Examining the Importance of the “Linchpin” Parcel in Land Aggregation

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Abstract: A series of economic experiments are utilized in this research to determine if real estate developers can successfully overcome the holdout problem by withholding information about the existence of a linchpin parcel when participating in land aggregation tasks. As a starting point, the results of a land aggregation task involving one developer and four landowners is examined to assess the prevalence of holdout in the absence of a linchpin parcel. The results serve as a baseline to determine if holdout situations become more or less common in two alternative scenarios. The first scenario involves landowners that are aware of a linchpin parcel, but unaware of whether it is the land they control. The second scenario involves a landowner that recognizes he owns the linchpin. Comparing outcomes across these contextual settings not only offers insight regarding the severity of the holdout problem, but also the extent to which it can be mitigated by developers through the strategic manipulation of information.
Introduction

It is often necessary for real estate developers to acquire multiple parcels of land from several different owners in order to assemble the entire site required to complete a development project. In some instances, one or more of these landowners may act strategically in the hopes of obtaining monopoly profits from their property by “holding out”. The threat of such behavior provides developers with an incentive to disguise the fact that a land assembly is underway or limit the amount of information landowners have about the importance of their parcel to the deal. A series of economic experiments are conducted in this study to evaluate the potential benefits derived from the latter of these approaches. This is accomplished by assessing whether landowners behave differently when they are aware they control a linchpin parcel essential to the completion of a land assembly. Experiments are appropriate for the task because it is difficult, if not impossible, to observe the behavior of parties involved in similar market negotiations.

The experimental setting involves one buyer and four sellers asked to engage in multiple rounds of negotiations, where the buyer’s objective is to acquire two contiguous parcels of land for a future development project. All parties involved in the negotiations are aware a land assembly is underway and that only two of the four parcels are needed by the buyer. The buyer can complete a successful assembly in the base case by acquiring any two contiguous parcels of land. A linchpin parcel essential to the assembly is introduced in the first treatment, of which all sellers are aware, but none know whether or not they control this strategically important piece of land. The second treatment involves a landowner who is aware he controls the linchpin. Comparing outcomes across these treatments offers a means of determining if the amount of information available to sellers about the existence of a linchpin parcel influences the number of successful assemblages, the time required to complete a deal, or developer profits.

Analyzing land assemblages in the aforementioned manner yields interesting insights because it is unclear from a theoretical perspective which treatments will produce the best outcomes for developers. For example, moving from a scenario with no linchpin to one where the location of the linchpin is unknown to the sellers may exacerbate or diminish holdout behavior depending upon how the parties respond to incomplete information. It is also unclear whether a developer interested in expediting land assembly and maximizing profits should negotiate differently when one landowner unequivocally knows she controls the linchpin, as compared to a contextual setting where multiple landowners are unsure whether their land is essential to the assembly. Both of these questions can be addressed in the controlled environment offered by economic experiments. The results not only inform theory pertaining to the severity of the holdout problem in partial land assembly scenarios, but also explore the extent to which it can be overcome through the manipulation of market information related to a linchpin parcel. Although few conclusions can be drawn from this research in its current state, the experimental design and preliminary findings offer a useful first step towards further exploration.
Land Assembly, Holdouts and Laboratory Experiments

Land is a special type of asset because its geographic attributes make each parcel unique. This quality affords landowners some degree of monopoly power when their property is needed to complete a real estate development project, especially when it would be more costly to construct or less profitable at an alternative location. Landowners that engage in strategic behavior to extract monopoly profits in these situations are referred to as holdouts and they can serve as an impediment to efficient land assembly. This market failure can be overcome by government entities through the use of eminent domain, but far fewer options exist in the private sector. Real estate developers interested in acquiring land must generally obtain it through contractual negotiations with the current owners and run the risk of a deal falling apart in the event mutually agreeable terms cannot be reached voluntarily.

In order to avoid potential holdout problems, some developers attempt to limit the amount of information available in the marketplace about the nature of their activities. This may involve the use of “dummy” buyers to negotiate with different landowners or efforts to conceal the intended future use of an assembled site. The latter approach can be useful when disclosing details about a project gives prospective land sellers information about the importance of their parcels to the transaction, thereby increasing the anticipated gains from holding out. Parcels of land essential to future development can be thought of as “linchpins” tying an assemblage together and will be referred to as such throughout the remainder of this paper.

Withholding information about a project to mask the existence of a linchpin parcel is unlikely to be a cost free endeavor from the developer’s perspective for a number of reasons. The need for secrecy may frustrate efforts to work with planning authorities and stakeholder groups to assess the feasibility of obtaining regulatory entitlements should the land ultimately be assembled. It may also inhibit informal marketing activities by preventing candid discussions with prospective tenants early in the development process. These challenges suggest open negotiations with landowners are preferable to surreptitious ones unless a developer can obtain significant financial benefits from concealing information about the intended future use of the site.

Since the negotiating behavior of developers and landowners cannot be readily observed in the market, it is difficult to quantify the benefits associated with taking steps to withhold information about the existence of linchpin parcels. Nonetheless, economic experiments offer a means of overcoming this challenge by having subjects participate in simplified land aggregation tasks in a controlled environment. This approach has been widely used in the economics literature to assess the magnitude of holdout problems in a variety of contextual settings.

Over the past 35 years there has been an increase in the use of laboratory experiments to study market behavior. Many of these experiments use the method of induced values, described in Smith (1982), in which participants are given “redemption” values for fictitious items they “own” at the end of the study session. Oftentimes the experiments involve markets in which
these items can be purchased, sold, and traded. Participants are paid based upon how much they actually earn in the experimental session. The payment is used to align the incentives of experiment participants with those that would be faced if posed with the task in everyday life.

The main reason laboratory experiments are used in economics is because researchers lack quality data on important economic variables. For instance, most models of behavior in auctions rely on knowing an individual’s personal value for the auctioned item. While it is possible to infer the individual’s value from the bidding process, the researcher (1) still does not have the actual value for the individual and (2) these inferences are based on individuals with a certain value behaving according to a specific model of bidding behavior. In examining land aggregation tasks there is a similar issue in that the landowner’s private value of the property is not known to the researcher. The market value of the property provides some indication of its value, but individuals may have higher values for the property due to their own personal reasons (i.e. they like area schools; it is close to work; they like their neighbors, etc.) Thus, the reason a landowner rejects an offer is unclear – it may be that the offer exceeds the landowner’s personal value for the property and the landowner is trying to extract a larger payout from the developer, or it may be that the developer has not made an offer capturing everything the landowner values.

Economic experiments are an affordable option to address the aforementioned concerns. Due to experimenter budget constraints and the need for an acceptable number of observations from which statistical inferences can be made, the payments made to participants are typically in the $15-$50 range for sessions lasting between 30 minutes and 2 hours. University students often serve as participants in these studies due to the small stakes. Since most students do not earn significant income while enrolled in school, experimenters believe earnings in this range will lead them to be more responsive to incentives than someone earning a substantial salary. It is also easier for both experimenters and students to coordinate meeting times and locations because both are generally on campus to attend classes.

The use of students has raised some concerns because the tasks they are undertaking in the experiments may not be ones they would undertake in everyday life, leading to questions of external validity. Typically this is more of an issue in experiments focusing on measuring innate characteristic, such as individual risk aversion, than in experiments which focus on behavior in markets. Nonetheless, there may be instances where differences in experimental treatments are so subtle that students unfamiliar with a particular market do not key in on important differences. Such may be the case in relatively complex land aggregation exercises, so there is value in taking steps to assess whether practitioners behave in a similar manner to students when possible.

Laboratory experiments that have been conducted over the last decade address a number of interest issues related to holdout problems in land aggregation such as the impact of delay costs, the amount of time allowed for negotiations, contingent vs. guaranteed payments, sequential vs. simultaneous bargaining, and whether or not the developer’s value for the aggregated site is
known to the landowners. Some notable examples include Cadigan et al. (2009), Swope et al. (2009) and Swope et al. (2011) whose work is primarily concerned with comparing behavior in experiments with predictions from their theoretical models. They vary who makes the initial offer (buyer or seller), as well as whether offers to sellers are simultaneous or sequential. In all of these experiments, the fallback position of the sellers is zero, meaning that if they do not accept an offer they will receive a payment of zero. Also, all parties know that the seller has a zero fallback position, making the seller’s private value for the parcel public information. This zero fallback position, and its public nature, likely contribute to the high percentage of successful aggregations seen in their data.

Collins and Isaac (2012) take an alternative approach by assuming the buyer participating in the experiment is capital constrained and cannot use the full value of the aggregated land to purchase of the N parcels needed for the aggregation. This assumption means that if the aggregated value of the land is 5000, the buyer can only use a certain amount, say 3000, to purchase the first N-1 parcels, and can only use the remaining value to purchase the last parcel. The study was structured in this manner to offer an alternative explanation for holdout problems, and as one might expect, fewer successful land aggregations were observed in this series of experiments.

Zillante, Schwarz, and Read (2014) were also able to increase the number of failed aggregations in an experimental setting simply by giving landowner participants a non-zero fallback position. The study additionally examined how guaranteed payments, payments contingent on aggregation, and a combination of the two influenced developer profits and speed to a successful assembly. Developers earned higher payoffs when using the combination payment mechanism, though the purely contingent payment mechanism led to faster aggregations as measured in the number of negotiating rounds undertaken by the participants.

Although the experimental research offers useful insights regarding the nature and the magnitude of holdout problems, none of the existing studies consider the importance of linchpins or examine the prevalence of holdout in scenarios where not all of the parcels involved in the negotiations are needed to complete a land assembly. The experiments presented in this paper fill these voids in the extant literature, while also providing some evidence that the negotiating behavior of students is consistent with that of real estate practitioners involved in similar tasks.

**Experimental Design**

The economic experiments presented in this research were conducted at the University of North Carolina at Charlotte during the fall semester of 2013 using z-Tree software (Fischbacher, 2007). Fifty students, comprising 10 groups across two treatments, participated in the first round of experiments. None of these subjects had previous experience with experiments focusing on land aggregation or hold-out problems. An additional round of experiments was conducted with 50
real estate practitioners active in the Charlotte market. Once again, these subjects did not have previous experience with land aggregation experiments, but each did have previous experience in real estate negotiations. Most of the statistical analysis presented in this paper focuses exclusively on the result of the student groups, with the data obtained from real estate practitioners serving only as a robustness check to determine if students generally behave in the same manner as practitioners. All of the individuals participating in the experiments received compensation based on the outcomes of the land aggregation exercises in which they engaged.

The experiment was designed to test how knowledge of a linchpin parcel affects land aggregation outcomes, including payments made to landowners. A group consists of one developer and four landowners. Each landowner is endowed with a parcel of land worth a defined amount. Individual landowner values are distributed randomly between 400 and 1500 according to the uniform distribution. To facilitate comparison, the same value draws are used in all treatments. These private values are the landowners’ reservation values and equate to the amount they will be paid by the experimenter should their land not be used in the assemblage. Providing landowners with a non-zero fallback position in this manner is intended to mimic the position these parties would be in should they retain their land after a land aggregation exercise fails or when their parcels are not needed by the developer to complete a successful assemblage.

Developers know the distribution of landowner values, but not each landowner’s individual private value for the land. Parcels are acquired by making simultaneous and private offers to the landowners. Offers are contingent upon the developer needing a parcel of land – in essence the developer and landowner make a contract giving the developer the option to purchase the parcel at the agreed upon price. Sessions end when either all landowners agree to an offer or the maximum number of rounds for negotiation is reached. Figure 1 shows a screen shot of the parcel layout, the developer values for the aggregated parcels, and individual landowner values.

Parcels of land are labeled A, B, C, and D. In all treatments, parcel C is the linchpin parcel, as aggregation cannot occur without this parcel. The parcels are set so that three of them represent road frontage (B, C, and D), with the remaining parcel (A) behind parcel C. There are three different combinations of land for which a developer can receive payment if the parcels are aggregated. Developers need to acquire two connected parcels, so only purchased combinations of BC, CD, or AC will be profitable. In the experiment, the two road frontage combinations (BC and CD) are more valuable than the combination with only one piece of road frontage (AC). Aggregated parcels BC and CD pay the landowner $30, while aggregated parcels AC pay $25. Landowners are aware a land assembly is underway, but do not know the developer payoffs for different combinations of parcels.

There are two treatments in the experiment and in both the landowners are informed that parcel C is the linchpin. In the UNKNOWN treatment, the landowners know they own a parcel of interest to the developer, but do not know where their parcel fits into the assemblage. In the KNOWN treatment, the landowner knows exactly which parcel they own.
After receiving an offer, the landowner can either accept or reject. If the landowner accepts the offer, no more offers will be forthcoming from the developer. A counteroffer can be submitted by the landowner after rejecting an initial offer from the developer. In order for this counteroffer to be accepted the developer needs to submit this as an offer in the next period and the landowner needs to then accept. In all rounds, all parties have their own prior offer and counteroffer histories displayed on the screen. Thus, the developer can see all offers landowners, as well as all counteroffers, and landowners can see their own offers and counteroffers with the developers.

Each group participates in two of these land aggregation tasks. The first task is for a much lower amount of money and lasts for a maximum of two negotiating rounds, while the primary task,
with the values as described in the prior section, lasts for ten negotiating rounds.\(^1\) Participants play the same role in each of these tasks, as the goal of the first task is to familiarize the participants with the interface and the decisions that they will be making. Only the results of the ten round experiments are presented in the results section of this paper.

**Figure 2 Landowner Screen Shot with Offer/Counteroffer Information**

Upon completion of the ten round experiment, the developer is awarded the combination of parcels that leads to the largest profit, which is simply the difference between the value of the combined parcels and the agreed upon contract prices for the individual parcels. Developer payouts at the end of the experiments are based on the profits achieved. Landowners involved in a successful assemblage are paid out in accordance with the contract price entered with the developer, whereas landowners not involved in a successful assemblage are paid their reservation value. Payments to students averaged $17, including a $5 show up payment, for individuals in the ten groups participating in the preliminary 60 minute sessions.

\(^1\) For the task with a maximum of two negotiating rounds, the developer values for the two-parcel combinations of AC, BC, and CD are all set at $2. The landowner private values are 54, 88, 36, and 52 cents for parcels A, B, C, and D, respectively.
Preliminary Results & Discussion

Comparisons between the results in the base case, treatment one and treatment two are made across three distinct measures, which include the first period offer made by the developer to each landowner; the amount of the offer accepted by each landowner; and whether or not a land assembly was successful. The first of these measures is intended to gauge how developer participants perceived the importance of each parcel prior to any input from the landowners, while the latter two provide information about the economic outcomes for the parties involved.

Figures 3-5 report results for the ten student-only experimental groups. As might be expected, first period offers for parcel C are slightly higher in both of the linchpin treatments, suggesting developers recognize the strategic importance of this parcel and adjust their negotiating behavior accordingly. There is also some evidence of holdout behavior, as landowner C receives more money in scenarios where all parties involved in the negotiations know who controls the linchpin. Land aggregation is successful in all ten groups, presumably due to the flexibility provided to developers by allowing them to make nonbinding offers and assemble the site in several different ways.

Figure 3 First Period Offer Results in the Student-Only Groups (10 Round Exp.)
Figure 4 Offer Acceptance Results for the Student-Only Groups (10 Round Exp.)

Figure 5 Aggregation Results in the Student-Only Groups (10 Round Exp.)
Despite the aforementioned observations, differences across treatments are not statistically significant at conventional levels as demonstrated by the results of Mann-Whitney tests presented in Figure 6. These outcomes may indicate that the presence of known vs. unknown linchpin parcel is too subtle to have an effect on the negotiating behavior of students. Nonetheless, additional data needs to be collected and analyzed before reaching this conclusion.

Figure 6 Mann Whitney Tests Comparing the Results of the Known vs. Unknown Linchpin Treatment Groups (10 Round Exp.)

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<td>Land C</td>
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<td>Land D</td>
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<table>
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**Practitioner Experiments**

Figure 7 presents a comparison of first period offers in different experimental treatments across the student and practitioner subject groups. In both cases, initial offers in the unknown setting are less than those in the known setting. This is particularly true for the practitioner subjects. Perhaps the most surprising result occurs when the linchpin landowner knows that he or she is the linchpin. The average first period offers to the linchpin parcel in this setting are less than, or about equal to, offers to landowners B and D, who know they are not linchpin owners. This result is consistent across participant types. When the owner of the linchpin is unaware that he or she owns the linchpin, the offer to the linchpin parcel is greater than the offers to other parcels. Again, this result is consistent across participant types.
Figure 8 shows the average accepted offers for each landowner type by treatment. Note that these are accepted offers and not necessarily ones that would be used in aggregation. On average there is not much difference across treatments. The biggest differences are in the amount that landowner B was able to extract in the Practitioner-Known treatment and the low amount that landowner A was able to extract in the Practitioner-Unknown treatment. Other than those results, the average accepted offers were fairly stable for other landowners. For instance, the average accepted offer for landowner D ranged between 1134 in the student group with an unknown linchpin to 1218 in a practitioner group with an unknown linchpin.
Given the values in the experiment, parcel combinations AC and CD were more likely to be aggregated than BD. Figure 9 shows aggregation outcomes for student and practitioner groups for the unknown and known linchpin settings. All but two groups were able to successfully aggregate land, which differs from prior research observing successful aggregation is as few as two-thirds of the experimental groups. The difference in the results is likely due to excess slack in the system in the current design, as a single landowner in the prior research could impede aggregation. The most commonly aggregated set of parcels is CD, with AC the most next common set of parcels.

*Figure 9 Aggregation Outcomes for the Student and Practitioner Groups (10 Round Exp.)*

Taken as a whole, the results of the economic experiments suggest students and practitioners generally behave in a similar manner when participating in stylized land aggregation exercises. The biggest difference in behavior between the two groups appears in the initial offers by the practitioners in the unknown linchpin setting, as practitioners made much lower initial offers to all landowners. However, when examining final outcomes, the average accepted offers by student and practitioner participants are fairly similar despite the difference in starting offers.
References


