Example Tax Policy

Market details:

Demand side:

$WTP_M = 2000 - 5Q_M^D$

Supply side:

10 sellers

Each with $WTA_i = 150Q_i^S$

Policy cases:

1	BAU, no tax	$T = 0$
2	New unit sales tax	$T = \$200$

Start analysis by deriving market demand and supply

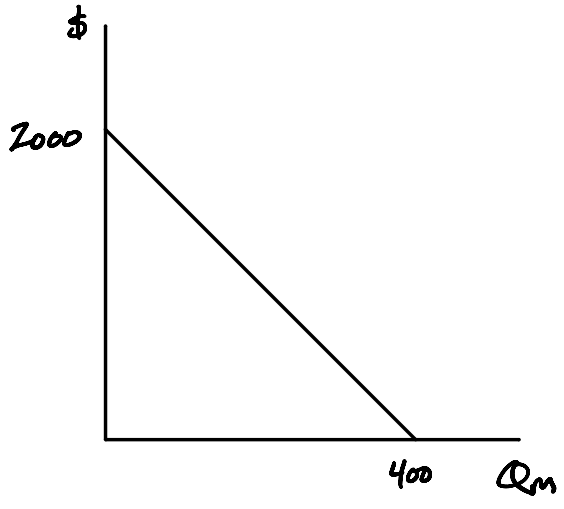
Demand

$WTP_M = 2000 - 5Q_M^D$

$WTP_M = P^d$

$P^d = 2000 - 5Q_M^D$

$$Q_M^D = \frac{2000 - P^d}{5}$$



Supply

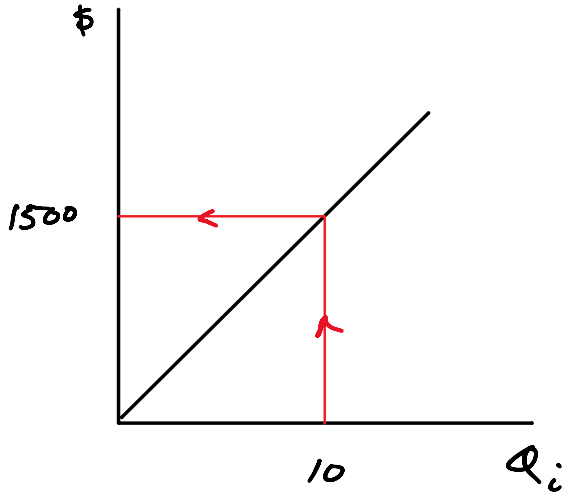
Individual supply:

Individual supply:

$$WTA_i = 150Q_i^S$$
$$WTA_i = P^s$$

$$P^s = 150Q_i^S$$

$$Q_i^S = \frac{P^s}{150}$$

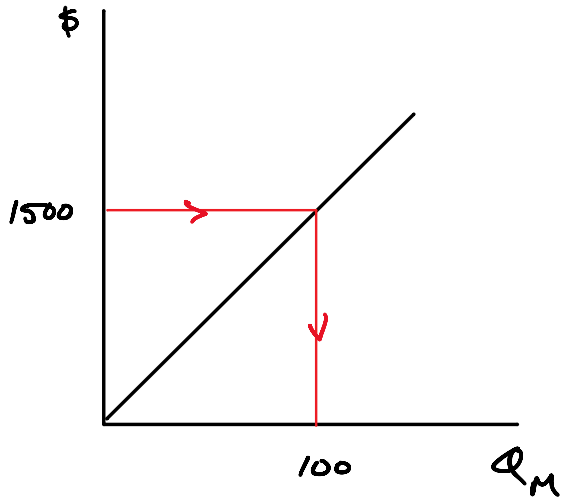


Market supply:

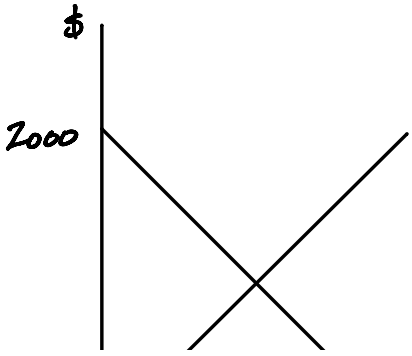
$$Q_M^S = \sum_{i=1}^{10} Q_i^S$$

$$Q_M^S = 10Q_i^S$$

$$Q_M^S = 10\left(\frac{P^s}{150}\right) = \frac{P^s}{15}$$

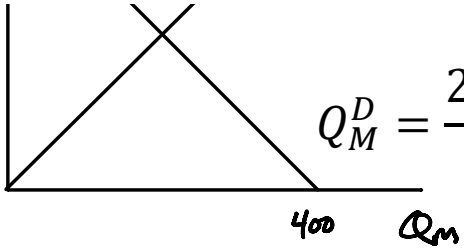


Combining into the market diagram:



$$Q_M^S = \frac{P^S}{15}$$

$$2000 - P^d$$



$$Q_M^D = \frac{2000 - P^d}{5}$$

Have four equations describing the equilibrium:

$$P^d = P^s + T$$

$$Q_M^D = \frac{2000 - P^d}{5}$$

$$Q_M^S = \frac{P^s}{15}$$

$$Q_M^D = Q_M^S$$

Very versatile: apply for any T

Case 1: Business as Usual

Set the tax:

$$T = 0$$

Find P^d and P^s:

$$Q_M^D = Q_M^S$$

$$\frac{2000 - P^d}{5} = \frac{P^s}{15}$$

$$P^d = P^s + 0$$

$$\frac{2000 - P^s}{5} = \frac{P^s}{15}$$

$$\frac{2000}{5} - \frac{P^s}{5} = \frac{P^s}{15}$$

$$400 = \frac{4P^s}{15}$$

$$P^s = \$1500$$

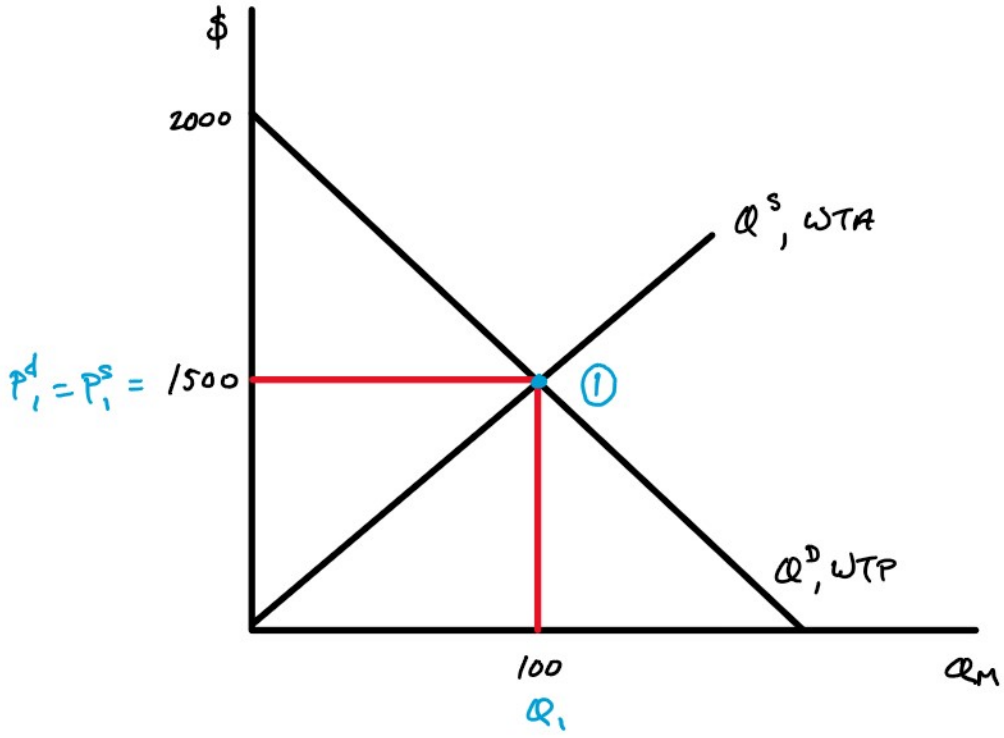
$$P^d = \$1500 + \$0 = \$1500$$

Find Q_M^D and Q_M^S:

$$Q_M^D = \frac{2000 - 1500}{5} = 100$$

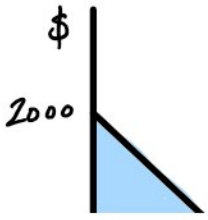
$$Q_M^S = \frac{1500}{15} = 100$$

Graphing:

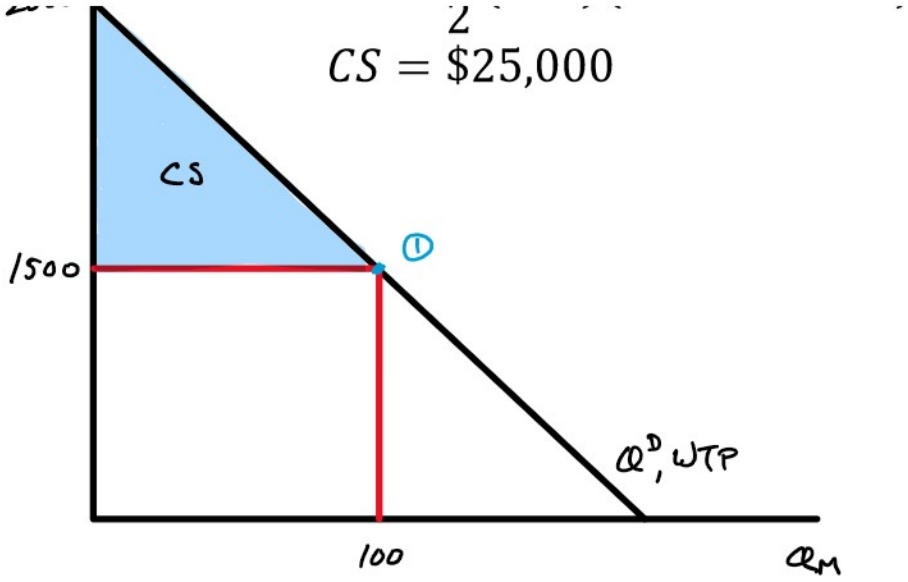


Impacts on welfare?

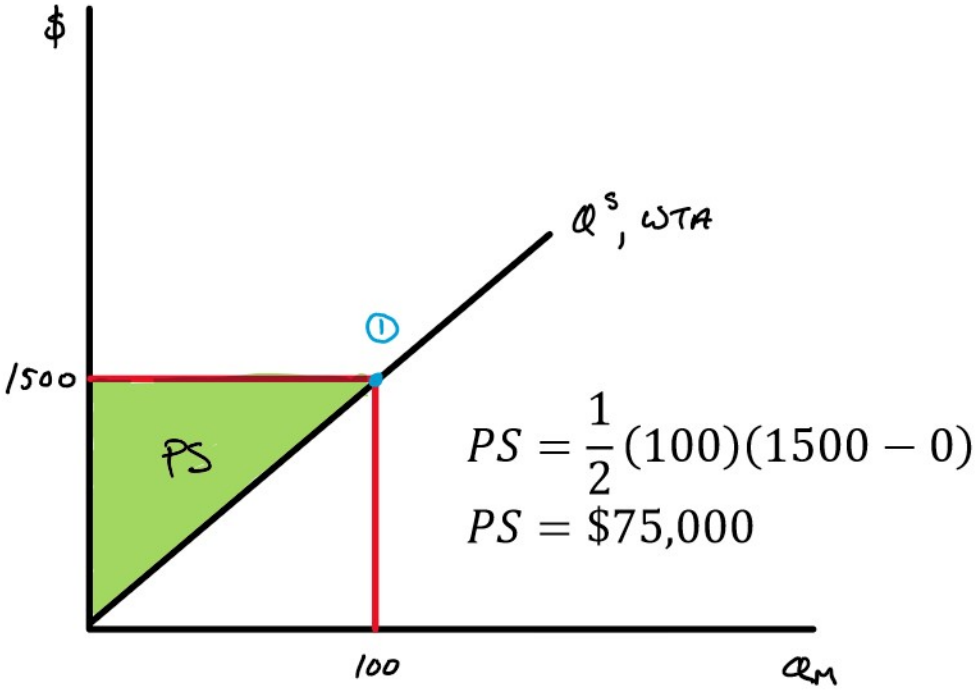
Consumer surplus



$$CS = \frac{1}{2}(100)(2000 - 1500)$$
$$CS = \$25{,}000$$



Producer surplus

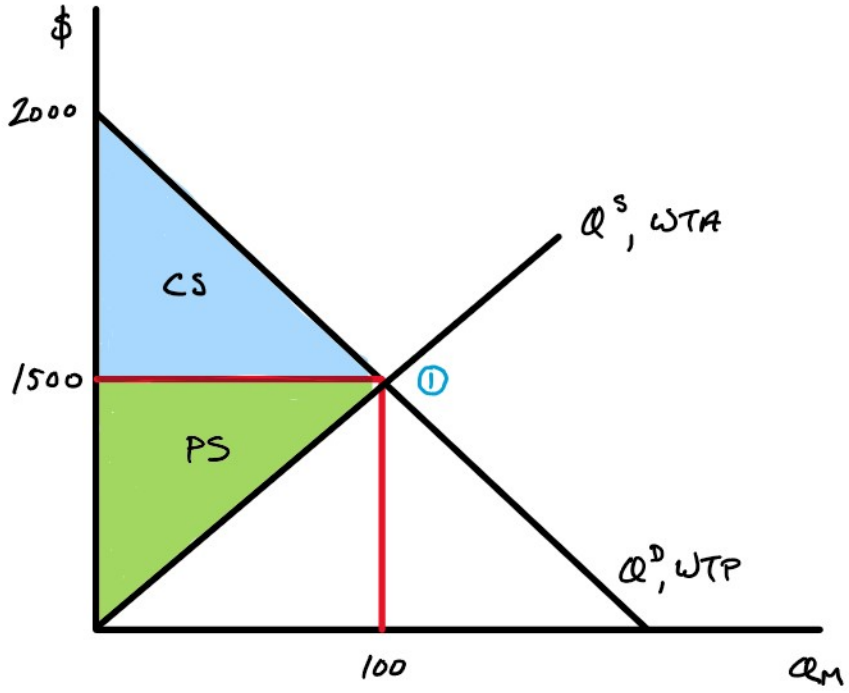


Social surplus

$$SS = CS + PS$$

SS = \$25,000 + \$75,000 = \$100,000

Overlaying the graphs of CS and PS:



Daily exercise 1 on Google Classroom