

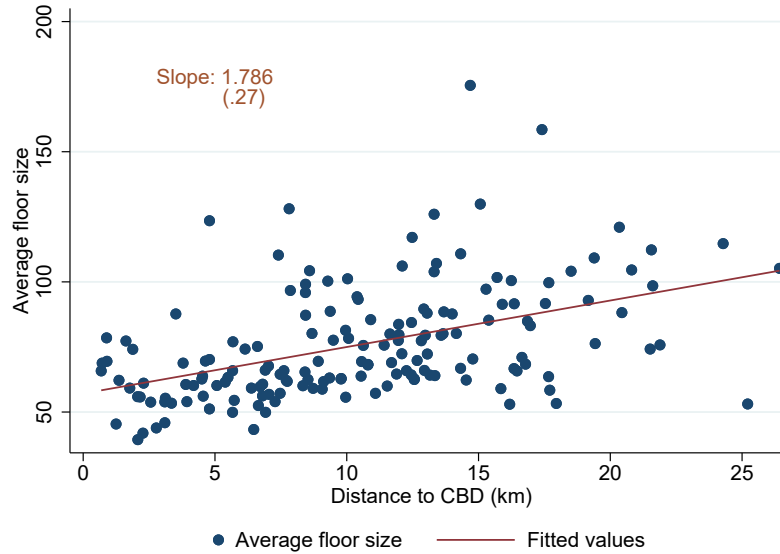
Urban Economics  
31C02100, REC-E3500  
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Problem set 1 - solutions

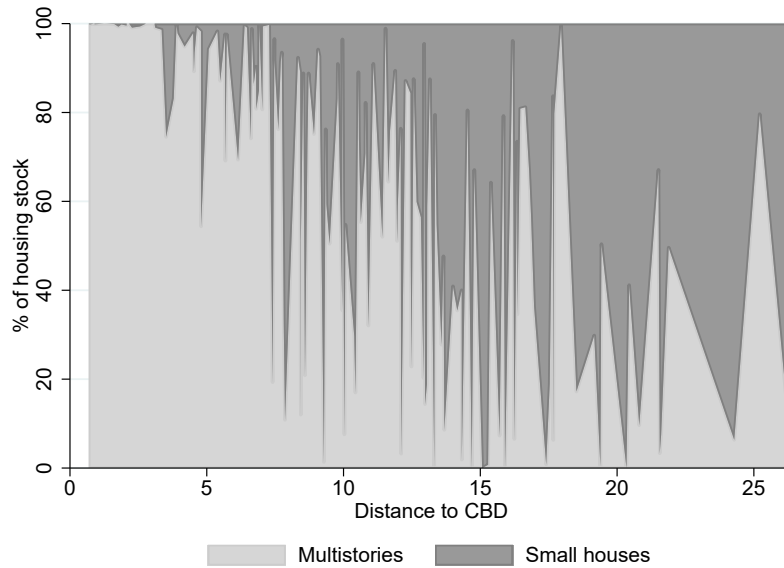
**1 Exercise 1**

- (a) False. The shrinking of Rochester's high-tech cluster followed from the product of its largest firm, Kodak, becoming obsolete. This makes for a good natural experiment because it is an exogenous shock that decreases the size of the cluster, in contrast to failed policies which might impact productivity through channels other than agglomeration.
- (b) False. The quality of matches is a channel through which the effects of agglomeration may act, not a confounder that would cause a spurious association between agglomeration and productivity.
- (c) False. He says that biotech firms are clustered in places where the important findings in the field happened in the past.
- (d) False. Moretti also points out that moving firms outside of the large clusters could cut aggregate productivity.
- (e) True. His findings imply that this would be the case in an extreme scenario where each city in the U.S. had the same number of inventors in each field.
- (f) False. The opposite has happened despite the predictions that internet would "level the playing field".

## 2 Exercise 2



- (a) We see that there is a positive relationship between average floor size and distance to the CBD. This is one of the predictions of the monocentric city model. As distance from the CBD increases, consumption of housing increases.
- (b) Zip-codes with highest share of small dwellings: Nöykkiönpuro, Suvisaaristo, Latokaski, Siikajärvi, Finnoo-Eestinmalmi, Keimola, Päiväkumpu, Kuusisto-Hakkila, Östersundom, Paloheinä.
- Zip-codes with highest share of multi-story dwellings: Sörnäinen-Harju, Itä- ja Keski-Pasila, Jätkäsaari, Kaartinkaupunki, Meilahden sairaala-alue, Pajamäki, Kallio, Helsinki City Center - Etu-Töölö, Keski-Töölö, Katajanokka
- (c) We see that zip-codes that are farther from the CBD have a higher share of small dwellings. This is in line with the predictions of the monocentric city model. As land gets cheaper farther from the CBD, building height decreases, hence there are fewer multi-story dwellings and more single-home dwellings.



### 3 Exercise 3

- (a) Substituting  $c^*$  in place of  $c$  in the budget constraint gives  $c^* + 2000p = 45 - 0.02x$ . Solving for  $p$  yields

$$p = \frac{45 - 0.02x - c^*}{2000}$$

So  $p$  falls as  $x$  increases. In this case, the dwelling size cannot adjust, so the relationship between  $p$  and  $x$  is linear. Or,

$$\frac{\partial p}{\partial x} = -\frac{0.02}{2000}$$

- (b) The profit for the housing developer is  $80,000p - 700 - r$ . Setting profits to zero and solving for  $r$  yields

$$r = 80,000p - 700$$

Substituting  $p$  from (a) yields

$$\begin{aligned}
r &= 80,000 \left( \frac{45 - 0.02x - c^*}{2000} \right) - 700 \\
&= 40(45 - 0.02x - c^*) - 700 \\
&= 1800 - 0.8x - 40c^* - 700 \\
&= 1100 - 0.8x - 40c^*
\end{aligned}$$

So land rent  $r$  falls as  $x$  increases. Also here, the relationship between  $r$  and  $x$  is linear because building size is now fixed.

- (c) Each square block of the city has 40 households living on it. A city with radius of  $\bar{x}$  blocks can accommodate  $40\pi\bar{x}^2$  households. If the city population is 115,000, the radius has to fulfill

$$\begin{aligned}
40\pi\bar{x}^2 &= 115,000 \\
\bar{x} &= \sqrt{115,000/(40)(3.1416)} \approx 30
\end{aligned}$$

- (d) Suppose that  $c^* = 27$  and that  $r_A = 5$ . Plugging these into the land rent function obtained in (b) gives

$$1100 - 0.8x - 40 \cdot 27 = 5$$

Solving for  $x$  gives

$$\bar{x} = \frac{15}{0.8} = 18.75$$

With this consumption level for bread, the city is not big enough to fit its population.

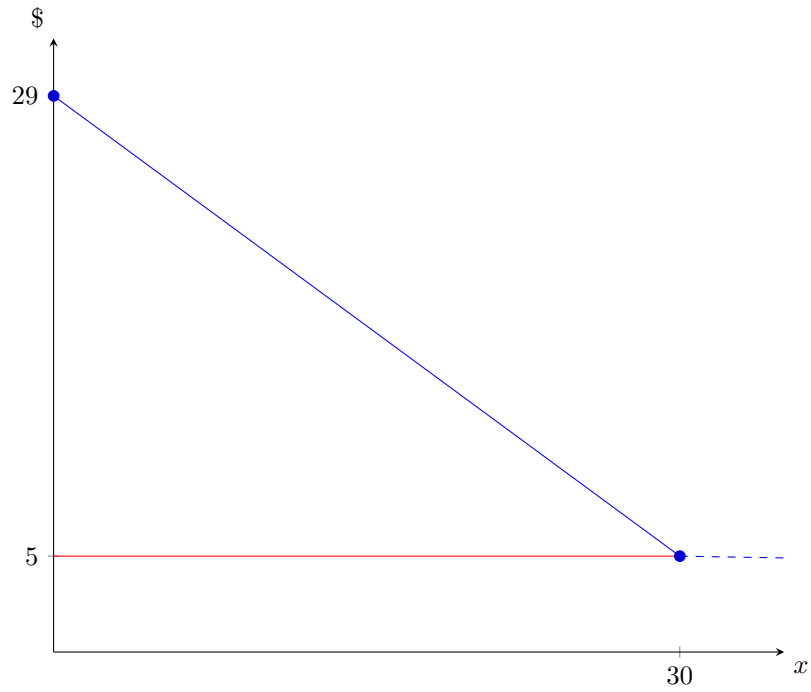
Solving for the value of  $c^*$  that leads to just the right radius for the city

$$\begin{aligned}
1100 - 0.8 \cdot (30) - 40c^* &= 5 \\
40c^* &= 1100 - 24 - 5 \\
c^* &= \frac{1071}{40} = 26.775.
\end{aligned}$$

- (e) The equilibrium land rent function is

$$r(x) = 1100 - 0.8x - 1071 = 29 - 0.8x$$

At the CBD, the land rent is  $r(0) = 29$  and at the city's edge  $r(30) = 29 - 0.8 * 30 = 5$ . The land rent function is plotted below.



The commuting costs for a household at the edge of the city is  $0.02 * 30 = 0.6$  or \$600.