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Taking the Castle: Efficiency and the Vibe of It
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Abstract

The owners of property taken for public use are often compensated for their loss. Compensation based on market value is known to create a moral hazard problem and induce inefficient investment. However, no compensation, while efficiency inducing, is not a feasible, or desirable alternative, because it is perceived to be unfair: individual landowners crushed under the governmental leviathan. An alternative is proposed for public projects (as road construction) for which all benefits are incorporated in land values. In this case compensation based on the value of a property had it not been taken, rather than its market value prior to the public project, is both efficient and fair.

The Castle

Darryl Kerrigan is the master of a modest house at 3 Highview Crescent, Cooloroo, on the edge of the Melbourne International Airport. In The Castle, an Australian movie made in the early 1990's, Darryl receives an official notice that his property is to be condemned to make way for an airport expansion. The house with it's many unique modifications, including a kennel for his racing greyhounds, is Darryl's "Castle". Because it is not just a house it is a "home" he is determined to remain and employs his friend, the solicitor Dennis Denuto, to challenge the condemnation. Denuto, a small time solicitor whose legal experience stretches to doing real estate conveyances, is well out of his depth with this case. Dennis knows Darryl is fighting the "big boys" on an issue that is clearly a constitutional challenge. Nonetheless, Denuto, as an act of friendship, agrees to represent Darryl. In response to a question put by the judge in the first Federal court appearance, Denuto raises a constitutional challenge to the condemnation. Asked directly about the constitutional point, Denuto responds, "It's the vibe of it [the Australian Constitution]." The judge is puzzled since she cannot recall any part of the Australian constitution that deals with the vibe. Naturally enough, Darryl-Denuto loses the first round in the magistrate court. The movie continues to a successful, and victorious conclusion for Darryl, when a distinguished QC, played by Charles Tingwell (of whom there are no more distinguished looking actors), takes up the case. In the High Court with all it bewigged participants, Tingwell argues that Section 51 of the Australian Constitution which states "The Parliament shall … have the power to make laws for … the government of the Commonwealth with respect to: …. (xxxii) The acquisition of property on just terms…." is the vibe. It is clear to Tingwell, as he argues before the high court justices, that it cannot be just to force a family out of the home it loves and cherishes. As in all good stories, Darryl wins the day, and, in the spirit of magnanimity of the grateful winner turns to the defendant's barrister and says, "Bad luck, you dickhead."

Notwithstanding Tingwell's elegance, Darryl would have been defeated in most courts – he would have been forced to move. The relevant issue is not whether the move should be imposed, but rather how much should he be compensated for his loss.

Much has been written about compensation of landowners for property condemned for public use (a taking). The topic is perpetually interesting to legal scholars, but, until the publication of the paper by Larry Blume, Dan Rubinfeld and myself[1] (BRS) in 1984, it attracted little attention from economists. The BRS paper challenged the conventional wisdom with the conclusion that compensation for lost land value induces inefficient landowner choices. The implication is that efficiency dictates no compensation for public takings.

Because of its orientation and its method of derivation, the applicability of this conclusion is limited. Zero compensation, while curing the inefficiency disease, might well kill the tolerance of a democratic citizenry: it is grossly unfair for the cost of a public project, one that benefits the general public, to be borne by a few unfortunate landowners. Furthermore, the conclusion is based on assumed circumstances that rarely apply. In BRS, the need to take land is based on an external event with known probability. Government acts passively, and takes land if and only if the event is realized. It is unlikely that public taking decisions are made by governmental automatons, but rather by agencies with their own agenda. Self-interest, rather than efficiency, likely dictate public choice.

In order to incorporate the potential for public agency, as well as landowner, self-interest, the taking process is modeled as a game. It is a game in which the strategy of the public bureau is the amount of land to condemn and that of the landowner is the amount of investment on (the level of improvements to) the land. A compensation rule is proposed in which the Nash equilibrium of the taking game is both efficient and fair.

Backround: Efficiency and Equity

In most countries there is no dispute about the government's ability to exercise its right of eminent domain. The issue is not whether the government can forcefully take

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[1] Blume, Rubinfeld and Shapiro (1984)

possession of property, but whether it should pay for it and if so, how much should it pay. The Fifth Amendment of the US Constitution states the "private property shall not be taken for public use without just compensation." A similar clause is in the Australian Constitution as well, but curiously it only restricts the federal, or Commonwealth, and not the individual states. In both constitutions the amount that is just is not specified, but in practice, the just price is equated with market value. The difficulty with this, as BRS pointed out, is that such a practice encourages an inefficient use of resources.

Individual landowners, if they are fully compensated to the amount of their market loss, will not account for the probability of a public condemnation. As a result they are induced to over-invest (invest more that is socially optimal (efficient)). The moral hazard loss is avoided if no compensation is paid, and thus none expected by the landowner. When the government is expected to take land without payment the individual landowner's objectives coincide with the collective welfare.

While the conclusion is indisputably correct, in so far as there are no logical flaws in the argument, it is unlikely that any policy as draconian as the one suggested would be adopted for the physical acquisition of private property.[2] Uncompensated condemnation is not consistent with the constitutional spirit. A condemnation without compensation has all the markings of a big unfeeling government strong-arming a small minority of landowners.

Frank Michelman (1967) incorporates the vibe within his proposed compensation calculus. He suggests explicit and quantifiable demoralization costs. While Michelman was a bit vague about the meaning, I interpret demoralization as the personal psychological reaction to observing the government leviathan running rough shot over a landowning minority and it manifests in two different ways. The first is an outpouring of sympathy for the downtrodden and the second a concern that the same can happen to you. Citizens worry about the sanctity of their own property rights.

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[2] Of course, public regulations with effects similar to physical takings, are not commonly thought to require compensation.

There are two distinct, and separate, aspects of the compensation question: economic efficiency and the vibes. I propose a compensation rule that produces both efficiency and good vibes. First I review the efficiency concerns.

Efficiency: The Landowners

BRS reason that if a property is taken, not only is its use diverted to a public purpose, but any improvements invested in the property are lost as well. Unmovable investments (e.g., construction of a house) are made before it is known whether or not the property will be taken. Clearly, if it were known with certainty that a property were to be taken, it would be optimal to invest nothing on it. However, in most cases, property improvements are contemplated before condemnation decisions are made. If property owners are fully compensated for both land and improvement values in the event of a taking, they have no incentive to account for the possibility of a condemnation. 'Just Compensation' induces a moral hazard in private investment decisions. Too much capital will be invested on the property. The subsequent destruction, by taking, of the immobile resource is a social loss. Compensation related to property value promotes inefficient resource use, while no compensation induces efficient choices. The surprising conclusion that the optimal compensation for a taking is none.

Zero compensation may induce efficient resource choices, but it is an infeasible alternative in a democratic state. Thus, it is not a practical policy prescription. However the analysis does illuminate problems with the existing compensation by current property value rule. Further thought suggest other problems as well. The case of *Haas vs City of San Francisco* is a pointed example of the tension between efficiency and equity.

Richard Epstein (1985) cites this case and it is interesting here because it is cogent example of the disjoint between BRS and the vibe. A developer, Haas, assembled a large plot of land in the Russian Hill district of San Francisco. The contract for his final purchase of the land specified that he would make payment (approximately $1.6 million) when he received a permit to build a multi-story apartment building on the site. Initial approval was given and on that basis Mr. Haas made payment a received title to the land. Mr. Haas complied with some post permit restrictions and then began construction of the

apartment complex. Prompted by a neighborhood protest, the City planning commission imposed a height restriction on the neighborhood, one that had a severe negative impact on the Haas project. The value of the land, subsequent to the new restriction, fell considerably (approximately $200,000). Mr. Haas suffered a substantial capital loss. Haas sued the City of San Francisco, claiming payment was his due because the height restriction constituted a taking of his property. The court decision, related with much scorn by Epstein, was that the regulation was not a taking and, thus, Mr. Haas was not entitled to compensation.

It is easy to sympathize with Epstein's condemnation of the court decision: it appears that Mr. Haas had followed a law-abiding course. On the basis of development permission, granted by the city, Haas paid for and was granted title to his property. His grievances are real and attract our sympathy. The vibe dictates restitution for his loss. Nonetheless, by the BRS test, no payment is fully justified. BRS make an ex ante argument. Nonpayment of compensation is an inducement to individuals to rationally account for the probability of a taking. What we do not know about Mr. Haas and the transaction by which he acquired the property, is whether the chance of new height restrictions figured into the price. For instance might the price have been $2million had there been assurance of no further land use restrictions? The compensation vibe is ex post. The BRS test is an ex ante one. The no compensation recommendation is designed to induce individuals to rightly calculate the chances of a taking (in this case an additional development restriction) and on that basis make and resource decision[3] that incorporates the probability of loss.

One of the difficulties with ex ante rules is that they are difficult to enforce ex post. Kydland and Prescott (1977) point this out with a cogent example: it is well know that it is inefficient to compensate for flood losses. To do so encourages too much investment on flood planes, but after the flood, the damage is already done, it seem

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[3] In the Haas case, the real resource using decision was the loss from clearing the land. Richard Epstein did not specify this, but it is reasonable to suppose that Mr. Haas had existing structures on his assembled property, torn down to make room for the new apartment complex. The lost structures and the resources used to tear them down represents the social cost of the project. The monetary costs are simply transfers and as such it would make little difference, even under the BRS framework whether or not they were deemed compensable. .

heartless to not aid families who have suffered a loss. This is very much the issue in Haas. Mr. Haas may have already factored the probability of an adverse outcome into his choices, if so there is no reason for compensation.   If his calculations included assurance of full compensation in the event of a building restriction, then his resource use was too large and there is no moral imperative for compensation.

There are two ways that compensation can lead landowners to make inefficient choices. First, with full compensation for the pre taking value of property, landowners have no incentive to account for the possibility that their land will be condemned for public use. As a consequence, they will over invest in immovable capital that will be destroyed if their land is taken. However, there is an alternative to this argument, namely, if landowners are not adequately compensated it will pay for them to expend resource to avoid loosing their land. Landholders can lobby, litigate, arouse public opinion and otherwise obstruct a potential taking of their land. These are pure rent seeking activities – ones that use resources but add nothing to total product. However, even if under-compensation did not induce an inefficient use of resources it is undesirable because it appears unjust.

Condemning land for public use creates winners and losers. A large number of people, those whose property is not condemned, benefit at the expense of a much smaller number who must surrender their property. The U.S. Supreme Court has interpreted the constitutional prohibition against taking without just compensation as a prohibition against an unfair practice of forcing the few (i.e., the taken landowners) to bear the entire cost of a project that profits the many[4].

Even when compensation is equal to the pre-taking value of property, as it is most commonly, the owners of condemned property lose relative to those escaping condemnation. Losing landholders are as likely to have held their property as long as the lucky ones, yet, they are excluded from the benefits of the public project. While one could argue that this is simply the potential breaks of holding property, it does seem a bit

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[4] As referenced in Fischel (1995) in the case of Armstrong v. United States (1960), Justice Black wrote for the majority opinion "The Fifth Amendment's guarantee … [is] designed to bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole."

unfair, as there is likely no more virtue resting with the lucky than with the unlucky. The potential of unequal reward induces additional inefficiencies. Those who face the unlucky outcome will expend resources to avoid condemnation – they will over-invest on their property to increase its value and make it a less desirable target for acquisition, and/or they may spend resources to lobby and otherwise influence the decision their way. This is not a speculation based on the theoretical model, but commonly observed behavior wherein individual or groups expend considerable resources to influence the placement of public projects.

Efficiency: The Bureaucracy

Most of the literature focuses on the compensation rule-induced behavior of the landowners, but the public project outcome depends on the behavior of the public decision maker (the bureaucrats) as well as that of the landowners. The interaction of the two groups creates a game (Taking Game) in which the strategy of a landowner is the level of investment and that of the bureaucrat is the selection of land to condemn. For the model that follows the landowners are assumed to be risk neutral wealth maximizers. A complete model of the taking game requires the inclusion of the motives of both participants.

Bill Fischel and I attempted to do this by contemplating the constitutional convention in which participants determine the compensation rules before it is known how much and whose land is to be condemned. The efficient compensation rules that come out of that exercise depend on the motives of those making the taking decision. This is a useful thought experiment because it indicated that zero compensation is efficient only if government is of two (polar opposite?) types. The beneficent dictator, or Pigouvian, government whose decision makers cared only about achieving efficient outcomes, is one type for which zero compensation induces efficient choices. The other is one we labeled the inexorable government (Bill liked to call it government as a five hundred pound gorilla). The inexorable government is influenced not one whit by any action of the landowners. Neither Pigou nor gorilla are entirely suitable as models of government behavior which observation tells us is more self serving than Pigou and more

likely to change its path than a five hundred pound gorilla. A richer model of the motives of the public decision makers is needed.

The government agency, whose members ultimately choose the amount of land to condemn, is an important player in the taking game. There are various models of public agencies, but the one of William Niskanen[5] is most commonly employed and it is chosen for this paper. In his book, initially published in 1971, Niskanen modeled bureaucratic decision-making guided by a desire to maximize the budget of its agency. In a "Reassessment"[6] included in a collection of his works, he now favors a modified version of the initial hypotheses over the first that he thinks is too simple a description of bureaucratic behavior: the bureaucratic attempts to maximize the *discretionary*, rather than total, budget of the employing agency. The "discretionary budget …[is] defined as the difference between the total budget and the minimum cost of producing the output expected by the political authorities"[7]

The Model

The model developed here focuses on the taking of land for a public project whose full benefits are captured in the market values of the surviving property. While there are many such projects, road building is the most common example and the one used. The particular aspects of a road is that land is consumed in its completion, surviving land benefits from increased accessibility and improved access leads to higher values for the uncondemned land. There are two distinct groups with interests in the process of road planning and acquisition.

Figure 1 represents the illustrative example. A road is to be built in a community with area N (abcd). The bureaucracy is to decide how large a road to build, and as a consequence, how much land to take. The decision can be for any area, A, no larger than the whole, N. Two possibilities are large road $A' = (efgh)$ or one that is smaller $A'' = (ijkl)$. Before the road is built, the land is homogeneous, one plot is

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[5] Niskanen 1994, 3-230
[6] ibid. 274.

indistinguishable from another. The benefit of the road is represented by increased land productivity and the benefit is the same for all land that is not taken. The extension of the homogeneity assumption to land after the completion of the road is difficult to justify given what is known about transport benefits. Land closer to the road enjoys larger accessibility benefits than does a plot farther away. Allowing for differential accessibility benefits would complicate the analysis without changing the basic result. For this reason the post-road homogeneity assumption is maintained.

There are many landowners, enough so that no one of them has significant market power. Whether or not there is a continuum of landowners or simply many makes no difference here. Naturally, landowners will have discrete parcels, but the taken amount does not necessarily conform to the entire holdings of the taken. A person may have any proportion of landholding condemned. If a person has some

THE ROAD

Figure 1

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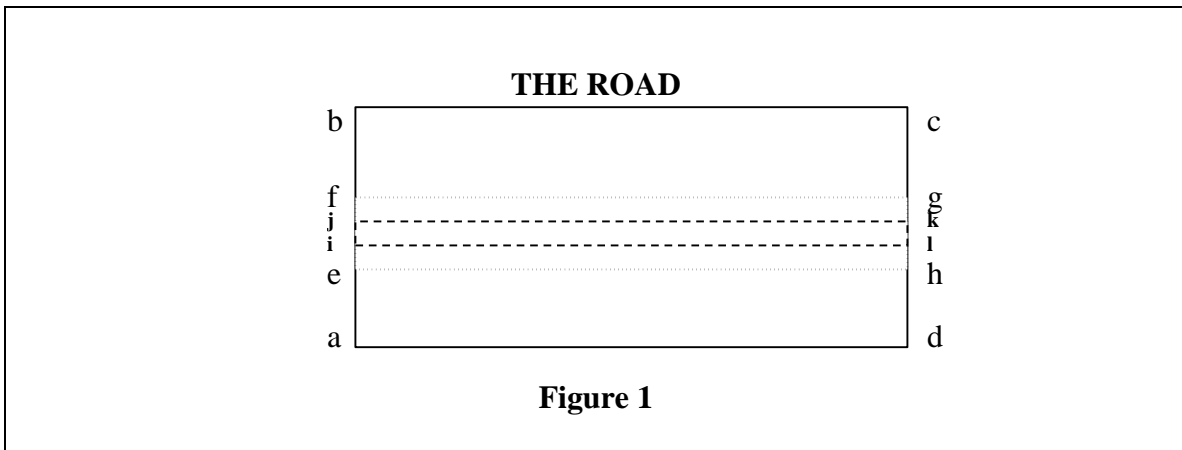
[7] ibid.

land taken and some left to enjoy the benefits of the new road, for the purpose of this model that person has two interests, and each is pursued without reference to the other. Even though it may be the same person, for the model there are two distinct individual, one whose interest lies with the taken and the other whose interest correspond to the untaken.

The financial arrangement parallel those common to many public works projects in the United States. The initial financing of the road is supported by the sales of bonds. The overseeing public bureau sells the bonds and is responsible for servicing the acquired debts. The bureau's meets its repayment obligation and its own operating costs with an ad valorem tax on property within its jurisdiction[8]. In order to simplify the calculations that follow, it is assumed that the bonds are consols (infinite lived) instruments sold at a constant rate of interest, r. The annual expenses of the bureau are the obligated interest on the debt – the product of the rate of interest and the size of the initial debt offering – and its overhead costs (employee salaries, computer purchases, office furniture, etc.). Overhead with the balanced budget accounting that must be done is what Niskanen calls the bureau's discretionary budget, in this case it is the difference between the taxes collected and the annual debt service.

Landowners' Welfare

For this analysis every spot within the jurisdiction, represented in Figure 1, has its own geographic coordinate, s. There are two types of spots, those that are designated for the road and those that are not. The set of road coordinate is designated H (for Highway) and those that escape condemnation and benefit from the road constitute a set B (for Beneficiary). The rate of output of a parcel of land at s is a strictly quasi concave, and differentiable, function of the amount of immovable capital invested at that point, $x(s)$ and the size of the road, A

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[8] Building and financing the road, as modeled, resembles redevelopment projects in many parts of the United States. Agencies are formed with direct responsibility for financing and carrying out the projects. They are responsible for the debt incurred. Both debt repayment and operating expenses are financed with a property tax related to the change in property value due to the project. The financial arrangement is called Tax Increment Financing. Jan Brueckner (2001) analyses the fiscal and welfare implication of this form of financing. This is not the form of financing used in Australia.

$$y(s) = \begin{cases} f_s(x(s), A) = 0 & \text{for} \quad s \in H \\ f_s(x(s), A) = f(x(s), A) & \text{for} \quad s \in B \quad f(0, A) = 0 \,\forall\, A \end{cases} \tag{1}$$

Consistent with the assumption of land homogeneity, the production function for the non-taken area, B, is not given a geographic index because all land is equally productive[9]. The annualized cost of invested capital is a strictly convex, and differentiable function $c(x)$, $c(0) = 0$, of the level of investment. The annual gross income (income before deducting the property tax), P (P for profit), for a particular spot is a strictly quasi concave function of level of private investment and road size A

$$P(x(s), A) = f(x(s), A) - c(x(s)). \tag{2}$$

Upon completion of the road, which is simultaneous with the condemnation of and payment for the designated property, an annual ad valorem property tax of rate τ is imposed. If $V(s)$ is the market value of property, it is related to the annual rent by

$$V(x(s), A) = \frac{P(x(s), A)}{r + \tau} \tag{3}$$

The landowner's annual income is

$$I(x(s), A) = \frac{r}{r + \tau} P(x(s), A). \tag{4}$$

The landowner whose property is not taken will invest so as to maximize the annual income

$$x(s, A) = \arg\max\{f(x(s), A) - c(x(s)). \tag{5}$$

It is clear from this that $x(s,A) = 0$ for $s \in H$.

With this define the profit when investment is optimally chosen as R (for rent)

$$R(s, A) = f(x(s, A), A) - c(x(s, A)). \tag{6}$$

By the homogeneity assumption, the investment decision is the same for all non-taken property and in equilibrium

$$R(s, A) = R(A) \,\forall\, s \in B. $$

(7)

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[9] $y(s)$ is the rate of output at a point, the quantity of product must be calculated at that produced over an interval

$$Y(s_1, s_2) = \int_{s_1}^{s_2} y(s) ds$$

where s_1, s_2 is an interval in B.

In equilibrium the value of all remaining property is the same, namely

$$V(A) = \frac{R(A)}{r + \tau}. \tag{8}$$

The tax base to service the debt and support the bureaucracy, for every value of A is

$$(N - A)V(A) = (N - A)\frac{R(A)}{r + \tau}. \tag{9}$$

Social Welfare

The citizens of the jurisdiction are all landowners, some have had their property condemned and the remaining have not. Since the landowners are all risk neutral the social welfare is synonymous with jurisdictional total before tax income. In this case with its homogeneity condition, all landowners make the same choice in equilibrium, social welfare, SW(A) is simple the product of the amount of untaken land and R(A) for any given A

$$SW(A, x) = (N - A)R(A, x).$$

The efficient level of investment, x*, is the one that maximizes R(A,x) for a given choice of A. This is the value x(s,A) as defined in (5) above. The choice of A=A* that maximizes social welfare is the value that satisfies the first order condition

$$(N - A^*)\frac{\partial R(x(A^*), A^*)}{\partial A} - R(x(A^*), A^*) = 0 .^{10} \tag{10}$$

The global concavity of R( ) insures that there is a unique A* that satisfies this equation.

The first order condition suggests a compensation rule that induces efficient choices by the landowners and the bureaucrats. For social efficiency the aggregate increase in economic rent (the first term of the first order condition) must equal the economic rent associated with one plot of land (in effect the last parcel taken). The aggregate marginal increase in economic rent is equated with the rent, evaluated at the level it would have been had it not been taken and enjoyed the benefit of the level of

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[10] The second derivative of the social welfare function with respect to A is $(N - A)\frac{\partial^2 R}{\partial A^2} - 2\frac{\partial R}{\partial A} < 0$.

public good A. This is not the pre taking amount (the value upon which current compensation practices is based), but the post taking value – the one that the taken landowner would have enjoyed had his land escaped condemnation.

Compensation

The compensation rule sought must satisfy two conditions. The first is that it induces landowners to make efficient investment choices. The second is that it is perceived as fair (consistent with the constitutional vibe). An acceptable compensation rule is one that is not only equitable ex ante, but also one that is perceived fair ex post. To an economist it may appear fair to deny compensation to a flood victim because the odds of loss are known prior to settlement on the flood plain. But this does not conform to good, or feasible, public policy. Simple matters of compassion dictate that victims of natural disasters receive aid, and aid will be given, if not by public agencies, then by private ones.

Public rules must be minimally compassionate to be feasible. For this reason the BRS finding that no compensation for a taking is efficient does not translate to real policy. For the same reason that uncompensated flood loss is infeasible as a public policy, so is uncompensated taking. The dilemma is that we know from BRS that the common practice of paying landowners the value of their land prior to the taking induces inefficient investment. Furthermore, as pointed out earlier, it even promotes further inefficiencies because condemnation precludes enjoying the benefits of the proposed road. The owners of condemned land can contemplate the prospect of their luckier neighbors becoming wealthier as better access increases the value of their land holdings. This is a further inducement to expend resources to avoid condemnation.

A compensation plan that passes both the equity and efficiency test is one in which the condemned and uncondemned landowners are equally rewarded. The proposal is that payment for condemnation is the market value of land that survived condemnation. With the assumed homogeneity all uncondemned land has the same market value. Therefore the condemned landowner receives compensation at the rate of V(A) per units of taken property.

This is undeniably equitable. Because the wealth of all landowners is the same there is no question of unfairness in this case. Furthermore, individual landowners gain no advantage from affecting the chance of a condemnation one way or another. Thus, the equitable scheme is also efficient, conditional on the correct choice of A. For any choice of road location and width (A' or A'' in Figure 1) those with land within the planned roadway will invest nothing and those outside it will invest the rent maximizing R(A). The remaining problem is to create an inducement for the bureaucracy to choose the efficient road size, A.

Post hoc compensation is a viable and practical alternative to the existing practice. It requires that owners of condemned property be paid the value had the property not been condemned and enjoyed the benefits of the public project. Implementation can be accomplished with reasonable simplicity. There are two possibilities. The first is to make the initial compensation payment an IOU whose value will be determined after the completion of the public project and the reassessment of uncondemned property. This procedure is consistent with tax increment financing that is now applied to redevelopment projects. The second is, perhaps, even simpler: namely, to record the market value of uncondemned land after the public project is announced and known by the market with certainty. Economic theory tells us that changes in property values accurately reflect the anticipated property-related benefits of the public project.

The objection to most prescription for curing compensation-induced inefficiencies is that they rely on foreknowledge, by the public agency, of the efficient level of investment. It seems to me that if public agencies were sufficiently informed to know what are efficient resource commitments, they should simply mandate them. This compensation formula requires only that the public agency rely on the market to dictate its choices and it provides the incentive for it to do so.

When the route and road size are announced, land will sell at road-enhanced values. Whether or not a parcel is on the roadway, its reward, either by public compensation, or optimal resource allocation, is the same. Thus, the pubic agency, if it must pay market value for right-of-way, is faced with the true social marginal cost of its

decision. There is sufficient information in the market to guide efficient public choices. It is important to provide the proper incentives for the agency to take that choice.

A final practical question is to what extent can the public authorities be relied on to implement efficient condemnation? The efficient criterion, namely equating the marginal increase in total economic rent with the rent on the last property taken, is easily stated, but may not be implemented, if it is not in the interest of the authority to do so. An inducement to public efficiency is to make the interests of the public authority coincident with the total economic rent. If bureaucratic behavior is governed by the desire to maximize discretionary budgets[11], as Niskannen asserts, then making the discretionary budget of the bureaucracy a constant fraction of the total rent induces efficient condemnation choices.

The bureaucracy is the tax-collecting agency; its mandate is to manage the project debt and to maintain itself. The maintenance is the discretionary budget. One rule that will induce efficient choices from the self-serving agency is that its discretionary budget is a fraction, ρ, of tax collections. With the proper selection of ρ

$$\rho = \frac{r + \tau}{\tau\gamma} \tag{11}$$

where γ is a value, greater than 1, set by fiat before any matters of road construction are considered. The larger γ, the smaller the agency share of tax collections; because of this relationship, $1/\gamma$ will be referred to as the 'overhead rate'. The bureau's discretionary budget, D, depends on both the amount of land it takes and the investment made by each landowner:

$$D(A, x) = \rho\tau(N - A)V(A, x). \tag{12}$$

From (8), the discretionary budget is a constant share of total net rent

$$D(A, x) = \frac{(N - A)R(A, x)}{\gamma}. \tag{13}$$

The agency objective is a constant fraction, $1/\gamma$, the overhead rate, of the social welfare. The value $A = A^*$ that maximizes the bureau's discretionary budget is the same value that maximizes social welfare.

The Game

The interaction of the landowner and bureaucrat choices is modelled simply as a game. Each of the player classes has distinct strategy instruments. The bureau's instrument is, A, the amount of land taken and for each landowner it is x, the personal investment on the land. The bureaucratic objective is to maximize its discretionary budget given the investment choices of the landowners and each landowner seeks to maximize yearly income given the bureau's road size decision. The choices are characterized easily as follows:

$$A(x) = \arg\max_A D(A, x)$$
$$x(A) = \arg\max_x R(x, A)$$

for the bureau and landowners respectively. The Nash equilibrium of this game are the strategy choices A^e and x^e such that

$$A^e = A(x^e) \text{ and } x^e = x(A^e).$$

It is clear from the discussion that follows (13) that the Nash equilibrium road size coincides with the socially optimum size, $A^* = A^e$. Those whose land have escaped condemnation will naturally choose to invest the amount that maximizes their rent and those who will loose there land will not find it advantageous to invest anything. Thus, the Nash equilibrium level of investment coincides with the efficient level $x^* = x^e$.

The scheme can be implemented as a Stackelberg game in which the government agency is the leader and the landowners the followers. This implementation requires that the bureaucrats know the response of the landowners, or at least the market value response to any announcement of A. The implementation would be as follows: the bureau announces a highway size of A, the landowners then respond with investment choices x(s). The social optimum (A^*,x^*) is a subgame perfect equilibrium. The problem with the Stackelberg implementation is that is requires more bureaucratic knowledge than is realistic. If the bureau does not know the effect of its announcements on land values, it is unable to compute the optimal first move. However, there is a less

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[11] Overhead, as I would prefer to call it.

elegant way to achieve the same outcome that requires the bureau to undertake a series of experimental announcements to learn about the link between road size and land values.

A serious objection to prescriptions for efficient compensation is that they require government (or whoever is to decide on compensation and/or amount of land condemned) to know more than is reasonable to expect. If knowledge of markets and the technology to convert land to useful output is possessed by the public agency, it can simply mandate the correct level of investment and use an arbitrary compensation plan. Furthermore, with sufficient knowledge, the bureau can easily decide on the correct level size of the highway. I had hoped to design an efficient and equitable compensation scheme that could be implemented in the absence of considerable knowledge by the public bureau. While it may be possible, I have not yet figured it out. Instead, I offer an implementation scheme that depends on some foreknowledge. It is a scheme that requires the bureau to experiment and learn the relationship between the size of the road and their discretionary budget. In the end, with a finite number of experiments, the bureau will be able only to get an unbiased estimate of their payoff function, and, consequently, only the expected value of the resulting policy is efficient.

Suppose the bureau knows that its discretionary budget is a concave function of the amount of land taken. Since the bureau's objective is proportional to the total before tax rent, it is represented by this value in Figure 2. Furthermore, assume that it is known to the bureau that the function is a finite m-order polynomial in A as represented in the Figure 2

$$(N - A_j)R_j = (N - A_j)R(0) + \sum_{i=1}^{m}\beta_i(N - A_j)^i + \varepsilon_j \quad \sum_{i=1}^{m}\beta_i N^i = 0 \ (14)$$

This representation account for a known rent, R(0) before the highway project and the foreknowledge that if the highway consumes all land, there is no income R(N) = 0. It is assumed that ε is uncorrelated with A^i and has expected value zero. This much knowledge allows the bureau to experiment with various announced policies and then obtain unbiased estimates of the β_i's.

Here is how the experiment and estimation works: The compensation policy is known by all: owners of condemned land, once it is incorporated in the highway are paid

the market value of land not taken. V(A) is the market price of untaken land, and, since it is known that that is the compensation for taken land, it is also the pre-taking price of land slated for condemnation. The first stage (stage 1) of the experiment starts with the announcement by the bureau of a planned taking of A_1. On the basis of this, the observable market price of land is $V(A_1)$. The bureau is able to compute its discretionary income from this[12] and that becomes one observation in the regression equation (14). With a minimum of j = m observations, the bureau is able to derive unbiased estimators for the β's. Since there are no costs to the experiment, the process of choosing different A's and observing the V(A)'s could continue indefinitely. However that is unrealistic. There are costs to such sampling and the bureau will employ some optimal stopping rule that equates the marginal benefit (in potential increases in discretionary income) with the marginal cost of finding one more sample value. The actual road size may be different from the optimal size, but the expected value of A is equal to the optimal A*.

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[12] See Appendix for calculating discretionary income from market value.

THE AGGREGATE RENT FUNCTION

(N-A)R(A)

(N-A*)R(A*)

$$(N - A_j)R_j = (N - A_j)R(0) + \sum_{i=1}^{m} \beta_i (N - A_j)^i + \varepsilon_j \quad \sum_{i=1}^{m} \beta_i N^i = 0$$
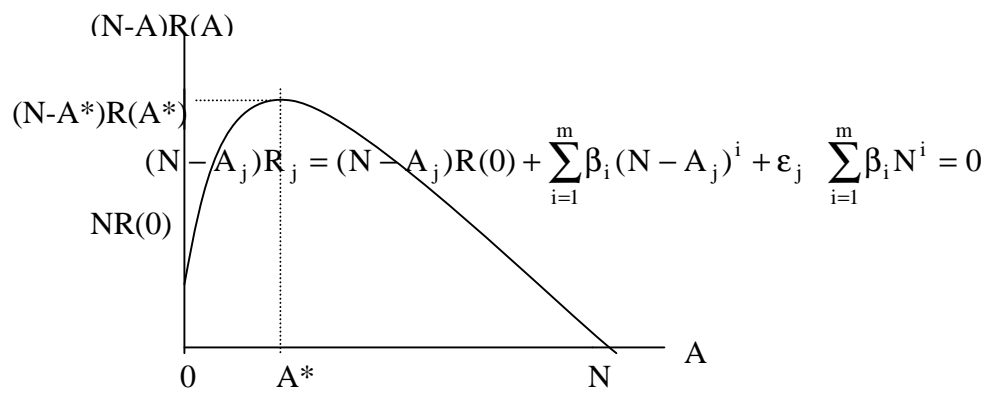
NR(0)

0   A*   N   A

Figure 2

Summary and Conclusion

It is unlikely that Darryl Kerrigan would have settled for the compensation proposed here. He would refuse any offer because the property coveted by the state for airport expansion is not just a house, it is a HOME, it is Darryl's castle. Compensation for that sort of overwhelming attachment to place is not contemplated in my derivation of 'just compensation'. Indeed my proposal only applies to public projects for which the entire benefit is captured in increased land values. The proposal is unique in that it is contemplates the financing of the compensation with an ad valorem property tax, rather than a lump sum head tax. In this case there is no loss in efficiency, as is common with ad valorem taxes, because individuals are taxed in proportion to the benefit they receive.

While my derivation is limited to property value captured benefits, the motivation to find compensations rules that are both just as well as efficient is sound and can be applied to a broader class of public decisions. The proposal to compensate landowners whose property is taken at a rate equivalent to the price of untaken land has all the desired attributes. It does not induce landowners to make wasteful rent seeking expenditures. At the end of the process there is not a small subpopulation of losers that creates the perception of after-the-fact unfairness, even if the choice of losers is made by a "fair" lottery.

The proposal has the additional feature of inducing an efficient choice of project size from the public bureaucracy even though the bureaucrat is motivated by the desire for personal rather than altruistic goals. A coincidence of interest between the bureaucrat and the social welfare is achieved by making the size of agency overhead a particular proportion of property tax collection. Because of the created coincidence, bureaucratic welfare is maximized at the same public project size as is the social welfare.

APPENDIX

CALUCULATING TAX RATES AND BUREAU DISCRETIONARY INCOME

The need for a balanced budget, combined with the compensation rule determines the ad valorem property tax rate.

Property tax collected is

$$\tau(N - A)V(A)$$

this tax must support the debt service on the payment for the taken land

$$rAV(A)$$

and the negotiated bureaucratic overhead

$$\rho\tau(N - A)V(A)$$

The balanced budget requires

$$\tau(1 - \rho)(N - A)V(A) = rAV(A)$$

Recalling that $\rho = \frac{r+\tau}{\gamma\tau}$, the relationship between the tax rate and the taking choice is

$$\tau = \frac{\gamma r}{\gamma - 1}\frac{N}{N - A}.$$

It is not surprising that the tax rate increases as the overhead rate (represented by $\frac{1}{\gamma}$) increases.

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