Land Acquisition: Fragmentation, Political Intervention and Holdout

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Abstract: This paper provides a theory of holdout based on the landowners' inability to manage large sums of money and consequent lack of consumption smoothing in case of sale. We find that under some reasonable conditions fragmentation increases holdout and moreover, this happens if and only if large landowners are relatively more willing to sale. Turning to the effects of politicization, we find that voice coupled with collective bargaining increases efficiency provided fragmentation is severe. Further, whether there is political intervention or not depends on the political maturity of the landowners, i.e. if they already have voice or not.

Key words: Land acquisition, holdout, fragmentation, politics, voice, collective bargaining.
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1 Introduction

This paper develops a theory of holdout based on the landowners' inability to manage large sums of money and consequent lack of consumption smoothing. In so doing we provide a theory of holdout that is complementary to the strategic bargaining approach to holdout (discussed later). We demonstrate that this approach provides important insights regarding the link between fragmentation and the landowners relative willingness to sale, as well as the effects of political interventions. Interestingly, we find that the efficiency implications of political intervention, as well as the possibility of such interventions depends on a subtle interaction of voice, collective bargaining and the severity of fragmentation.

While the traditional approach to industrialization, e.g. Lewis (1954), emphasizes the role of capital and labor for industrialization, the importance of land is gradually being realized. This is true of all countries, land-poor, as well as land rich, since industrialization requires land with good connectivity, infrastructure, etc. which are quite likely to have alternative uses, in particular for cultivation, and as homestead.[1]

It is therefore something of a concern that land acquisition for development is often problematic, especially in less developed countries (henceforth LDCs). In fact, as of now, delays in land acquisition for industrial projects are threatening investments worth USD 100 billion all over India in near term, according to an ASSOCHAM Eco Pulse Study entitled "Land acquisition scenario in India."[2]

[1] For example in West Bengal, India, the backdrop of some recent agitations over land acquisition, most of the better infrastructure are in areas where land is fertile (Banerjee et al. (2007)).

[2] Please see, http://www.commodityonline.com/news/The-cost-of-land-acquisition-delays-in-India-$-82-bn-21747-3-1.html. The study states that according to an assessment report released by the Indian Steel Ministry, 22 major steel projects in the country worth USD 82 billion are being held up because of several reasons, including public protests. Even in China, in 2005 alone there were over 60,000 local disturbances provoked by attempts at acquiring agricultural land (Banerjee et al. (2007)). In fact many countries,

One of our motivating examples comes from West Bengal, India, where the state government used the Land Acquisitions Act, 1894, to acquire 997 acres of land for building an automobile factory for Nano (the one lakh rupee car) in Singur. This led to widespread protests and ultimately the project had to be scrapped (see, e.g. Sarkar (2007) and Ghatak and Bannerji (2009)). There are several other instances of agitations against land acquisition in India in the recent years, often involving extra-legal means of protests, and sometimes even violence.[3]

In the literature, such ex post problem with transactions is often referred to as *holdout*.[4] Given that land can, in general, be expected to have higher value under industrial use, holdout seems to run counter to the Coase theorem. While the literature has mostly focused on the strategic bargaining approach, here we seek to provide an explanation based on the fact that managing large sums of money is problematic for landowners from LDCs (see, e.g. Banerjee et al. (2007)). Such problems with managing lump sum amounts arises out of the interaction of several factors, (a) missing markets, in particular appropriate savings and insurance instruments,[5] (b) lack of complementary assets like skill and knowledge, and (c) exogenous income and consumption shocks (see, e.g. Ghatak and Bannerji (2009)).[6] Hence

including the USA, have promulgated eminent domain laws (that allow land acquisition for public purposes on payment of compensation), presumably to counter problems associated with land acquisition.

[3]Such protests took place against land acquisition by the West Bengal government in Nandigram for building a chemical hub (Banerjee et al. (2007)), by the Orissa government for building a steel plant by Posco (Chandra (2007)), by the Jharkhand government for building a steel plant and also a power project in Khuntia district (12,000 acres, see Basu (2008)), by the Himachal Pradesh government for building an international airport along with air cargo hub at Gagret in Una district (11,500 acres, see Panwar (2008)), etc.

[4]See, for example, Cai (2000, 2003) and Benson (2005), among many others.

[5]Farmers hardly have any access to deposits that are inflation linked, one of their primary concerns.

[6]Ghatak and Bannerji (2009) argues that the fact sale price of land may be high "is driven by the absence of good insurance mechanisms and financial instruments, and low levels of human capital, all of which make switching to alternative occupations costly."

land, which yields a steady stream of income over the future, is preferred to having its present discounted worth as a lump-sum payment.

This argument is clearly related to the use-value approach which argues that value of land to its owner, exceeds what follows from productivity calculations. While there can be many different reasons for such divergence (including sociological ones that claim that land is special, especially for agriculturists),[7] the inability to manage the large sums of money obtained as compensation is one. Sarkar (2007), for example, suggests that such a divergence can arise since once the land-owner sells her land, she will have little alternative use for her labor. Mookherjee (1997) on the other hand focuses on credit market imperfections coupled with productivity shocks. For ease of exposition we shall call our approach the use-value approach, though calling it a sale-value approach may be more accurate.

In this context it is instructive to examine what happened in the 1990s in Kharagpur, West Bengal, India in the wake of land acquisition by the government for setting up pig-iron factories. Guha (2007) reports that the households receiving compensation for handing over land to Tata Metaliks Limited (TML), mostly used the money for consumption, marriage and house building purposes, and to a much lesser extent for bank deposits and investments.[8] Turning to anecdotal evidence, Guha (2007) mentions Nirod Chowdhury who used up the compensation money for marriage purposes, and was, at the time of writing, subsisting as agricultural daily laborer.[9]

[7] Even economists, for example the physiocrats in 18th century France, claimed a special place for land among factors of production.

[8] According to Guha (2007), out of the households receiving compensation for TML acquisition, 43.1% spent at least a part of compensation money on domestic consumption, 21.5% on marriage purposes and 28% for house-building and or repair. While about 40.3% put it in bank deposits, and only about 13.9% used it for buying land elsewhere, or in investments (shallow tube-wells).

[9] Ghatak and Bannerji (2009) mention that farmers in Singur, India were worried that in case of sale some of the compensation amount will be used up by their children for buying motorcycles.

In contrast Dhiren Chowdhury, who re-invested the compensation money in land, has not yet taken up any non-agricultural job. In fact, the farmers themselves seemed to realize that what was important was access to a steady stream of income, as seen from the fact that one of the demands of the peasants agitating against this acquisition was job for land.[10]

We next turn to formalizing the idea that because of market failures and exogenous shocks, people prefer having staggered incomes over their planning horizons, to having a single large sum of money. We adopt a reduced form approach, whereby this is *captured as over-consumption by the landowners following a sale of their land.* It is natural to formalize this idea as farmers having hyperbolic discounting, i.e. present biased preferences, which is what we do. While there appears to be enough evidence showing that people do display hyperbolic preferences[11] (which adds to the robustness of our approach), we treat this as essentially a reduced form formalization, rather than any attempt to claim that holdout can be traced to hyperbolic discounting.

We begin by considering a dynamic two period example with one buyer facing $n \geq 2$ identical landowners, where the efficient outcome involves implementing the grand project in the first period. In order to abstract from the issues already dealt with by the strategic approach, we assume that the buyer has all the bargaining power, formalized as the buyer making take-it-or-leave-it offers to the landowners in both the periods.

The landowners have hyperbolic preferences so that their consumption pattern following a sale is going to be distorted. This however is suboptimal for the landowners' long term selves, which increases the use value of the plot, and, for a large class of parameter values, can lead to holdout in the

[10]Further, in a subsequent agitation in the same area against acquisition of land for Century Textile Company, the peasants demanded either job for land, or land for land (see Guha (2007)).

[11]See, among others, Phelps and Pollack (1968), Laibson(1997), O'Donoghue and Rabin (1999), and the references cited in these papers.

form of a delay in reaching the efficient outcome. Further, in an effort to reduce this use-value effect, the buyer may have an incentive to postpone transactions even past the period when it is feasible. Thus the presence of the use-value effect may trigger further inefficiency by the buyer. This is in contrast to the strategic bargaining approach, where any inefficiency can be traced to landowner interactions.

We then use this framework to examine if an increase in fragmentation increases the chances for holdout or not. We show that this is true if and only if richer households are relatively more willing to sell their plots. Further, this will be the case whenever the relative risk aversion is not too large. These results have some interesting implications, suggesting, for example, that the land reform program undertaken in West Bengal, India, may have worsened the holdout problem by increasing fragmentation.

We then turn to a study of the effects of possible politicization of the process of land acquisition. This is motivated by the fact that in several recent instances of land acquisition in India, including Singur and Nandigram in West Bengal, and Posco in Orissa, the process of land acquisition became heavily politicized, with political parties, NGOs, as well as the civil society getting involved in the debate. It may be argued that this is only natural given that land acquisition is an emotive issue, especially in an LDC context since, in the absence of proper rehabilitation, it can lead to serious humanitarian tragedies.[12]

We begin by examining the possible efficiency implications of such politicization. Conceptually, the effects of politicization can be of two kinds, voice, i.e. the landowners getting a greater say in the bargaining process, and collective bargaining. Interestingly, the efficiency implications of politicization is linked to the extent of fragmentation, in the sense that voice coupled with collective bargaining increases efficiency provided the landowners are

[12]Fernandez (2007), for example, argues that over the period 1947-2000, as many as 60 million persons were displaced for various development projects, many of whom were not properly rehabilitated.

relatively small, but not otherwise. The efficiency implications of voice is ambiguous. This is of interest given that the strategic bargaining approach suggests that an increase in voice, by increasing the bargaining power of the landowners, can only worsen the holdout problem.

Interestingly, it appears land acquisition does not always lead to political interventions. For example while in West Bengal, land acquisition in both Singur and Nandigram led to serious political complications, the earlier land acquisition in Kharagpur for pig-iron factories did not lead to any political involvement (Guha (2007)).[13] In fact, even at the time the Singur agitation was going on, the Jindal group of companies managed to acquire land for their factory in West Bengal without any political intervention.[14] Further, in certain states of India like Gujarat, land acquisition, even in the absence of government intervention, seems relatively trouble free.[15]

Our analysis suggests that the extent of political intervention is linked to whether landowners are already politically mature. We find that in the absence of voice, existing members of a landowner coalition may be unwilling to admit more members. This follows since, with a smaller coalition size, more landowners can be pushed down to their reservation payoff and moreover, the surplus so generated can be transferred to the existing coalition members. In that case political parties, who are more interested in increasing their vote-bank, may have little incentive for getting involved. Further, in case intervention does take place, party size may not be too large. The result however may be reversed in case the landowners already have voice. In this case with a less than inclusive party, the landowners who are out-

[13] In case of Singur and Nandigram it may be argued that the political payoff from involvement, in the form of an expected increase in rural votes in the coming assembly elections in West Bengal in 2011, was incentive enough.

[14] A PTI report dated July 16, 2007, mentioned that the West Bengal government has finalized the land rates for JSW Bengal Steel's 10 million tonne integrated steel plant at Salboni in Midnapore district. See, http://www.highbeam.com/doc/1G1-166468250.html

[15] See, http://www.business-standard.com/india/news/land-acquisition-in-gujarat-less-bloody/377151/

side the party may appropriate the surplus given that they have voice. Thus there is an incentive for inclusion, which in turn implies that political parties may have an incentive to intervene.

1.1 Related Research

Formal treatments of the holdout problem have mostly focused on the strategic approach, which builds on the idea that plots of lands constitute complementary assets, so that landowners who bargain later can extract a greater share of the surplus. Consequently landowners have an incentive to wait until others have already done so, so that inefficiencies, in the form of delay, or the implementation of an inefficient project, is likely, e.g. Eckart (1985) and Asami (1988). [16] The subsequent literature, in particular Cai (2000, 2003), Menezes and Pitchford (2004) and Roy Chowdhury and Sengupta (2009), use infinite horizon bargaining models to analyze this issue. In Cai (2000) and Menezes and Pitchford (2004) holdout takes the form of bargaining delays, whereas in Cai (2003) it is manifested in the fact that as the number of landowners becomes large, buyer payoff gets arbitrarily close to zero. Roy Chowdhury and Sengupta (2009) on the other hand challenge the traditional wisdom by showing that holdout is unlikely to be serious either when the bargaining protocol is transparent (formalized as the buyer offers being publicly observable), or when the complementarity is not too large.

Next turning to the use value approach, while in recent years this approach has been championed by several authors, including Banerjee et al. (2007), Ghatak and Banerji (2009) and Sarkar (2007), to the best of our knowledge there has been no serious attempts at formalizing it. The present paper seeks to take this approach forward by providing a very simple formalization of the idea, demonstrating, *inter alia*, that it can be used to address several issues of interest.

[16] In the patents literature, Shapiro (2001), suggests that holdout arising out of bargaining issues is a serious obstacle to R&D, and consequently long-run growth.

Finally, Ghatak and Mookherjee (2009) uses a one buyer one landowner model to analyze a *holdup* problem (i.e. one with ex ante inefficiency) associated with land transfer, as well as the issue of compensation. They however do not examine the issue of ex post inefficiency.

Section 2 sets up the basic framework, examining the conditions for holdout, as well as the effects of fragmentation on holdout. Section 3 takes up the issue of politicization, analyzing the efficiency effects of voice and collective bargaining. Section 4 examines the issue of whether political intervention at all occurs or not. Finally, section 5 concludes.

2 The Framework

There is a single buyer, who is interested in collecting n identical plots of lands from n landowners, where $n \geq 2$. These plots can be combined to generate returns for the buyer. The grand project, where he manages to buy up all the plots, yields a per period return of V to the buyer. However, the project return for the buyer is zero in case he fails to collect all n plots. The plots of lands also generate returns for the landowners in their current use, yielding $\frac{v}{n}$ per period to each landowner. We assume that $V > v > 0$, so that efficiency implies implementing the grand project.

We begin by considering a simple dynamic model of bargaining, where the buyer and the landowners bargain over the price of the plots over two periods. At the start of the second period, the set of 'active' landowners, i.e. those who are yet to sell their objects, is common knowledge. Every period is further sub-divided into four stages. Consider any period t:

Stage 1. The buyer makes an offer to all active landowners, with each landowner only observing her component of the offer.[17]

Stage 2. The landowners simultaneously decide whether to accept the

[17]The buyer of course can always make a negative offer to any landowner that is sure to be rejected by her.

offers made to them or not.

Stage 3. The landowners simultaneously decide on their consumption levels.

Stage 4. The buyer can exit and implement a project of size m, where m denotes the number of plots collected to date. The buyer can also exit the game without acquiring any plot of land.

Note that this formulation implies that the landowners have no bargaining power. This is a modeling device that allows us to abstract from the strategic bargaining issues that have been analyzed so far in the literature, and focus on the use-value aspects.

The buyer has a time consistent risk neutral utility function, with a discount factor of 1. The landowners' utility functions display present bias in consumption, formulated along the standard $\beta - \delta$ lines. Let $u(c)$ denote the per period utility from consuming c for all landowners.

Assumption 1 $u(c)$ is twice differentiable, increasing, strictly concave, $u(0) = 0$ and satisfies the Inada conditions.

Let $U_{ik}(c_1, c_2)$ represent the continuation utility of a landowner in stage k of period i, when she consumes c_i in period i. We assume that $\delta = 1$[18] and $\beta < 1$, so the landowners' utility is present biased. Then

$$\begin{aligned} U_{1k}(c_1, c_2) &= u(c_1) + u(c_2),\ k = 1, 2, \\ U_{1l}(c_1, c_2) &= u(c_1) + \beta u(c_2),\ l = 3, 4, \\ U_{2m}(c_1, c_2) &= u(c_2),\ m = 1, 2, 3, 4. \end{aligned} \tag{1}$$

Our formulation is in line with O'Donoghue and Rabin (1999), in that in the pre-consumption stages, the consumer takes a long run view of her utility. Thus her utility at these stages only depend on her consumption vector (c_1, c_2) and is not subject to any present bias.

[18]The assumption that $\delta = 1$ is for expositional reasons alone, and can be relaxed without affecting the results qualitatively.

We study subgame perfect equilibria in pure strategies, the focus being on the existence of efficient equilibria, i.e. in which the buyer implements the grand project at $t = 1$.

2.1 The Analysis: Holdout

As is standard, we solve this game backwards, starting with period 2 first. For ease of exposition, we have the tie-breaking rule that in case of indifference, an agent prefers to accept an offer, rather than reject it.

Given that the reservation payoff of any active landowner in period 2 is exactly $\frac{v}{n}$, and the buyer makes a profit only if he manages to collect all the plots, the following result is straightforward.

Observation 1 *In period 2, the unique equilibrium involves the buyer offering $\frac{v}{n}$ to the active landowners, all of whom agree.*

We then turn to solving the game in period 1. Note that in stage 4, the buyer never exits unless he has managed to acquire all the plots of land. Next consider stage 3, when a landowner decides on her consumption c_1.

First consider a landowner who is yet to sell her land. She has a current income of v/n, and will obtain another v/n in the next period. Given that her consumption is present-biased, she fully consumes her current income, so that $c_1 = c_2 = v/n$.[19] Thus the utility of such a landowner at stages 1 and 2 of period 1 is given by

$$\tilde{U} = 2u(\frac{v}{n}). \tag{2}$$

Consequently $\tilde{U}$ is the reservation utility of a landowner who refuses an offer in period 1.

We then consider a landowner who has already sold her land for p, say. She then selects her consumption vector so as to maximize $u(c_1)+\beta u(p-c_1)$.

[19]Given that $u(c)$ is strictly concave, for any $c_1 < v/n$, $u'(c_1) > \beta u'(c_2)$, so that increasing c_1 leads to an increase in $u(c_1) + \beta u(c_2)$.

Therefore the optimal $c_1(p,\beta)$ involves

$$u'(c_1) = \beta u'(p - c_1). \tag{3}$$

Given (3), we find that following the sale of her land in period 1, a landowner's consumption in period 1 exceeds that in period 2. This creates a distortion since her long run self at the earlier stages of period 1 does not prefer such a consumption pattern. Further, period 1 consumption, i.e. $c_1(p,\beta)$, is increasing in her income, and decreasing in β. Thus straightforward calculation yields

Observation 2 *(i)* $c_1(p,\beta) = c_2(p,\beta)$.
(ii) $\frac{\partial c_1(p,\beta)}{\partial p} = \frac{\beta u''(c_2)}{u''(c_1)+\beta u''(c_2)} > 0$, $\frac{\partial c_2(p,\beta)}{\partial p} = \frac{u''(c_1)}{u''(c_1)+\beta u''(c_2)} > 0$ *and* $\frac{\partial c_1(p,\beta)}{\partial p} + \frac{\partial c_2(p,\beta)}{\partial p} = 1$.
(iii) $\frac{\partial c_1(p,\beta)}{\partial \beta} = \frac{u'(c_2)}{u''(c_1)+\beta u''(c_2)} < 0$ *and* $\frac{\partial c_2(p,\beta)}{\partial \beta} = -\frac{u'(c_1)}{u''(c_1)+\beta u''(c_2)} > 0$.

Example. For $u(c) = \sqrt{c}$, note that $c_1(p,\beta) = \frac{p}{1+\beta^2}$ and $c_2(p,\beta) = \frac{\beta^2 p}{1+\beta^2}$. Thus Observation 2 holds.

We then introduce the notion of use-value of land.

Definition. The *use-value* of a plot, $\tilde{v}$, is such that at $t = 1$ a landowner is indifferent between selling her land for $\tilde{v}$, and not selling the land at all (when her utility is $\tilde{U}$).

Recalling that $\tilde{U}$ is the reservation utility of a landowner in period 1, the use-value $\tilde{v}$ solves

$$u(c_1(\tilde{v},\beta)) + u(\tilde{v} - c_1(\tilde{v},\beta)) = \tilde{U}, \tag{4}$$

if a solution exists,[20] otherwise we define $\tilde{v} = \infty$.

Let $\frac{2v}{n}$ denote the present discounted value of the land. Proposition 1 below shows that the use value of land exceeds $\frac{2v}{n}$, formalizing the idea that

[20] Given that $u(c_1(\tilde{v}))+\beta u(c_2(\tilde{v}))$ is increasing in p, if a solution exists it must be unique.

the value of having land may not be adequately captured by the present discounted value of v/n. The intuition follows from Observation 2(i), which shows that with hyperbolic discounting sale of land leads to a distortion in the consumption pattern, so that landowners need to be compensated over and above the present discounted value of the land.

Proposition 1 *(i) The use value of land, i.e. $\tilde{v}$, exceeds the present discounted value of the land, i.e. $2v/n$.*

(ii) $\tilde{v}$ is decreasing in β.

Proof. (i) Suppose to the contrary $\tilde{v} \leq \frac{2v}{n}$. Observe that

$$u(c_1) + u(c_2) < 2u(\tilde{v}/2) \leq \tilde{U}, \tag{5}$$

where the first inequality follows since, from strict concavity of $u(c)$, maximizing $u_1(c) + u_2(c)$ implies that $\tilde{v}/2$ should be consumed in both periods, whereas from Observation 2(i), $c_1 \neq c_2$. The second inequality follows since $\tilde{v} \leq \frac{2v}{n}$. We note however that (5) contradicts the definition of $\tilde{v}$.

(ii) Totally differentiating (4), and using Observation 2,

$$\frac{d\tilde{v}}{d\beta} = \frac{[u'(c_2) - u'(c_1)]\frac{\partial c_1(p,\beta)}{\partial \beta}}{\frac{\partial c_1(\tilde{v},\beta)}{\partial \tilde{v}}u'(c_1) + \frac{\partial c_2(\tilde{v},c_2)}{\partial \tilde{v}}u'(c_2)}. \tag{6}$$

The result now follows from Observation 2.■

We are finally in a position to solve the game. Proposition 2 below shows that an efficient equilibrium exists if and only if $V - n\tilde{v} + v \geq 0$, when the outcome where the buyer makes an acceptable offer of $\tilde{v}$ to all the landowners at $t = 1$, can be sustained as an equilibrium. Whereas if $V - n\tilde{v} + v < 0$, then no efficient equilibrium exists, with the unique equilibrium involving the buyer making acceptable offers at $t = 2$, so that there is delay.

Proposition 2 *If $V - n\tilde{v} + v \geq 0$, then the unique equilibrium involves all the landowners selling their land for $\tilde{v}$ at $t = 1$. Otherwise, the unique equilibrium involves the buyer acquiring all n plots at $t = 2$ for v/n each.*

Proof. Suppose that $V - n\tilde{v} + v \geq 0$. Consider the strategies where at $t = 1$ the buyer offers $\tilde{v}$ to all landowners, and a landowner accepts an offer if and only if she obtains at least $\tilde{v}$. The strategies in period 2 follow Observation 1. Given that $\tilde{v}$ constitutes a landowner's reservation payoff, the landowners' strategies at $t = 1$ are optimal. Next consider the buyer's strategy. Given that $2V \geq n\tilde{v}$, the buyer has a non-negative payoff. Further, given that $VV - n\tilde{v} + v \geq 0$, the buyers payoff from implementing the project at $t = 1$, exceeds that from implementing it at $t = 2$. Hence these strategies constitute the unique equilibrium for these parameter values. Whereas if $2V - \tilde{v} \geq 0$, but $2V - n\tilde{v} < V - v$, then it is optimal for the buyer to reach an agreement at $t = 2$. Finally, if $V < n\tilde{v}$, then making acceptable offers to all landowners at $t = 1$ is loss making given that $2V < n\tilde{v}$. Consequently, the grand project is not implementable at $t = 1$, and acceptable offers can only be made at $t = 2$. The result now follows from Observation 1. ■

Holdout, i.e. delay in Proposition 2, follows because sale of land leads to a distortion in consumption pattern, thus pushing up use-value beyond the present discounted value of v. Clearly, this is inefficient, so that we have a violation of the Coase theorem despite there being no incomplete information.

Further, if $2V - n\tilde{v} \geq 0$, but $2V - n\tilde{v} < V - v$, then it is the buyer who may have an incentive to delay bargaining, with an agreement being reached at $t = 2$, even though an agreement at $t = 1$ is feasible. While, with time, the project value from reaching an agreement decreases, the amount payable to the landowners may decrease even faster, hence the delay. This is in contrast to the bargaining logic so far explored in the literature, where (any) inefficiency is essentially driven by the landowners.

Remark 1 *For comparison, let us consider the case where the landowners are time consistent so that $\beta = 1$. Note that in this case $\tilde{v} = 2v/n$, so that $2V - n\tilde{v} = 2(V - v) > V - v$. Thus from Proposition 2 the unique*

equilibrium involves the buyer offering $2v/n$ *to all landowners, who accept.*

Remark 2 *It is clear that the holdout problem may be resolved in case the buyer can make a credible offer to make staggered payments to the landowners, e.g.* v/n *every period. The fact that such contracts are rarely seen in practice may be because of commitment issues, e.g. if there is a chance that the buyer may get bankrupt in the next period, rendering such contracts null and void. Further, in the context of LDCs, the landowners are unlikely to have the financial muscle required to enforce contracts against buyers who may be large firms.*[21]

In the rest of the paper we focus on the case where present bias is extreme, i.e. $\beta = 0$. One benefit is analytical tractability since this has the implication that all income will be consumed in the current period. Even more importantly though, this crystalizes the notion that people may not be that good in managing large sums of money, the primitive of our analysis. Thus all our subsequent results follow from this primitive, rather than from anything specific to the $\beta - \delta$ formulation.

2.2 Fragmentation and relative willingness to sale

We then put this model to work by examining two issues of interest, the effect of increased fragmentation on holdout, and the relative willingness to sale of bigger landlords vis-a-vis smaller ones. Interestingly, we find that the answers to these questions are inter related.

It is commonly argued that increased fragmentation leads to greater holdout, the idea being that with land being contiguous, fragmentation

[21] Interestingly, Ghatak and Bannerji (2009) report that when they asked landowners in Singur, West Bengal (the proposed site for the Tata-Nano car) if they would prefer a monthly payment, they said that they could not trust the buyers to keep their commitment. Banerjee et al. (2007), in fact not only suggests compensation in the form of monthly pensions with a savings bond, but also suggests the setting up of independent regulatory authorities to take care of the commitment issue.

makes plots that are centrally located extremely critical, increasing the strategic incentives for holdout. While this is undoubtedly an important insight, we demonstrate that the use-value effect can lead to the same result.

Turning to the question of relative willingness to sale, it is interesting to note that Ghatak and Bannerji (2009) suggest that relatively larger landowners are more willing to sale their plots.[22] Formally, we say that a larger landowner has a greater incentive to sale if the proportional willingness to sale, i.e. $\frac{\tilde{v}(v)-v}{v}$, is decreasing in v. We find that the answer to these two questions are connected, so that fragmentation increases holdout if and only if larger landowners are relatively more willing to sale.

Given that $\beta = 0$, in case of a sale, all consumption by the landowners occur in period 1 itself. Thus $\tilde{v}(n)$ solves

$$u(\tilde{v}(n)) = 2u(\frac{v}{n}). \tag{7}$$

Totally differentiating and manipulating, we obtain

$$\frac{d\tilde{v}(n)}{dn} = -\frac{2vu'(\frac{v}{n})}{n^2u'(\tilde{v})}. \tag{8}$$

Turning to the effect of fragmentation, recall from Proposition 2 that holdout occurs if and only if $V - n\tilde{v} + v < 0$. Thus we say that fragmentation increases holdout whenever $V - n\tilde{v}(n) + v$ is decreasing in n, i.e. $n\tilde{v}(n)$ is increasing in n. Observe that

$$\frac{d[n\tilde{v}(n)]}{dn} = \frac{\tilde{v}u'(\tilde{v}) - 2\frac{v}{n}u'(v/n)}{u'(\tilde{v})}. \tag{9}$$

Consequently, fragmentation increases holdout if and only if $\tilde{v}u'(\tilde{v}) - 2\frac{v}{n}u'(v/n) > 0$.

[22] For very large landowners however the effect may be reversed because of status effects, see, e.g. Ghatak and Bannerji (2009).

We then examine the effect of an increase in v on the proportional willingness to pay. From (7), $\frac{d\tilde{v}(v)}{dv} = \frac{2u'(v/n)}{nu'(\tilde{v})}$, so that

$$\frac{d[\frac{\tilde{v}(v)-v}{v}]}{dv} = \frac{1}{v^2u'(\tilde{v})}[2\frac{v}{n}u'(\frac{v}{n}) - \tilde{v}u'(\tilde{v})]. \tag{10}$$

Hence the landowners with larger v has a relatively greater willingness to sale if and only if $\tilde{v}u'(\tilde{v}) - 2\frac{v}{n}u'(v/n) > 0$. Note that this is the same as the condition that fragmentation increases holdout. This discussion is summarized in Proposition 3 below.

Further, we show that fragmentation increases holdout (and hence willingness to sale is increasing with v) whenever relative risk aversion is not too large (and some additional technical conditions hold).

Proposition 3 *(i) Fragmentation increases holdout if and only if larger landowners have a relatively greater willingness to sale.*

(ii) Let the relative risk aversion be less than one, i.e. $\frac{-u''(x)}{u'(x)/x} < 1$. *Then an increase in fragmentation increases the chances for holdout, i.e.* $\frac{dn\tilde{v}(n)}{dn} > 0$, *whenever* $-\frac{u'''(x)}{u''(x)/x} > 2$ *and* $\lim_{x\to 0} xu'(x) \geq 0$.

Proof. (ii) Given that $\frac{-u''(x)}{u'(x)/x} < 1$, it follows that $xu'(x)$ is increasing in x. Further, since $-\frac{u'''(x)}{u''(x)/x} \leq 2$, it follows that $xu'(x)$ is weakly convex in x. Next since $xu'(x)$ is increasing (and $\tilde{v} > \frac{2v}{n}$), $\tilde{v}u'(\tilde{v}) > \frac{2v}{n}u'(2v/n)$. Further, since $xu'(x)$ is weakly convex and $\lim_{x\to 0} xu'(x) \geq 0$, $\frac{2v}{n}u'(2v/n) \geq \frac{2v}{n}u'(v/n)$.■

Note that the condition that relative risk aversion is not too large is equivalent to the absolute risk aversion at x being less than $1/x$, which, for x small, may not be a very severe restriction. The condition that $-\frac{u'''(x)}{u''(x)/x} > 2$ is not innocuous though, since, for $u(c) = \sqrt{c}$ (which violates this condition), fragmentation has no impact on holdout.

Proposition 3(i) has some interesting implications. For example, recall the observation by Ghatak and Bannerji (2009) that in the Singur area

richer landlords are relatively more willing to sale their land. But then from Proposition 3, any further fragmentation would increase holdout. Thus, if fragmentation increases with the passage of time (perhaps because of population pressure), holdout in this area can only be expected to increase![23]

Note however that the preceding discussion, which implicitly assumes that average productivity of land is constant, ignores the literature on land size and productivity. Clearly, if there is an optimal operational holding size (see, e.g. Binswanger et al. (1995), pp. 2694-2707), then the analysis also needs to take into account the effect of fragmentation on operational plot size.

Remark 3 *Interestingly, Eckart (1985) provides an alternative argument based on the strategic bargaining approach as to why bigger landowners may be more willing to sale. Larger the landowner, the greater is her impact on total price and thus on the probability that the offer will be rejected. Internalizing this fact, larger landowners charge relatively lower prices in his framework.*

Remark 4 *We then consider an alternative formulation where the landowners have a longer planning horizon compared to that of the buyer. It is easy to show that Propositions 1-3 go through as long as the landowners have a longer, but finite planning horizon. The more interesting case is when the landowners have an infinite time horizon and a discount factor of $\delta < 1$. The rest of the game is as before. In this case the reservation payoff of a landowner is given by $\tilde{v}'$ where*

$$u(\tilde{v}') = \frac{u(v/n)}{1-\delta}.$$

Further, for $2V < n\tilde{v}'$, there is complete breakdown of transactions. Otherwise, however the efficient outcome is reached at $t = 1$. Interestingly,

[23]Further, as argued by Ghatak and Bannerji (2009), the limited land reform in West Bengal, India, may have, by increasing fragmentation, created a situation which is very susceptible to holdout.

the buyer does not have an incentive to delay an agreement (since the use-value effect is constant across time). Further, as the rate of interest goes to zero (so that δ goes to 1), $\tilde{v}'$ goes to infinity, so that holdout necessarily happens. Further, it is straightforward to extend the argument to show that an analogue of Proposition 3 goes through. We however feel that the finite horizon framework is perhaps more appealing in the context of land acquisition. This is for two reasons. First, even in LDCs the landowners do not always see land as a hereditary occupation, anticipating (sometimes even hoping), that their progeny would move on to non-agricultural occupations. Second, land acquisition may take place in the backdrop of eminent domain, so that landowners may fear that the government is going to step in unless an agreement is reached soon.[24]

3 Politicization of the Landowners

We then turn to examining the effects of politicization of the process of land acquisition. As argued in the introduction, while such politicization need not always occur (and in Section 4 we shall later try to provide a reason as to why this may be the case), clearly sometimes they do, and examining the incentives for such interventions, as well as their efficiency implications are of interest.

Consider a scenario with a political party which first decides whether to participate in the land agitation or not. We shall model this aspect very sketchily, and just say that the party has a bigger incentive to participate in case more landowners are likely to join in case of involvement (so that there is an increase in its vote-bank). In case of involvement, the party provides two services, it gives its members voice (in case they do not already have it), as well as the ability to bargain collectively with the buyer.

[24] In fact, the proposed modification to the Indian Land Acquisition Act has provisions that states that the buyer may invoke eminent domain once it acquires a certain fraction of the required plots.

In this section we abstract from the participation decision, analyzing the efficiency implications in case of participation. In order to clarify the role of these two aspects, we however analyze these separately.

3.1 Voice

We first examine the efficiency implications of voice, formalized through a bargaining game where landowners alone make the offers, so that they have all the bargaining power. In order to focus on the effects of voice alone, we begin by examining a scenario where the landowners, while having voice, bargain individually.[25]

We examine a variation of the model in Section 2 where at $t = 1, 2$ all the active landowners simultaneously make offers to the buyer, followed by the buyer announcing his decisions as to which one of the offers he accepts, which is followed by the landowners' consumption decisions, and finally the buyer's exit decision.

Let $\bar{t}$ be the earliest instant when implementing the grand project is feasible even after paying all the landowners their reservation prices. Thus $\bar{t} = 1$ if $2V \geq n\tilde{v}$, and $\bar{t} = 2$ otherwise.

Let $\tilde{v}(t)$ denote the reservation payoff of a landowner at t, so that $\tilde{v}(1) = \tilde{v}$ and $\tilde{v}(2) = v/n$. We show that there is a multiplicity of equilibria, such that any outcome where the grand project is being implemented at $\bar{t}$, or later, can be sustained as an equilibrium. In particular the second best outcome, where an agreement is reached at $t = \bar{t}$, can be sustained as an equilibrium.

Proposition 4 *For any $t \geq \bar{t}$, there is an equilibrium where the landowners all ask for $\tilde{v}(t)$ at t and the buyer accepts.*

The proof of Proposition 4, as well as all subsequent propositions can be found in the appendix.

[25] The case of collective bargaining is taken up in the next sub-section.

Note that an equilibrium with landowner voice may or may not be efficient compared to that without voice. Suppose for example, that $0 < 2V - n\tilde{v} < V - v$, so that the equilibrium without voice involves delay (Proposition 2), but with landowner voice an efficient equilibrium at $t = 1$ can be sustained. On the other hand, for $2V - n\tilde{v} \geq V - v$ the equilibrium without voice involves the efficient outcome being implemented (Proposition 2), however with voice there may be delay!

Thus an increase in voice may, or may not increase efficiency. This is essentially because of a standard coordination problem, leading to multiple equilibria. Interestingly, the strategic approach to holdout suggests that allowing for landowner offers would, by increasing the bargaining power of the landowners, necessarily worsen the holdout problem.

3.2 Collective Bargaining with Voice

We then examine the case where all landowners join the party to form a party $C(n)$, consisting of all n landowners, that bargains collectively with the objective of maximizing aggregate landowner utility.

We modify the game in the previous sub-section so that at $t = 1, 2$, the party $C(n)$ offers all the n plots in return for a price. The buyer responds to this offer, either accepting it or not. In case this offer is accepted, the received amount is equally distributed among all landowners. This is followed by the landowners making their consumption decisions, and then the buyer making his exit decision.

Turning to the analysis, note that the average utility of a party member is $2u(v/n)$ in case there is no agreement, $u(v/n) + u(V/n)$ in case of an agreement at $t = 2$, and $u(2V/n)$ in case of an agreement at $t = 1$. This follows since the party, which has the bargaining power, will extract all the surplus from the buyer. Further, given that $V > v$, reaching an agreement at $t = 2$ is better than never reaching an agreement for the party.

Proposition 5 below shows that depending on the value of v relative to

V, collective bargaining (with voice) may or may not improve efficiency. Intuitively, for v large, the holdout problem is serious so that the buyer has an incentive to wait, so as to reduce the use-value effect. Under collective bargaining this delay cost can be avoided. Hence politicization improves efficiency when v is low, not otherwise.

Proposition 5 *There exists $\overline{v}$ such that for $v \geq \overline{v}$ collective bargaining is at least as efficient as bargaining without politicization. Further, there exists $\underline{v}$ such that for $v \leq \underline{v}$ bargaining without politicization is at least as efficient as collective bargaining.*

4 Political Intervention: When Does it Happen?

Finally, we seek to answer the question as to why land acquisition, despite its obvious emotive appeal, is not always taken up by the political parties.[26] Here we seek to provide an explanation based on the number of landowners who have an incentive to join the party following such intervention, arguing that this number is likely to be low in case the landowners are politically immature (in the sense of having voice), and likely to be large otherwise. Thus political parties will have a greater incentive to intervene when the landowners already have voice.

Suppose m of the landowners, $m < n$, join the political party. Let us denote this party by $C(m)$. Thus there are $n - m$ landowners who are not part of any party, and bargain individually (we call them 'individual' landowners for ease of exposition). The objective of the party $C(m)$ is to maximize the average payoff of its members.

[26] Of course, depending on the context, there can be many different explanations. In the Indian context, for example, one reason may be that the affected people are often the tribal (Fernandez (2007)).

4.1 Politically immature landowners

In case the individual landowners do not have voice, the game takes the following form: at every $t = 1, 2$, $C(m)$ makes an offer to the buyer regarding the price of the m plots under its control, which the buyer can either accept, or reject. Following this stage, the buyer makes offers to all the remaining active individual landowners, who then simultaneously decide whether to accept, or reject. This is followed, as before, by the landowners' consumption and then the buyer's exit decisions.

Our next proposition shows that the average utility of the party is decreasing in party size. A smaller party size helps increase the surplus available to the buyer following an agreement with $C(m)$ (this is also the surplus that the party can extract for itself) since more landowners can now be pushed down to their reservation payoffs.

Proposition 6 *In case the individual landowners do not have voice, the average utility of the party members is decreasing in party size.*

Proposition 6 thus suggests that members of an existing party may not be interested in inducting new members. Given that political involvement may require some fixed costs for political parties, such involvement may not be worthwhile as potential gains in terms of an increase in votes, or party membership may be small.

4.2 Politically mature landowners

We then examine a somewhat different scenario where the landowners are already politically mature, in the sense that they have voice. At every t the game is as follows: $C(m)$ makes an offer, followed by the buyer's accept/reject decision. This is followed by all the other active landowners making their offers simultaneously. As usual, this is followed by the buyer's acceptance decisions, then the landowners' consumption decision and the buyer's exit decision.

Proposition 7 *In case the landowners already have voice, for any $C(m)$, $m < n$, there is an equilibrium where no agreement is reached.*

In such a scenario, the landowners may have an incentive to all join a political party, when from Proposition 5 earlier, average landowner utility is greater. Further, with larger memberships, political parties have a greater incentive to participate. Combining Propositions 6 and 7 we have the following

Corollary. *In case the landowners are not politically mature (in the sense of not having voice), political intervention is not very likely. Even if it happens, not many landowner may join the party. In case landowners already have voice, political intervention is more likely, which moreover is accompanied by greater membership.*

In this context it may be of interest to note that many of the political interventions in India actually occurred in West Bengal, which, because of its history of land reforms, can be said to be more politically mature compared to many other Indian states.

5 Conclusion

This paper develops a theory of holdout, based on the landowners' inability to manage large sums of money and consequent lack of consumption smoothing. This inability arises naturally in the presence of market failures and exogenous shocks, both of which are reasonable in LDC contexts. Further support for this framework can perhaps be garnered from the literature on development induced displacement. This literature, e.g. Cernea (2000), demonstrates that following such displacement, landowners often go into a downward spiral in several aspects of their life, leading to joblessness, homelessness, food insecurity and increased morbidity and mortality. Along with the reasons discussed by Cernea (2000), e.g. loss of access to common prop-

erty and services, social disarticulation, etc., clearly the inability to manage large sums of money can be another contributory factor.

We find that this formulation yields the prediction that fragmentation increases holdout and moreover, this happens if and only if large landowners are relatively more willing to sale. Further, in contrast to the strategic bargaining literature, delay can be caused by the buyer. Turning to the effect of politicization, voice coupled with collective bargaining increases efficiency provided fragmentation is severe. Further, depending on whether the landowners already have voice or not, political parties may, or may not have an incentive to intervene in the process.

This paper of course only scratches the surface of what is clearly a very complex issue, and can be extended in several directions. For one, in an effort bring out the main points more clearly, this paper deliberately abstracts from the issue of strategic holdout. We feel that a proper understanding of the holdout problem in land acquisition requires an integration of both these aspects and hope that such a synthesis is in the offing.

6 Appendix

Proof of Proposition 4. Consider the following strategies. For any $t' \neq t$, the landowners all ask for $2V$. At t all landowners ask for $\tilde{v}(t)$. At any t', a buyer accepts all landowner offers if and only if accepting all such offers leads to a non-negative payoff for the buyer.■

Proof of Proposition 5. Suppose that v is large, but to the contrary the grand project is implemented at $t = 2$ under collective bargaining, and at $t = 1$ without politicization. Consider collective bargaining. Since an agreement is reached at $t = 2$, $u(2V/n) < u(v/n) + u(V/n)$ so that

$$u(2V/n) - u(V/n) < u(v/n) = u(\tilde{v}) - u(v/n). \tag{11}$$

Similarly, since without politicization, an agreement is reached at $t = 1$,

$$V/n \geq \tilde{v} - v/n. \tag{12}$$

Combining the above two equations

$$\frac{u(2V/n) - u(V/n)}{V/n} < \frac{u(\tilde{v}) - u(v/n)}{\tilde{v} - v/n}. \tag{13}$$

Given the concavity of $u(c)$, for v close to V, $\tilde{v} > 2V/n$, so that this condition is violated. Similarly, for v small, $\tilde{v} < V/n$, so that an analogous argument shows that politicization is relatively inefficient. ■

Proof of Proposition 6. Note that following an acceptable offer by $C(m)$, the buyer will offer the individual landowners their reservation payoff. Thus the average utility of $C(m)$ is

$$u(\tilde{v} + \frac{2V - n\tilde{v}}{m}), \tag{14}$$

in case an agreement is reached at $t = 1$, and

$$u(v/n) + u(\frac{V - v}{m} + v/n), \tag{15}$$

in case an agreement is reached at $t = 2$. Clearly, if an agreement is reached at $t = 1$, then $2V \geq n\tilde{v}$. Thus the average payoff is decreasing in party size m.■

Proof of Proposition 7. Consider the following strategy profile. At any t, $C(m)$ asks for $2V$ (which is an unacceptable offer). The individual landowners all ask for $\tilde{v}(t)$. Given the strategies of the individual sellers, any acceptable offer by $C(m)$ must ask for a price of zero from the buyer for the n plots under its control. Thus it is optimal for $C(m)$ to never make an acceptable offer. ■

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