Eminent Domain: Compensation and Incetives

Ram Singh

Lecture 2

July 23, 2015

Questions

Compensation

- Should compensation be equal to valuation of the owner? Will it ensure efficient outcome?
- Should there be provision for Resettlement and Resettlement and Rehabilitation ($R\&R$)?
- Should there be compensation for the non-owner land dependents?
- Should there be compensation for investment made on the land?

Land Supply

- Is land in fixed supply?
- Does law have a bearing on effective supply of land?

Eminent Domain and Land Use

- Owners make investment in land/property - whether land is owned or not.
- Such investments affect the value of the property to the owner.
- Generally, the value of the property to the owner increases due to such investments.
- However, the government can acquire the property for provision of public goods.
- If government acquires a property, the investment on it will turn out to be a waste.

Question

1. *How does possible use of Eminent Domain affect incentives to invest in property?*
2. *What is the optimum compensation for the owners - full compensation or less or more?*

Basic Idea I

Let,

- x be the (self-interested) investment made by the Owner;
- V be the value to the Owner due to the investment x;

$$V = V(x),\ V'(x) > 0,\ V''(x) < 0$$

- There is possibility of project coming up.
- B the benefit from the public good; $B = nb$, b the the per-person benefit
- $C(x)$ be the Compensation paid by the G to the O, if land is acquired

So, the net benefit to O from x is:

$$V(x) - x \text{ if no acquisition}$$
$$b - x \text{ if acquisition}$$

Assume: Project is financed by a total lump sum tax T.

First Best x

- π probability that property of an Owner will NOT be acquired under the ED. That is,
- $1 - \pi$ is the probability land will be acquired;
- π is the same of each owner and is exogenously given

The SOP is

$$\max\{\pi V(x) - x\}$$

So, x^* solves

$$\pi V'(x) - 1 = 0 \tag{1}$$

However, if there was no possibility of ED use, i.e., $\pi = 1$, the SOP will be

$$\max\{V(x) - x\}$$

Now, the optimum $\bar{x}^*$ will solves

$$V'(x) - 1 = 0 \tag{2}$$

So, $x^* < \bar{x}^*$. That is, x^* accounts for the possibility of acquisition.

A Context I

Assume that

- There are n individuals with one parcel of land each; parcels are identical
- If the project comes up, m parcels will be needed
- B benefits from public good is B=nb.
- However, B is a random variable drawn from $[0, \bar{B}]$, $0 << \bar{B}$
- $F(B)$ and $f(B)$, respectively, be the distribution and density functions of B.
- The project is funded using lump sum tax/transfers

A Context II

Remark

Suppose the identity of m owners whose land will be needed for the project is known in advance. (Think of a road project)

Remark

The time line as follows:

- Date $t = 1$: individuals choose x.
- Date $t = 3/2$: B gets known to all parties including government.
- Date $t = 2$: the decision about the project is taken. Land acquired iff project is taken up.

First Best I

Suppose, we are date 2. At date $t = 2$ note that:

- x is a sunk cost
- the opportunity cost of taking up the project is $mV(x)$ - since m owners will loose land and the associated benefits
- Therefore, according to K-H criterion, for any given level of x, G should acquire land iff $B = nb > mV(x)$.

That is, for given x,

- The efficient Acquisition Set $AS^*(x) = \{B | B > mV(x)\}$

First Best II

Suppose, the acquisition decision is efficient. That is, for given x project is taken up iff $B \in AS^*(x)$. Note that when $B \in AS^*(x)$,

$$\begin{aligned} B &> mV(x), i.e., \\ B + (n - m)V(x) - nx &> mV(x) + (n - m)V(x) - nx. \end{aligned}$$

Therefore, if the acquisition decision is efficient, then for given given x opted by each O, at $t = 2$, the ex-post social surplus is equal to

$$\max \left\{ \begin{array}{c} B + (n - m)V(x) - nx \\ mV(x) + (n - m)V(x) - nx \end{array} \right\} \tag{3}$$

At date $t = 1$, B is a random variable. So, at date $t = 1$, (expected) social surplus is the expected value of (3), i.e.,

$$Z(x, AS^*(x)) = \int_0^{\bar{B}} \max \left\{ \begin{array}{c} B + (n - m)V(x) - nx \\ mV(x) + (n - m)V(x) - nx \end{array} \right\} dF(B)$$

However, note that:

First Best III

- By assumption, identify of m owners contributing land is known.
- The remaining $n - m$, owners face no risk of acquisition - their choice of x neither goes waste nor it affects decision about the project.
- So, each of $n - m$ solves $\max_x \{mV(x) - mx\}$.

Therefore, we can focus on (expected) total gains from project Versus the loss to m owners. That is,

$$Z(x, AS^*(x)) = \int_0^{\bar{B}} \max \left\{ \begin{array}{c} B - mx \\ mV(x) - mx \end{array} \right\} dF(B)$$

The optimal x, denoted by x^*, solves $\max_x Z(x, AS^*(x))$. Recall, the FB efficient acquisition set is $AS^*(x^*) = \{B | B > mV(x^*)\}$. Therefore,

- $1 - F(mV(x))$ is the probability that project will be implemented, i.e., land will be acquired.

First Best IV

Therefore, the SOP can be written as

$$\max_x \left\{ mF(mV(x))V(x) + \int_{mV(x)}^{\bar{B}} BdF(B) - mx \right\}, i.e.,$$

$$\max_x \left\{ \int_0^{mV(x)} mV(x)f(B)dB + \int_{mV(x)}^{\bar{B}} Bf(B)dB - mx \right\} \quad (4)$$

The foc for (4) is given by

$$\int_0^{mV(x)} mV'(x)f(B)dB + mV(x)f(mV(x))mV'(x) - mV(x)f(mV(x))mV'(x) - m = 0, i.e.,$$

$$\int_0^{mV(x)} mV'(x)f(B)dB - m = 0.$$

First Best V

That is, x^* solves:

$$F(mV(x))V'(x) - 1 = 0. \tag{5}$$

Note: $F(mV(x)) < 1$. If acquisition was always undesirable, the socially optimum x will solve

$$V'(x) - 1 = 0. \tag{6}$$

Let $\bar{x}^*$ solve (6). Clearly,

$$\bar{x}^* > x^*.$$

Is Full Compensation Desirable?

Suppose the Acquisition Decision is exogenous:

- It does not depend on x and $C(x)$
- Project is implemented iff $B \geq \hat{B}$; $\hat{B}$ is decided by govt
- b and t are zero for project affected people.

If, $C(x) = V(x)$, project does not affect payoff of the Owner. So, he will choose x to maximize

$$\int_0^{\hat{B}} V(x)f(B)dB + \int_{\hat{B}}^{\bar{B}} V(x)f(B)dB - x, \ i.e.,$$

$$V(x) - x, \ i.e.,$$

the x opted by the Owner solves

$$V'(x) - 1 = 0. \tag{7}$$

That is, O will choose $\bar{x}^*$ - excessive investment.

Economics of Temples

Let, $C(x) = x$. Suppose, the G will follow:

$$AS(x) = \{B | B > mx\}.$$

The Owner will choose x that maximizes

$$F(mx)V(x) + (1 - F(mx))x + E(b \mid B > xm) - E(t \mid B > xm) - x, \ i.e.,$$

$$F(mx)[V(x) - x]$$

if $b = t = 0$ for project affected people. So, the foc is

$$V'(x) - 1 = -\frac{V(x) - x}{F(mx)} \tag{8}$$

Let, x^T solve (8). Clearly,

$$x^T > \bar{x}^* > x^*.$$

Outcome Under Eminent Domain I

Let

- $C(x)$ be the Compensation paid by the G to the O, if land is acquired
- $C(x)$ is a pre-specified rule; $C'(x) \geq 0$
- T be the lump sum tax per-person to finance the public good.

Suppose, the G will acquire land iff $B \geq mC(x)$. So, acquisition set

$$AS(x) = \{B | B > mC(x)\}$$

Now, the owner will choose x, to solve

$$\max_x \{ \int_0^{mC(x)} V(x) f(B) dB \quad + \quad \int_{mC(x)}^{\bar{B}} C(x) f(B) dB + \int_{mC(x)}^{\bar{B}} bf(B) dB$$
$$- \quad \int_{mC(x)}^{\bar{B}} tf(B) dB - x \}$$

Outcome Under Eminent Domain II

Suppose: $C(x) = V(x)$. Now, we get

$$AS(x) = \{B | B > mV(x)\}.$$

The Owner chooses x that maximizes

$$\max_x \{ \int_0^{mV(x)} V(x) f(B) dB + \int_{mV(x)}^{\bar{B}} V(x) f(B) dB + \int_{mV(x)}^{\bar{B}} b f(B) dB - \int_{mV(x)}^{\bar{B}} t f(B) dB - x \}$$

That is, O solves:

$$\max_x \left\{ V(x) + \int_{mV(x)}^{\bar{B}} [b - t] f(B) dB - x \right\}.$$