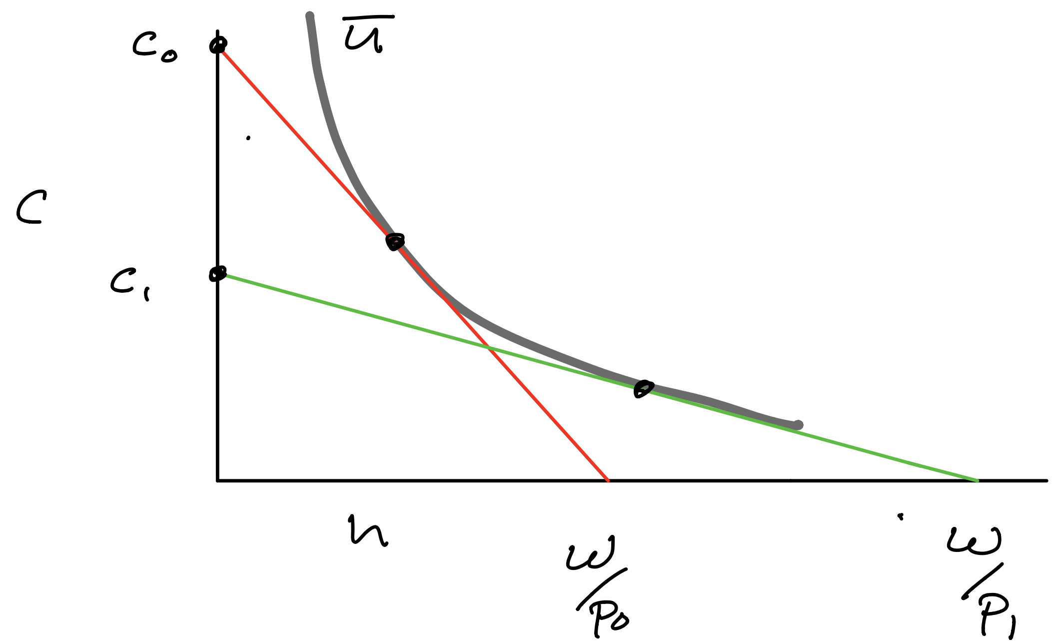
1.



- WE ARE GIVEN THAT $x_1 > x_0$. THAT IS, THE FLATTER BUDGET LINE DESCRIBES A MORE REMOTE LOCATION.

- WHEN $h=0$, WE HAVE

$$c_0 = w - 2tx_0 \quad , \quad c_1 = w - 2tx_1$$

THESE ARE y-INTERCEPTS OF THE BUDGET LINES.

- SINCE $x_1 > x_0$, WE MUST HAVE $c_1 < c_0$, AS DRAWN

- IN SPATIAL EQUILIBRIUM, HOUSEHOLDS OPTIMIZE $\Rightarrow$ BUDGET LINE IS TANGENT TO INDIF CURVE FOR OUTSIDE OPTION, $\bar{u}$.

- THIS CAN ONLY HAPPEN IF $p_1 < p_0$. THUS WE HAVE $p \downarrow$ AS $x \uparrow$

2. (a) MAX $c^{1/2} h^{1/2}$

S.T. $\tilde{\omega} = c + ph$ $\qquad \tilde{\omega} \equiv \omega - 2tx$

$$\Rightarrow \text{MAX } (\tilde{\omega} - ph)^{1/2} h^{1/2}$$

$$\text{F.O.C.} \Rightarrow \frac{1}{2}(\tilde{\omega}-ph)^{-1/2}(-p)h^{1/2} + \frac{1}{2}(\tilde{\omega}-ph)^{1/2} h^{-1/2} = 0$$

$$\Rightarrow -ph + (\tilde{\omega} - ph) = 0$$

$$\Rightarrow -2ph = -\tilde{\omega}$$

$$\Rightarrow h^* = \frac{\tilde{\omega}}{2p}$$

$$\Rightarrow c^* = \tilde{\omega} - ph^*$$

$$c^* = \tilde{\omega} - p\frac{\tilde{\omega}}{2p}$$

$$c^* = \frac{\tilde{\omega}}{2}$$

(b) USING $u(c,h) = 3 \Rightarrow$

$$c^{*1/2} h^{*1/2} = 3$$

$$\Rightarrow \left(\frac{\tilde{\omega}}{2}\right)^{1/2}\left(\frac{\tilde{\omega}}{2p}\right)^{1/2} = 3$$

$$\Rightarrow \frac{\tilde{\omega}}{2\sqrt{p}} = 3$$

$$\Rightarrow \sqrt{p} = \frac{\tilde{\omega}}{2}$$

$$\Rightarrow p^* = \left(\frac{\tilde{\omega}}{2}\right)^2 = \left(\frac{\omega - 2tx}{2}\right)^2$$

(c) $\max_S \; P S^{2/3} - iS - R$

F.O.C. $\Rightarrow \frac{2}{3} P S^{-1/3} - i = 0$

$$\Rightarrow S^{-1/3} = \frac{3}{2} \, i/P$$

$$\Rightarrow S^* = \left(\frac{3}{2} \, i/P\right)^{-3}$$

$$\Rightarrow S^* = \left(\frac{2}{3} \, \frac{P}{i}\right)^{3}$$

SUBSTITUTING INTO $h_S(S)$

$$\Rightarrow h_S^*(S^*) = \left[\left(\frac{2}{3} \, \frac{P}{i}\right)^{3}\right]^{2/3}$$

$$= \left(\frac{2}{3} \, \frac{P}{i}\right)^{2}$$

(d) POPULATION DENSITY IS

$$\frac{h_S^*}{h^*} = \frac{\text{HOUSING}/\text{AREA}}{\text{HOUSING}/\text{PERSON}} = \frac{\text{PERSON}}{\text{AREA}}$$

$$= \frac{\left(\frac{2}{3} \, \frac{P^*}{i}\right)^{2}}{\frac{\tilde{\omega}}{2p^*}} = \frac{4}{9i^2} \cdot \frac{2p^{*3}}{\tilde{\omega}}$$

$$= \frac{4}{9i^2} \cdot \frac{2}{\omega - 2tx} \left[\left(\frac{\omega - 2tx}{2}\right)^{2}\right]^{3}$$

$$= \frac{8}{9i^2} \cdot \left(\frac{w - 2tx}{2}\right)^5$$

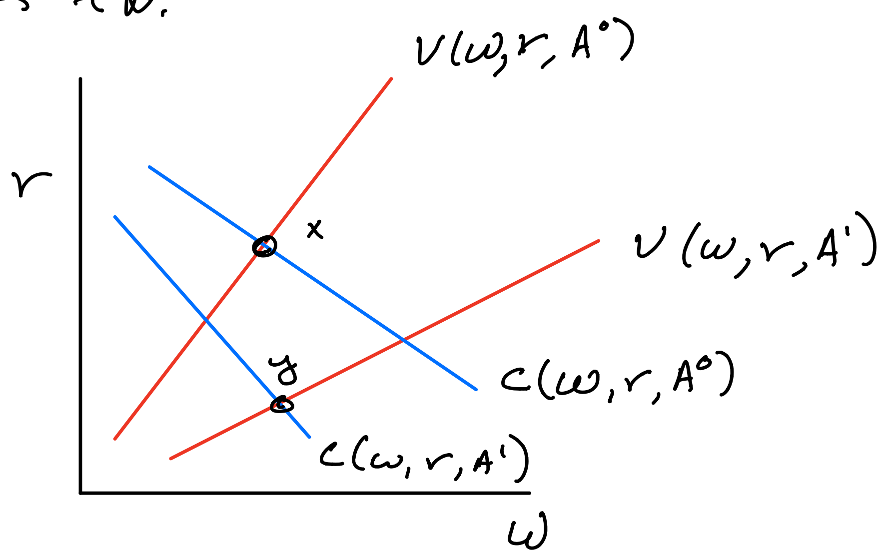
$$= \frac{1}{36 i^2} \left(w - 2tx \right)^5$$

(e) • WE SEE IN (d) THAT POPULATION DECLINES WITH DISTANCE TO THE CENTER. JUST LIKE BOTH THE 1900 AND 1940 DENSITY GRADIENT.

• WE SEE THE DENSITY GRADIENT IN (e) GETS FLATTER FROM 1900 TO 1940. THIS WAS THE PERIOD WHEN THE AUTOMOBILE CAME INTO USE, SO $t \downarrow$. IN (d) THE DENSITY GRADIENT ALSO GETS FLATTER AS $t \downarrow$.

3.

(a)

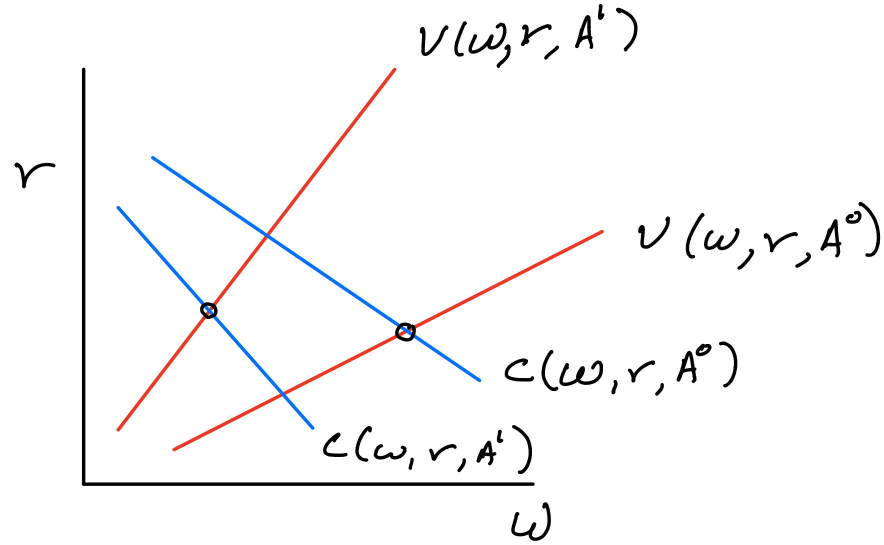


• WITH $A = A'$, EQUILIBRIUM IS AT x, WHERE $(r, w) = (r', w')$

- HOUSEHOLDS LIKE LESS RENT HOLDING w CONSTANT, SO, HOLDING UTILITY CONSTANT AND WAGE CONSTANT, HOUSEHOLDS NEED LOWER RENT TO LIVE WITH A^0 THAN A^1. SINCE $A^1 > A^0 \Rightarrow$ A IS A GOOD FOR HOUSEHOLDS.

- FIRM PRODUCE ONE UNIT AT THE SAME COST HOLDING RENT CONSTANT ONLY IF THE WAGE IS LOWER FOR A_1 THAN A_0. SINCE $A_1 > A_0 \Rightarrow A_1$ IS A BAD FOR FIRMS.

(b)



SIMILAR TO ABOVE:

- FIXING RENT, FIRMS CAN HOLD CONSTANT COSTS WHILE PAYING A HIGHER WAGE WITH A^0 THAN $A^1 \Rightarrow A^1$ IS GOOD FOR FIRMS

- FIXING RENT, H.H. HOLD UTILITY CONSTANT ~~AT~~ AT A LOWER RENT WITH A^1 THAN A^0.
$\Rightarrow$ NEED MORE CONSUMPTION ~~AT~~ AT
$\Rightarrow$ A^1 IS A BAD FOR H.H.

4. IF WE PERFORM THE REGRESSIONS

$$\ln r = B_0 + B_1 A + \varepsilon$$

AND

$$\ln w = C_0 + C_1 A + \eta$$

THEN

$$\frac{d \ln r}{dA} = B_1$$

AND

$$\frac{d \ln w}{dA} = C_1$$

WE CAN DO THESE REGRESSIONS WITH GIVEN DATA.

WE ARE ALSO GIVEN THAT $\frac{l_c r}{w} = 1/3$

THUS WE HAVE

$$\frac{P_A}{w} = \frac{1}{3} \cdot B_1 - C_1$$

THAT IS, WE CAN ESTIMATE THE REAL PRICE OF A FROM THE GIVEN DATA.

6. • THE SOLID LINE IN THE FIGURE IS THE OBSERVED DISTRIBUTION OF PAIRWISE DISTANCES FOR THIS INDUSTRY.

• THE TWO DASHED LINES BOUND THE AREA WHERE WE WOULD EXPECT THIS CURVE TO LIE IF FIRMS LOCATED AT RANDOM.

. THE GRAPH SHOWS TOO MANY PAIRS OF FIRMS CLOSE TOGETHER FOR RANDOM CHOICE

$\Rightarrow$ FIRMS ARE MORE AGGLOMERATED THAN RANDOM

7. TOP: NEW BIG GROCERY ENTRY DRAWS ABOUT 3% OF ALL FOOD EXPENDITURE FROM FOOD DESERT RESIDENTS

MIDDLE: BIG GROCERY STORE SHARE OF ALL FOOD EXPENDITURE FROM FOOD DESERT RESIDENTS DOES NOT CHANGE WITH ENTRY OF NEW GROCERY

BOTTOM: DIET OF FOOD DESERT RESIDENTS DOES NOT CHANGE WITH ENTRY OF STORE.

$\Rightarrow$ ADDING GROCERIES TO FOOD DESERTS DOES NOT CHANGE DIETS OF RESIDENTS.