Second Type of Policy: Tariff

Tax that differs by the source of good

Source	Tax
Foreign	T
Domestic	0

Stylized example: Harley Davidson Tariff in the 1980s

45% tax on motorcycles competing with Harleys

Two suppliers:

Harley: H

Japan: J

Assume (heroically!) products are identical:
All sell in a single market at the same P^d

Case 1: BAU

No tariff

Initial prices:
$P_1^d = \$10{,}000$
$P_{1H}^s = P_{1J}^s = P^d = \$10{,}000$

Initial quantities:

Total sales:	Q_M^D	30,000
Harley:	Q_H^S	10,000
Japan:	Q_J^S	20,000

Elasticities:

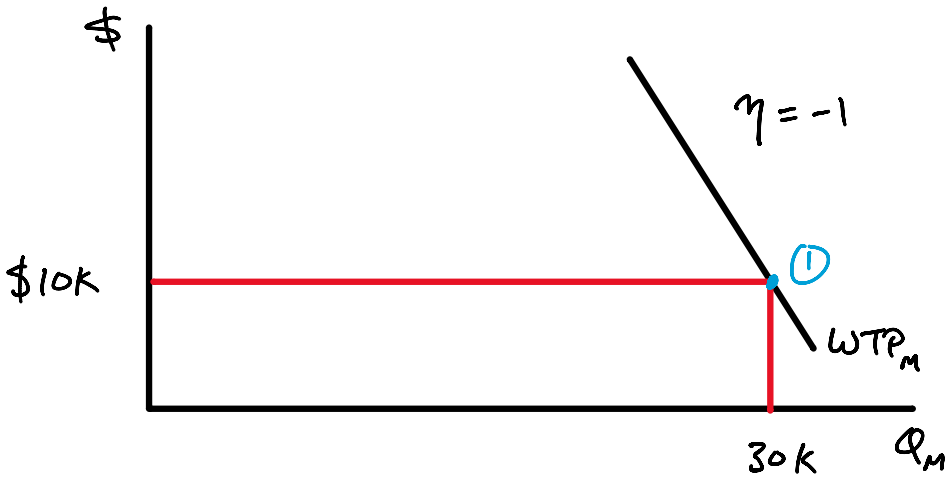
Demand: $\eta = -1$

Harley: $\eta_{sH} = +2$

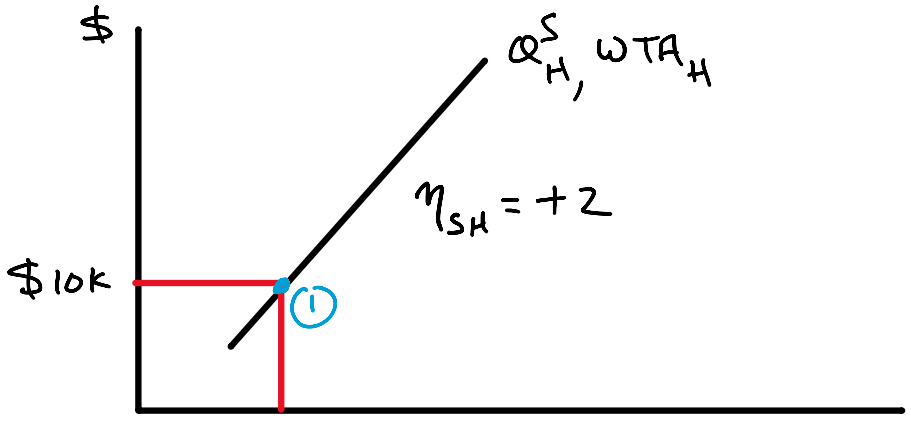
Japan: $\eta_{sJ} = \infty$ at $WTA_J = \$10{,}000$

Graphing the individual pieces:

Market demand

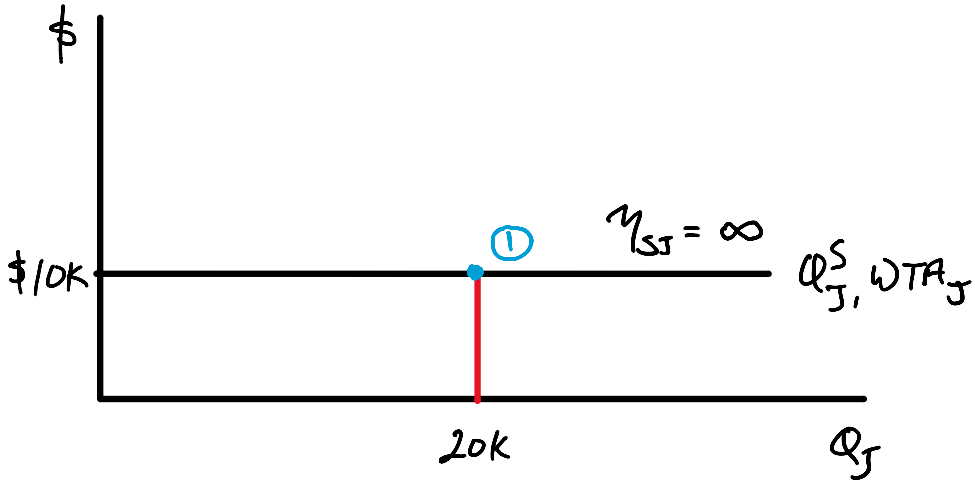


Harley's supply



10K Q_H

Japan's supply



Constructing the market supply:

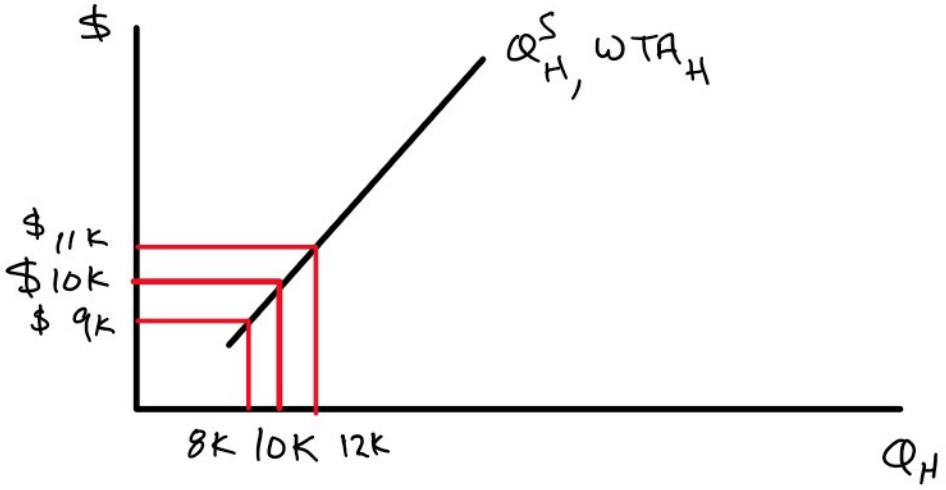
Step 1: calculate a couple of extra points for Harley

$$\eta_{SH} = +2 = \frac{\%\Delta Q_H^S}{\%\Delta P_H^S}$$

$$\%\Delta Q_H^S = 2 * \%\Delta P_H^S$$

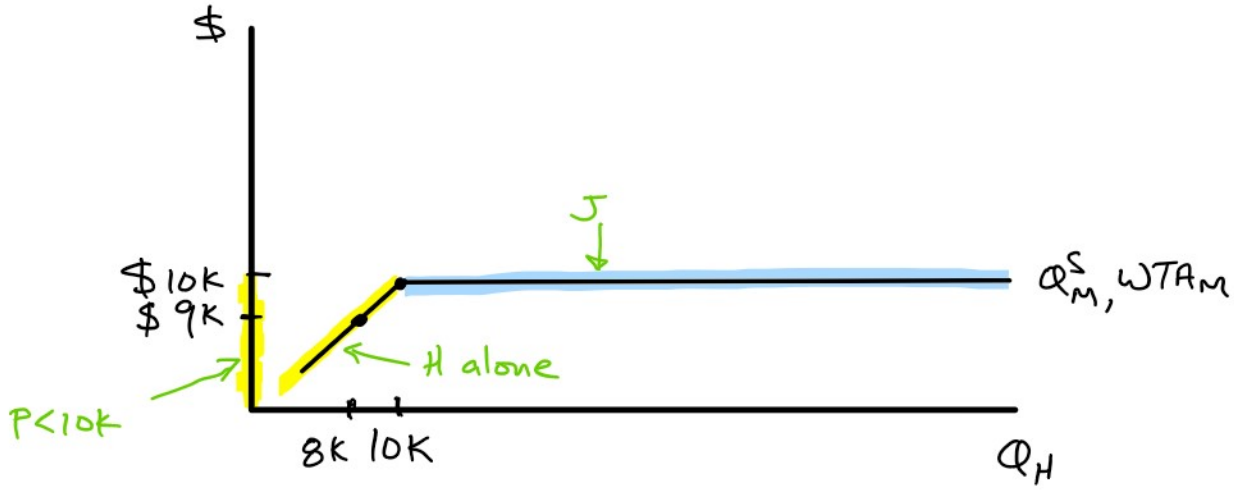
P	ΔP	$\%\Delta P$	$\%\Delta Q_H^S$	ΔQ_H^S	Q_H^S
9,000	-1,000	-10%	2(-10%)	-2,000	8,000
10,000	0	0%		0	10,000
11,000	+1,000	+10%	2(10%)	+2,000	12,000

$1 Q^S_H WTA$_H$

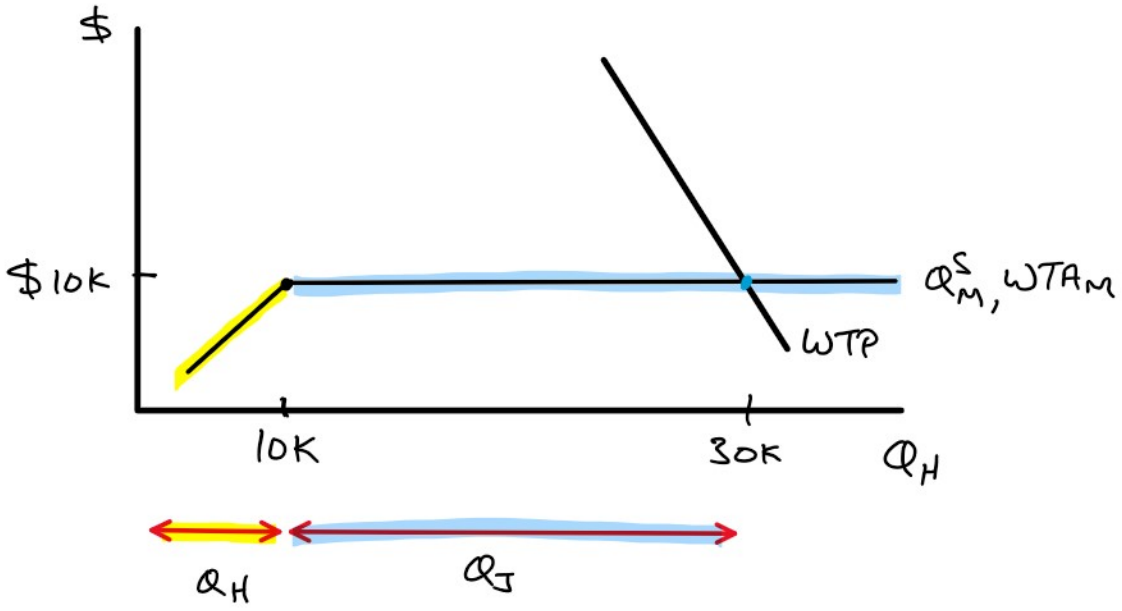


Step 2: add Q_H^S and Q_J^S at each possible price

- Only Harley sells if $P < \$10{,}000$ ($Q_J^S = 0$)
- Japan sells any amount at $P = \$10{,}000$
- Japan sells very large amount if $P > \$10{,}000$



Add market demand to finish diagram:



Case 2: new $1,000 tariff

Buyer pays same price for either bike: P_2^d

Seller prices will differ:

Accounting rule for supplier i: $P_2^d = P_{2i}^s + T_i$

Solving for seller price: $P_{2i}^s = P_2^d - T_i$

Harley: $P_{2H}^s = P_2^d - 0$

Japan: $P_{2J}^s = P_2^d - \$1000$

Has a large impact on Japan's supply:

Japan *only* supplies if $P_{2J}^S \geq WTA_J$

How high does P_2^d need to be?

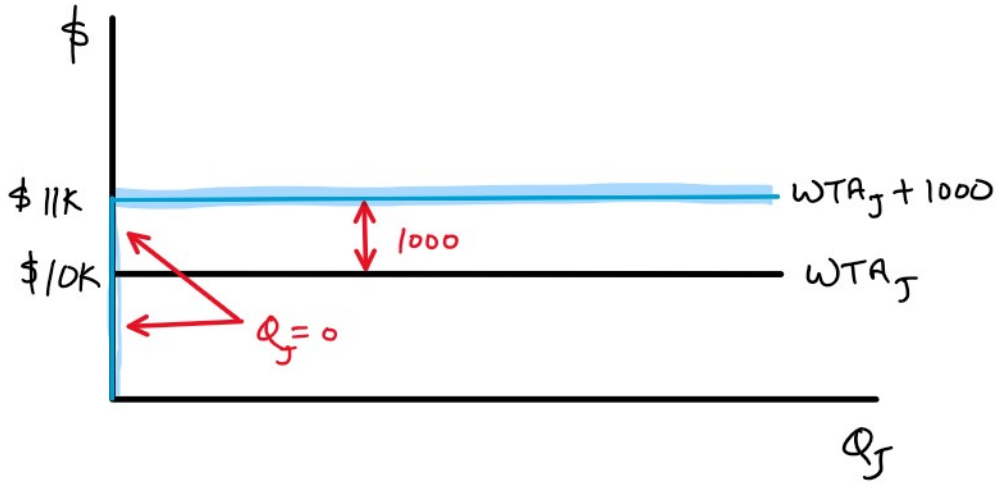
$P_{SJ}^S \geq WTA_J$

$$P_2^d - \$1000 \geq \$10{,}000$$

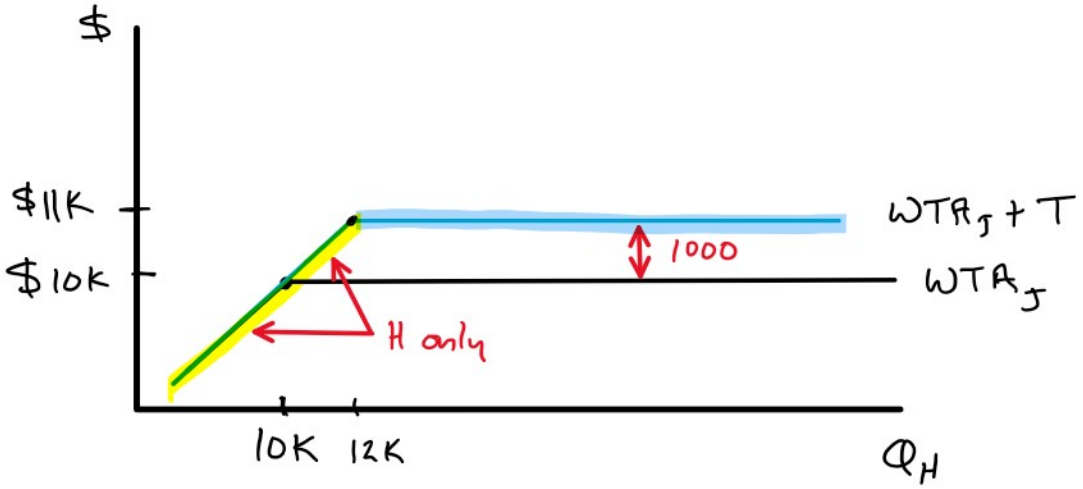
$$P_2^d \geq \$11{,}000$$

Japan supplies 0 below $11,000

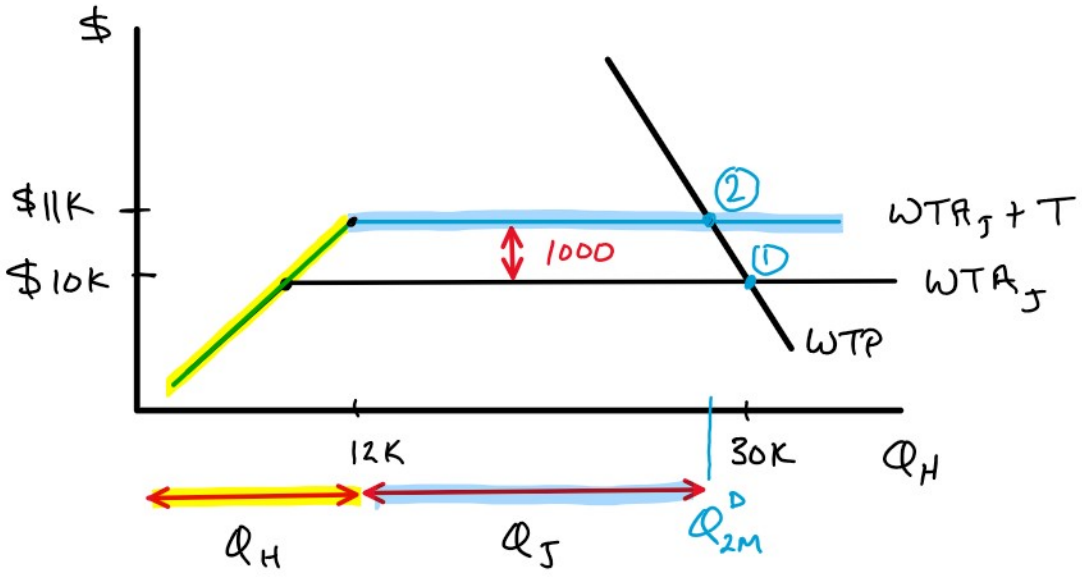
Only Harley will sell below $11,000



New market supply curve:



Adding in the market demand:



Use the market demand elasticity to find the new Q_{2M}^D:

$$\eta = \frac{\%\Delta Q^D}{\%\Delta P^d}$$

$$\%\Delta P^d = \frac{1{,}000}{10{,}000} = 10\%$$

$$-1 = \frac{\%\Delta Q^D}{10\%}$$

$$\%\Delta Q^D = -10\%$$

$$\Delta Q = (-0.1)(30{,}000) = -3{,}000$$

$$Q_{2M}^D = 27{,}000$$

Can find Japan's Q as a residual:

$$Q_{2H}^{S} = 12{,}000$$

$$Q_{2M}^{D} = 27{,}000$$

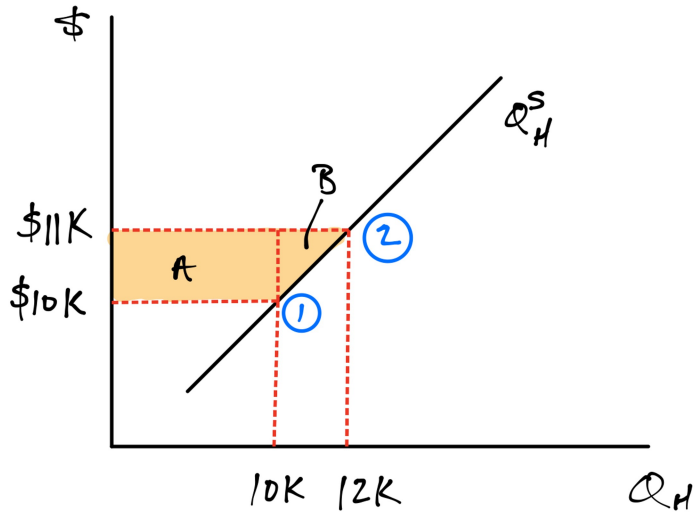
$$Q_{2H}^{S} + Q_{2J}^{S} = Q_{2M}^{D}$$

$$12{,}000 + Q_{2J}^{S} = 27{,}000$$

$$Q_{2J}^{S} = 15{,}000$$

Impacts on Welfare

Harley's ΔPS_H:

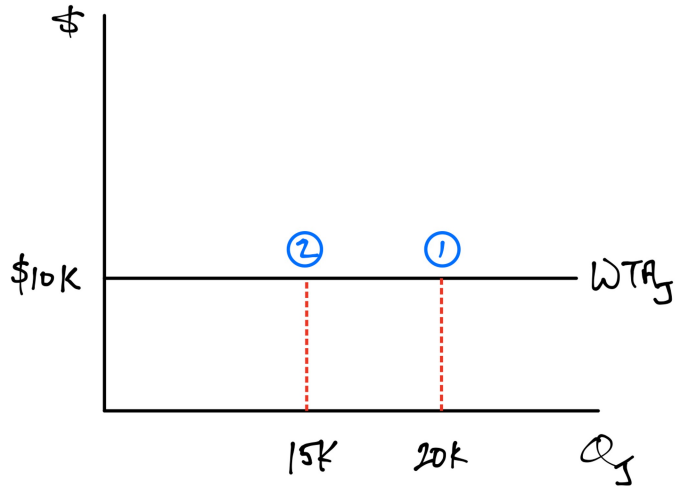


$$A = \$1{,}000 * 10{,}000 = \$10\ M$$

$$B = \frac{1}{2}(\$1000) * (2{,}000) = \$1\ M$$

$$\Delta PS_H = +\$11\ M$$

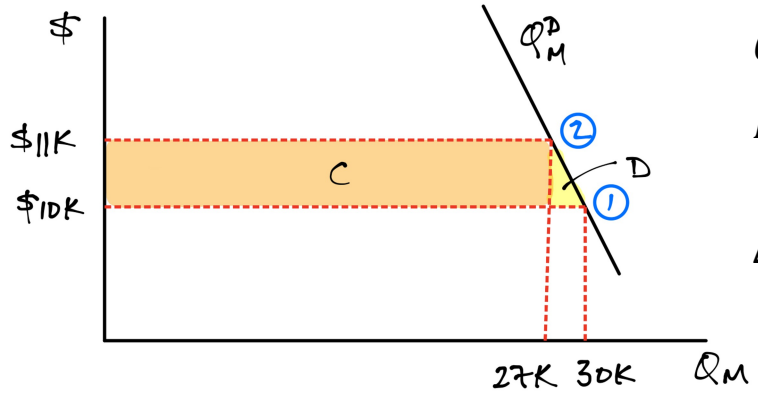
Japan's ΔPS_J:



Case	P_J^S	WTA_J	PS_J
1	\$10,000	\$10,000	0
2	\$10,000	\$10,000	0

$$\Delta PS_J = 0$$

Buyers' ΔCS:

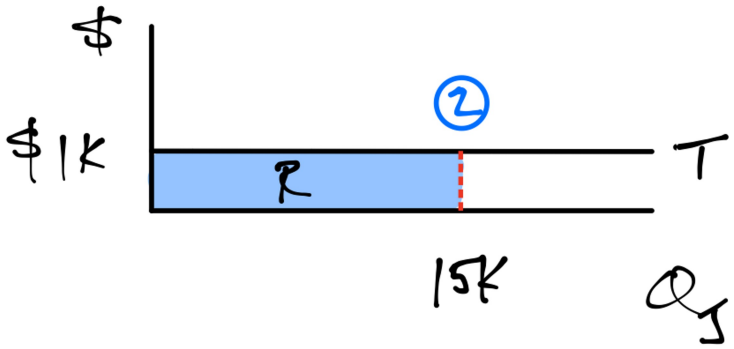


$$C = \$1{,}000 * 27{,}000 = \$27\ M$$

$$D = \frac{1}{2}(\$1{,}000) * \$3{,}000 = \$1.5\ M$$

$$\Delta CS = -\$28.5\ M$$

New government revenue ΔRev:



$$R = \$1{,}000 * 15{,}000 = \$15\ M$$

Overall ΔSS:

ΔPS_H	+$11 M
ΔPS_J	$0
ΔCS	-$28.5 M
ΔRev	+$15 M

$$\Delta SS = -\$2.5\ M \text{ (or DWL} = \$2.5\text{ M)}$$

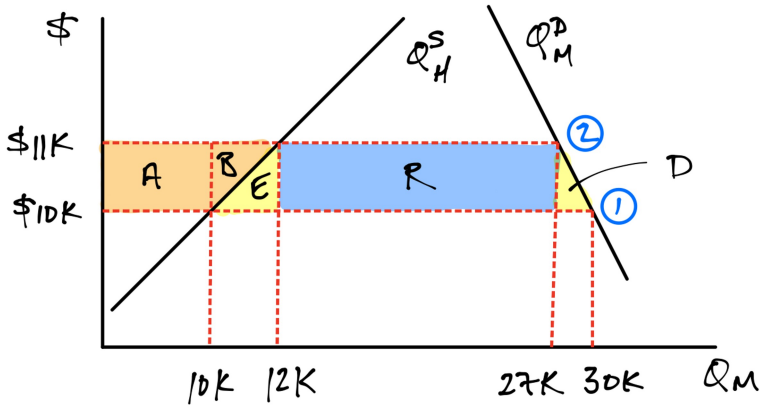
Consumers lose more than Harley and the government gain.

Two Forms of Inefficiency

Overall DWL has two distinct components:

1. Lost gains from trade [form of DWL so far]
2. Foregone saving on lower cost motorcycles [new form]

Assembling the complete market diagram:



$$\Delta PS_H = A + B$$
$$\Delta PS_J = 0$$
$$\Delta CS = -(A + B + E + R + D)$$
$$\Delta Rev = R$$

$$\Delta SS = -(D + E)$$

Area D

Lost gains from trade on 3,000 motorcycles no longer sold.
Value = $1.5 M

Area E

New component: lost CS not received by anyone
Value $= \frac{1}{2}(2{,}000) * \$1{,}000 = \$1\ M$

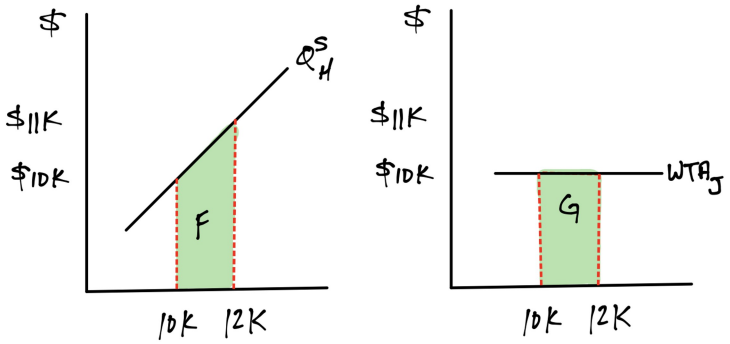
Total DWL

Matches previous calculation: $\$1.5\ M\ +\ \$1\ M\ =\ \$2.5\ M$

Where does E go?

Motorcycles between 10K and 12K now produced at higher cost.
Can see from total WTA required by each producer for those bikes

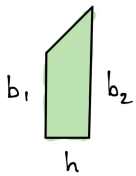
Harley's WTA: Japan's WTA



$$F = \left(\frac{\$10k + \$11k}{2}\right) * 2000 = \$21\ M$$

$$G = \$10k * 2000 = \$20\ M$$

Trapezoid area:



$$\left(\frac{b_1 + b_2}{2}\right) * h$$

Potential gain from switching from Harley back to Japan:

Save F: +$21 M

Spend G: -$20 M

Net = +$1 M