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## **The theorem of consumer surplus and demand elasticity at equilibrium price in a monopolist competition case**

Grebennikov, Petr I

The Higher School of Economy. Russia

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## The theorem of consumer surplus and demand elasticity at equilibrium price in a monopolist competition case

**Theorem:** Let the monopolist competitor production demand has a linear function type, and its total production cost is given by formula  $TC = F + vQ$ , where  $F$  and  $v$  stand for fixed and average variable costs, and  $Q$  is a production quantity. Then, at the price of a long-run equilibrium, the consumers' surplus is equal to a half of fixed cost value, and the price elasticity is equal to the ratio of total to fixed costs.

**The proof:**

1) In the case of monopolist competition long-run equilibrium, the average cost curve  $AC = F/Q + v$  is tangent to the demand curve  $P = g - hQ$  (see the figure below). Total consumers' surplus value is presented, then, by the  $gEP_0$  triangle area that is equal to  $0,5Q_0$  times the length of the leg  $gP_0$ ; the latter being equal to  $h \cdot Q_0$  product, where  $h = |dAC/dQ| = F/Q_0^2$ . Finally, one gets that the surplus equals to  $0,5Q_0 \cdot F/Q_0^2 \cdot Q_0 = 0,5F$ .

2) In the long-run equilibrium,  $P = AC = F/Q + v$ , hence giving  $Q = F/(P - v)$ , and  $dQ/dP = -F/(P - v)^2$ . Therefore:

$$e^D = \frac{dQ}{dP} \cdot \frac{P}{Q} = -\frac{F}{(P-v)^2} \cdot \frac{P(P-v)}{F} = \frac{P}{P-v} = \frac{AC}{AFC} = \frac{TC}{TFC}.$$

