

Economics 431

Residual Demand

Suppose that there are N identical sellers on the market. In the long-run equilibrium, the supply curve is flat at p_0 , where p_0 is the equilibrium price. (the $p_0 - p_0$ line on the figure) and Q_0 is the equilibrium quantity. For simplicity, assume that the demand is linear so that its slope is constant:

$$\frac{dQ}{dp} = -\frac{1}{B}$$

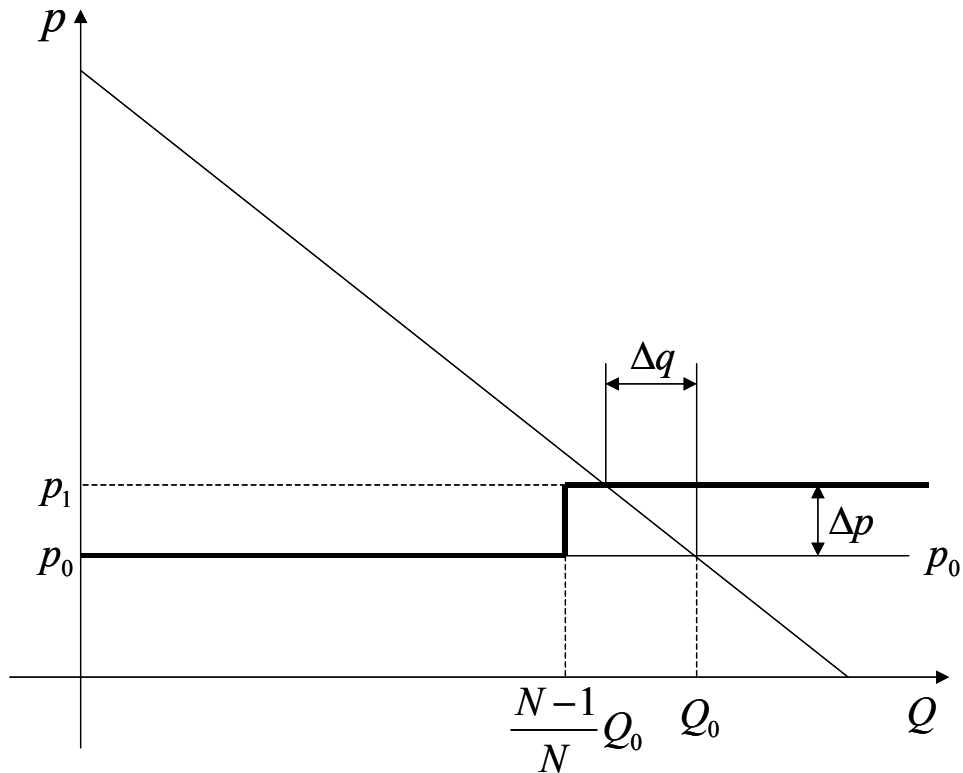
Then, at market price p_0 , the elasticity of demand equals

$$\varepsilon_D = \frac{dQ}{dp} \frac{p_0}{Q_0} = -\frac{1}{B} \frac{p_0}{Q_0}$$

Let q denote the amount supplied by each individual seller. Since all sellers are identical,

$$q = \frac{Q_0}{N}$$

Suppose that one of the sellers decides to charge a price $p_1 = p_0 + \Delta p$, and other sellers do nothing - they still charge p_0 and produce $\frac{Q_0}{N}$ each. Then the first $Q_0 \frac{N-1}{N}$ units are sold at price p_0 and any quantity above that is sold by a deviant seller who charges p_1 . The resulting "supply" curve is the bold line on the figure.



Let us compute the elasticity of demand for the deviant seller. When he raises the price by Δp above p_0 , his sales fall by Δq . Note well that

$$\frac{\Delta q}{\Delta p} = -\frac{1}{B},$$

because the points (p_0, Q_0) and $(p_0 + \Delta p, Q_0 - \Delta q)$ are on the same demand curve whose slope is $-1/B$. Then, the elasticity of residual demand at point p_0 equals

$$\varepsilon = \frac{\Delta q}{\Delta p} \frac{p_0}{q} = -\frac{1}{B} \frac{p_0}{q} = -\frac{1}{B} \frac{p_0}{Q_0} N = N\varepsilon_D.$$

In words, the elasticity of residual demand ε is N time larger than the market elasticity of demand ε_D , because when one seller raises the price and others do nothing, the whole impact of change in quantity demanded by the market falls on one seller, and this impact is large relative to his own sales of Q_0/N .

Remark 1: Consumers appear to be buying at both a lower price p_0 and a higher price p_1 . However, the demand curve is derived from consumer preferences under the assumption that all goods are sold for the same price. Will the demand curve stay the same if the good is available at two different prices? Under a certain set of assumptions on consumer behavior it will, so the analysis on the figure will still be valid. Suppose, for example, that consumers are identical, demand multiple units of the good and each individual unit is supplied by a randomly chosen seller (Suppose that you are walking along the street and whenever you feel thirsty you buy a soda in the nearest store, and never walk back to the store that had the lowest price). Then each consumer buys some units at a lower price p_0 and other units at a higher price p_1 .

Remark 2: It is true that the other sellers can raise their profits by also charging p_1 instead of doing nothing. Then industry supply becomes a flat line at p_1 . However, the *equilibrium* with price p_1 is still the same.