Practice Question A

Consider a standard monocentric city. Each household occupies $\frac{1}{2}$ acres of land ($l = 0.5$). The city population is fixed at 2,000. Agricultural land rent is \$200 per acre. 400 workers drive to work and have transportation costs of \$20 per km. 1,600 workers walk to work and have transportation costs of \$100 per km. Every household in the city must travel to work at the city center. (1 acre = 0.004 km^2)

a) At what distance from the city center does land use change from residential to agricultural?
b) At what distance from the city center does the local population change from walkers to drivers?
c) What is land rent (per acre) at the city center?

Practice Question B

A local metropolitan area contains 3 municipalities: City One, City Two, and City Three.
Each city charges a poll tax to residents:

City One: \$40 City Two: \$250 City Three: \$640

Each city has 1,000 homes that are inelastically supplied. Every house is identical in characteristics and price. Governments efficiently collect taxes on each local person and spend 100% of local revenue on local public goods.

a) How much money does each municipality spend on public goods?

You are considering moving to the area. You can buy a house in any of the 3 cities. If you move there, you displace one household from the region so that all cities maintain populations of 1000. The utility you receive from local public goods is equal to $\sqrt{R}$. Where R equals local expenditure on public goods. The utility you lose from paying taxes is equal to the dollar value of taxes paid.

b) Which city do you prefer?

c) If there was a vote to raise taxes by \$1 in your chosen city, how would you vote? If there was a vote to lower taxes by \$1 in your chosen city, how would you vote?

Practice Question C

The town of Turin has strict zoning laws. The amount of housing available in Turin is set by local government and is perfectly inelastic. In particular, the supply of housing in Turin is:

$$q_s = 600$$

The demand for housing in Turin is:

$$q_d = 1100 - p$$

Turin decides to host the Olympics. As a result, demand for housing at Turin (at any particular price) increases to 10× the previous level. Additionally, the national government commands Turin to permanently abolish its zoning laws, and allow the free market to provide housing, which it does with the following supply function:

$$q_s = p$$

Housing supply can increase but never decrease. Developers are myopic (not forward looking) and only care about current demand and supply levels.
Concerned about a surge in local housing prices, the local government imposes a permanent rent ceiling of $900. After the Olympics, housing demand falls to the original levels.
a) What is the price and quantity of housing traded before the Olympics? During? After?
b) By what amount did consumer surplus change due to the Olympics (CS_{After} - CS_{Before})? By what amount did producer surplus change (PS_{After} - PS_{Before})?

Practice Question A.

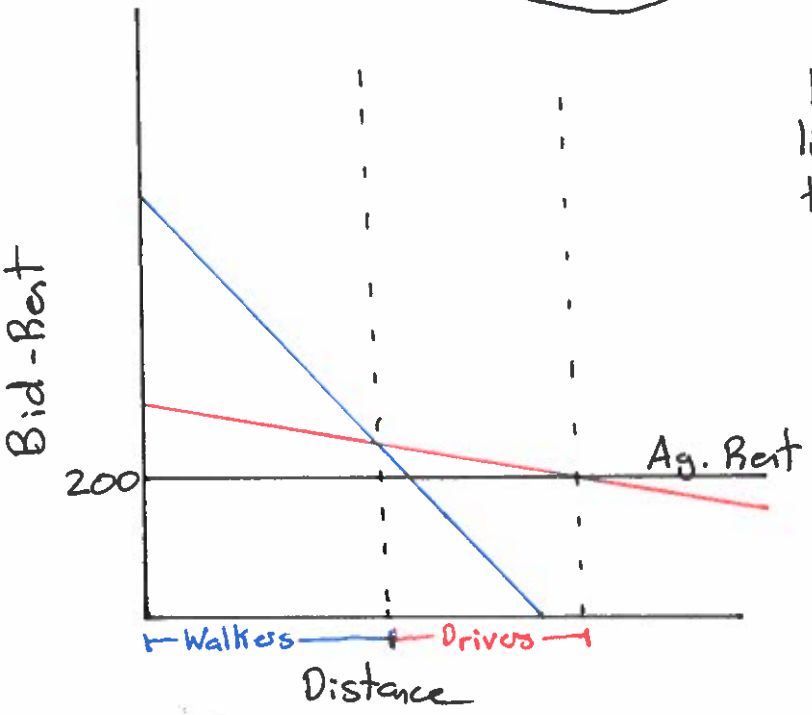
a) 2000 workers × 0.5 acres/worker
= 1000 acres

1000 acres × 0.004 $\frac{km^2}{acre}$
= 4 km^2

$A = \pi r^2$ $\quad 4km^2 = \pi r^2$ $\quad r^2 = \frac{4km^2}{\pi}$ $\quad r = \sqrt{\frac{4km^2}{\pi}}$

$r = 1.128km$

b) Note that group with higher transportation costs will locate closer to the city ceter:



So Walkers must have a bid rent (BR) line that is higher than Driver's BR line over land close to the city ceter.

The Area where Walkers outbid Drivers must be exactly large enough to fit all land demanded by Walkers.

How much land do walkers demand?

$1600 \text{ workers} \times 0.5 \frac{\text{acres}}{\text{worker}} = 800 \text{ acres}$

$800 \text{ acres} \times 0.004 \frac{\text{km}^2}{\text{acre}} = 3.2 \text{ km}^2$

How far from city center until all Walkers are accommodated?

$A = \pi r^2 \quad 3.2\text{km}^2 = \pi r^2 \quad r = \sqrt{\frac{3.2 \text{ km}^2}{\pi}}$

$= 1.01 \text{ km}$

c) Need to find y-intercept of the Walkers BR line...

Slope of Driver BR line: $\frac{-I}{\ell} = -\frac{20}{0.5} = -40$

Slope of Walker BR line: $\frac{-I}{\ell} = \frac{-100}{0.5} = -200$

We know 1 point on Driver's BR line, (1.128, 200)

Equation of Drivers BR: $y = mx + b$

$200 = -40(1.128) + b$

$b = 245.12$

$y = -40x + 245.12$

Walker & Driver BR lines cross at 1.01 km

BR at 1.01km = $BR = -40(1.01) + 245.12$

$= 204.72$

NOW, we have 1 point on the Walkers BR line: (1.01, 204.72)

$y = mx + b$

$204.72 = (-200)(1.01) + b$

$b = 406.72$

BR at city center is $406.72

Practice Question B.

a) Public goods spending = Local Revenue = 1000 × Tax

City One: $1000 \times 40 = \$40,000$

City Two: $1000 \times 250 = \$250,000$

City Three: $1000 \times 640 = \$640,000$

b) Utility from City One:

$$U = \sqrt{R} - T = \sqrt{40,000} - 40$$
$$= 200 - 40 = 160$$

Utility from City Two:

$$U = \sqrt{R} - T = \sqrt{250,000} - 250$$
$$= 500 - 250 = 250$$

Utility from City Three:

$$U = \sqrt{R} - T = \sqrt{640,000} - 640$$
$$= 800 - 640 = 160$$

You prefer City Two.

c) If taxes went up \$1: $U = \sqrt{251000} - 251 = 249.999$

If taxes went down \$1: $U = \sqrt{249000} - 249 = 249.999$

You would vote against <u>both</u> changes.

Practice Question C

Before Olympics

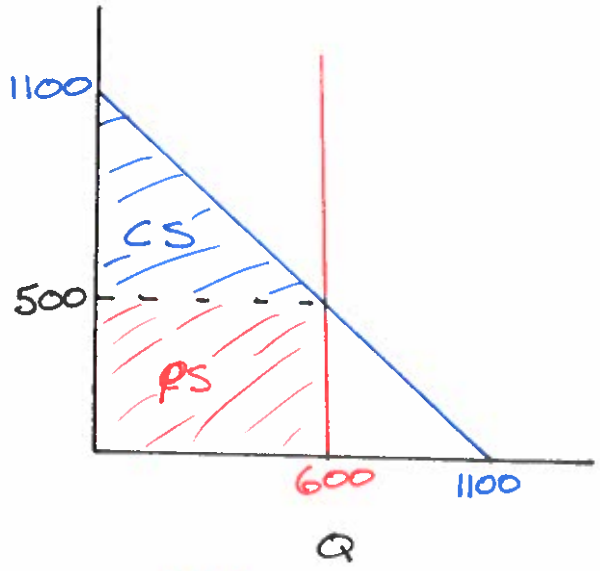
$q_s = 600$

$q_d = 1100 - p$

$600 = 1100 - p$

$p^* = 500$

$q^* = 600$



$PS = 500 \times 600$

$= 300{,}000$

$CS = \frac{600 \times 600}{2} = 180{,}000$

During Olympics

$q_s = p$

$q_d = 10(1100 - p)$

$q_d = 11{,}000 - 10p$

$p = 11{,}000 - 10p$

$11p = 11000$

$p^* = 1000$

$q^* = 1000$

<u>But</u> Best Ceiling = 900

so $p = 900$

$q_s = 900$

$q_d = 2000$

After Olympics

$q_s = p$

$q_d = 1100 - p$

$p = 1100 - p$

$2p = 1100$

$p^* = 550$

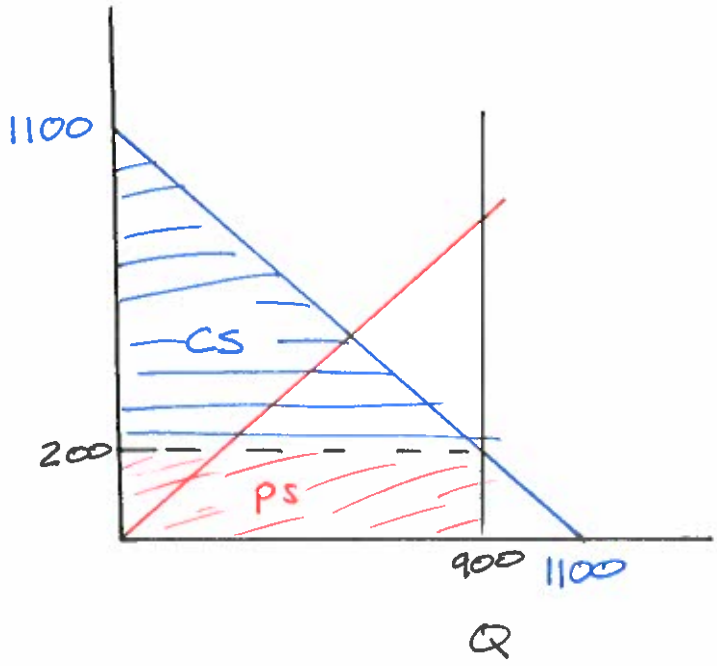
$q^* = 550$

But already built up to $q = 900$

$q_d = 1100 - p$

$900 = 1100 - p$

$p = 200$



$PS = 200 \times 900 = 180{,}000$

$CS = \frac{900 \times 900}{2} = 405000$

Producer suplus changed by $-120{,}000$

Consumes surplus changed by ~~$+387{,}000$~~ $+225{,}000$