11.433J / 15.021J Real Estate Economics
Fall 2008

Week 8: Public Goods, Externalities, Development and regulations.

- Public goods (e.g. open space) and “free riding”.
- Externalities across properties: Nash versus cooperative solutions.
- The impact of historical development in “locking in” current land use patterns.
- Regional open space/land constraint impacts.
- Congestion and development decisions.

1). A number (n) of neighbors contemplate purchasing a vacant lot in their midst.

MV = valuation of the lot by each (as a piece of adjoining open space).

p = price of lot

MV >p/n , but MV<p

Free riding with open space as a *pure* public good. Sharing? Exclusion? Voting?

House Prices and Park Access: greater distance = less benefit or more sharing?

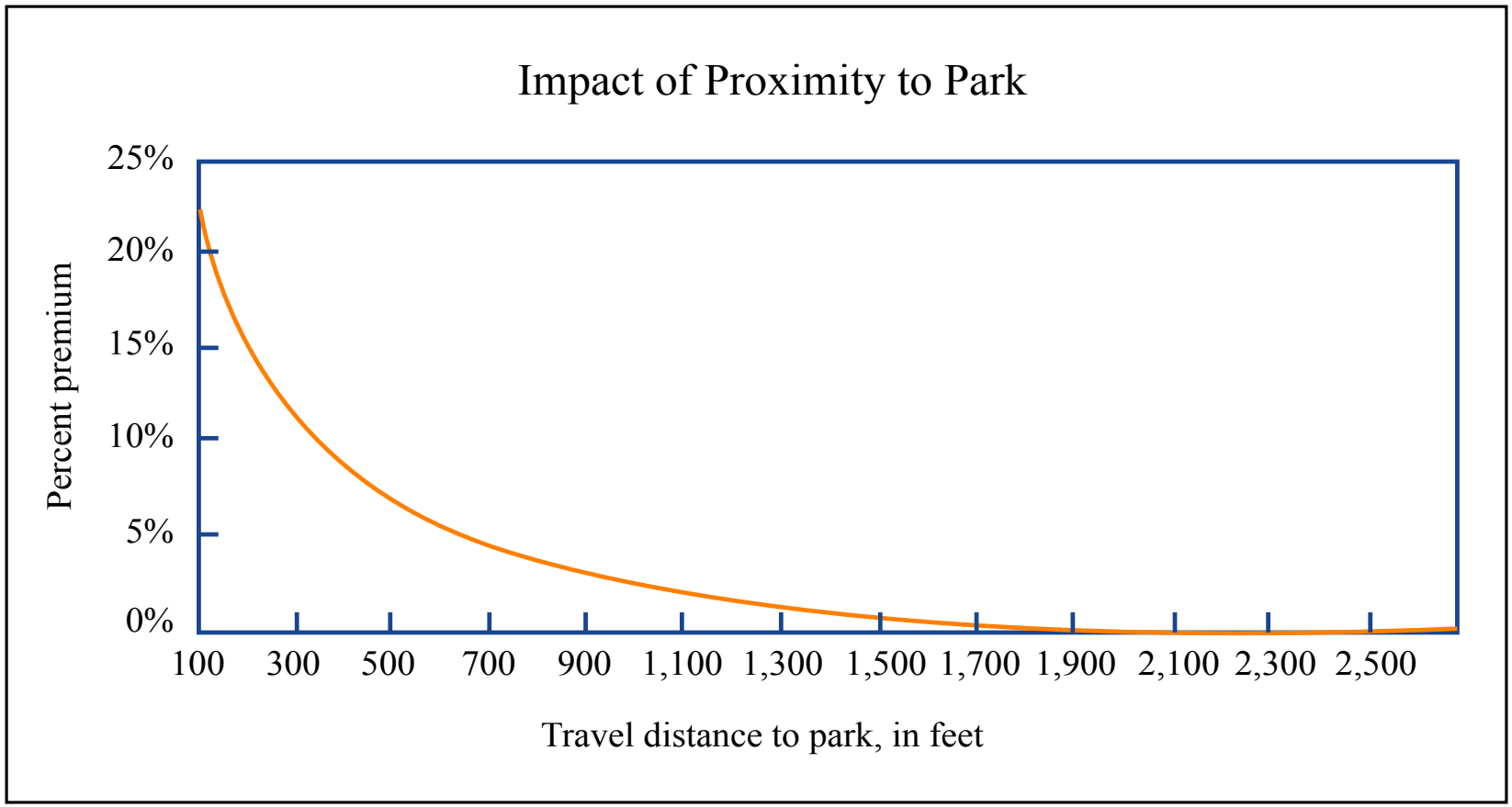


Figure by MIT OpenCourseWare.

2). Suppose park benefits depend on the number using it (n)?

MV(n) = valuation of the park by each (as a function of how many are sharing it)

If the park is not excludable how many will use it:$MV(n_0) = 0$ so $n_0 = \infty$ (possibly)

[examples: Fishing, grazing]

3). Total value of usage to group: nMV(n)

How many should use to maximize total usage value: $MV(n^*) + n\partial MV/\partial n^* = 0$

$MV(n^*) = - n\partial MV/\partial n^* > 0$, hence $n^* < n_0$

4). $n_0 - n^*$ = degree of "over grazing, fishing…"

If the park is excludable it can be "privatized". Owner winds up setting an entrance fee as above = $[- n\partial MV/\partial n^*]$.

Public Goods –vs- Externalities

Externalities: impact of what happens on one parcel to adjoining ones.

Public good: a collective impact on many parcels whose origination is not one specific other parcel.

5). $P = \alpha - \beta F - \gamma f$

F = FAR of subject's lot

f = FAR of neighbors [*an externality*]

β = marginal impact of own FAR on price

γ = marginal impact of neighbor FAR

α = all other location factors

6). $C = \mu + \tau F$ [construction costs:as before]

7). $p = [(\alpha-\mu) - (\tau + \beta)F - \gamma f]F$

8). Nash ["a beautiful mind"] solution:

$F^m = [(\alpha-\mu) - \gamma f] / 2(\tau + \beta)$

$F^m = f$, implies:

$F^m = (\alpha-\mu) / [2(\tau + \beta) + \gamma]$

$p^m = (\alpha-\mu)^2 (\tau + \beta) /[2(\tau + \beta) + \gamma]^2$

9). Cooperative solution that maximizes all property recognizing that f=F from the beginning:

$$p = (\alpha-\mu)F - (\tau + \beta)F^2 - \gamma F^2$$

Solution is:

$$F^* = (\alpha-\mu) / 2(\tau + \beta + \gamma) , \quad F^* < F^m$$

$$p^* = (\alpha-\mu)^2 / 4(\tau + \beta + \gamma) , \; p^* > p^m$$

What if $\gamma<0$ and greater neighborhood FAR increases home values?

Additional examples of public goods/externalities

- Infrastructure: sidewalks, roads, waterways, lagoons..in addition to open space.
- Historic Districts. Designation provides insurance and control against adverse design/use (a public good). Downside is loss of individual development options. Net is positive (Coulson)? Empirical issue: suppose “better” properties are chosen for historic designation?
- Comprehensive Development Design. Is the “style” of your property an externality to others? Yes in Europe, no in the US.

Solutions to Public Good/Externality Problems.

- **Scale**: single (collective) ownership of a large parcel of land insures few negative and many positive externalities at development stage (Thorsnes shows development scale matters – lots are worth more in big developments)
- Single owner maximizes the total value of development – sacrificing value at one location if such a sacrifice creates more value at other locations.
- If development ownership is fragmented – each fragment considers only what best for his portion.
- Is the "whole" *always* worth more than the sum of the parts? [Liquidity – versus – externalities]. Does the price of an acre decrease/increase with the size of purchase?

Solutions to Public Good/Externality Problems.

- With large scale Private development, what happens later on – maintaining the original concept and adapting to change.
  - ***Are covenants and restrictions enough?***
  - ***Lessons from Houston, Hilton Head***

- **Public Regulation/Planning.** Alternatively, careful public regulations and master-planning could achieve such harmony. (If you trust planners or politicians to maximize aggregate land value). How to insure this – give them a stake?
- "Town Architects" in Europe. What if there is little consensus on what good design is?

Are there "externalities" in commercial Real Estate?

- Office Building height: views versus view blockage, the market for air rights.
- "Good" office architecture. Where is the externality, tenants or neighbors?
- Adjacent retail stores: auto strips (multiple dealerships), shopping centers.
- Hospitals, medical "zones".

Region Wide Externalities

10). Industry (I)-Household (H) Externalities can operate at a metropolitan scale.

$r_I(d) = r_I - k_I d$

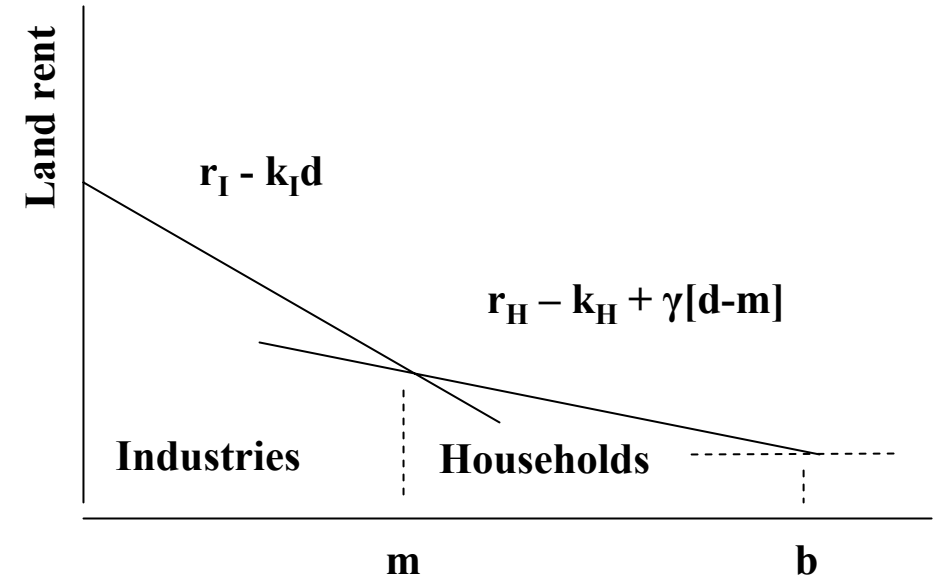
$r_H(d) = r_H - k_H d + |m-d| \gamma$

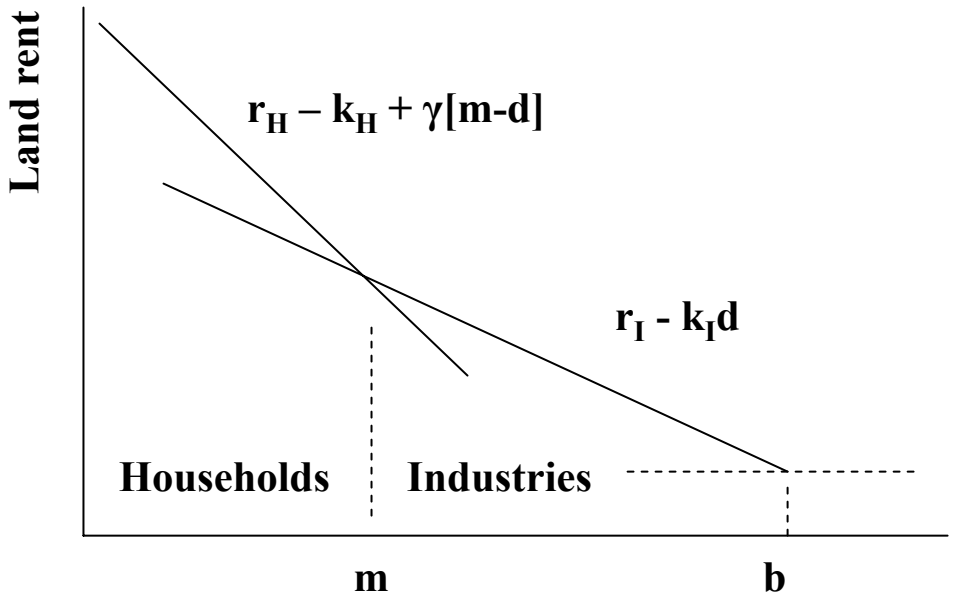
k_I, k_H = marginal values for commuting to the center: $k_I < k_H$

γ = marginal valuation of distance from industries by households: assume γ "large"

[note works in both directions with the absolute value function |--|.]

Multiple equilibrium solutions to a city in which one use dislikes being near to the other. History matters! Which patterns maximizes regional land value?





Bidding for Uses: Coase Theorem Revisited

	Town A	Town B
Production Costs	15	10
Environmental Harm	10	20
Production + "Compensation"	***25***	***30***
Production + "Exclusion"	***-5***	***0***

"Compensation" = firm pays town environmental costs if it locates there. *[town has location "rights"]*

"Exclusion" = town pays environmental costs for firm *not* to locate there. *[firm has location "rights"]*

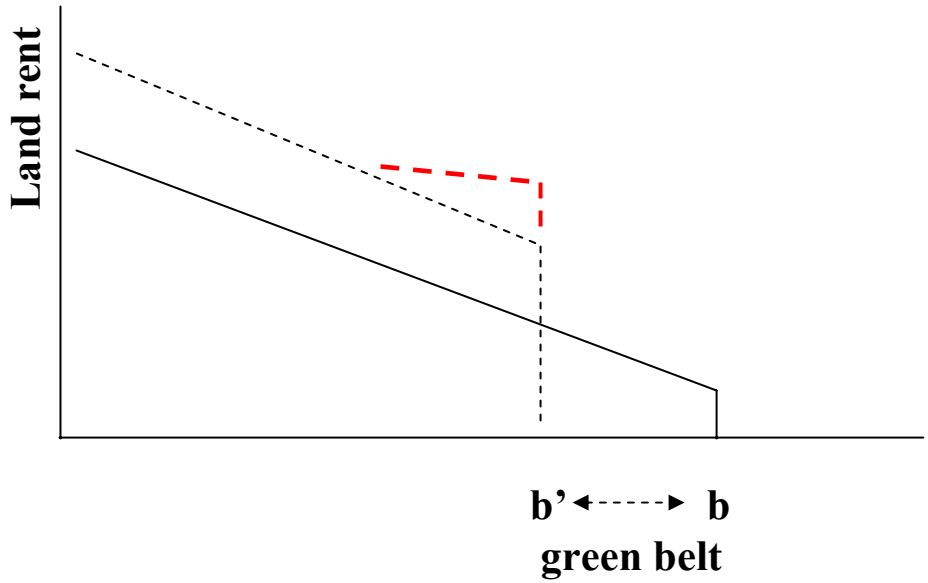
What if environmental impacts spread beyond boundaries?

Then firms must compensate all towns for each possible location – that location where the sum of production costs plus all compensation payments is lowest – is best.

Impacts of regional open space policy: *Always* raises house prices and land values. How much is from constricting supply as opposed to generating true "public good" benefits? London Green Belt, Seattle growth boundary

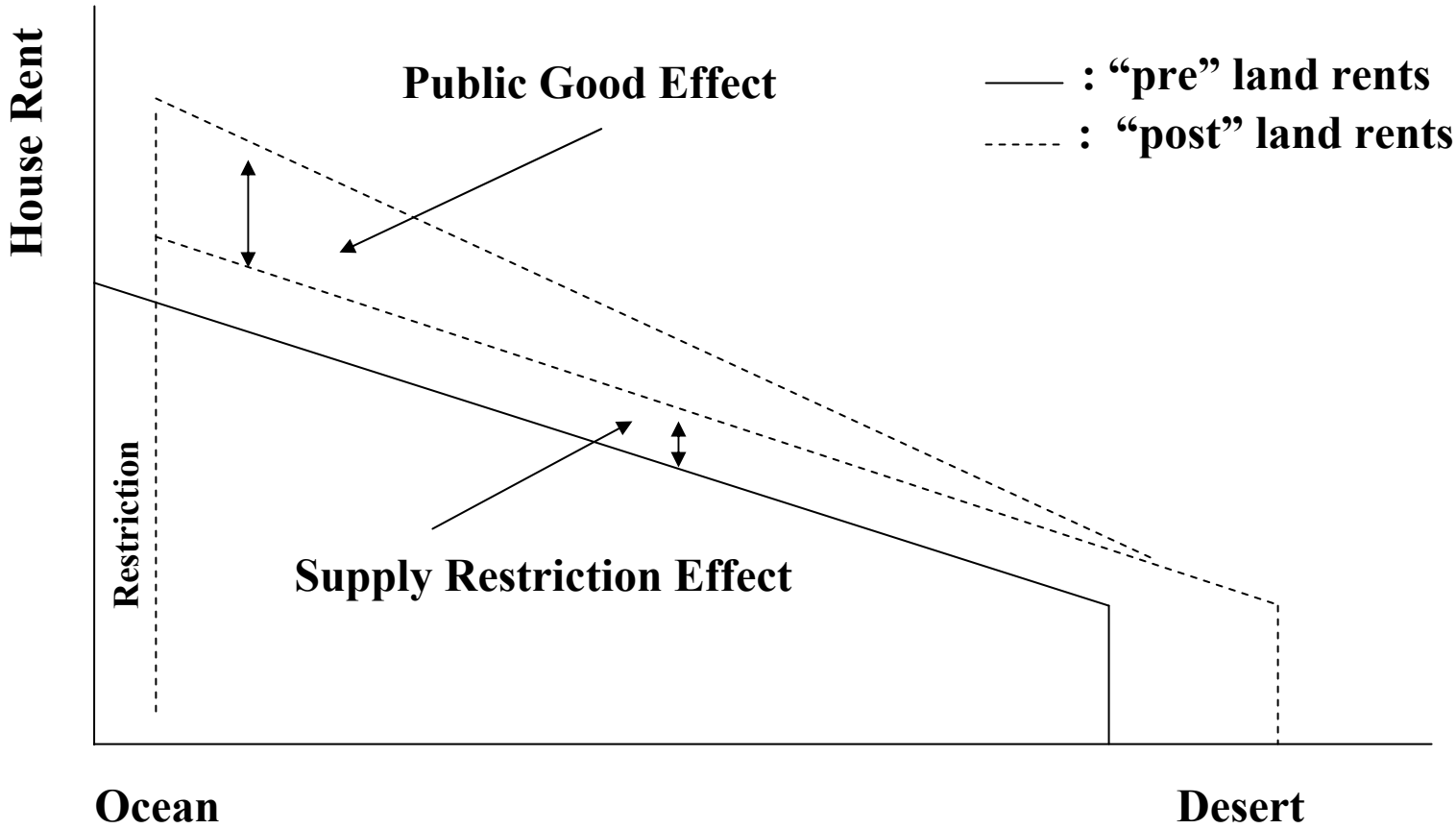
b : pre restriction rent and development

b' : post restriction rent from constrained development



Ditto California Coastal Commission Zoning

[see French and Lafferty]



11). **Travel demand congestion**.

Sort travelers according to their valuation of car usage: W(V), where V is the # travelers who value using their car by *at least* W dollars per trip. W(1) is the value of the highest valuer in the population. If travel costs C^0, then V^0 is the solution to $W(V^0)=C^0$. V^0 people drive, and the total value of all auto usage is:

$$\sum_{V=1}^{V0} W(V) > C^0V^0$$

12). Traffic congestion: Equilibrium.

As more travelers use their cars, the cost of travel for each rises: $C(V)$, $\partial C/\partial V>0$.

Ask what travel usage V^0 equalizes the value of usage to the last user with the cost of that trip:

$$W(V^0) = C(V^0)$$

Still true that total value $[\sum W(V)] > C(V^0)V^0$

Can we do better?

13). Traffic congestion: Planning.

Ask what travel usage V^* maximizes the aggregate value of usage-minus-total-costs:

$$\sum_{V=1}^{V^*} W(V) - C(V^*)V^*$$

Answer: $W(V^*) = C(V^*) + V^* \partial C / \partial V$

and $V^* < V^0$

14). Why and How to implement?

a). Let the V^* car users *pay* the $V^0 - V^*$ (lower valuing) people *not to drive!* The gain to the V* users is greater than the payment, and the value of the payment to the receivers is greater than their loss of driving.

b). Enact a toll or charge for driving of:

$$V^* \partial C / \partial V$$ (social cost).

c). London and Singapore cordon licenses.

Travel Congestion: Magnitudes

d). One rule of thumb suggests that the social cost of driving is at least as great as the private cost of driving.

- If you are traveling 60mph and value time at $10 per hour: the congestion toll is $.16 per mile ($3-$4 per gallon).

- If you are stuck at 20mph its closer to $.50 per mile or $10-$15 per gallon!

- Worse MPG=lower fuel toll per gallon (it's a tax on *driving* not a green tax on emissions)

15). Extensions: travel distortions.

- People drive too often and should double up
- Trips are too long (land uses too spread out)
- Transit and other *less congestion-prone* modes are not used enough
- Peak periods of travel need to be broadened: work hours need to be spread out.
- When development creates traffic it needs to be taxed/regulated (!) Not only for local infrastructure, but for regional Traffic impacts as well.
- Impacts beyond local jurisdiction borders suggests bargaining between town-Developer is not enough.