Cross-Subsidies: Telephone Service

Example: Local and long distance telephone service

Prior to deregulation in 1980's:

- One phone company in the US: ATT
- Two markets:
  1. Local lines (L)
  2. Long distance minutes (M)
- Prices regulated
- Allowed to **charge extra** in M to **subsidize** L

Analyze a stylized version below

Case 1: BAU

Local market (lines):

Price per month:	$P_{L1} = \$30$
Quantity:	$Q_{L1} = 100\ k$
Demand elasticity:	$\eta_L = -0.2$
Cost to provide:	$WTA_L = ?$
Effective subsidy:	$S = ?$

Long distance market (minutes):

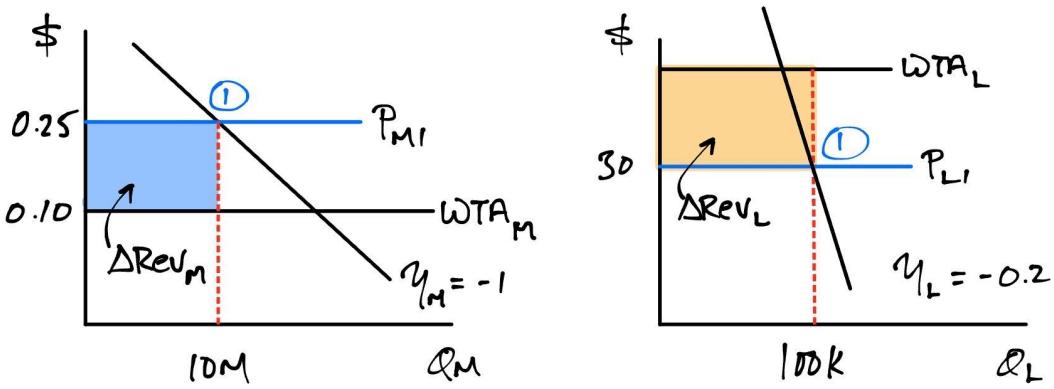
Price per minute:	$P_{M1} = \$0.25$
Quantity:	$Q_{M1} = 10\ M$
Demand elasticity:	$\eta_M = -1$
Cost to provide:	$WTA_M = \$0.10$
Effective tax:	$T = \$0.15$

Budget is balanced:

Tax revenue in M = Subsidy expenditure in L

Formally, net revenue is 0: $\Delta Rev_M + \Delta Rev_L = 0$

Graphing:



Determining S and WTA_L:

Tax revenue raised in long distance market (M):

$$\Delta Rev_M = \$0.15 * 10\ M = \$1.5\ M$$

Total subsidy expenditure in local market (L):

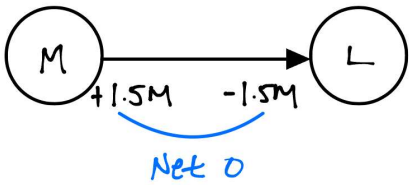
$$\Delta Rev_L = -S_L * Q_{L1} = -S_L * 100\ k$$

Budget balanced:

$$\Delta Rev_M + \Delta Rev_L = 0$$

$$\$1.5M\ - S_L * 100k = 0$$

$$\$1.5\ M = S_L * 100\ k$$



Local subsidy per line:

$$S_L = \frac{\$1.5\ M}{100\ k} = \$15$$

WTA_L:

$$P^d + S = P^s$$

$$P_{L1} + S = WTA_L$$

$$\$30 + \$15 = \$45 = WTA_L$$

Case 2: Eliminate cross subsidy

Long distance market:

$$P_{M2} = WTA_M = \$0.10$$

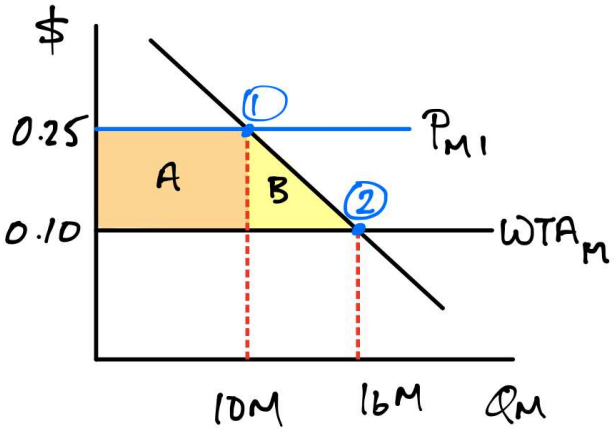
$$\%\Delta P_M = -\frac{0.15}{0.25} = -60\%$$

$$\eta = \frac{\%\Delta Q_M}{\%\Delta P_M}$$

$$-1 = \frac{\%\Delta Q_M}{-60\%}$$

$$\%\Delta Q_M = +60\%$$

$$Q_{M2} = 10M + 0.6 * 10M = 16M$$



A = 0.15*10M = \$1.5 M

B = 0.5*0.15*6M = \$450 k

$\Delta CS = +(A + B) = \$1.95\ M$

$\Delta Rev = -A = -\$1.5\ M$

$\Delta SS_M = +B = \$450\ k$

Removing the cross subsidy:

Net gain in long distance market

Market for local lines:

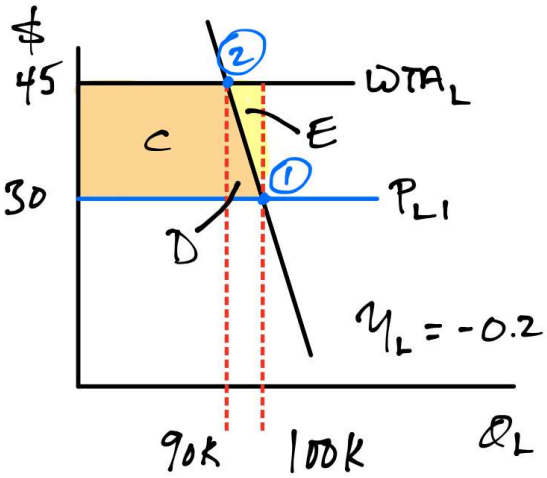
$P_{L2} = WTA_L = \$45$

$\%\Delta P_L = +\frac{\$15}{\$30} = +50\%$

$\%\Delta Q_L = \eta_L * \%\Delta P_L$

$\%\Delta Q_L = -0.2 * 50\% = -10\%$

$Q_{L2} = 100\ k\ - 0.1 * 100\ k = 90\ k$



C = 15*90 k = \$1.35 M

D = 0.5*15*10 k = \$75 k

E = 0.5*15*10 k = \$75 k

$\Delta CS = -(C + D) = -\$1.425\ M$

$\Delta Rev = +(C + D + E) = +\$1.5\ M$

$\Delta SS_L = +E = +\$75\ k$

$$\Delta SS_L = +E = +\$75\ k$$

Overall impact on both markets together:

Eliminating the cross subsidy:

Gain in long distance: $450 k

Gain in local: $75 k

Total gain: $525 k

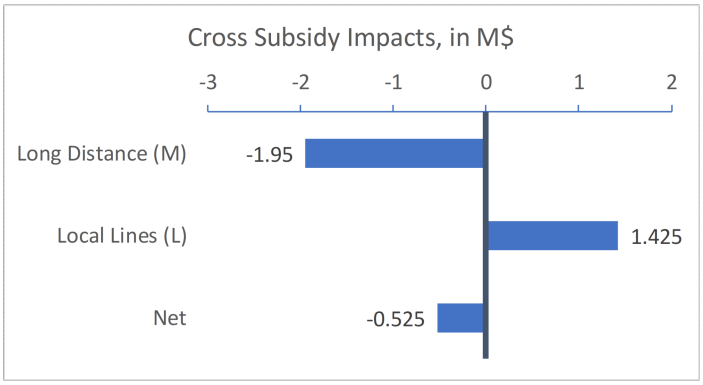
Interpretation:

Net **cost** of **having** the cross subsidy: $525 k

Overall, cross subsidy has two impacts:

Costs $1.950 M to M consumers

Delivers $1.425 M to L consumers



Daily exercise