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Land Acquisition: Political Intervention, Voice and Fragmentation

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Abstract: This paper develops a simple dynamic framework of holdout in land acquisition (both with and without political intervention), where holdout arises because of the landowners' inability to manage large sums of money (and consequent lack of inter-temporal consumption smoothing in case of sale). We then use this framework to analyze two issues, political intervention and fragmentation, showing that the results depend on a subtle interaction of voice, collective bargaining and the severity of fragmentation. Political intervention leads to a large party size (and is consequently more likely) in case it leads to voice for both members and non-members, but not otherwise. Moreover, under both these scenarios, politicization may lead to inefficiency. Further, the efficiency implications of fragmentation also depend on the nature of politicization, with fragmentation increasing holdout in the absence of politicization.

Key words: Land acquisition, holdout, fragmentation, politics, voice, collective bargaining.
JEL Classification No.: D03, O12, O43, Q15, R14, R52.

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1 Introduction

This paper develops a theory of holdout in land acquisition, using it to analyze some issues of interest, namely politicization and fragmentation. The theory builds on the idea that landowners cannot manage large sums of money (arising out of sale of their land) very well, formalizing it as over-consumption and consequent lack of consumption smoothing on the part of the landowners. This idea seems to be in consonance with reality, especially in less developed countries (LDCs), thus providing a theory of holdout that is complementary to the strategic bargaining approach (discussed later).

This framework yields the result that, the effects of political intervention depend on a subtle interaction of voice, collective bargaining and the severity of fragmentation. Political intervention leads to a large party size (and is consequently more likely) in case it leads to voice for both members and non-members (as for example in case of mass based political agitations). Otherwise politicization leads to a small party size in case it happens at all. Under both these scenarios however politicization leads to inefficiency whenever the holdout problem is neither too severe, nor too small. Turning to fragmentation, we find that under some reasonable conditions it increases holdout and moreover, this happens if and only if large landowners are relatively more willing to sale. Interestingly, when there is politicization with voice for members alone, fragmentation may improve efficiency.

While the traditional approach to industrialization, e.g. Lewis ([14]), 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 is 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 the 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. ([1])).

[2]Please see, http://www.commodityonline.com/news/The-cost-of-land-acquisition-

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 ([19]) and Ghatak and Bannerji ([11])). There are several other instances of agitations against land acquisition in India in 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. In this paper we seek to provide an explanation of holdout based on the fact that managing large sums of money is problematic for landowners from LDCs (see, e.g. Banerjee et al. ([1])). Such problems with managing lump sum amounts arise 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 ([11])).[6] Hence land, which yields a relatively 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

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. ([1])). In fact many countries, 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. ([1])), by the Orissa government for building a steel plant by Posco (Chandra ([6])), by the Jharkhand government for building a steel plant and also a power project in Khuntia district (12,000 acres, see Basu ([2])), 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 ([16])), etc.

[4]See, for example, Benson ([3]), among many others.

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

[6]Ghatak and Bannerji ([11]) 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."

that the 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 ([19]), for example, suggests that such a divergence can arise since, once a land-owner sells her land, she will have little alternative use for her labor. Mookherjee ([15]) 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 ([12]) 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 ([12]) 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] 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 re-

[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 ([12]), 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 ([11]) 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.

[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 ([12])).

duced form approach, whereby this is *modeled 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 interpret our adoption of this framework as essentially a reduced form formalization, rather than any attempt to claim that holdout can be traced to hyperbolic discounting by itself.

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 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.

We then apply this framework to examine some questions of interest, in particular the effects of politicization and fragmentation. The study of political intervention in this context 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] Interestingly though, land acquisition does not always lead to political interventions. For example while in West Bengal,

[11] See, among others, Phelps and Pollack ([17]), Laibson ([13]), O'Donoghue and Rabin ([7]), and the references cited in these papers.

[12] Fernandez ([9]), 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.

India, 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 ([12])).[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 politicization, as well as the efficiency implications, depend on whether politicization involves the non-members getting a voice in the bargaining process or not (which in its turn is likely to be related to whether the political movement is mass-based, or not). We consider a scenario where incumbent party members decide whether to admit new members or not. When politicization involves even the non-members getting voice, we find that the politicization involves all landowners joining the party. Otherwise, there may be no political involvement, and in case there is, party membership would be small.

Consider the case where politicization involves voice for all landowners and moreover suppose that the party is less than fully inclusive. In this case the landowners who are outside the party may appropriate the surplus given that they have voice. Consequently, the party members have zero payoff in case of a sale. Thus there is an incentive for including all the landowners in the party, when the party can extract all of the surplus for its members. This in turn implies that political parties may have an incentive to intervene since there is likely to be a sizable increase in their vote bank.

We next consider the case where politicization does not lead to voice for the non-members. In this case existing members of a party may be unwilling to admit more members. This follows since, with a smaller party 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

[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/

their vote-bank, may have little incentive for getting involved. Further, in case intervention does take place, party size may not be too large. Taken together, these two results suggest that there is a link between the mass nature of the political movement, and party size. Further, this link arises purely out of the strategic calculations of the incumbent party members.

Turning to the efficiency effects of politicization, we find that for intermediate levels of holdout, politicization may lead to productive inefficiency. This is true irrespective of whether politicization involves voice for all landowners or not, and is intuitive since with politicization, it is the landowners (who have a greater incentive to holdout) who decide when an agreement is reached. Further, when politicization does not involve voice for non-members, we find that there are distributional implications with the party members gaining at the expense of non-members.

We next turn to fragmentation. Given population pressure (and the thinness of land markets) fragmentation is naturally of interest in LDCs. Further, government policies, for example the land reforms program in West Bengal, India, can also lead to fragmentation. We show that, in the absence of politicization, fragmentation increases the chances for holdout if and only if richer households are relatively more willing to sell their plots. Further, this will be the case whenever 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.

Interestingly though, in the presence of politicization with voice for members alone, this result may be reversed in that fragmentation may increase efficiency. Intuitively, greater the fragmentation, greater the amount that can be extracted by the party from the independent landowners. Consequently, reaching an early agreement becomes more attractive so as to extract this surplus. Further, fragmentation may also improve efficiency if the utility function is convexo-concave and politicization involves voice for all. Thus our analysis shows that the effect of fragmentation depends on the nature of politicization, as well as the utility function.

1.1 Related Research

Formal treatments of the holdout problem have largely 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 are likely, see e.g. Eckart ([8]) and Roy Chowdhury and Sengupta ([18]).[16]

The present paper develops an approach that is complementary to the strategic bargaining one, bringing together and building on ideas that has been suggested by several authors in recent years. For example, Banerjee et al. ([1]) and Sarkar ([19]) makes the case that the use-value of land may be higher than its sale-price. While Sarkar ([19]) traces such discrepancy, among other things, to landowners having skills that are land specific, the arguments in Ghatak and Bannerji ([11]) would suggest that such discrepancy can arise out of incomplete markets, etc. This paper however seeks to take this approach forward by (a) showing that the notion of over-consumption provides a very simple unified formalization of all the different, though related, ideas in the literature, and (b) by demonstrating that it can be used to address several issues of interest, in particular politicization and fragmentation, generating several interesting results.

Finally, Ghatak and Mookherjee ([10]) uses a one buyer one landowner model to analyze the efficiency effects of compensation when the landowner rents out the land to a tenant, and both the landowner and the tenant can make investments in the land. Clearly, the focus here is on *ex ante*, rather than *ex post* inefficiency.

The paper is organized as follows. Section 2 sets up the basic framework, examining the conditions for holdout. We then use this framework to address some issues of interest. Section 3 examines the effect of fragmentation on holdout, while Section 4 takes up the issue of politicization, analyzing the likelihood of politicization, as well as the efficiency implications of such intervention. Finally, section 5 concludes. Appendix A contains an extension of the model with political intervention, while many of the proofs can be found in Appendix B.

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

[16] In the patents literature, Shapiro ([20]), suggests that strategic holdout is a serious obstacle to R&D, and consequently long-run growth.

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 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 thrice 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]

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

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

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 ([7]), in that in the pre-consumption stages, the landowner 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.

We study subgame perfect equilibria in pure strategies, the focus being on the efficiency property of equilibria, i.e. whether the grand project can be implemented at $t = 1$, or not.

2.1 The Analysis: Holdout

As is standard, we solve this game backwards, starting with period 2 first.[19]

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 $c_1 = c_2 = v/n$.[20] Thus the utility of such a landowner at stages 1 and 2 of period 1 is given by

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

[19] For ease of exposition, we have the tie-breaking rule that in case of indifference, the buyer, as well as the landowners prefer to accept an offer, rather than reject it.

[20] 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 $u(c_1) + \beta u(c_2)$.

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 $u(c_1)+\beta u(p-c_1)$. 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)* $c_1(p,\beta) > c_2(p,\beta)$ *for all* $\beta < 1$.
(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* $\frac{\partial c_2(p,\beta)}{\partial \beta} = -\frac{u'(c_1)}{u''(c_1)+\beta u''(c_2)} > 0$.

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,[21] 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

[21] 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) The use value $\tilde{v}$ is decreasing in β.

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 the value of the grand project is large, in that $V - n\tilde{v} + v \geq 0$, 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.*

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. In the context of LDCs in particular, poor landowners are unlikely to have the financial muscle required to enforce such long term contracts against buyers who may be large firms.*[22]

Remark 3 *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 1-2 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 $\delta < 1$. For simplicity, let the discount factor of the landowners be 0. 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, 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. 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.[23]

[22] Interestingly, Ghatak and Bannerji ([11]) 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. ([1]), 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.

[23] 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.

3 Politicization of the Landowners

We then put this model to work by using it to examine two issues of interest, namely politicization and fragmentation. 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. Given that $\beta = 0$, in case of a sale, all consumption by the landowners occur in period 1 itself. Thus $\tilde{v}(n)$ solves

$$u(\tilde{v}(n)) = 2u(\frac{v}{n}). \tag{5}$$

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,[24] 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 get involved in the process of land acquisition, or not. We assume that the party has a greater incentive to get involved in case more landowners are likely to join the party (so that there is an increase in its vote-bank). Suppose m of the landowners, $m \leq n$, 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).

One key assumption here is that party formation involves an agency problem, in the sense that we consider a scenario where the party has very little presence in the concerned area, so that approaching the landowners directly is much too costly for the party. In that case the party's options may be limited to either not getting involved at all, or getting involved, but delegating the recruitment drive mainly to the initial members. In that case the agency problem arises because the interest of the party, i.e. maximizing

[24] Of course, depending on the context, there can be many different explanations for such non-intervention. In the Indian context, for example, one reason may be that the affected people are often the tribal (Fernandez ([9])).

the number of members, may not be shared by the initial members who may be more interested in maximizing their own utility. In general of course party size will depend on a mixture of both these objectives, and our formulation focuses on the extreme case where the whole of the weight is placed on average member utility.

We find that when politicization leads to voice for all, the agency problem disappears in that the party size is going to be large. While the agency problem turns out to be severe when politicization involves voice for members alone (in that party size is small), this may still be of interest to the party in case it is interested in a long term presence in the area, and hopes to increase its party base later on when this particular issue is settled.

The agency problem is formalized by our assumption that party size will be set so as to maximize the average utility of the landowner members.[25] In case of political intervention, the party provides its members with (a) voice in the bargaining process, and (b) the ability to bargain collectively with the buyer.

We shall argue that the outcome, i.e. the extent of participation, as well as the efficiency implications, depend on whether political intervention leads to voice for even the non-members or not. We therefore examine the outcome under both these scenarios next.

3.1 Politicization with Voice for all Landowners

We begin by examining a scenario where politicization leads to voice for both members, as well as non-members. This can arise in case the process of politicization involves raising political awareness in the region as a whole through some mass based political movement (before the party gets to know who are going to join).[26]

We begin by considering a scenario where the party has decided to intervene and m landowners have joined, so that $C(m)$ is now involved in the bargaining process. In the ensuing bargaining game all individual landowners have voice, so that they can make offers to the buyer and, in addition,

[25] In Appendix A, we later suggest a game form that leads to the same outcome as under this assumption.

[26] Alternatively, this case can be interpreted as one where the landowners are already politically mature. This is likely in areas with a history of political movements, for example in West Bengal, India, with its history of the peasant agitations during the Barga movement.

members of $C(m)$ can bargain collectively. At every $t = 1, 2$ the bargaining game is formalized as follows:

$C(m)$, if it is still active, makes an offer to the buyer regarding the price of the m plots under its control, followed by the buyer's accept/reject decision. This is followed by all the other active individual landowners simultaneously making their offers to the buyer. As usual, this is followed by the buyer's acceptance decisions, then the landowners' consumption decisions and finally the buyer's exit decision.

The amount obtained by $C(m)$ from sale at t, say P_t, is equally divided among its members. Thus the utility of the party members is $u(P_1/m)$ in case an agreement is reached at $t = 1$, $u(v/n) + u(P_2/m)$ in case agreement is reached at $t = 2$, and $2u(v/n)$ otherwise. The payoff of the individual landowners can be calculated similarly.

We begin by solving for this very simple game. We find that the average utility of the party members is maximized when the party is fully inclusive, i.e. $m = n$. In fact, whenever $m < n$, we show that no agreement is ever reached. The result is quite intuitive. Suppose that the party $C(m)$ is not fully inclusive in the sense that $m < n$. In that case in any equilibrium where an agreement is reached, the individual landowners extract the whole of the surplus. This of course implies that in such a case $C(m)$ is better off not selling at all. Thus there is an incentive to form an inclusive party so as to avoid this possibility.

Proposition 3 *Suppose politicization involves voice for all landowners.*

(a) Suppose the party $C(m)$ is not fully inclusive, i.e. $m < n$. Then the outcome involves extreme inefficiency, in that no sale ever takes place.

(b) Suppose the party is fully inclusive, i.e. $m = n$. Then an agreement is necessarily reached either at $t = 1$, or $t = 2$, with an agreement being reached at $t = 1$ if and only if $u(2V/n) \geq u(v/n) + u(V/n)$.

(c) The average utility of the party members is the highest when an inclusive party forms, i.e. $m = n$.

Proof. (a) First consider the case where $m < n$. We prove that in any candidate equilibrium where an agreement is reached, $C(m)$ will be asking for a price of zero. Suppose to the contrary there is an equilibrium where an agreement is reached at some t, but $C(m)$ obtains a positive price. Consider the subgame at t. There are two cases:

Case (i). Suppose some individual landowners are still active. In this subgame the buyer's expected payoff must be zero, otherwise one of the remaining active landowners can ask for a slightly higher price. This will be accepted since otherwise, the game either terminates, or goes to the next period which involves a loss for the buyer. Thus the buyer's surplus in this sub game must involve a payoff of zero. This in turn implies that $C(m)$ must be asking for a price of zero. Hence $C(m)$ is better off never selling the plots under its control.

(ii) Next suppose no individual landowners are active. Then $t = 2$, but then the buyer's continuation payoff in this subgame is zero. Consequently, all individual landowners must be asking for a price of zero at $t = 1$, which is sub-optimal.

(b) For the case where $m = n$, $C(n)$ extracts the whole of the surplus. Thus the average utility is $u(2V/n)$ in case it decides to sale at $t = 1$, and $u(v/n) + u(V/n)$ in case it decides to sale at $t = 2$.[27]

(c) In case $m < n$, note that the average utility of the party members is $2u(v/n)$, which is less than $u(V/n) + u(v/n)$, which is the average utility when $m = n$ and an agreement is reached at $t = 2$. In case an agreement is reached at $t = 1$ under politicization, average utility is greater than $u(v/n)+$ $u(V/n)$, which in turn is greater than $2u(v/n)$. ■

Remark 4 *The bargaining game considered here focuses on the effects of universal voice. A more general game form would, for example, allow for counter-offers by the buyer also. While we plan to pursue such extensions in future work, preliminary work using a random bargaining protocol suggests that the results are qualitatively similar as long as the buyer's bargaining power is not too large.*

3.1.1 Efficiency

We then demonstrate that efficiency may fall because of such political intervention. For simplicity, we resort to an example where $u(c) = \sqrt{c}$. First consider the case where there is no politicization. From Proposition 2, it is straightforward to check that there is holdout, i.e. an agreement is reached at $t = 2$, if and only if V is relatively small in the sense that $V < 3v$. We next consider the case where there is politicization with voice for all

[27] In the appendix we write down strategies that sustain these outcomes as equilibrium outcome for all these cases.

and $C(n)$ forms. From Proposition 3(b), recall that the average utility is $u(v/n) + u(V/n)$ in case an agreement is reached at $t = 2$, and $u(2V/n)$ in case agreement is reached at $t = 1$. Consequently there is holdout if and only if $u(v/n) + u(V/n) > u(2V/n)$, i.e. $V < \frac{v}{3-2\sqrt{2}}$. Consequently, whenever V is at an intermediate level, i.e. $3v < V < \frac{v}{3-2\sqrt{2}}$, politicization leads to holdout, while there is no holdout in the absence of politicization.

The result follows from the fact that with politicization, the decision as to whether there should be holdout or not is taken by the landowners rather than the buyer. This makes delay more likely under politicization since it is the landowners who, because of their inability to handle large sums of money, has an incentive to delay an agreement. This intuition is quite general, and should go through for general utility functions, as well as more general bargaining games where both sides have some bargaining power. Summarizing the above discussion we have

Proposition 4 *Suppose politicization involves voice for all landowners and let* $u(c) = \sqrt{c}$. *Whenever* V *is at an intermediate level, i.e.* $3v < V < \frac{v}{3-2\sqrt{2}}$, *politicization leads to holdout, while there is no holdout in the absence of politicization.*

3.2 Politicization with No Voice for the Non-members

This case may be more likely when the party has a target group of landowners in mind, and approaches some of them directly, bypassing the other landowners who get no benefit out of this process.

Consider the case where the party has decided to intervene and $C(m)$ has already formed. In this case the game involving $C(m)$ is formalized as follows:

At every $t = 1, 2$, $C(m)$ (if active) 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. The intuition follows from the fact that the equilibrium involves the buyer extracting all the surplus from the individual lenders, which in its turn is extracted by $C(m)$. 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. Consequently, it helps increase the average utility of the party members as well.

Proposition 5 *Suppose politicization involves voice for members alone. The average utility of the members of $C(m)$ is maximized when $m = 1$. Further, an agreement is reached at $t = 2$ whenever either $2V < n\tilde{v}$, or $u(v/n) + u(V - v + v/n) > u(2V - (n-1)\tilde{v})$.*

Proposition 5 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. Thus there is clearly an agency problem in delegating the recruitment drive to the members. The parent party may however find this acceptable in case it has long term interests in developing a party base in the area.

Let us finally consider a somewhat more general case where the party conducts a *limited* political campaign (perhaps based on caste/ethnic/religious identities), aimed at providing voice to a target group of landowners. Combining the analysis in Propositions 3 and 5, it may be argued that the resultant party would comprise a subset of the landowners who have acquired voice, but the landowners without voice will excluded from membership. Thus, despite the agency problem, there appears to be a clear link between the mass character of the political agitation and the eventual party size. This link however arises out of the strategic calculus of the incumbent members, and not because of any other factors.

3.2.1 Efficiency

Next we turn to the efficiency implications of such politicization. Note that as v increases, so does $\tilde{v}$, so that for v sufficiently large, $2V < n\tilde{v}$ and there is inefficiency. Recall that in the absence of politicization the efficient outcome obtains if and only if $2V - n\tilde{v} \geq V - v$. Thus whenever $2V < n\tilde{v}$ (so that politicization leads to inefficiency), there is inefficiency in the absence of politicization as well.

For the case where $2V \geq n\tilde{v}$, we use our maintained example where $u(c) = \sqrt{c}$ to show that such politicization can lead to inefficiency. Consider

the case where $C(1)$ forms. Note that following an acceptable offer by $C(1)$, the buyer will offer the individual landowners their reservation payoff. Thus the average utility of $C(1)$ is $u(2V-(n-1)\tilde{v})$, in case an agreement is reached at $t=1$, and $u(v/n)+u(V-v+v/n)$ in case an agreement is reached at $t=2$. Thus, for $u(c)=\sqrt{c}$, there is delay provided $V<3v+\frac{2\sqrt{2}v}{n}$. Consequently, for $3v<V<3v+\frac{2\sqrt{2}v}{n}$, politicization leads to holdout, while there is no holdout in the absence of politicization. As in the case in the preceding sub-section, the result follows from the fact that the decision as to whether there should be holdout or not is taken by the landowners rather than the buyer when there is politicization. Summarizing the above discussion we have

Proposition 6 *Suppose politicization involves voice for members alone and let $u(c)=\sqrt{c}$. Whenever V is at an intermediate level, i.e. $3v<V<3v+\frac{2\sqrt{2}v}{n}$, politicization leads to delay in implementing the project, while there is no delay in the absence of politicization.*

Interestingly, while politicization may or may not have efficiency implications, it clearly has *distributional* implications, with the members gaining at the expense of non-members.

Taken together, the analysis in this section suggests that party size related is to whether the political agitation is mass based or not. Moreover, there are cases where politicization may aggravate the holdout problem (there being no efficiency implications in the other cases).

Remark 5 *Finally, we briefly examine the outcome when the political party can ensure that the recruitment drive is aimed at maximizing party size, so that there is no agency problem. Interestingly, it is optimal to restrict voice to members alone, since this increases the incentives for non-members to join. Clearly, party size will be $C(n)$. Whether there is inefficiency or not will depend on the objective of the party. For example, if the party has a lexicographic preference, so that given party size it maximizes the average utility of the members, then there is inefficiency if and only if $u(2V/n)<u(v/n)+u(V/n)$.*

4 Fragmentation

In this section we examine the effect of fragmentation, formalized as an increase in n, on holdout. It is commonly argued that increased fragmenta-

tion leads to greater holdout, the idea being that with land being contiguous, fragmentation 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 have similar implications. We begin by examining the case where there is no political intervention.

Interestingly, we find that the answer to this question is related to the relative willingness to sale of bigger landlords vis-a-vis smaller ones. In fact, Ghatak and Bannerji ([11]) suggest that relatively larger landowners are more willing to sale their plots.[28] 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 fragmentation increases holdout if and only if larger landowners are relatively more willing to sale.

Recall, from (5), that $\tilde{v}(n)$ solves $u(\tilde{v}(n)) = 2u(\frac{v}{n})$. Totally differentiating (5) and manipulating, we obtain

$$\frac{d\tilde{v}(n)}{dn} = -\frac{2vu'(\frac{v}{n})}{n^2u'(\tilde{v})}. \tag{6}$$

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

$$\frac{d[n\tilde{v}(n)]}{dn} = \frac{\tilde{v}u'(\tilde{v}) - 2\frac{v}{n}u'(v/n)}{u'(\tilde{v})}. \tag{7}$$

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

We then examine the effect of an increase in v on the proportional willingness to pay. From (5), $\frac{d\tilde{v}(v)}{dv} = \frac{2u'(v/n)}{nu'(\tilde{v})}$, so that

$$\frac{d[\frac{\tilde{v}(v)-v}{v}]}{dv} = \frac{1}{v^2u'(\tilde{v})}[2\frac{v}{n}u'(\frac{v}{n}) - \tilde{v}u'(\tilde{v})]. \tag{8}$$

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

[28] For very large landowners however the effect may be reversed because of status effects, see, e.g. Ghatak and Bannerji ([11]).

as the condition that fragmentation increases holdout. This discussion is summarized in Proposition 7(i) 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). In that case the utility function is not too concave, so that smaller landowners do not need *relatively* larger compensations.

Proposition 7 *(i) Fragmentation, i.e. an increase in n, makes holdout more likely if and only if larger landowners have a relatively greater willingness to sale, i.e.* $\frac{d[\frac{\tilde{v}(v)-v}{v}]}{dv} < 0$.

(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* $-\frac{u'''(x)}{u''(x)/x} \geq 2$ *and* $\lim_{x\to 0} xu'(x) \geq 0$.

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 7(i) has some interesting implications. For example, recall the observation by Ghatak and Bannerji ([11]) that in the Singur area richer landlords are relatively more willing to sale their land. But then from Proposition 7, 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![29]

Note however that the preceding discussion, which implicitly assumes that average productivity of land is constant, does not allow for the fact that there is an optimal operational holding size, one of the insights from the literature on land size and productivity (see, e.g. Binswanger et al. ([4]), pp. 2694-2707). Clearly, once this is factored in, then our analysis also needs to take into account the effect of fragmentation on operational optimality of plot size.

Remark 5 *Interestingly, Eckart ([8]) provides an alternative argument*

[29]Further, as argued by Ghatak and Bannerji ([11]), the limited land reform in West Bengal, India, may have, by increasing fragmentation, created a situation which is very susceptible to holdout.

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.

4.1 Effects of Politicization

Finally, we consider the efficiency implications of fragmentation *in the presence of politicization*. Interestingly, unlike the case where there is no politicization (Proposition 7), the result can go either way.

We focus on the case where politicization involves voice for members alone. From Proposition 5 recall that in this case there is delay whenever $n\tilde{v} > 2V$. Note that whenever relative risk aversion is less than 1 (and the additional technical conditions identified in Proposition 7(ii) hold), an increase in fragmentation increases $n\tilde{v}$, which makes it more likely that $2V < n\tilde{v}$, so that there is holdout (Proposition 5). There is however a second effect in operation here. Greater the fragmentation, greater the amount that can be extracted by the party from the $n-1$ independent landowners. Consequently, reaching an early agreement becomes more attractive so as to extract this surplus. In order to illustrate this effect, we use the example where $u(c) = \sqrt{c}$ and suppose that $V > 3v$, so that $2V > n\tilde{v}$ for all n. Recall from Proposition 6 that in this case politicization increases holdout whenever $3v < V < 3v + \frac{2\sqrt{2}v}{n}$ is satisfied. With an increase in n however, this becomes less likely.

Remark 6 *We briefly consider the effects of fragmentation when politicization involves voice for all. Clearly, for the example where $u(c) = \sqrt{c}$, fragmentation has no impact on efficiency. There is however an interesting example where an increase in fragmentation may decrease inefficiency. Suppose that there is a minimal subsistence level of consumption, say $X > 0$, so that $u(c) = 0$ for all $c \leq X$, and $u(c)$ is increasing, concave and differentiable for all $c > X$ (Figure 1). Further, let there be n, n', $n' > n$, such that $v/n' = X$. Then with n' plots of land, $u(v/n') = 0 < u(2V/n') - u(V/n')$, so that there is efficiency (Proposition 3(b)). Next let c'' be such that $u(c)/c = u'(c)$. Then for v close to V, and n such that $v/n \geq c''$, it is clear that $u(v/n) > u(2V/n) - u(V/n)$,*[30] *so that there is inefficiency. This*

[30]For $v = V$, this is equivalent to showing that $\frac{u(v/n)-u(0)}{v/n} < \frac{u(2v/n)-u(v/n)}{v/n}$, which is

suggests that for v close to V, an increase in fragmentation can improve efficiency.[31]

Taken together, the results in this section therefore suggest that the efficiency implications of fragmentation depend on several factors, (a) whether there is politicization or not, (b) the nature of politicization, in case its present, and (c) the nature of the utility function.

Remark 7 *In order to examine the role played by our central premise, that the landlords cannot manage large sums of money, we briefly consider the case where $u(c)$ is linear, so that $\tilde{v} = 2v/n$ and there is no inefficiency from overconsumption. It is straightforward to check that the efficiency implications are quite different in this case. Irrespective of whether there is politicization (with or without voice for all), or not, an agreement is reached at $t = 1$ itself in all cases, so that there is no inefficiency. Consequently, it can never be the case that politicization, or fragmentation increases inefficiency.*[32]

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, especially in LDC contexts, in the presence of market failures and exogenous shocks, etc. Further support for this framework can perhaps be garnered from the literature on development induced displacement. This literature, e.g. Cernea ([5]), 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

satisfied since, from the convexity of $u(c)$ we have that

$$\frac{u(v/n) - u(0)}{v/n} < \frac{u(v/n) - u(X)}{v/n - X} < \frac{u(2v/n) - u(v/n)}{v/n}.$$

Thus the result is true for all v close to V.

[31] Note though that if $u(c)$ is convexo-concave, then an increase in fragmentation may improve efficiency even in the absence of politicization. The proof, which is straightforward, is available from the author on request.

[32] Similar results hold if $u(c)$ is concave, but $\beta = 1$, so that there is no present bias. The proofs for Remark 7, which are straightforward, are available from the author on request.

discussed by Cernea ([5]), e.g. loss of access to common property 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 political intervention is likely (with a large party size) in case politicization leads to voice for non-members also, but not otherwise. Further, irrespective of whether politicization involves voice or not, politicization is welfare reducing whenever the holdout problem is neither too severe, nor too small. Turning to the effects of fragmentation, we find that it increases holdout and moreover, this happens if and only if large landowners are relatively more willing to sale. In the presence of politicization however this effect may be reversed.

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. Allowing for such strategic aspects, as well as the presence of *ex ante* inefficiency (of the kind analyzed by Ghatak and Mookherjee ([10])) within this framework should yield new insights. These exercises are beyond the scope of the present paper though.

6 Appendix A

In this appendix we write down a simple game which leads to the same outcomes, as the simpler formulations adopted in Sections 4.1 and 4.2. We however stick to the simpler formulation described in the main text as the more general formulation yields no additional insight.

Stage 1. The political party decides whether to intervene in the process of land acquisition or not. It intervenes if and only L (≥ 1) landowners join the party. For simplicity we take $L = 1$, though it is simple to allow for $L > 1$.

Stage 2. Stage 2 is divided into several sub-stages:

(2a). The party randomly selects one of the landowners and offers her membership. In case she rejects, the bargaining game without any political intervention is played. If accepted, the game goes to (2b).

(2b). The incumbent party member decides whether or not to offer membership to a randomly selected landowner out of those remaining. If she rejects, then the party $C(1)$ forms and the game moves to stage 3. Otherwise, the game goes to stage (2c). This continues until there is some

rejection, or all members accept.

Stage 3. In stage 3, the bargaining game described in sub-section 4.1 is played in case politicization involves voice for all members. Otherwise, the bargaining game described in subsection 4.2 is played.

7 Appendix B

Proof of Proposition 1. (i) Suppose to the contrary $\tilde{v} \leq \frac{2v}{n}$. Observe that

$$u(c_1) + u(c_2) < 2u(\tilde{v}/2) \leq \tilde{U}, \tag{9}$$

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 (9) contradicts the definition of $\tilde{v}$.

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

$$\frac{d\tilde{v}}{d\beta} = \frac{[u'(c_2) - u'(c_1)]\frac{\partial c_1(p,\beta)}{\partial \beta}}{\frac{\partial c_1(\tilde{v},\beta)}{\partial \tilde{v}}u'(c_1) + \frac{\partial c_2(\tilde{v},c_2)}{\partial \tilde{v}}u'(c_2)}. \tag{10}$$

The result now follows from Observation 2. ■

Proof of Proposition 2. 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 $V - n\tilde{v} + v \geq 0$, the buyer's 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. ■

Proof of Proposition 3. (a) Let $p^m(t)$ denote the price asked for by $C(m)$ at t. For $m < n$ consider the following strategy profiles where along

the equilibrium path $C(m)$ makes unacceptable offers at both $t = 1, 2$, and no sale is made.

$t = 1$:

(i) $C(m)$ asks for $p^m(1) = 3V$, which is an unacceptable offer.

(ii) The buyer accepts an offer from $C(m)$ if and only if $p^m(1) \leq 0$.

(iii) Irrespective of whether the buyer accepts an offer from $C(m)$ or not, all individual landowners ask for $2V$ if $n - m \geq 2$. If $n - m = 1$, the individual landowner asks for $2V$ if $2V \geq \tilde{v}$, and $3V$ otherwise.

(iv) The buyer rejects all offers by individual landowners if he has rejected $C(m)$. In case he has accepted $C(m)$ he accepts all offers if his continuation payoff from doing so is positive. Otherwise he rejects all offers.

Next consider $t = 2$ (and $m < n$):

Suppose the buyer has accepted $C(m)$ and j individual landowners are active. Then the individual landowners ask for V, with the buyer accepting all offers if and only if doing so yields him a non-negative continuation payoff. Otherwise he rejects all offers.

Next suppose that the buyer has rejected $C(m)$, but j individual landowners are active. Then the strategies are as follows:

(i) $C(m)$ asks for $p^m(2) = 3V$, which is an unacceptable offer.

(ii) The buyer accepts an offer from $C(m)$ if and only if $p^m(2) \leq 0$.

(iii) In case the buyer accepts an offer from $C(m)$, all individual landowners ask for V/j. Otherwise, all ask for V.

(iv) The buyer rejects all offers by individual landowners if he has rejected $C(m)$. In case he has accepted $C(m)$ he accepts all offers if his continuation payoff from doing so is positive. Otherwise he rejects all offers.

(b) Consider the case where $m = n$. In case

$$u(2V/n) > u(v/n) + u(V/n),$$

then $C(n)$ asks for $2V$, which the buyer accepts.

Otherwise, $C(m)$ makes an unacceptable offer at $t = 1$ (i.e. asks for more than $2V$), and asks for V at $t = 2$. ■

Proof of Proposition 5. 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

$$u(\tilde{v} + \frac{2V - n\tilde{v}}{m}), \tag{11}$$

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

$$u(v/n) + u(\frac{V - v}{m} + v/n), \tag{12}$$

in case an agreement is reached at $t = 2$. There are two cases to consider.

Case A. Let $2V < n\tilde{v}$. Note that the average utility of the party members in case an agreement is reached at $t = 1$, i.e. $u(\tilde{v} + \frac{2V - n\tilde{v}}{m})$, is increasing in m. Whereas in case an agreement is reached at $t = 2$, it is $u(v/n) + u(\frac{V-v}{m} + v/n)$, which is decreasing in m. Thus average utility of party members is maximized at $m = 1$ and $t = 2$ if and only if:

$$u(v/n) + u(V - v + v/n) \geq u(2V/n),$$

otherwise it involves $m = n$ and $t = 1$. We then argue that the above inequality holds. Note that

$$u(2V/n) < u(\tilde{v}) = 2u(v/n) < u(v/n) + u(V/n),$$

where the first inequality follows since $2V < n\tilde{v}$, the equality follows from the definition of $\tilde{v}$, and the second inequality follows since $V > v$.

Case B. Let $2V \geq n\tilde{v}$. Then irrespective of whether an agreement is reached at $t = 1$, or $t = 2$, average payoff is decreasing in m. Thus optimal party size involves $m = 1$. Whether there is inefficiency or not depends on whether average payoffs are higher at $t = 1$, or $t = 2$. ■

Proof of Proposition 7(ii). Given that $\frac{-u''(x)}{u'(x)/x} < 1$, it follows that $xu'(x)$ is increasing in x. Further, since $-\frac{u'''(x)}{u''(x)/x} \leq 2$, we have 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 $\lim_{x\to 0} xu'(x) \geq 0$, $\frac{2v}{n}u'(2v/n) \geq \frac{2v}{n}u'(v/n)$. ■

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