasticities along a linear demand curve : $q = a - bp$

$$\varepsilon = \frac{\partial q}{\partial p} \cdot \frac{p}{q} = -b \times \frac{p}{a-bp} = \frac{-bp}{a-bp}$$



$$|\varepsilon| = 1 = \frac{bp}{a-bp}$$

$$\Rightarrow a - bp = bp$$

$$a = 2bp$$

$$p = \frac{a}{2b}$$

$q(p)$ at $p = \frac{a}{2b}$

$$= a - bp$$

$$= a - \cancel{b}\left(\frac{a}{2\cancel{b}}\right)$$

$$= a - \frac{a}{2} = \frac{a}{2}$$