Bargaining and Litigation Over Compensation Under Eminent Domain*

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1 Introduction

Eminent Domain laws empower the state to acquire private property for public purpose. These laws permit compulsory acquisition or what is popularly called condemnation of a property by the government, if the owner refuses to sale the property voluntarily. At the same time, the compulsory acquisition laws entitle the owner to compensation equal to the 'market value' of the property. The compensation is to be paid by the acquiring-agency/condemnor at the time of acquisition. Depending on the jurisdiction or the context, the owner of the condemned property may or may not be allowed to negotiate the compensation amount with the condemnor. However, under all jurisdictions the owner has right to litigate the compensation amount, if not satisfied with the compensation offered by the condemnor.

The first question is whether the owner received compensation is indeed equal to the market value of the property or not. Several empirical studies on the subject argue that the actual compensation received by the owners of condemned properties is generally different from their market value. See, e.g., Burger and Rohan (1967), Munch (1976), Bell and Parchomovsky (2007), Aycock and Black (2008), Chang (2008), and Kades (2008).

The variance between the compensation offered by the government, on one hand, and the 'market value' of the property, on the other hand, is not entirely surprising. Since, determination of the market value of a condemned property is by no means an easy exercise. In the first place, the actual market price does not exist for an acquired property. By definition, a condemnation means lack of an actual voluntary market transaction that could reveal the market price. In practice, the market price

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for the condemned properties is determined by taking the average of the sales prices of 'similar' properties that have been transacted through voluntary exchanges. However, many attributes of a property affect its market valuation, and no two properties are exactly identical. Identification of similar properties and, therefore, the market price of the condemned property is a genuinely difficult task vulnerable to errors.[1] In this scenario, it is not entirely surprising that the compensation granted by the government officials is generally different from what researchers will find as the 'market value' of the property.

However, the empirical studies also argue that in many instances, the differences between the compensation received, on one hand, and the market price, on the other hand, is significantly large.[2] This especially is the case with very low and very high value properties, regardless of whether the compensation is received by accepting the official offer or granted by a court through litigation. For instance, in an empirical study of bargain-settlement over eminent domain compensation for 89 properties in New York City, Chang (2008) concludes:[3]

> "47 out of 89 condemnees (or 53 percent) were compensated with less than fair market value; 36 condemnees (40 percent) received more than fair market value; 6 condemnees (7 percent) got roughly fair market value. Furthermore, "compensation percentage" (actual compensation divided by the estimated fair market value) is not bell-shaped; 36 condemnees (40 percent) received extreme compensation payments - compensations that are higher than 150 percent or lower than 50 percent of fair market value."

Moreover, the compensation structure seems to be regressive: Compensation for high-value properties is much greater than their market value; in contrast, compensation for the low-value properties is significantly less than the market value as determined by researchers. The regressive nature of compensation persists, regardless of whether the compensation is received by accepting the official offer or through the litigation process.

In many instances, the acquisition affected owners choose to litigate the government awarded compensation before a court of law. Indeed, litigation over compensation is a universal phenomenon. However, the litigation does not make the compensation any less iniquitous. If any thing, the court awards are said to be more iniquitous in this sense. For instance, another empirical study of 798 properties in Chicago by Munch (1976) concludes:[4]

[1] Naturally, the government officials enjoy lot of discretion in the matter.

[2] The researchers have calculated market value of property on the basis of the actual transaction prices of other properties similar to the property in question in terms of location, such as distance from main road, market places etc.

[3] See Chang (2008), p.4.

[4] See Munch (1976), p. 488.

"low-valued properties receive less than market value and high-valued properties receive more than market value," and " [a]s a rough approximation, a $7,000$ parcel receive about $5,000$, a $13,000$ property breaks even and a $40,000$ property may get two or three times its market value."

These findings naturally raise the following questions: Why the deviations from market value are large for the very low and very high value properties? Why there is rampant litigation over compensation amount? Why the compensation structure under eminent domain laws is regressive, regardless of whether the compensation is received by accepting the official offer or by litigating,?

The scanty literature on these issues attribute above-mentioned outcomes to ignorance of low-valued properties (Chang, 2008), poor quality of government lawyers (Munch 1976; and Bell and Parchomovsky, 2007), and different precedent values of court awards (Posner, 2003).[5] The literature on litigation attributes the existence of, in equilibrium, litigation to the imperfect information or asymmetric information between the parties parties involved.[6]

In contrast, in this paper we show that the incentive structure induced by the eminent domain laws is the main factor accounting for the above-mentioned empirical findings. In the first place, the government officials responsible for making the initial compensation awards do not have strong enough incentives to search for market value of condemned properties. This leads to large deviations between the compensation offered by the government, on one hand, and the market value, on the other hand. We model the bargaining and litigation over compensation and show that, *ceteris paribus*, the litigation is much more profitable for the owners of the relatively high-value properties than for those owning low-value properties. Since, during litigation the government lawyers do not have strong incentives to put in the required efforts. The litigation efforts of the owner, in contrast increase in the direct proportion the market value, leading to higher expected court/jury awards. Naturally, the owners decide whether to accept the official offer or not, in the shadow of their litigation payoffs. However, the relative litigation award increase with market value. Therefore, the owners of high-value properties accept only the official offers only if it is sufficiently large; otherwise they reject the offer and go for litigation. In contrast, the owners of the low-value properties can accept the official award even when it is less than the market value.

The formal model developed in the paper is used to discuss the problems with

[5]Posner (2003) has argued a low value property is similar to many more properties than is the case with a high value property. Therefore, he argues, the judicial compensation awards have greater precedent value, and this makes courts conservative in awarding compensation. As a result, relatively low value properties receive comparatively less compensation

[6]See, e.g., Bebchuk (1984), Schweizer (1989), Spier (1992) and for a review of the literature see Shavell (2004).

the land acquisition process in India. In addition to the above discussed problems with the eminent domain laws, a unique feature of the Indian land acquisition law creates further incentives for the acquisition affected property owners to litigate the government awards. Under the Indian law, court awarded compensation cannot be less than the government awards,[7], making the litigation a costly but risk-free choice for the affected parties. This explains the unusually high frequency of litigation over land acquisition in India.

The rest of the paper is organized as follows. Section 2 provides the basic formal setup for government awards and litigation process. Section 3 shows how the court awards vary with the market value of the property. Section 4 models the bargaining over compensation. Section 5 explores the above issues in the Indian context. Section 6 concludes with final remarks on the analysis and the results derived in the paper.

2 The Basic Setup

Consider an instance of land acquisition by a government under *eminent domain* laws. Suppose, the government needs to acquire land for a public project. There is a population of properties/land-parcels government use for the purpose. Different properties/land-parcels are owned by different individuals. Depending on the context, government may or may not be able choose location of the project and, therefore, of the land needed for the purpose. Also, properties or one or more individuals may need to be acquired. If traded in the market, generally different properties will fetch different price to the owners.[8]

We will show that the bargaining over compensation and the litigation outcomes will vary across properties, due to differences in their market values. Let us start with a property that is being acquired, i.e, either it is the only property or one of the several properties to be acquired. Suppose, the size of this property is S, say square-meter, and market value of V^m. Let us call this property as *reference* property and describe the attributes of the other properties in terms of the relevant attributes of the reference property.

At the time of acquisition government has to offer compensation to the owner. Most legal systems entitle the owner of condemned property to compensation equal to the market value of the property.[9] So, the owner of the reference property is entitled to V^m. Clearly,

$$V^m = r^m \times S,$$

[7]Section 25 of the Land Acquisition (Amendment) Act, 1984 expressly prohibits the courts from doing so.

[8]Specifically, assume that each property has market value similar to some other properties, but different from many others.

[9]Definition of Market value..

r^m is the per-unit market rate of the reference property, say per-square-meter. While for the properties that actually get voluntarily traded, the transaction price is the market price. However, the condemned properties by definition there is voluntary transaction. Therefore, for these properties the actual market transfer is unknown. Generally, market price for the condemned properties is taken to be the average of sales prices of 'similar' properties that have been transacted through voluntary exchanges. However, many attributes of a property affect its market valuation, and no two properties are exactly identical. Therefore, finding out similar properties is a genuinely difficult task. Naturally, the government officials/evaluators enjoy lot of discretion in the matter.

To sum up, the calculation of the market-rate, i.e., r^m, for the acquired property is a challenging exercise. Nonetheless, the government officials responsible for making awards can put in efforts to assess the market value. The efforts are privately costly for the officials.

Remark 1 *In the following, depending on the context, the term government official would mean either the market value evaluator - individual responsible for searching for the market value -, or the official who makes the compensation offer to the owner, or government lawyers. However, the meaning should be clear from the context.*

The time line runs as follows. At $t = 1$, using eminent domain, the government goes ahead and acquires/condemns the property. The efforts by officials to assess the market value of the condemned property are put in at $t = 1$ it self. Let,

x_1 denote the effort put in by the officials to assess the market value.

x_1 can be interpreted as the effort put in by the government officials/surveyors to search for properties that are similar to the one in question,[10] and also to find out their 'true' transaction prices.[11] Let $\underline{x_1}$ denote the minimum effort the official surveyors have to put in.[12] So, $x_1 \in [\underline{x_1}, \infty)$.

As a result of effort x_1, the official get a signal or the market rate of the property. Let,

$\tilde{r}$ denote the signal about r^m.

For the purpose of analysis here, r^m can be interpreted as the average market rate for the population of 'similar' properties. On the other hand, $\tilde{r}$ can be taken as the average rate for the set of the similar properties that are examined by the

[10] To assess the market value, most surveyors use what is known as comparable sale/market data approach. The approach requires finding of the similar properties that have been transacted in the market.

[11] To rule out under-reporting in order to avoid taxes, etc.

[12] For example, they must declare some properties as similar and find out their prices.

government evaluator. By putting in more effort the evaluator can consider more of similar properties. The relation between $\tilde{r}$ and r^m is stochastic.

$$\tilde{r} = r^m + \epsilon,$$

where ϵ is random variable. Plausibly, the informativeness of $\tilde{r}$ about r^m depends on the level of x_1. The stochastic relation between $\tilde{r}$ and r^m is modeled in Section 4.

At $t = 1$, the owner of the condemned property can also put in effort to assess the market value of her property. Let,

y_1 denote the effort put in by the owner; $y_1 \in [0, \infty)$.

As a result of effort y_1, the owner also gets a signal which is noisy but partially correlated with the market rate as discussed above. Using the available information, the official makes offer for compensation rate. For simplicity assume that the offer is made at $t = 1$ itself. Let,

$\hat{r}$ be the compensation rate offered by the government.

We model the choice of official offer, $\hat{r}$, in the next section. However, for given $\hat{r}$, the total compensation offered to the owner is

$$\hat{r} \times S.$$

Upon receiving the offer, the owner has to decide whether to accept the award or reject it and go for litigation.[13] Suppose, the owner takes this decision at $t = 1$ itself. Litigation, if resorted to, takes place at 2, and then the court/jury announces its award rate.

As discussed in Introduction, the litigation under eminent domain is a costly with uncertain outcome. That is, there is uncertainty as to whether the court/jury awarded rate will be greater than $\hat{r}$ or not. Whether the owner will accept the official offer only if her payoff from accepting it is a least as much as expected payoff from litigation. That is, only if the offer is at least equal to the value of the expected court award minus the litigation costs. However, efforts by the litigants affect not only the litigation costs but also the expected award. Therefore, to find out the set of mutually acceptable offers, we need to determine the payoffs of the parties from litigation. Formally, the uncertainty over court award is modeled as follows. Let,

r denote the compensation rate awarded by the court/jury.

[13] This right is granted by most eminent domain laws.

Rate r is awarded by the court/jury at $t = 3$, and the final compensation received by the owner is

$$r \times S.$$

The choice of r determined by court/jury depends on several factors, including the efforts put in by the plaintiff and the defendant to strengthen their case. Even for the given choice of efforts, there remains uncertainty about rate that will be awarded by the court. However, r is likely to depend on the efforts put in by the litigants before as well as during litigation. To illustrate, the officials/defendant, can surely use the evidence acquired as result of effort x_1. Besides, if they would like to do so, they can put in extra effort during the litigation stage. Likewise for the owner plaintiff. Let,

x_2 denote the effort put in by the plaintiff at $t = 2$, i.e., during litigation.
y_2 denote the effort put in by the defendant at $t = 2$.

Let $\underline{x_2}$ denote the minimum effort the official defendant has to put in.[14] So, $x_2 \in [\underline{x_2}, \infty)$. However, $y_2 \in [0, \infty)$. Plausibly, an increase in search effort by the plaintiff at $t = 1$ as well as at $t = 2$, *ceteris-paribus*, is likely to strengthen her case. So, increase is y_1 as well as y_2 increases probability of win as well of winning the higher compensation. Therefore, the total effort matters. Increase in efforts by the defendant should have just the opposite effect. Let,

$$\begin{aligned} x &= x_1 + x_2 \\ y &= y_1 + y_2. \end{aligned}$$

In view of the above, $x \in [\underline{x_1} + \underline{x_2}, \infty)$ and $y \in [0, \infty)$. At $t = 1$, r is a random variable distributed, say over $[\underline{r}, \bar{r}]$, where $\underline{r} \leq 0 < \bar{r}$.[15] Let,

$F(.)$ be the conditional distribution function for r.
$f(.)$ be the associated conditional density function.

The functions $F(.)$ and $f(.)$ are conditional on the total efforts by the defendant, x, and the total effort by the plaintiff, y. That is, $F(.) = F(r \mid x, y)$ and $f(.) = f(r \mid x, y)$.

Remark 2 *The mainstream literature on litigation attributes choice of litigation by parties to different divergent beliefs about the litigation outcomes, asymmetric information among litigants, etc.*[16] *Departing from the mainstream literature, we assume that the parties have symmetric and common beliefs about the litigation outcome. Formally, we assume that the functions $F(.)$ and $f(.)$ are part of common knowledge*

[14] For example, arranging the lawyers, submitting already acquired information, if any, etc.
[15] Relationship b/w the signal and the support of r.
[16] See e.g. ....

for the parties. The primary motivation behind this assumption is to show that the incentive structure induced by eminent domain laws is inherently litigious, even in the absence of other factors believed to be the primary causes behind litigation. Moreover, our assumption seems to be justified given that parties are likely to share their information about the market price during bargaining at $t = 1$.

Besides, we make the following intuitive assumptions. $\frac{\partial F(r|x,y)}{\partial y} < 0$ for all $r \in [\underline{r}, \bar{r})$, i.e, $F(r \mid x, y)$ displays first-order stochastic dominance w.r.t. y. W.r.t. effort by the defendant, i.e., x, $\frac{\partial F(r|x,y)}{\partial x} > 0$ for all $r \in [\underline{r}, \bar{r})$. Moreover, assume that $\frac{\partial^2 F(r|x,y)}{\partial y^2} > 0$ and $\frac{\partial^2 F(r|x,y)}{\partial x^2} < 0$; $F(r \mid x, 0) = 1$ for all $r \in [\underline{r}, \bar{r}]$, i.e., the plaintiff definitely loses the case if she does not to put in effort at all. Let,

$$E(r \mid x, y) = \int_{\underline{r}}^{\bar{r}} r f(r \mid x, y) dr.$$

That is, $E(r \mid x, y)$ is the expected value of the rate, per-square meter, awarded by the court. The following lemma show that this the expected rate awarded by the court is an increasing and concave [resp. decreasing and convex] function of the effort put in by the plaintiff [resp. the defendant].

Lemma 1 $\frac{\partial E(r|x,y)}{\partial x} < 0$, $\frac{\partial^2 E(r|x,y)}{\partial x^2} > 0$, $\frac{\partial E(r|x,y)}{\partial y} > 0$ *and* $\frac{\partial^2 E(r|x,y)}{\partial y^2} < 0$.

Proof: Integration by parts yields,

$$\begin{aligned} E(r \mid x, y) &= rF(r \mid x, y) \mid_{\underline{r}}^{\bar{r}} - \int_{\underline{r}}^{\bar{r}} F(r \mid x, y) dr \\ &= \bar{r} - \int_{\underline{r}}^{\bar{r}} F(r \mid x, y) dr \end{aligned}$$

Hence, in view of assumptions $\frac{\partial F(r|x,y)}{\partial y} < 0$, $\frac{\partial F(r|x,y)}{\partial x} > 0$, etc., we get

$$\begin{aligned} \frac{\partial E(r \mid x, y)}{\partial x} &= -\int_{\underline{r}}^{\bar{r}} \frac{\partial F(r \mid x, y)}{\partial x} dr < 0; \\ \frac{\partial^2 E(r \mid x, y)}{\partial x^2} &= -\int_{\underline{r}}^{\bar{r}} \frac{\partial^2 F(r \mid x, y)}{\partial x^2} dr > 0; \\ \frac{\partial E(r \mid x, y)}{\partial y} &= -\int_{\underline{r}}^{\bar{r}} \frac{\partial F(r \mid x, y)}{\partial y} dr > 0; \\ \frac{\partial^2 E(r \mid x, y)}{\partial y^2} &= -\int_{\underline{r}}^{\bar{r}} \frac{\partial^2 F(r \mid x, y)}{\partial y^2} dr < 0. \end{aligned}$$

□

Further, to ensure an interior solutions of the optimization problems assume $\frac{\partial E(r|x,0)}{\partial y} = \infty$ and $\frac{\partial E(r|x,\infty)}{\partial y} = 0$. [work out all other technical assumptions as well...]

For analytical convenience, let the cost of effort functions be $\frac{x^2}{2}$ and $k\frac{y^2}{2}$ for the defendant and the plaintiff, respectively. The parameter k captures the relative cost (dis)advantages of the plaintiff vis-a-vis the defendant.[17] Besides, the cost of efforts, the litigation has some fixed costs too. Let x_0 and y_0 denote the fixed cost of litigation for the defendant and the plaintiff, respectively; such as, court fees etc.

When it comes to solving for the equilibrium litigation efforts, there can be two approaches. In the first approach, one party (presumably the defendant department) puts in effort first. The second party, chooses its best-response effort after observing the effort of the first party. However, the first party makes its choice keeping in mind the response of the second party. In the second approach, the two parties choose best-response efforts simultaneously, believing that the party will do the same. That is, they play Nash Equilibrium. Both approaches are analytically equivalent. Under either approach, for any given x opted by the defendant, the plaintiff's problem is to choose y to solve:

$$\max_y \left\{ S\int_{\underline{r}}^{\bar{r}} rf(r \mid x, y)dr - k\frac{y^2}{2} - y_0 \right\}, i.e.,$$

$$\max_y \left\{ SE(r \mid x, y) - k\frac{y^2}{2} - y_0 \right\} \tag{1}$$

Given our assumptions, for any given x, the optimization problem in (1) is strictly concave in y. Hence, for any given x, there is a unique solution to (1), which is identified by the following first order condition:

$$S\frac{\partial E(r \mid x, y)}{\partial y} = ky. \tag{2}$$

For any given x, let $y^*(x)$ solve (2). Clearly, y^* is a function of S, k and x; formally, $y^* = y^*(S, k, x)$.

While the expected court award is the expected gain for the plaintiff, for the litigation it is the expected cost of litigation for the defendant, over and above the cost of efforts and the fixed-cost. However, the officials may assign less than full weight to the cost of awards, since these costs are met using exchecqure/tax-payers's money. Hence, for given y opted by the plaintiff, the defendant department solves:

$$\min_x \left\{ \lambda \left[SE(r \mid x, y) + x_0 \right] + \frac{x^2}{2} \right\}, \tag{3}$$

where

[17] It may be plausible to argue that $k > 1$. Since to get access to the same set of evidence, e.g., sale-deeds of similar property, the plaintiff has to put in higher efforts or equivalently incur higher costs. Of course, nothing depends on this assumption.

λ is the weight put by the officials on the costs of litigation to the exchequer.

Assume $\lambda \in [0,1]$. $\lambda < 1$ would mean that the officials may care less for the cost of litigation to the exchequer. Recall, the effort is privately costly to the officials. Therefore, in (3) they assign full weight to the costs of effort $\frac{x^2}{2}$.

For any given y and $\lambda \in [0,1]$, the minimization problem in (3) is strictly convex in x. Let $x^*(y)$ denote the optimum response for the defendant, for any given y. The optimum $x^*(y)$ is: solution to the following foc

$$-\lambda S \frac{\partial E(r \mid x, y)}{\partial x} = x, \text{ if } x^*(y) > \underline{x}; \tag{4}$$

otherwise, $x^*(y) = \underline{x}$.

Clearly, $x^* = x^*(S, \lambda, y)$. For any given S, from (3) and (9) note that as $\lambda \to 0$, $x^*(S, \lambda, y) \to \underline{x}$. That is, for small values of λ the officials will put in only the mandatory effort and not more. In fact, for any given y, opted by the plaintiff,

$$(\forall \lambda [0, \underline{\lambda}])[x^*(S, \lambda, y) = \underline{x}], \tag{5}$$

where $\underline{\lambda}$ satisfies

$$-\lambda S \frac{\partial E(r \mid \underline{x}, y)}{\partial x} = \underline{x}. \tag{6}$$

Let, x^* and y^* simultaneously solve (9) and (2), respectively. Then, x^* and y^* constitute mutually best-responses. That is, the pair (x^*, y^*) is a Nash equilibrium and satisfies:

$$S \frac{\partial E(r \mid y^*, x^*)}{\partial y} = k y^* \tag{7}$$

and

$$-\lambda S \frac{\partial E(r \mid y^*, x^*)}{\partial x} = x^* \tag{8}$$

Remark 3 *Generally apart from the search effort y the plaintiff will have to incur monetary costs. These costs may increase in direct proportion to the effort level y, i.e., may not be fixed as we have assumed here. However, we can easily generalize our analysis by interpreting $\frac{y^2}{2}$ as the cost of search efforts and other expenses by the plaintiff. Similarly for the defendant. With this more general interpretation also we will get the very similar results. Note that nothing will change in the optimization problem for the plaintiff. For the defendant, let $\frac{x^2}{2} = [\delta + (1-\delta)]\frac{x^2}{2}$, where $0 < \delta < 1$ denotes the fraction of monetary expenses in total litigation cost for the defendant. Now, it can be seen that the results similar to the ones presented below will still hold.*[18]

[18] Now, the the defendant will solve:

3 Market Value Vs Litigation Payoff

In this section, we analyze the relation between the market value of a property, on one hand, and the expected court awards if the owner decides to reject the official offer and go for litigation, on the other hand. We do so assuming that $\lambda = 0$. That is, the officials do not care at all about the cost of litigation, apart from the cost of efforts put in by them. This assumption help us present results in a less technical setting. However, as we show in the Appendix, the results derived assuming $\lambda = 0$ hold even when $\lambda > 0$ but small. In fact, under certain conditions, the results can hold even when λ is large.

The total market value of a property depends on the its size as well as the market rate, per-unit area, the property commends. Therefore, two properties can enjoy different market values either on account of their different sizes or due to the different market rates for them, or both. *Ceteris paribus*, if one property is bigger in size than the other, the market value will be higher for the former. Similarly, *ceteris paribus*, if one property enjoys higher per-unit of area market rate than the other, the market value is higher for the former.

3.1 Property Size Vs Litigation Payoff

In this subsection, we study the *ceteris-paribus* effect of the changes in the property-size on the litigation outcome, specifically on the litigation payoff of the plaintiff-owner.

From (2)-(9) it is easy to see that when $\lambda = 0$, $x^*(S, 0, y^*)$ and $y^*(S, k, x^*)$ satisfy

$$x^*(S, 0, y^*) = \underline{x}, \tag{9}$$

and

$$S\frac{\partial E(r \mid \underline{x}, y^*)}{\partial y} = ky^*, \tag{10}$$

respectively.

The following Lemma shows that as the property size S increases so does the effort of the plaintiff. However, changes in the property size does not affect the effort of the defendant.

Remark 4 *Note that since here we are considering the ceteris-paribus effect, the market value of the property, i.e.,* V^m *will change in the direct proportion to the*

$$\min_x \left\{\lambda\left[SE(r \mid x, y) + \delta\frac{x^2}{2} + x_0\right] + (1-\delta)\frac{x^2}{2}\right\},$$

and the foc will be

$$-\lambda S\frac{\partial E(r \mid x, y)}{\partial x} = [\lambda\delta + (1-\delta)]x, \text{ if } x^*(y) > \underline{x}.$$

change in the property size, i.e., S. So, in the results in this subsection can be restated by replacing S with V^m.

Lemma 2 *(i)* $\frac{dx^*(S,0,y^*)}{dS} = 0$, *and (ii)* $\frac{dy^*(S,k,x^*)}{dS} > 0$.

Proof: (i) From (9) and (10) it can be seen that

$$\frac{dx^*(S,0,y^*)}{dS} = 0 \tag{11}$$

$$\frac{dy^*(S,k,x^*)}{dS} = \frac{\frac{\partial E(r|x^*,y^*)}{\partial y}}{k - S\frac{\partial^2 E(r|x^*,y^*)}{\partial y^2}} > 0. \tag{12}$$

The inequality holds since $\frac{\partial E(r|x^*,y^*)}{\partial y} > 0$, by assumption, and $k - S\frac{\partial^2 E(r|x^*,y^*)}{\partial y^2} > 0$ follows from the second order condition for the plaintiff's optimization problem.

□

In fact, as the following proposition shows, the expected award-rate as well as the expected litigation payoff plaintiff increases with the increase with S. Let,

$$V(.) = \left\{ SE(r \mid x, y) - k\frac{y^2}{2} - y_0 \right\}$$

That is, V is expected total compensation received of the owner, net of the litigation costs. Note that for given x and other parameters the plaintiff optimization problem can be re-written as

$$\max_y V(x, y, S, k). \tag{13}$$

So, corresponding to V, the maximand or the optimum value function is

$$V^* = SE(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - k\frac{y^*(S,k,x^*)}{2} - y_0. \tag{14}$$

Proposition 1 *(i)* $\frac{dE(r|x^*,y^*)}{dS} > 0$, *and (ii)* $\frac{dV^*}{dS} > 0$.

Proof: (i) Note that

$$\frac{dE(r \mid x^*, y^*)}{dS} = E_x(r \mid x^*, y^*)\frac{dx^*}{dS} + E_y(r \mid x^*, y^*)\frac{dy^*}{dS}.$$

Now, the claim follows immediately, in view of (11) and (**??**).

(ii) Using envelope theorem, from (15) we get[19]

$$\frac{dV^*}{dS} = E(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) > 0.$$

[19]Note that the litigation is feasible only if $E(r \mid x^*, y^*) > 0$.

□

Given S, let r^a solve:

$$r^a \times S = V^*.$$

That is, the owner is indifferent between accepting the offer of r^a, on one hand, and going for litigation, on the other hand. Note that r^a depends on S, i.e., $r^a = r^a(S)$. Specifically, $r^a(S)$ satisfies

$$r^a(S) \times S = SE(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - k\frac{y^*(S,k,x^*)}{2} - y_0. \tag{15}$$

Clearly, for given S, the owner will accept the award $\hat{r}$ only if $\hat{r} \geq r^a$, and go for litigation if $\hat{r} < r^a$.[20] Therefore, for given S, $r^a(S)$ is the minimum asking rate for the owner. Moreover, given that the litigation costs are positive, the owner will opt for litigation only if the expected court awarded rate is higher than the official offer rate, i.e., only if

$$E(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - \hat{r} > 0. \tag{16}$$

Note that (16) must hold for all $\hat{r} \leq r^a$ and specifically for $\hat{r} = r^a$. Next, we show that among owners who choose to reject the official offer, litigation becomes increasingly more profitable as S increases. Let,

$$\pi(.) = V(x,y,S,k) - \hat{\gamma}S$$

That is, $\pi(.)$ denotes the *additional* expected gains for the owner, from opting for litigation instead of accepting the official offer.

Proposition 2 *For litigating owners,* $\frac{d\pi(.)}{dS} > 0$.

Proof: From (9) note that when $\lambda = 0$, $x^*(S,0,y^*) = \bar{x}$ regardless of the level of S. Now, consider the following optimization problem: Given S, $\hat{\gamma}$, and holding $x^*(S,0,y^*) = \bar{x}$ solve:

$$\max_y \pi(.) \equiv \max_y \{V(.) - \hat{\gamma}S\}. \tag{17}$$

The solution to (17) is the same as the solution to (10). Moreover, the corresponding maximum value function is

$$\pi^*(.) = V^*(x,y,S) - \hat{\gamma}S, i.e.,$$

$$\pi^*(.) = \left\{SE(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - k\frac{y^*(S,k,x^*)}{2} - y_0\right\} - \hat{\gamma}S. \tag{18}$$

[20]Assume that when $\hat{r} = r^a$, the owner accepts the award.

Now, using envelope theorem, from (18) we get

$$\frac{d\pi^*}{dS} = E(r \mid x^*(S, 0, y^*), y^*(S, k, x^*)) - \hat{\gamma}.$$

However, for each litigating owner $E(r \mid x^*(S, 0, y^*), y^*(S, k, x^*)) - \hat{\gamma} > 0$ holds. Therefore, $\frac{d\pi^*}{dS} > 0$.

□

For a specific application of Proposition 2, consider a scenario in which two properties of sizes S_1 and S_2 get acquired under eminent domain. The properties are otherwise are identical except that one is bigger than the other. WLOG assume $S_1 < S_2$. The Proposition implies that: (i) If owner of 1st property is indifferent between accepting the award, on one hand, and going for litigation on the other hand, the 2nd owner will surely opt for litigation; (ii) if both owners opts for litigation, the expected gains from litigation, over and above the official award, will be higher for the second owner.

3.2 Market Rate Vs Litigation Payoff

Now, we analyze the *ceteris-paribus* affect of the per-square meter market rate, r^m, on the litigation payoff for the owner-plaintiff. The effect obviously will depend on the nature of the relationship between the market rate, on one hand, and the expected rate awarded by the court, on the other hand. Consider a change [increase or decrease] in the market rate from r^m to any other arbitrary value say $r^{m'}$. For analytical convenience, we express $r^{m'}$ as a fraction of r^m. Let,

$$\gamma = \frac{r^{m'}}{r^m}.$$

Let

$E'(r \mid x, y)$ be the expected rate awarded by the court for the property when the market rate is $r^{m'}$. It seems reasonable make the following assumption:

$$(\forall x, y)[r^{m'} \overset{>}{\underset{<}{=}} r^m \Rightarrow E'(r \mid x, y) \overset{>}{\underset{<}{=}} E(r \mid x, y)],$$

respectively. That is, expected rate awarded by the court/jury increases with the market value of the property. For concreteness, we assume

$$(\forall x, y)\left[\frac{E'(r \mid x, y)}{E(r \mid x, y)} = \frac{r^m}{r^{m'}} = \gamma\right]. \tag{19}$$

That is, for given choice of efforts by the litigants, the expected rate awarded by the court changes in direct proportion to the change in the market rate. [Discuss Plausibility?]

When the market rate is $r^{m'}$, the optimization problem for the plaintiff can be written as: For given x, choose y to solve:

$$\max_{y} \left\{ SE'(r \mid x, y) - k\frac{y^2}{2} - y_0 \right\}, i.e.,$$

in view of (19),

$$\max_{y} \left\{ \gamma SE(r \mid x, y) - k\frac{y^2}{2} - y_0 \right\} \tag{20}$$

Similarly, for given y, the defendant's optimization problem can be written as:

$$\min_{x} \left\{ \lambda \left[\gamma SE(r \mid x, y) + x_0 \right] + \frac{x^2}{2} \right\}, \tag{21}$$

Note that when $r^{m'} = r^m$, (20) and (21) reduce to (20) and (20), respectively. The optimum value function for the plaintiff, V^*, can now be written as

$$V^* = \gamma SE(r \mid x^*(S, 0, y^*), y^*(S, k, x^*)) - k\frac{y^*(S, k, x^*)}{2} - y_0. \tag{22}$$

Here x^* and y^* also depend on $r^{m'}$ or γ, in addition to the arguments listed in (22).

For given S, suppose $r^a(\gamma)$ satisfies

$$r^a(\gamma) \times S = \gamma SE(r \mid x^*(S, 0, y^*), y^*(S, k, x^*)) - k\frac{y^*(S, k, x^*)}{2} - y_0. \tag{23}$$

That is, the owner is indifferent between accepting the offer of r^a, on one hand, and going for litigation, on the other hand. Note that here r^a depends on γ, i.e., $r^a = r^a(\gamma)$.

Now if we consider the effects of changes in the value of γ, we get the following results.

Lemma 3 *For given S, (i) $\frac{dx^*(S,0,y^*)}{d\gamma} = 0$, and (ii) $\frac{dy^*(S,k,x^*)}{d\gamma} > 0$.*

Proposition 3 *For given S, (i) $\frac{dE(r|x^*,y^*)}{d\gamma} > 0$, and (ii) $\frac{dV^*}{d\gamma} > 0$.*

The arguments behind the proofs are analogous the ones used to study effects of changes in S. Therefore, proofs have been omitted.

Remark 5 *Note that since here we are considering the ceteris-paribus effect, the market value of the property, i.e., V^m will change in the direct proportion to the change in the market rate, or γ. So, in the results in this subsection can be restated by replacing γ with V^m.*

Suppose, the official offer changes in proportion to the market value. That is, if the official offer rate is $\hat{r}$ when the market rate r^m, it changes to $\gamma\hat{r}$ when the market rate changes to $r^{m'}$, recall $r^{m'} = \gamma r^m$. Note that we are not insisting that the official offer be equal to the market value. In such a scenario, the additional profit from litigation, over and above accepting the official offer is:

$$\pi^*(.) = V^*(.) - \gamma\hat{r}S,$$

where $V^*(.)$ is as in (22).

Proposition 4 *For litigating owners,* $\frac{d\pi(.)}{d\gamma} > 0$.

Consider a scenario in which two properties of the same size but different market rates, say r^m and $r^{m'}$ respectively, get acquired. Assume that $r^m < r^{m'}$. The Proposition 4 implies that if owner of 1st property is indifferent between accepting the award, on one hand, and going for litigation on the other hand, the 2nd owner will surely opt for litigation. If both owners find the litigation to be attractive, the second owner will put in higher efforts in litigation (Lemma 3) and, as a result, the court-awarded rate as well as litigation payoff will be higher for the second property (Proposition 3). Proposition 4 implies that the expected gains from litigation, over and above the official award, will be higher for the second owner.

3.3 Market Value Vs Litigation Payoff

Consider any two properties with market value of, say V^m and $V^{m'}$ respectively. Let r^m and $r^{m'}$, respectively be market rate, and S and S', respectively be the size of first and second property. WLOG assume $V^{m'} > V^m$. There are four possibilities: (i) $r^{m'} \geq r^m$ and $S' > S$; (ii) $r^{m'} > r^m$ and $S' \geq S$; (iii) $r^{m'} < r^m$ and $S' > S$; and (iv) $r^{m'} > r^m$ and $S' < S$.

Analysis in Subsections 3.1 and 3.2 shows that in first and second cases, the expected court awarded rate, and the litigation payoff is strictly higher for the second owner. In contrast, if either (iii) or (iv) is the relevant scenario, then there will be two conflicting factors at play. For instance, in case (iii), the *ceteris-paribus* effect of $S' > S$ will make the expected court awarded rate, and the litigation payoff strictly higher for the second owner. But, the *ceteris-paribus* effect of $r^{m'} > r^m$ is just the opposite. However, as the difference between V^m and $V^{m'}$ is large -, i.e., the second property as significantly higher total market value, in spite of enjoying lower rate - this will be on account of the fact that S' is much larger than S. In such a scenario, the first effect will dominate the second effect. As a result, the expected court awarded rate, and the litigation payoff is strictly higher for the second owner. Similarly, it is easy to see that when the difference between V^m and $V^{m'}$ is large, the same will be the outcome under case (iv) too.

4 Bargaining Over Compensation

As discussed in Section 2, the relation between $\tilde{r}$ and r^m is stochastic and depends on the effort level x_1, i.e.,

$$\tilde{r} = r^m + \epsilon,$$

where ϵ is random variable distributed, say over $(-\zeta, \zeta)$, where $\zeta > 0$. Let,

$G(\epsilon \mid x_1)$ and $g(\epsilon \mid x_1)$, respectively be the conditional distribution and density functions of ϵ; and

$\sigma^2(\epsilon \mid x_1)$ be the conditional variance of ϵ.

Assume that $g(\epsilon \mid x_1)$ is symmetrically distributed around zero, and

$$G(\epsilon|\infty) = \begin{cases} 0 & \text{if } \epsilon \in (-\zeta, 0); \\ 1 & \text{if } \epsilon \in [0, \zeta). \end{cases} \tag{24}$$

Moreover,

$$\frac{\partial \sigma(\epsilon \mid x_1)}{\partial x_1} < 0, \ \& \ \frac{\partial^2 \sigma(\epsilon \mid x_1)}{\partial x_1^2} > 0. \tag{25}$$

For instance, for all $x_1 > 0$, one can think of ϵ as 'normally' distributed, and $G(\epsilon|x_1)$ to be differentiable at every $\epsilon \in (-\zeta, 0)$ and every $\epsilon \in (0, \zeta)$, such that:

$$(\forall \epsilon \in (-\zeta, 0)) \left[\frac{\partial G(\epsilon|x_1)}{\partial x_1} < 0, \ \& \ \frac{\partial^2 G(\epsilon|x_1)}{\partial x_1^2} > 0 \right],$$
$$(\forall \epsilon \in (0, \zeta)) \left[\frac{\partial G(\epsilon|x_1)}{\partial x_1} > 0, \ \& \ \frac{\partial^2 G(\epsilon|x_1)}{\partial x_1^2} < 0 \right].$$

Then, (25) will hold. (24) already implies that $\sigma(\epsilon \mid \infty) = 0$.

In view of the above, $\tilde{r}$ is a random variable 'normally' distributed over $(r^m - \zeta, r^m + \zeta)$, and is an unbiased indicator of r^m. Let,

$H(\tilde{r} \mid x_1)$ and $h(\tilde{r} \mid x_1)$, respectively be the conditional distribution and density functions of $\tilde{r}$. (24) already implies that as effort level approaches infinity, $\tilde{r}$ approaches/coincides with r^m.

We assume the cost of effort functions to be increasing and convex. Let,
$\frac{x_1^2}{2}$ be the cost of effort function for the official.

The social optimization problem w.r.t. x_1 can be stated as:

$$\min_{x_1} \left\{ \chi \sigma(\epsilon \mid x_1) + \frac{x_1^2}{2} \right\},$$

where χ is the weight put by the society on securing the market rate to the affected parties.

The official evaluator's private optimization problem is to choose x_1 to solve:

$$\min_{x_1} \left\{ \lambda\chi\sigma(\epsilon \mid x_1) + \frac{x_1^2}{2} \right\},$$

where λ is the weight assigned by the evaluator to the social objective of securing the market rate to the affected parties. It is easy to see that when λ is small, the evaluator will put in very small or even the minimum effort, i.e., $\underline{x_1}$. The small effort, in turn, implies high variance, i.e., large deviations, upwards as well as downwards, from the market price of the property. As mentioned earlier, at $t = 1$, the owner of the condemned property also put in effort y_1 to assess the market value of her property. As a result of effort y_1, the owner gets a signal which is noisy but partially correlated with the market rate as discussed above.

Using the available information, the official makes offer for compensation rate.

In the following, we show that the expected compensation offered is lesser [resp. higher] for lower valued [higher valued] properties. To start with, we establish this claim considering the *ceteris-paribus* effects of properties size, i.e., S.

Recall, the owner will accept the offer only if

$$\hat{r} \geq r^a,$$

where r^a solves (15) and is function of S. From (15) it can be seen that

$$\begin{aligned} S\frac{dr^a(S)}{dS} &= \frac{dV^*}{dS} - r^a(S) \\ &= E(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - r^a(S). \end{aligned} \tag{26}$$

But $E(r \mid x^*(S,0,y^*), y^*(S,k,x^*)) - r^a(S) > 0$. Therefore,

$$\frac{dr^a(S)}{dS} > 0. \tag{27}$$

To the implications of (27), consider a scenario involving two identical but different size properties with market rate r^m and sizes S_1 and S_2, respectively. WLOG assume $S_1 < S_2$. So, $V_1^m < V_2^m$, i.e., the second property has higher market value. Let $r_1^a = r^a(S_1)$ and $r_2^a = r^a(S_2)$. From (27) it follows that $r_1^a < r_2^a$. So, (27) implies that: (i) If owner of 2nd property accepts the award, the 1st owner will surely accept it; (ii) however, the opposite is not true. Specifically if $r_1^a \leq \hat{r} < r_2^a$, the owner of the lower-value (1st) property will accept the award but the owner of the higher-value (2nd) property will reject the offer and resort to litigation to get higher rate.

Further, the result implies that the expected rate received by the 2nd owner from official offers will be strictly higher than the one received the first owner. This obviously will be the case, if the department offers a rate of $r^a(S)$ and not more. Then, the rate accepted by the 2nd owner from official offer will be strictly higher than the one for the first owner. The argument holds in general too. Note that for several reasons, the official rate cannot be greater than $\tilde{r}$, the rate revealed as a result of efforts put in by the government evaluators. If officials offer more than $\tilde{r}$ may fear sanctions from the audit department. As several empirical studies indicate, this indeed seems to be the case. [Discuss this issue and site literature.]. So, the possibility of acceptable offer arises only when $r^a(S) \leq \tilde{r}$. In such a case suppose

$$\hat{r} = r^a(S) + \alpha[\tilde{r} - r^a(S)] = \alpha\tilde{r} + (1-\alpha)r^a(S),$$

where $\alpha \in [0,1]$ and denotes the bargaining power of the owner. Also note that for given S, the probability of the owner accepting the offer is

$$1 - H(r^a(S)).$$

Since, $H(r^a(S))$ is an increasing function of S, it follows that the probability of the owner accepting the offer decreases as S, i.e., the property value increase. It also implies that the probability of litigation increases with the value of the property. Let

$\hat{E}(\hat{r})$ denote the expected rate received from official offer, *conditional on the owner accepting the offer.*

So,

$$\hat{E}(\hat{r} \mid x_1, S) = \frac{\alpha \int_{r^a(S)}^{r^m+\zeta} \tilde{r} h(\tilde{r} \mid x_1) d\tilde{r}}{1 - H(r^a(S))} + \frac{(1-\alpha) \int_{r^a(S)}^{r^m+\zeta} r^a(S) h(\tilde{r} \mid x_1) d\tilde{r}}{1 - H(r^a(S))} \tag{28}$$

It can be shown that

$$\frac{d\hat{E}(\tilde{r} \mid x_1, S)}{dS} > 0.$$

Therefore, in the above context, the expected rate received by the 2nd owner from official offers will be strictly higher than the one received the first owner.

5 The Indian Context

The higher judiciary in India has made it clear that the owners are entitled to compensation determined on the basis of the higher of among the circle-rate and registered sale-deeds of similar land. The circle-rates, popularly known as registry rates, are perpetually outdated and well below the market value. Due to several reasons, sale-deeds are also under-valued. Between two, however, rates mentioned in the sale-deeds are generally greater than those of the circle-rates. Nonetheless, the land acquisition collectors (LACs) - the officer responsible for awarding the compensation - have been awarding compensation on the basis of circle-rates. While the LACs use the circle-rates, courts tend to use relatively high-value sale-deeds as the basis. Consequently, court awarded compensation is consistently higher, inducing the affected parties to go for litigation. In some cases, the difference between the LAC award, on one hand, and the judiciary awarded compensation is startling. [21]

The problem is exacerbated by a seemingly benevolent provision of the Indian land acquisition laws. The Section 25 of the existing Land Acquisition (Amendment) Act 1984 mandates that the court awarded compensation cannot be less than the LAC awarded compensation. This condition makes the choice of litigation by the affected parties as a costly but risk-free venture, in that the compensation cannot be reduced. Formally, let

r_{LAC} denote the compensation rate offered by the LAC.

Now, is the expected value of the compensation rate, per-square meter, awarded by the court can be written as

$$E(r \mid x, y) = \int_{r_{LAC}}^{\bar{r}} r f(r \mid x, y) dr.$$

It is immediate to see that $E(r \mid x, y) > r_{LAC}$. Therefore, litigation is always profitable for the owners, as long as the cost of legal efforts is relatively small. In fact, it can be easily be seen that all of the above claims hold even more strongly in the Indian context.

6 Concluding Remarks

We have shown that the incentive structure induced by the eminent domain laws is the main factor behind the empirically observed deviations of the received compensation from the market value of the properties.are large for the very low and very high value properties? Why there is litigation over compensation amount? It also accounts for the regressive nature of compensation determination processes under the eminent domain laws. Our model of the bargaining and litigation over compensation shows that, *ceteris paribus*, the litigation is much more profitable for the owners of the relatively high-value properties than for those owning low-value properties. Since, during litigation the government lawyers do not have strong incentives to put in the required efforts. The litigation efforts of the owner, in contrast increase in the

[21]An empirical study undertaken by the author corroborates these claims. For example, in 96 percent of the judgments delivered by the Punjab and Haryana High Court during 2009-10, the court awarded compensation is higher than the LAC award. Moreover, the average judicial awards are 342 percent higher than the LAC awards! See Singh 2011.

direct proportion the market value, leading to higher expected court/jury awards. However, the relative litigation award increase with market value. Therefore, the owners of high-value properties accept only the official offers only if it is sufficiently large; otherwise they reject the offer and go for litigation. In contrast, the owners of the low-value properties can accept the official award even when it is less than the market value.

Finally, we have argued that a unique feature of the Indian land acquisition law makes it highly prone to litigation. Under the Indian law, court awarded compensation cannot be less than the government awards, making the litigation a costly but risk-free choice for the affected parties. This explains the unusually high frequency of litigation over land acquisition in India.