Problem Set 6 - Question 1

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Question

One million people live and work in a city, which is arrayed on a line segment. The feasible population density in the city is 100,000 per mile. All of the work occurs downtown, which we label as point zero. Commuting in this city requires T units of time per mile traveled.
The city borders a vast farmland, where the daily land rental rate is $100,000a$. That is, a farm owner would accept converting a mile of his farmland to 100,000 residences if each resident paid daily rent of a. The population consists of low and high skill workers, with time values w_L and w_H, respectively. The time units for wages are the same as for commuting. Consumers treat commute time as equivalent to work time in terms of the value forgone opportunities for leisure or household production.

Overview

- What is the proper role of government?
  - Identify and correct for market failure
  - Social planner is omniscient, omnipotent, benevolent
- What is the role of government in practice?
  - You'll see in PTIII a little bit of mechanism design, which removes omniscience and omnipotence
  - Are governments benevolent?
  - What is the role of economists in all of this? We are pretty good at identifying market failures...
- Relevant papers:
  - Stigler (1971): capture theory of regulation
  - Becker (1983): interest group competition

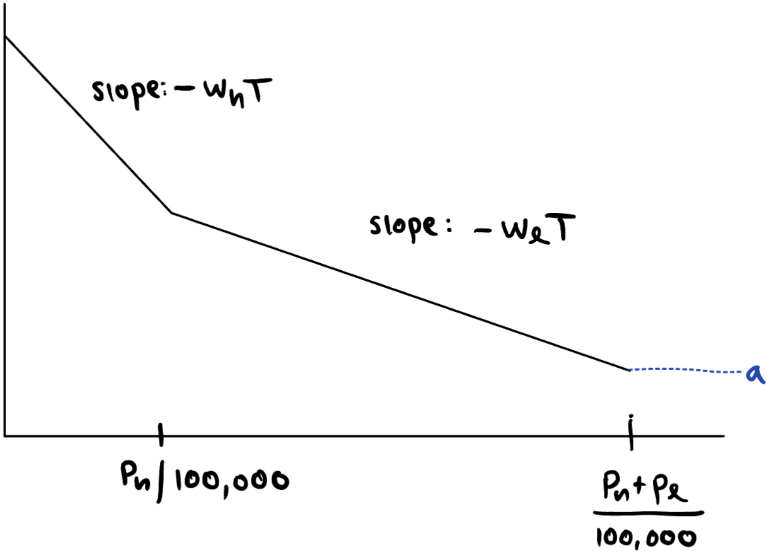
Part A

a) What is the equilibrium residential rental rate downtown?

- Pretty straightforward from textbook/Murphy's lectures
- Rent curve is kinked linear with slope equal to cost of commuting
- Let p_j be size of skill group j

$$
\begin{aligned}
r(0) &= a + \left(\frac{p_h}{p_h + p_l} w_h + \frac{p_l}{p_h + p_l} w_l \right) \frac{p_h + p_l}{100000} T && (1) \\
&= a + \bar{w} m T && (2)
\end{aligned}
$$

Part A-Graph



Part B

b) How would the downtown rental rate be affected by an increase in population? Does it matter whether the new city residents are low- or high-skill?

Part B

- Both increase price by expanding border of the city
- A high skilled worker increases the price more because of their wages

$$r(0) = a + \frac{p_h w_h + p_l w_l}{100000} T$$

$$\frac{\partial r(0)}{\partial p_h} = \frac{w_h}{100000} T$$

$$\frac{\partial r(0)}{\partial p_l} = \frac{w_l}{100000} T$$

Part C

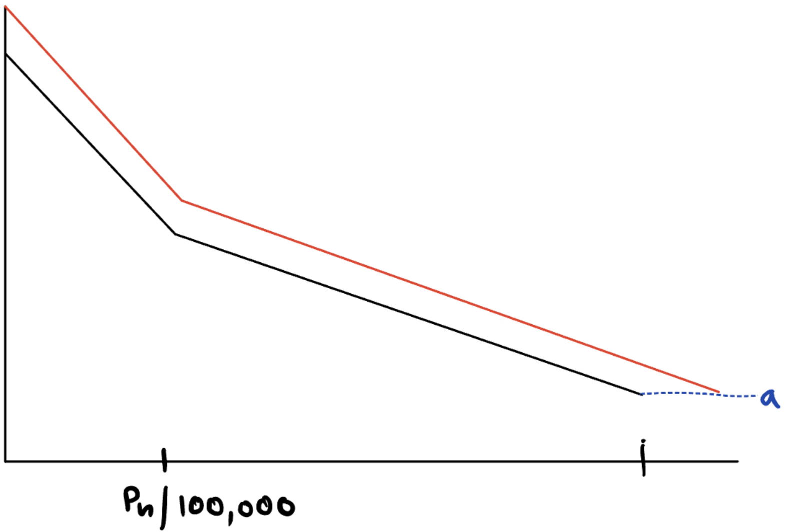
c) At a time when the city population was one million, an ordinance was passed limiting residential density beyond mile 9. We model regulatory stringency as a parameter τ, with regulation limiting density to 100,000τ per mile. How are the different types of workers harmed by this regulation?

Part C

- Assume that nine miles is beyond point of where high skilled workers live
- Because wages and the time to travel didn't change, the land use regulation does not affect the slopes of the curves but does increase rents by extending the city's border.
- The city is extended because now 100,000 people live at density $100,000\tau$ instead of at density 100000. The vertical shift in rents is therefore:

$$\left(\frac{1}{\tau} - 1\right) w_l T$$

Part C-Graph



Part D

d) Aside from the workers, who might benefit from the land use restriction? How does the dollar amount of their benefit compare to the cost to workers?

Part D

- Landowners clearly benefit from regulation as they receive increased rental payments.
- The aggregate increase in rental payments is:

$$\begin{aligned}\Delta R(\tau) &= 10\left(\frac{1}{\tau}-1\right)w_l T + \frac{1}{2}\left(\frac{1}{\tau}-1\right)^2 w_l T \\ &= \left[\frac{1}{2\tau^2}+\frac{9}{\tau}-9.5\right]w_l T\end{aligned}$$

- Harm to workers in dollar terms is exactly equal to benefit in rents
- Regulation hurts efficiency through harm to employers as workers spend more time commuting and work fewer hours–but this is unmodelled

Part E

e) The regulatory beneficiaries are loosely organized to pressure the city government to tighten the regulations, or at least refrain from loosening them. They spend $B \geq 0$ *in such lobbying. Likewise, the workers are loosely organized and spend* $A \geq 0$ *trying to convince the city government to do the opposite. The policy outcome is* $\tau = \frac{A}{A+B}$*. Each group understands how their lobbying affects the policy outcome. They take the other group's spending as given. What factors would each group take into consideration when deciding how much to lobby?*

Part E

- Loose organization was a key phrase here. The lobbying group needs to raise revenue somehow and while a government can levy taxes a lobbying group cannot. They must organize
- You can think of lobbying as a public good: every dollar I contribute has a direct effect on my rent but also on the rent of everyone else. Lobbying is underprovided for this reason
- On the landowner side: big difference between one landlord who receives all the benefits from the regulation vs many landlords who also have to coordinate
- Could be creative with this problem!

Part E

The key considerations are

- The marginal change in rent with respect to regulation
- The marginal change in regulation with respect to lobbying
- The difficulty in controlling freeriding

Part E

Without free-riding, the workers problem taking A as given is:

$$\min_A \Delta R(\tau) + A$$

Implies FOC:

$$\Delta R'(\tau)\frac{\partial \tau}{\partial A} = -1$$

This says the lobbying group spends until the marginal cost of lowering rent by a dollar is exactly one dollar.

Part E

Without free-riding, the owners problem taking B as given is:

$$\max_{B} \Delta R(\tau) - B$$

Implies FOC:

$$\Delta R'(\tau)\frac{\partial \tau}{\partial B} = 1$$

Combining this with the above condition implies:

$$\frac{\partial \tau}{\partial A} = -\frac{\partial \tau}{\partial B}$$

Part E

$$\frac{\partial \tau}{\partial B} = \frac{-A}{(A+B)^2}$$
$$\frac{\partial \tau}{\partial A} = \frac{B}{(A+B)^2}$$
$$\implies A = B$$

We might have expected in this symmetric setup where the benefits of the regulation exactly outweigh it's costs that we get an uninteresting result.
When $A = B$, $\tau = 1/2$, this is probably an undesirable property of the model as it gives a clear advantage to landowners.

Part E

- Now we assume that each lobbying group must exert effort to raise funds and control the free rider problem
- One way to model this is so that only a fraction of contributions to the lobbying group, δ_A and δ_B , make it to the politician
- Each worker/homeowners is considering how much to donate and gives until the marginal dollar exactly lowers rent by 1 dollar:

$$\frac{dR}{db} = 1$$

$$\frac{dR}{da} = -1$$

(where a is the amount an individual donates)

Part E

$$\frac{dR}{db} = \Delta R'(\tau)\frac{\partial \tau}{\partial B}\frac{\partial B}{\partial b} = 1$$

$$\frac{dR}{da} = \Delta R'(\tau)\frac{\partial \tau}{\partial A}\frac{\partial A}{\partial a} = -1$$

$$\frac{A}{B}\frac{\delta_B}{\delta_A} = 1$$

$$B = \frac{\delta_B}{\delta_A}A$$

$$\tau = \frac{A}{(1+\frac{\delta_B}{\delta_A})B} = \frac{1}{1+\frac{\delta_B}{\delta_a}} = \frac{\delta_A}{\delta_A+\delta_B}$$

Part F

- Adding population increases rents across the city as shown above
- Population also increases the burden of regulation because now more people live beyond the 9 mile cutoff
- While this makes the stakes of lobbying higher, it does so in a symmetric way that will not impact the relative marginal benefits
- As above, equilibrium regulation only affected through relative organizational capacity

Part F

- How does increasing population affect free-ridership?
- Obviously going from 1 to 2 people makes the freerider problem worse
- Generally more difficult monitoring/enforcement of donations unless new investment in monitoring technology
- Larger population probably erodes connection to the entire lobbying group
- With these kinds of arguments likely landowners are better organized

Part G

Raising the relative organization ability of a group means that their fraction of donations that go toward the regulation increases.
This has the effect of reducing allowed density:

$$\frac{\partial \tau}{\partial \delta_B} = \frac{-\delta_A}{(\delta_A + \delta_B)^2}$$