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The holdout problem, urban sprawl, and eminent domain

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Abstract

Developers attempting land assembly often face a potential holdout problem that raises the cost of development. To minimize this extra cost, developers will prefer land whose ownership is less dispersed. This creates a bias toward development at the urban fringe where average lot sizes are larger, resulting in urban sprawl. This paper examines the link between the holdout problem and urban sprawl and discusses possible remedies, including the use of eminent domain for urban redevelopment.

JEL codes: K11; R14; R52

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1. Introduction

Urban sprawl is a term that has been used to describe a wide variety of undesirable aspects of urban growth, including excessively large cities, overly long commutes and traffic congestion, loss of open space, and failure to redevelop decayed inner city properties (Brueckner, 2000; Nechyba and Walsh, 2004). Proper policy responses to these problems,

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however, require a clear understanding of the underlying causes of sprawl. Unfortunately, there does not exist a consensus on this issue. The purpose of this paper is to point out a particular form of land market failure—the holdout problem—that may contribute to sprawl by creating an outward bias in the development process.

Like sprawl, the hold out problem has been defined in many ways. Properly understood, it is a form of monopoly power that potentially arises in the course of land assembly. Once assembly begins, individual owners, knowing their land is essential to the completion of the project, can hold out for prices in excess of their opportunity costs. The result is that large-scale projects requiring assembly, like housing developments or shopping centers, will entail high bargaining costs. More importantly, developers of such projects will have an incentive to seek land where ownership is less dispersed in order to minimize the need for assembly in the first place. As suggested above, this will create a bias toward the urban fringe where average parcel sizes are larger, resulting in excessive outward development, or urban sprawl.[2]

The remainder of the paper is organized as follows. Section 2 briefly surveys the economic literature on urban sprawl as a basis for our analysis. Section 3 defines the holdout problem in the context of land assembly and develops a simple model of land assembly to illustrate the problem that it causes for would-be developers. The section then uses well-known results from the monocentric city model to derive the spatial implications of the holdout problem—specifically, the incentive that developers will have to seek land further from the city center where lot (parcel) sizes are larger and ownership is less dispersed. Section 4 discusses possible remedies for sprawl in light of the analysis, focusing especially on the controversial use of eminent domain for urban renewal. Finally, Section 5 concludes.

2. The economic literature on urban sprawl

The economics and planning literatures have not arrived at a generally accepted definition of urban sprawl. After reviewing previous efforts to define the phenomenon, Galster et al. (2001, p. 685) proposed the following, multi-dimensional definition:

> Sprawl (n.) is a pattern of land use in [an urban area] that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed uses, and proximity.

Nechyba and Walsh (2004, p. 178) offer a more concise definition: "By sprawl we... mean the tendency toward lower city densities as city footprints expand." Based on this definition, evidence for sprawl is found in the increasing urbanization of the US population, especially during the twentieth century, combined with an increase in the fraction of urban dwellers living in the suburbs. To illustrate, the fraction of the overall population living in urban areas increased from 50% in 1920 to 79% in 2000, while the fraction of urbanites living in the suburbs rose from 35% in 1950 to 65% in 1990. At the same time, the amount of land occupied by central cities fell from 40% of urban land in 1950 to 20% in 1990 (Nechyba and Walsh, 2004).

[2] To our knowledge, this is the first paper to draw an explicit link between the holdout problem and urban sprawl, although Helsley and Strange (1997) examine the closely related issue of assembly costs and city formation.

The theoretical explanation for these trends derives from the standard monocentric city model, which predicts outward expansion of the city edge (and hence, decreasing population density) as transportation costs fall and incomes rise (Henderson, 1985). The trend is further accentuated by Tiebout sorting effects, which draw relatively mobile households to the suburbs in search of better public services, and to escape the disamenities of the central city (Nechyba and Walsh, 2004).

While most urban economists would agree that sprawl describes some undesirable aspects of urban growth, they would also add that the spatial growth of cities, reflecting a transformation of rural or agricultural land to urban uses, is not in itself a bad thing.[3] If, in an efficiently operating land market, land developers outbid agricultural users for their land, this implies that the land is more valuable in urban use, and the conversion is therefore efficient. Expanding cities will thus tend to be a natural consequence of an efficiently growing economy (reflecting, for example, an increasing relative demand for manufactured goods over agricultural goods as income grows),[4] reinforced by technological improvements that lower the cost of commuting.

Since some growth in cities is efficient, we will follow Brueckner (2000, p. 163) and define urban sprawl to be the "excessive spatial growth of cities," implying *inefficient* outward growth. Brueckner cites three possible sources of market failure that in combination may lead to excessive growth. First, the price of agricultural land does not fully reflect its social value as open space, thus causing excessive conversion of agricultural land to urban uses. Second, commuters ignore the costs of congestion when making their commuting decisions (the congestion externality), resulting in an excessive amount of commuting and an inefficiently large commuting range. (A necessary by-product of this is increased urban air pollution, which is primarily caused by auto emissions.) Finally, real estate developers do not take into account the full social cost of the required infrastructure, thus artificially lowering development costs and causing an excessive loss of open space. The following sections advance a fourth source of market failure—namely, the holdout problem—as a possible contributor to the inefficient spatial growth of cities.[5]

3. Land assembly and the holdout problem

Large-scale developments often require the assembly of land whose ownership is dispersed. Examples include public projects like highways and parks as well as private projects like shopping centers and residential developments. A potential impediment to all such projects is the holdout problem, which arises when individual owners, realizing that they can impose substantial costs on the developer, seek prices well in excess of their true reservation prices. The holdout problem is therefore a form of monopoly power (Posner, 2003, p. 55), though it has also been characterized in terms of transaction costs (Cooter, 2000, p. 289) and rent seeking (Goldberg, 1985). In any case, it represents a form of market failure in the urban land market.

[3] Turnbull (2005) surveys the economic literature on urban growth.

[4] This shift is a consequence of the relatively high income elasticity of demand for manufactured goods compared to food (Mills and Hamilton, 1994, pp. 434–437).

[5] In addition to the efficiency losses from urban sprawl, Nechyba and Walsh (2004) note that Tiebout sorting effects, while possibly efficient, tend to cause an inequitable distribution of public services as low income households disproportionately remain in the inner city.

It is important to emphasize that a true holdout problem requires assembly. Thus, for example, the negotiations between a buyer and seller for a single parcel, no matter how difficult, do not constitute a holdout problem in the above sense because the seller's unwillingness to sell does not affect any other transactions; it simply reflects his efforts to obtain the highest possible price. In contrast, when assembly of multiple parcels is necessary, recalcitrance of any single seller spills over to the negotiations with all other sellers by raising the cost of the entire project. The key difference is the existence of complementarities among properties in the assembly case that are not present in the individual transaction.

An important implication of the holdout problem is that the transaction costs of assembly will exceed those of disassembly, creating a one-way bias in the land market toward excessive fragmentation (Parisi, 2002; Heller, 1999).[6] Further, the spatial variation in the fragmentation of ownership in urban areas suggests a possible causal relationship between the holdout problem and urban sprawl. Specifically, because average lot sizes decrease closer to the city center as a result of the land rent gradient, ownership becomes more fragmented, thereby increasing the severity of the holdout problem for potential land assemblers, whether public or private. This will tend to push development outward compared to a fully efficient land market. The remainder of this section develops this argument in more detail.

3.1. A simple model of the holdout problem

This section develops a simple model of the holdout problem to illustrate the impact of dispersed ownership on a prospective developer's costs.[7] The next section then introduces the spatial dimension.

Consider a developer who needs to acquire two adjacent, individually owned parcels to produce a project worth V dollars in aggregate.[8] Suppose each parcel is worth v to the current owner, making the total value of the land in its current state of dispersed ownership $2v$. Individual parcels are also worth v to the developer, but we assume that

$$V > 2v \tag{1}$$

reflecting the complementarities associated with assembly. We assume individual owners know (1) when bargaining with the developer.

Suppose that bargaining between the developer and the individual owners can take place at two dates: now ($t = 1$) and later ($t = 2$). The developer can thus proceed with the project if: (a) he acquires both parcels now, (b) he acquires one now and one later, or (c) he acquires both later. Otherwise, he must scrap the project. The developer is not indifferent among the various scenarios under which he can proceed, however, since options (b) and (c) involve delay in completing the project. To capture this, we assume that the project is worth $V - \varepsilon$ if it is completed in period two rather than period one, where ε is the cost of delay. Still, we assume that the project is profitable at that date, or

[6] Parisi (2002) likens this bias toward fragmentation to the Second Law of Thermodynamics in physics, which says that in a closed physical system, the extent of disorder (entropy) will increase over time. It is also related to the "anti-commons problem," which describes a situation in which multiple owners each have the right to block a certain use of their collectively owned property (Heller, 1999).

[7] The model is based on Miceli and Segerson (2007), Menezes and Pitchford (2001), and Dixit and Olson (2000).

[8] We consider the case of two parcels for simplicity. It will be evident that the analysis generalizes to n parcels.

$$V - \varepsilon > 2v. \tag{2}$$

Finally, we assume that all payoffs are realized as of period two, and there is no discounting.

In this context, bargaining between sellers and the developer unfolds as follows. In each of the two periods, sellers can adopt one of two strategies: "bargain" or "holdout." By choosing to bargain in a given period, a seller commits to sell in that period at whatever price he or she can negotiate with the developer. (If both sellers choose to bargain in the same period, the prices are determined in a three-way negotiation.) We begin by determining the prices in each of the possible scenarios, and then derive the equilibrium behavior of sellers.

Proceeding in reverse sequence, we first consider the case where both sellers held out in period one. Since there is still a surplus to be gained by bargaining (according to (2)), and no possibility of future bargaining, both sellers choose to bargain at this point (Cohen, 1991, p. 354). For simplicity, we assume that prices in this and all subsequent cases are determined by the maximum willingness to pay of the developer.[9] When both sellers bargain, they split the total payment evenly. Thus, the price per parcel when both sell in period two is

$$P^* = \frac{V - \varepsilon}{2}. \tag{3}$$

Next consider the case where one seller sold in period one for a price P_1 (to be determined), while the other held out. If the developer acquires the second parcel for a price P_2, his net return from the project is $V - \varepsilon - P_1 - P_2$, whereas if he fails to acquire it, his net return from the single parcel (given that the overall project is scrapped) is $v - P_1$. The developer's net gain from the purchase is therefore $V - \varepsilon - P_1 - P_2 - (v - P_1)$, which, when set equal to zero, yields

$$P_2 = V - \varepsilon - v. \tag{4}$$

It is easy to verify that $P_2 > P^*$ given (2), showing that it is better for a seller to be the lone holdout in period two, as opposed to the case where both sellers hold out and sell in period two. This is true for the usual reason, that the final seller expects to capture all of the remaining surplus from the project.

Now move back to period one. The two cases we need to consider are: (a) both sellers bargain, and (b) only one seller bargains while the other holds out. If both bargain, we assume, as above, that they split the seller's gross return, yielding a price for each parcel of

$$\tilde{P} = \frac{V}{2}. \tag{5}$$

Note that $\tilde{P} > P^*$, implying that sellers would prefer to sell jointly in period one as opposed to period two, given that the latter involves delay. However, $\tilde{P}$ may be larger or smaller than P_2, implying that it may or may not be advantageous to be the lone holdout as compared to selling jointly in period one. The source of the ambiguity is that, while the

[9] For a more general specification in which the prices are determined by a Nash bargaining game, see Miceli and Segerson (2007). The conclusions are unaffected by the specific manner in which prices are set.

Table 1
Payoff matrix for the sellers' bargaining game

Seller 2	Seller 1	
	Bargain	Holdout
Bargain	$\tilde{P}, \tilde{P}$	P_1, P_2
Holdout	P_2, P_1	P^*, P^*

holdout has superior bargaining power, the available surplus in period two is smaller due to the cost of delay.

Finally, consider the case where only one seller bargains in period one. Since the developer can anticipate that he will acquire the second parcel in period two for a price of $P_2 = V - \varepsilon - v$, his net return if he succeeds in acquiring the first parcel now will be $V - \varepsilon - P_1 - P_2 = V - \varepsilon - P_1 - (V - \varepsilon - v)$. Setting this equal to zero and solving for P_1 yields

$$P_1 = v. \tag{6}$$

Clearly, this is the lowest of the prices, implying that being the lone seller in period one is the worst possible outcome.

Now that we have derived the prices for the various outcomes, we can proceed to determine the equilibrium strategies of the sellers regarding when to bargain, assuming that they make this choice by playing a non-cooperative game.[10] As noted, sellers have two possible strategies: bargain or holdout. Table 1 shows the payoffs that would result from each of the various possible combinations. (Note that, although the model involves two periods, we can treat it as a one-shot game given that we have assumed that any sellers who held out in period one will bargain in period two. Thus, the strategy "holdout" should be interpreted as "hold out in period one and bargain in period two.")

The nature of the equilibrium of this game depends on the relationship between $\tilde{P}$ and P_2, which we showed above is ambiguous. Suppose first that $\tilde{P} > P_2$, which is true when

$$\varepsilon > \frac{V - 2v}{2}. \tag{7}$$

In this case, there are two pure strategy Nash equilibria: (bargain, bargain) and (holdout, holdout). If the inequality in (7) is reversed, however, there is a unique Nash equilibrium: (holdout, holdout). It follows that a joint holdout is always an equilibrium of this game, and, if the cost of delay is small enough, it is the only equilibrium.[11]

This simple model has shown that costly delay is a likely consequence of projects involving land assembly. Further, it is almost certainly the case that this cost will rise with the number of parcels that need to be purchased. An obvious implication of this conclusion is that developers will prefer locations where ownership is less dispersed, all else equal. This observation provides the link with the spatial dimension of the assembly problem, to which we now turn.

[10] In deriving the equilibrium, we consider only pure strategies.

[11] In our model, delay is the only cost arising from the holdout problem. In other models, incomplete assembly is also a possibility. See, for example, Munch (1976), Strange (1995), and Helsley and Strange (1997).

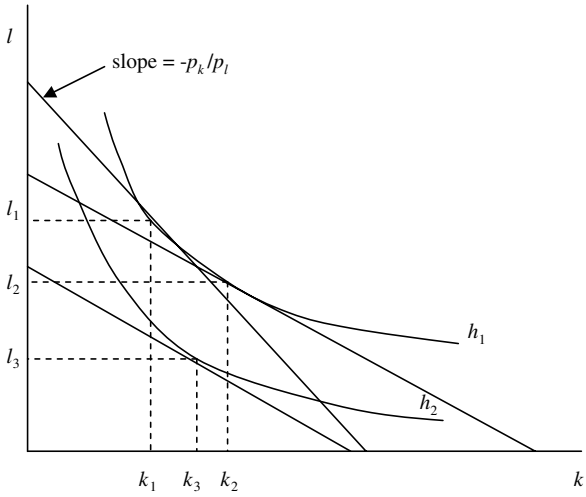

Fig. 1. Decrease in the cost-minimizing lot size closer to the city center.

3.2. The spatial configuration of lot sizes and urban sprawl

It is a well-known implication of the standard monocentric city model that lot sizes decrease toward the city center. This is due to two reinforcing factors.[12] First, increasing land prices toward the city center cause housing producers to substitute capital for land. Thus, average lot sizes decrease, holding the quantity of housing fixed. This is shown in Fig. 1, where the flatter cost line reflects an increase in the price of land relative to capital (i.e., a decrease in p_k/p_l) nearer to the city center, resulting in a decrease in the cost-minimizing lot size per house from l_1 to l_2. Second, increasing housing prices toward the city center also cause the demand for housing to decrease, as reflected by the inward shift in the isoquant in Fig. 1 from h_1 to h_2. This causes a further decrease in the optimal lot size from l_2 to l_3. The overall effect is therefore an unambiguous decrease in lot size from l_1 to l_3, implying greater population density nearer to the city center.

It follows that the ownership of a piece of land of a given size is more dispersed the closer it is to the city center. As the discussion of the holdout problem suggested, this will tend to cause an increase in development costs toward the city center, beyond that already embodied in the land rent gradient. To illustrate, suppose that the contemplated development requires a piece of land of size S.[13] The total cost of this parcel to the developer, ignoring considerations of assembly, is p_lS, which varies spatially as shown by the solid line in Fig. 2.[14] The aggregate value of the project, V, presumably also varies spatially,

[12] See generally Henderson (1985, Chapter 1).

[13] With n owners, the lot size of each owner is therefore $l = S/n$.

[14] The gradient in Fig. 2 reflects only variation in the price of land resulting from access effects, as in the standard monocentric model. In fact, Colwell and Munneke (1997) and Thorsnes and McMillen (1998) have shown empirically that land prices increase toward the CBD quite apart from access, owing to the concavity of the land price function. Specifically, as lot sizes become smaller towards the CBD, unit prices rise. While this fact does not affect our conclusions regarding the impact of the holdout problem, it does suggest one more obstacle to land assembly near the CBD. In contrast, Colwell and Munneke (1999) argue that the degree of concavity should be lower for smaller lots and may even be convex near the CBD, thus promoting assembly.

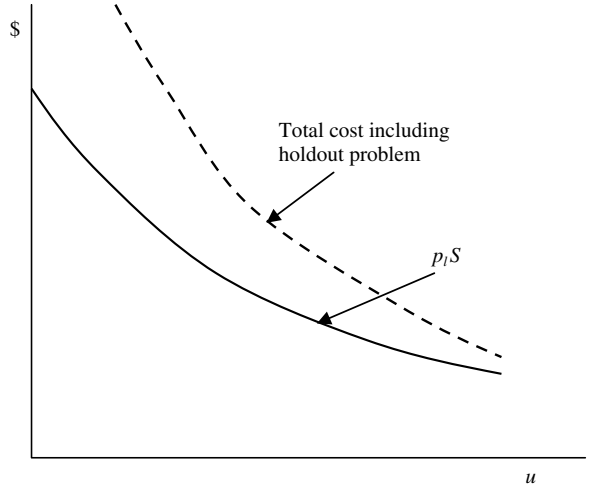

Fig. 2. Total development costs as a function of the distance from the city center (u).

reflecting the distribution of consumer demand, transportation costs, etc. In a competitive land market, the optimal location choices by developers will therefore balance these benefits and costs, resulting in an equilibrium distribution of new development that is also efficient.

Now add consideration of the strategic cost associated with the holdout problem. Since we argued above that these costs will increase with greater dispersion, and that dispersion increases toward the city center, then the strategic cost associated with assembly will also increase toward the city center. This is shown by the dashed line in Fig. 2, which reflects the total cost of a given development project as a function of location. The implication is that, compared to the situation without assembly, the optimal location choices of developers will be systematically biased outward, toward the urban fringe, where land ownership is more consolidated and assembly costs are therefore minimized. The result is a city characterized by urban sprawl.

4. Remedies

Because sprawl arises from a form of market failure, it is appropriate to consider several remedies that could potentially be used to counteract the outward development bias. The first is one that developers will pursue on their own to the extent possible—namely, to attempt to maintain secrecy about the nature of the project.[15] The most common means of doing this is to use dummy buyers acting on behalf of the developer. The law of undisclosed agency actually promotes this practice by allowing buyers to conceal the identity of their principal under certain conditions (Parisi, 2002, pp. 617–619). As Fischel (1995, p. 70) notes, however, this remedy is difficult to employ for government-backed projects such as urban renewal due to the need for openness, which is why eminent domain is often necessary to overcome holdouts (as discussed at length below).

[15] See Merrill (1986, p. 82), Cohen (1991, p. 359), and Kelly (2006).

A second remedy is for the government to adopt policies specifically aimed at offsetting the bias toward fringe development. This can be done by a combination of policies that increase the cost of suburban development (e.g., zoning and other regulatory controls, development taxes, and impact fees), while lowering the cost of inner city redevelopment (e.g., subsidies or tax breaks for the development of brownfields and other distressed properties, as well as subsidies for mass transit).[16]

A final policy that deals directly with the holdout problem is for the government to use its power of eminent domain to facilitate efficient redevelopment through urban renewal (Parisi, 2002, p. 632). Seen in this light, urban renewal is a legitimate (albeit drastic) public response to a failure in the urban land market. This may explain why it has endured for so long, despite its many shortcomings (O'Flaherty, 1994).

Not least of these shortcomings is that it raises serious constitutional questions regarding the proper scope of the government's taking power. In particular, should a private party ever be allowed to use (or benefit from) eminent domain when confronting a holdout problem? The controlling legal standard is the Fifth Amendment Takings Clause of the US Constitution, which limits the government's power to take private property to projects involving so-called "public uses."[17] Historically, courts have interpreted this to permit certain private uses of eminent domain as a way of promoting economic development, including its use for urban renewal,[18] but the issue remains controversial.

Recently, the US Supreme Court revisited the constitutionality of this practice in the case of *Kelo v. City of New London*.[19] In a close decision, the Court held that the use of eminent domain as part of a comprehensive economic development plan does satisfy the public use requirement. In support of its decision, the Court argued that the city's plan involved "a variety of commercial, residential, and recreational uses of land, with the hope that they will form a whole greater than the sum of the parts." In other words, it advanced a legitimate public purpose. Though controversial, the ruling is consistent with previous Supreme Court and state court decisions that have broadly interpreted public use to include job creation and tax base enhancement.[20] The analysis in this paper suggests that "combating urban sprawl" can be added to that list.

[16] See, for example, Brueckner (1997) and McFarlane (1999). But also see Turnbull (2005), who argues that in a dynamic context, threatened regulations, however well-intentioned, can have significant distortionary effects on land use incentives. For example, they can actually speed the pace of development as landowners seek to pre-empt certain restrictions. Nechyba and Walsh (2004) also caution that many of the proposed policies will have unintended, counrervailing effects. For example, suburban land use controls will make it even costlier for the poor to relocate to the suburbs, while subsidizing mass transit will actually encourage outward expansion of the city by lowering commuting costs.

[17] The relevant clause reads "nor shall private property be taken for public use, without just compensation."

[18] Another example was the routine granting of takings power to private railroad builders in the nineteenth century (Fischel, 1995, p. 72).

[19] 125 S.Ct. 2655, 545 US 469 (2005).

[20] See generally Merrill (1986) and Fischel (1995, pp. 71–75). The difficulty of this issue is nevertheless illustrated by a pair of cases decided by the Michgan Supreme Court. In *Poletown v. City of Detroit* (304 N.W.2d 455, 410 Mich. 616, 1981), the Court allowed the city of Detroit to condemn an entire ethnic neighborhood in order to clear way for a General Motors assembly plant. The Court argued that the public use requirement was satisfied by the promised jobs and increased tax revenues. In 2004, however, just a year before *Kelo* was announced, the Court reversed itself in the case of *Wayne v. Hathcock* (684 N.W.2d 765, 471 Mich. 445, 2004), arguing that its earlier ruling in *Poletown* was contrary to the fundamental protection of property rights afforded by the Constitution.

In evaluating the Supreme Court's argument in *Kelo*, it is interesting to note that it did not directly address the problem of holdouts, which we have argued is the proper economic rationale for eminent domain. If it had, the fact that private developers engaged in land assembly are no less susceptible to holdouts than is the government would have been apparent, and the argument in favor of eminent domain for urban redevelopment presumably would have been stronger. Nor was the *Kelo* Court alone in failing to advance this argument. What explains this apparent oversight?

Merrill (1986) suggests an answer by distinguishing between what he calls the "ends approach" to takings, which focuses on the use to which the taken land will be put, and the "means approach," which focuses on how the land is acquired. While the means approach is the correct justification for takings (because it embodies the holdout problem), courts instead typically opt for the ends approach. The likely reason is their need to satisfy the Constitutional requirement of public use. Specifically, because the ends approach involves enumeration of the various public benefits that will flow from the proposed project, it is an easier argument to square with the plain meaning of "public use."

To be sure, most large development projects involve both land assembly, and promise significant spillover benefits, implying that the means and ends approaches will often coincide. To the extent that this is true, courts will generally arrive at the right decision (though possibly for the wrong reason). Private property advocates nevertheless fear that the decision in *Kelo* opens the door to excessive use of eminent domain for private development. Fischel (1995, pp. 74–75) suggests two reasons why that fear may be unwarranted. First, he argues that the transaction costs of using eminent domain will generally make market acquisition of the land cheaper than condemnation, absent a severe holdout problem. Second, public revulsion at the expropriation of private property for what is perceived to be largely private benefits may result in adverse political consequences for the offending government. (Legislative efforts in many states to limit or prevent the use of eminent domain for economic redevelopment are a manifestation of this response.) For these reasons, Fischel suggests that the use of eminent for private development is largely self-limiting. Ultimately, of course, identifying the factors that lead a municipality to use eminent domain (or to refrain from using it) is an empirical question.

5. Conclusion

This paper has drawn the link between two economic problems that are often discussed but poorly understood: the holdout problem and urban sprawl. The holdout problem represents a situation where landowners whose property is essential to the completion of some large development project seek to block completion of the project in an effort to extract monopoly rents, while urban sprawl is the (apparently) inefficient outward expansion of land development. In this paper, we have argued that the holdout problem is one potential cause of urban sprawl because it biases redevelopment away from the city center where ownership is dispersed, and toward the urban fringe where it is more concentrated.

To the extent that sprawl is in fact a socially undesirable phenomenon, it is appropriate to enact policies to counteract it. The most controversial of these is the use of eminent domain to ease the redevelopment of urban land. Our analysis lends support to the limited use of this tool as one way to help overcome the holdout problem facing developers, and in the process, to combat urban sprawl.

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