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Free Riders, Holdouts, and Public Use: A Tale of Two Externalities

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Abstract

Free riders and holdouts are market failures that potentially impede the completion of otherwise beneficial transactions. The key difference is that the free rider problem is a demand side externality that requires taxation to compel payment for a public good, while the holdout problem is a supply side externality that requires eminent domain to force the sale of land for large scale projects. This paper highlights that distinction between these two problems and uses the resulting insights to clarify the meaning of the public use requirement of the Fifth Amendment takings clause.

Journal of Economic Literature Classification: H41, K11

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1. Introduction

The free rider and holdout problems are well-known sources of market failure. The free rider problem arises from the non-excludability of public goods, which allows all consumers, including those who have not contributed to the cost of provision, to enjoy their benefits. Private markets therefore tend to underprovide public goods. The holdout problem, in contrast, most commonly arises in the context of large scale development projects that require the assembly of land.[1] Once the assembly becomes public knowledge, individual owners recognize that they can impose substantial costs on the developer by refusing to sell. Sellers thereby acquire a kind of monopoly power that allows them to extract rents from the developer, resulting in delay or failure to complete the project altogether.

What is not so well known is the relationship between the two problems.[2] Specifically, does the presence of one tend to give rise to the other? And, are the appropriate remedies the same? The next section develops simple game-theoretic models of the free rider and holdout problems in an effort to answer these questions.

In addition to their theoretical importance, these questions have practical relevance in the context of the recent Supreme Court decision in *Kelo v. New London* (2005), which explored the proper scope for the government's use of its constitutional power of eminent domain. The particular issue examined in *Kelo* was whether the government can use eminent domain to take land from one private party for use in a redevelopment plan whose primary beneficiary is another

[1] The problem need not be restricted to land assembly, however. See, for example, Menezes and Pitchford (2004).
[2] But see the insightful paper by Cohen (1991), which previously examined this relationship in an informal way. The current paper formalizes his analysis and draws implications for the appropriate use of eminent domain.

private party. According to the public use requirement of the Fifth Amendment takings clause, the use of eminent domain is limited to projects that provide a public benefit.[3] The use of eminent domain to acquire land for public facilities like highways, parks, and airports is therefore a well-accepted practice. However, its use to acquire land for commercial development projects, so-called "private takings," is much more controversial. In a narrow ruling, the Supreme Court in *Kelo* allowed the use of eminent domain in such cases on the grounds that redevelopment projects that are expected to generate substantial spillover benefits to the public in the form of new jobs and increased tax revenues are consistent with public use.[4]

This "spillover benefit" argument apparently ties the use of eminent domain to the government's role in providing public goods. As such, it represents a natural interpretation of the public use requirement, but does it make economic sense? An alternative justification for eminent domain is to overcome the holdout problem associated with land assembly, but this argument suffers from the lack of a logical basis for distinguishing between public and private projects. Specifically, since holdouts can arise in both contexts, then eminent domain should be available for both. Such a conclusion, however, renders the public use requirement virtually meaningless, which probably explains why the Court did not rely on it in *Kelo*.

Section 3 of the paper uses the insights from the theoretical analysis in Section 2 to sort out these competing justifications for eminent domain. In so doing, it develops a general framework for determining the appropriate role for government in facilitating market exchange.

2. Theoretical Analysis

[3] The exact clause reads: "nor shall private property be taken for public use, without just compensation."
[4] Miceli, Segerson, and Sirmans (200?) pursue the tax motivation for takings arising from the *Kelo* decision.

This section develops simple game-theoretic models of the free rider and holdout problems with the aim of revealing their similarities and differences. The models are intentionally over-simplified in order to highlight the relationship between these two sources of market failure.

2.1. The Free Rider Problem

As noted, a public good is one whose benefits cannot be denied to non-payers. The result is a free rider problem, which results in under-provision of public goods by private purchases. The following model provides a simple demonstration of this form of market failure.

Consider a non-cooperative game played between two consumers, each of whom can purchase at most one unit of a particular good at a constant cost c.[5] Suppose that the purchaser receives benefits of v when he or she buys a unit of the good, but in addition, the non-purchaser receives an external benefit of α. In the case of a pure private good, $\alpha=0$ (i.e., there is no spillover benefit), whereas for a pure public good, $\alpha=v$ (i.e., the non-purchaser receives the full benefit). The net payoffs if only one individual purchases the good are therefore $v–c$ for the purchaser, and α for the non-purchaser, yielding a net social benefit of $v+\alpha–c$.

Now suppose that both consumers purchase a unit of the good. In this case, each purchaser receives a net benefit of $v+\alpha–c$, yielding aggregate benefits of $2(v+\alpha–c)$. We assume that the following inequalities hold:

$$v + \alpha > c > v. \qquad (1)$$

Thus, the first-best outcome is for both consumers to purchase a unit of the good, but it is better for one consumer to purchase the good than for neither to do so. However, the private return to the purchaser of a single unit is negative. Given these conditions, the question is how much of the good will be purchased in equilibrium.

[5] See Dixit and Olson (2000) for a related, but more sophisticated, model.

[Figure 1 here]

Figure 1 shows the game tree for a sequential move game in which the consumers separately decide either to "buy" or "not buy" a unit of the good. Consumer one moves first and either buys a unit of the good or does not buy. Then, after observing consumer one's decision, consumer two makes the same choice. It is easy to show that the subgame perfect Nash equilibrium of this game is for neither consumer to buy the good.[6] Using backwards induction, we first consider consumer two's choice. If consumer one has bought a unit of the good, consumer two will not buy another unit since $\alpha > v + \alpha - c$, which holds by (1). Likewise, if consumer one did not buy a unit of the good, two will not buy it either since $v - c < 0$. Thus, consumer two's dominant strategy is not to buy. Given this, consumer one, moving first, will also choose not to buy since $v - c < 0$.

This equilibrium in which neither consumer buys the good illustrates an extreme version of the free rider problem. In a more general setting some amount of the good will be provided privately, but, because of the externality, it will be less than the efficient amount.[7] The usual remedy is for the government to take over the provision of public goods (or at least to subsidize their provision), and to finance their cost of provision with a tax. For example, each consumer in the above model would be assessed a tax, the sum of which equals the total cost of purchasing two units of the good. In the case of equal cost sharing, each consumer would therefore pay a tax of $T = c$ and receive a net benefit of $v + \alpha - c$, which is positive by (1).[8] Tax financing of public

[6] The outcome would be the same if the consumers moved simultaneously. (In that case, the game has the structure of a prisoner's dilemma, and the unique Nash equilibrium is for neither consumer to buy.) I consider a sequential move game to highlight the comparison with the holdout problem below.

[7] See, for example, Mas-Colell, Whinston, and Green (1995, pp. 361-363).

[8] The actual design of taxes for public goods is complicated by the unobservability of individual benefits, which makes it difficult both to tie individual taxes to benefits, and to calculate the efficient quantity of the public good. Economists have developed demand-revealing tax schemes to deal with these problems, but they are generally impractical. See Atkinson and Stiglitz (1980, pp. 513-518).

goods can therefore be characterized as a "forced purchase" of the good given the inadequate incentives for consumers to purchase them voluntarily.

2.2. The Holdout Problem

Some large scale projects require the assembly of several contiguous parcels of land. The problem that producers of such projects face is that individual owners acquire a kind of market power that potentially enables them to hold up the provision of the project by refusing to sell. The following model provides a simple illustration of this problem.[9]

Consider a game played by two owners of adjacent parcels of land, each worth v to its owner. A buyer arrives seeking to acquire both parcels for a development project (public or private) that, when completed, would be worth $2v+\varepsilon$. The parameter ε represents a scale benefit, or complementarity, associated with consolidation of the two parcels. From the perspective of the sellers, however, ε represents an external benefit that the owner selling first would confer on the owner selling second. Specifically, if the buyer acquires the first parcel for its individual value of v, the value of the second parcel immediately increases to $v+\varepsilon$.[10] Clearly it is efficient for both owners to sell (owing to the complementarity), but assuming that they cannot coordinate their behavior, the problem of determining who will sell first may delay or prevent the sales from occurring.

To be concrete, suppose that bargaining between the buyer and the two sellers can take place in two time periods, "now" and "later." Further, assume that the buyer can proceed with the project if he acquires both parcels now, one now and one later, or both later. However, if he

[9] The model is based on Miceli and Segerson (2007). Also see Miceli and Sirmans (2007) and Strange (1995), both of which examine the holdout problem in an urban development setting, and Menezes and Pitchford (2004), who examine it in a more general context.

[10] One might argue that either seller could realize the gain ε by buying the other's parcel, thereby avoiding the problem. We can ignore this possibility without loss of generality, however, as most actual assembly situations involve more than two parcels. In that case, it doesn't matter whether the assembler is one of the owners or not.

acquires both later he incurs a cost of delay equal to δ, though we assume that $\varepsilon > \delta$ so that consolidation is still profitable at that time. After the second period, however, the gain from consolidation vanishes.

In this setting, each seller has two possible strategies: "sell now" or "wait" (sell later).[11] If both sell now, assume that they split the aggregate value; that is, each gets $(2v+\varepsilon)/2$. Likewise, if both wait, they each get $(2v+\varepsilon-\delta)/2$. Finally, if one sells now and the other waits, the one who sells now gets v, while the one who waits gets $v+\varepsilon$.[12] Figure 2 shows the game tree for this entry game.

[Figure 2 here]

Proceeding as above, we use backwards induction to show, first, that the dominant strategy of seller two is to wait. Specifically, if seller one sells now, it is optimal for seller two to wait since $v+\varepsilon > (2v+\varepsilon)/2$. Alternatively, if seller one waits, it is also optimal for seller two to wait since $(2v+\varepsilon-\delta)/2 > v$ given $\varepsilon > \delta$. Thus, it is optimal for seller two to wait, regardless of seller one's prior choice. As a result, the optimal strategy of seller one, moving first, is also to wait since $(2v+\varepsilon-\delta)/2 > v$. The subgame perfect Nash equilibrium of the sellers' entry game therefore involves a joint holdout. Thus, although the project ultimately goes forward, there is a deadweight loss of δ due to the delay.

In contrast to the free rider problem which involves too few purchases, the holdout problem results in too few voluntary *sales* (or, more precisely, an inefficient delay in sales). Thus, the appropriate remedy is to allow "forced sales" (or eminent domain), which requires that

[11] We assume that if both parties choose to wait, they jointly sell in the second period since after that the surplus from a joint sale is gone (Cohen, 1991, p. 354).

[12] These payoffs assume that the seller gets all of the surplus from any sale. Miceli and Segerson (2007) consider the more general case where the buyer and seller (or sellers) share any surplus according to the Nash bargaining solution. The outcome does not depend on the particular assumption.

each owner be paid the fair market value for his or her land but does not allow them to refuse the transfer.[13] The remedy of forced sales reflects the fact that the externality in this case is on the supply side rather than the demand side.

3. Application to the Public Use Debate

This section uses the insights from the preceding analysis to shed light on the debate regarding the proper scope for eminent domain. Recall that this debate centers on the meaning the "public use" requirement of the Fifth Amendment takings clause. In his seminal analysis of this question, Merrill (1986) distinguishes between the government's intended use of the land that it acquires—what he calls the "ends" approach, and the manner in which the land will be acquired—the "means" approach. He argues that, in deciding on the proper use of eminent domain, courts nearly always frame the issue in terms of ends—that is, they inquire into whether the land will be used to provide some sort of public benefit. This test is easily satisfied when eminent domain is used to acquire land for public projects like highways, airports, or parks, given that these projects literally involve "public use" of the land. The test is more problematic, however, when the land is targeted for a project that is primarily private in nature, as when it is part of an urban redevelopment plan. In these cases, courts nevertheless struggle to discover the public benefit of the project, usually pointing to the new jobs, enhanced tax revenues, and/or elimination of urban blight that are expected to arise as by-products.

[13] Although market value is the accepted legal definition of "just compensation," it is generally recognized that it undercompensates owners compared to their true reservation prices (Fischel, 1995, pp. 207-209). Although this is a necessary response to the unobservability of the v's, it runs the risk of allowing excessive takings since buyers (the government or a private developer) do not face the full opportunity cost of the land. See Plassmann and Tideman (2008) for a demand revealing approach (along the lines of that applied to public good provision) for eliciting sellers' true reservation prices.

Two prominent cases illustrate this approach. In *Poletown Neighborhood Council v. City of Detroit,*[14] the Michigan Supreme Court justified the use of eminent domain by the city of Detroit to acquire an entire residential neighborhood in order to make way for a General Motors assembly plant on the grounds that the plant would preserve jobs and generate additional tax revenues for the city. The U.S. Supreme Court used similar logic in *Kelo v. New London*[15] to allow the use of eminent domain by the City of New London, Connecticut, to acquire several private homes as part of a comprehensive redevelopment plan aimed at revitalizing the downtown area.

The problem with this approach to public use is not that it inappropriately permits the use of eminent domain in these cases; it may or may not. Instead, by focusing on ends rather than means it identifies the wrong market failure as the proper justification for eminent domain. The issue becomes clear, however, when framed in terms of the free rider and holdout problems. As the above models revealed, these are separable issues: whereas the free rider problem arises in the presence of a demand-side externality and therefore justifies the use of taxation, or forced purchase, to finance a public good, the holdout problem arises in the presence of a supply-side externality and therefore justifies eminent domain, or forced sale, to facilitate land assembly. By framing the public use question in terms of ends rather than means, the court therefore focuses on the wrong side of the market and hence on the wrong remedy.

[Table 1 here]

This point is illustrated more generally by Table 1, which shows four possible cases, depending on whether the transaction in question involves a free rider problem (the vertical dimension) or a holdout problem (the horizontal dimension). In cell I, neither problem is present,

[14] 410 Mich. 616, 304 N.W.2d 455 (1981).
[15] 125 S.Ct. 2655, 545 U.S. 469 (2005).

so neither tax financing to force a purchase, nor eminent domain to force a sale, is justified. This is the case of ordinary market transactions, whether between two private parties or between a private party and the government. At the other extreme is cell IV, where both a free rider and a holdout problem are present. This represents situations in which the government needs to assemble land for provision of a public good like a highway or park. In this case, use of eminent domain is justified by the means approach, and tax financing to raise the revenue necessary to compensate owners is justified by the ends approach.[16]

Next consider cell III, where a free rider problem is present, but there is no holdout problem. This situation arises when the government provides a public good that does not require land assembly. In this case, taxation to finance the good is appropriate, but use of eminent domain to acquire the land (or other inputs) is not. For example, the government properly uses taxes to finance the provision of police protection for all of its citizens (because it is a public good), but it should not be allowed to use its taking power to conscript police officers, or acquire a fleet of patrol cars or a single parcel of land for a police station. Instead, it should have to acquire these inputs on the market, just as a private security firm would. Fischel (1995, p. 74) notes that in most cases governments do this voluntarily because the transaction costs of using eminent domain in settings where holdouts are not present are generally high enough to deter its overuse. In this sense, the use of eminent domain in this case is largely "self limiting."

Finally, consider cell II, in which there is no free rider problem but there is a holdout problem. Most private takings cases fall into this category—that is, they involve private developers facing holdout problems. Historically, courts have tended to allow the use of eminent domain in such cases, but, as the *Kelo* and *Poletown* cases show, they nearly always seek to justify this action in terms of ends rather than means (Merrill, 1986, p. 67). The difficulty with

[16] See Ulen (1992) whose "dual constraint" approach to eminent domain would limit its use to this case.

this approach, as suggested above, is the ambiguous meaning of public use. Whereas its plain meaning suggests that eminent domain should be limited to cases where the land will literally be put to a public use—a demand side consideration—economic theory reveals that the proper justification lies in the presence of a holdout problem—a supply side failure. As a consequence, the court is forced to engage in a strained effort to identify the "public purpose" behind what is largely a private project. And while it is not necessarily incorrect to assert that certain private uses of land will generate spillover benefits to the public, such reasoning ultimately places few limits on the use of eminent domain since virtually all commercial enterprises generate some external benefits.[17] (And in any case, such benefits, if present, would call for a subsidy of the development rather than the use of eminent domain.)[18] If courts instead focused on the means rather than the ends, they would easily identify the proper test for the use of eminent domain—namely, the presence of a holdout problem.[19] And as a result, much of the confusion (if not the controversy) surrounding private takings cases would vanish.

Two well-known cases from outside of takings law illustrate the generality of the above analysis. The case of *Boomer v. Atlantic Cement Co.* involved a factory whose operation imposed harm on several nearby residents, a group of whom filed suit seeking an injunction to have the factory shut down.[20] The court opted instead to allow the factory to continue operating

[17] As Merrill (1986, p. 61) notes, a series of public use cases in the 1980s (one being *Poletown*) rendered the public use limitation a "dead letter" in the opinion of most observers. However, in 2004, a year before *Kelo*, the Michigan Supreme Court reversed its decision in *Poletown*. Specifically, in *Wayne v. Hathcock* (684 N.W.2d 765, 471 Mich. 445), the Court rejected its earlier argument that a largely private taking can satisfy the public use requirement merely by demonstrating the existence of a general economic benefit from the project for the community.

[18] One might argue that eminent domain acts as an implicit subsidy to the extent that market value compensation understates the true opportunity cost of the land (as pointed out in note 13 above). This, however, reflects a flaw in the practical implementation of eminent domain, not an inherent aspect of it.

[19] Kelly (2006) argues that although the holdout problem can plague both public and private projects, two factors argue for limiting the use of eminent domain to public projects. First, private developers often have the ability to conceal the scope of the project by using secret buying agents, whereas the government needs to act in public view. Second, the concentration of benefits arising from the private use of eminent domain creates the threat of rent seeking and corruption in the political process.

[20] 26 N.Y.2d 219, 309 N.Y.S.2d 312, 257 N.E.2d 870, Court of Appeals of New York (1970).

as long as it was willing to pay damages to the residents. Although this is a case in nuisance law, the court essentially allowed a private taking by the factory of the residents' right to be free from noise and pollution (Fischel, 1995, pp. 75-77). In terms of the taxonomy in Table 1, this case therefore fits into cell II, along with *Kelo* and *Poletown*, given that the factory would have faced a holdout problem if each resident had been awarded the right to enforce an injunction against it. In particular, the factory would have had to negotiate with all affected residents in order to have the injunction lifted. The court therefore acted properly to award damages instead.[21] Since, from an economic standpoint, the problem facing *Boomer* is the same as that facing a land assembler, the appropriate remedy is the same; namely, a forced sale.

The second case, *Peevyhouse v. Garland Coal & Mining Co.*,[22] involved a contract between the Peevyhouses, who owned a tract of undeveloped land, and a mining company that wanted to conduct a strip mining operation on the land. The contract called for the mining company to restore the land to its pre-mining state after completing the mining operation, but the company breached this clause, claiming that the $29,000 cost of restoration exceeded the mere $300 increase in market value that would have resulted. The court allowed the breach and awarded the Peevyhouses $300 in damages. Again, one can interpret the court's ruling in this case as allowing a private taking by the mining company of the Peevyhouses' right to performance of the contract. In contrast to the *Boomer* case, however, we would conclude, based on the above logic, that the court acted improperly to allow the "taking" in this case because there was no holdout problem.[23] Rather than belonging to cell II in Table 1, this case properly belongs in cell I, implying that the appropriate resolution of the dispute would have been a

[21] This case is often discussed in the context of the choice between "property rules" and "liability rules" (Calabresi and Melamed, 1972).
[22] 382 P.2d 109, *cert. denied*, 375 U.S. 906, Okla. (1962).
[23] One could argue that there was bilateral monopoly in that each party had no alternative aside from bargaining with the other, but this does not justify a taking any more that it would be justified in any two-sided bargaining situation.

consensual transaction between the mining company and the Peevyhouses. In other words, the court should have ordered the mining company to perform the contract, thereby enforcing the Peevyhouse's property right to their land and setting the stage for bargaining between the parties in search of a mutually acceptable resolution.[24] The departure of *Peevyhouse* from the logic of Table 1 is therefore the exception that proves the rule.

4. Conclusion

Free riders and holdouts are both sources of market failure that potentially impede the completion of otherwise beneficial transactions. But that is where the similarity ends. The free rider problem is a demand side externality that requires taxation to compel payment for a public good, while the holdout problem is a supply side externality that requires eminent domain to force the sale of land for a large scale development. This paper has highlighted that distinction and used the insights derived therefrom to clarify the meaning of the public use requirement of the Fifth Amendment Takings clause.

Extant legal doctrine suggests that a pre-requisite for the use of eminent domain is that the targeted land must provide a public benefit, either directly as part of a public good, or indirectly as a spillover benefit from a private development project. The analysis in this paper reveals the inconsistency of this argument. In particular, it shows that eminent domain is an appropriate response to the holdout problem, independently of whether the taken land will be put to a public or a private use. According to this logic, the Supreme Court's decision in *Kelo v. New London* to allow the city to take land for a largely private urban redevelopment project is justified by economic theory because of the presence of a holdout problem. The Court's effort to

[24] See Friedmann (1989) and Ulen (1984) who argue for the superiority of specific performance (a property rule) over money damages (a liability rule) in breach of contract cases, given the generally low transaction costs between parties to a contract.

clothe its ruling in “public benefit” language, however, while clearly an effort to conform to the plain meaning of public use, only stands in the way of a clear understanding of the underlying economic issue. In other words, the Court reached the right decision, but for the wrong reason.

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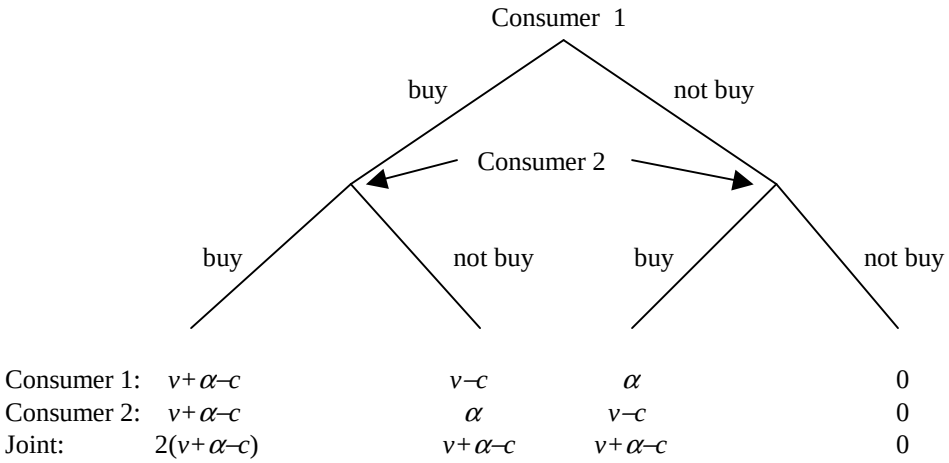

Figure 1: Game tree for the free rider problem.

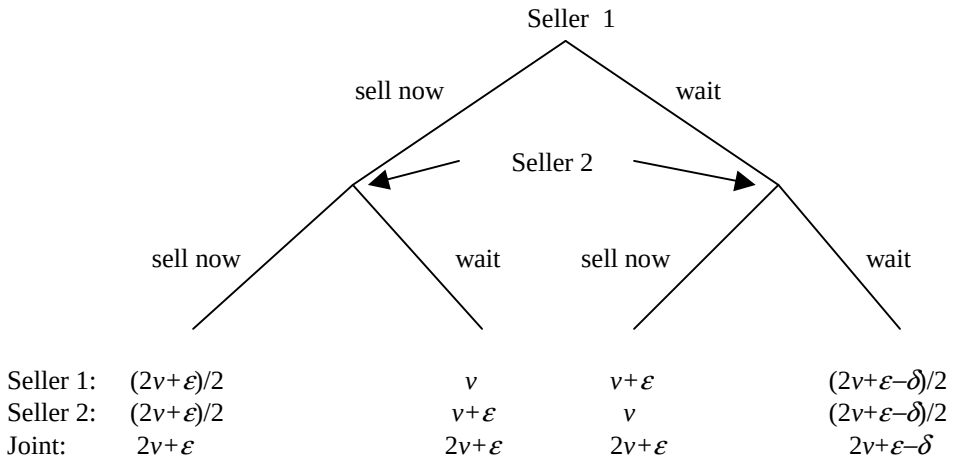

Figure 2: Game tree for the holdout problem.

		Holdout Problem?	
		No	Yes
Free Rider Problem?	No	Case I: No tax financing No eminent domain	Case II: No tax financing Eminent domain
	Yes	Case III: Tax financing No eminent domain	Case IV: Tax financing Eminent domain

Table 1: General framework for determining the appropriate scope for government intervention in the market.