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Institutional Imperfections and Buyer-Induced Holdout in Land Acquisition

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Institutional imperfections and buyer-induced holdout in land acquisition

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Abstract

Imperfect institutions, particularly in developing economies, encourage bureaucratic corruption and outside interference by political parties or civic-society organisations, thereby distorting property rights for land. We characterise conditions when an industrial buyer's optimal design to acquire land strategically involves holdout as a response to these imperfections. We propose testable hypotheses suggesting that such form of holdout increases (i) with a reduction in corruption if the current imperfections are significant, (ii) with an increase in ease of political opposition, and (iii) during elections. We also study welfare implications and discuss the relevance of the framework and the results for advanced economies.

JEL Classification:. DO4, K11, O25, Q15, R52

Keywords: Land acquisition, institutional imperfections, outside interference, buyer-induced holdout.

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1 Introduction

Lack of availability of land is a major obstacle to industrialisation in many countries. Agitations and counter agitations over land acquisition are an everyday feature in many less developed countries (LDCs) that are seeking rapid industrialisation, and this trend is also observed in some parts of the developed world. A common problem is the difficulty of agreeing on a price for this special asset that is fair to all the stakeholders. Another is strategic holdout by sellers while bargaining with the buyers. Many countries, including the US, India, UK, and the EU have therefore promulgated 'eminent domain' laws that allow land acquisition for public purposes.

The aim of the present paper is to look beyond the issues of compensation and seller-induced holdout. We argue that institutional imperfections that increase transaction costs and encourage outside interference by political parties and/or civic societies in the form of protests and agitations, give birth to a new form of holdout that is buyer-induced. The buyer strategically designs an acquisition mechanism to tackle institutional imperfections through political involvement, incentivising sellers to holdout.

Agitations over land acquisition are widespread across the political and economic spectrum, ranging from relatively poor democracies like India and Brazil, to rich democracies like the US, to emerging economies like China that is a political dictatorship. We then briefly discuss a few case studies of such agitations that generate the sylized facts that we use in our formal modelling. Taken together they show the involvement of several types of 'agents' including political parties, civil societies, state machinery and of course the buyers and the sellers. In particular, land acquisition involves a significant amount of mediation by the local government and one often finds that the party in power supports acquisition of land for industrial use.[1] This can either be direct or indirect, involving the (mis)use of government machinery. In contrast, opposition may come from a much wider spectrum of stakeholders, including various interest groups like the civil society organisations and political parties that are typically out of office.[2] In many cases such agitations are wholly carried out by interest groups. In others, while one or more interest groups may initiate the protest, political parties step in later, and either take over from them, or conduct the agitation in partnership with them.[3] We now turn to specific case studies.

[1]Although our focus is on democratic nations, land-grabbing is widespread all over the world. In China, for example, in 2005 alone, there were over 60,000 local disturbances provoked by attempts at acquiring agricultural land (Banerjee et al., 2007). Cao et al. (2008) report that, in the first 9 months of 2006, there were 17,900 cases of "massive rural incidents" in China, involving around 385,000 protesting farmers. Further, between 1996-2005, 20 million farmers were evicted from agriculture due to land acquisition, with more than 21 per cent of arable land being converted to non-agricultural use between 1996-2005 (Goswami, 2007).

[2]In the Indian context, the growth of civil society has been astronomical, from around a few hundred thousand NGOs around the 1970s, to around around 3.3 million by mid-2010. Many of these NGOs are actively involved is various land agitations. Such ideological stances by NGOs are easy to understand given that land acquisition is an emotive issue, especially in an LDC context leading to serious humanitarian tragedies. 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.

[3]The presence of certain key conditions, central to our theoretical study, incentivise involvement by political parties (for a discussion of the Indian scenario see Chakravorty, 2013). An active media presence ensures greater political mileage in case of involvement. Second, locally active interest groups not only provide necessary information and

Tata project in Singur, West Bengal, India. In 2006, the state government of West Bengal, India, used the archaic Land Acquisitions Act of 1894 to help a private firm acquire 997 acres of prime agricultural land for building an automobile factory in Singur. The process was not only championed by the ruling Left Front, the ruling coalition, which anticipated violent protests, used the state bureaucracy and the police to further its cause.[4] The opposition to land acquisition was organised around the Krishi Jomi Bachao Committee (Committee to Save Farmland).[5] The problem spread elsewhere in the state and exhibited the same pattern of stakeholders.[6]

Vedanta project in Kalahandi, Orissa, India. In 2002, the Vedanta project in the Kalahandi districts of Orissa, India, to develop an alumunium factory is another troubled case of land acquisition with identical features. While the land acquisition process was supported by the ruling Biju Janata Dal (BJD) government, it was opposed by a local organisation, the Save Niyamgiri Group, later joined by others like Green Kalahandi, as well as some international organisations, including Amnesty International. Much of this opposition was backed by the government machinery of the Central Government (including the Ministry of Environment and Forests), then ruled by the Congress party.[7]

Brazil, Kenya and Bangladesh. State-led land-grabbing and violent protests against it by the civil society are not new in Brazil too. Efforts to secure economic development have inflicted great territorial losses on native Brazilians and peasant communities. Prominent among them are the relatively recent protests against the acquisition of farmland between 2009-2011 that delayed one of

support to the involved landowners, but also coordinate the initial resistance. This creates potential 'flash points' which political parties can exploit. Further, intervention becomes more attractive if land is fragmented, increasing the number of affected people, along with economic development, which creates a need for land acquisition.

[4]During this agitation the state government used the state machinery to impose Section 144 of the Criminal Procedure Code in parts of Singur, with Section 144 conferring several powers on the government aimed at restricting personal liberty. See http://timesofindia.indiatimes.com/india/Sec-144-in-Singur-illegal-HC/articleshow/1614554.cms?referral=PM.

[5]This was a rainbow coalition, consisting of various interest groups, e.g. the Uchchhed Birodhi Committee (Committee Against Forced Displacement), the Gana Unnayan O Jana Adhikar Sangram Committee, among others. It also involved the main local opposition parties, the Trinamul Congress (TMC), as well as parties belonging to the extreme left, e.g. the CPI (ML) State Organising Committee. The resulting agitation led to fasts, highway blockades, strikes, and even alleged rapes and suicides. Ultimately the project had to be scrapped (see, e.g. Sarkar, 2007).

[6]The so-called 2007 Nandigram agitations in West Bengal started when the West Bengal government tried to acquire land for building a chemical hub, leading to violent agitations. This attempt at land acquisition was backed by the ruling Left Front helped by the local bureaucracy and the police. The agitation was initially spearheaded by two interest groups, the Gana Unnayan O Jana Adhikar Sangram Committee (Committee for Public Development and People's Rights Struggle) and the Nandigram Jomi Uchhed Birodhi O Jana Shakti Raksha Committee (Nandigram Committee to Resist Land Ousting and Save People Power). Later, several political parties, including the Congress and the Trinamul Congress joined the protests. The resulting agitations led to massive violence requiring police involvement, and even to farmer deaths (Banerjee et al., 2007). While the buyer, with the ruling party's help convinced some land owners to sell their plots early on in the process, the project was abandoned as the Congress and the Trinamul Congress won the political contest.

[7]Political interference was also evident in several other land acquisition processes in India, such as by the Orissa government for building a steel plant by Posco (Chandra, 2008), by the Jharkhand government for building a steel plant and also a power project in Khuntia district (Basu, 2008), by the Himachal Pradesh government for building an international airport along with air cargo hub at Gagret in the Una district (Panwar, 2008), among others.

its most promising industrial projects, CISPA, worth USD 40 billion (Pedlowski, 2012). In Kenya, local community protests led to the eventual scrapping of a project by Nuove Iniziative Indutrialis Sri (Maggi, 2013). In Bangladesh, differences between local and state politicians often result in land disputes and violence, that lead to political interference (Pons-Vignon and LeComte, 2004).

Foxconn project, USA. Extra legal involvement of outsiders in the process of land acquisition is observed in the US too. Foxconn's investments in Wisconsin in 2017 had famously raised a controversy around the buyer's involvement with the US government, including the political relationship between president Trump and Terry Tou, the then Taiwanese presidential candidate, founder and chairman of Foxconn.[8] The project, aiming at 3,000 acres of farmland, was exempted from state environmental protections and the deal was regarded as "the richest tax credit and subsidy package in the state's history." The Milwaukee Business Journal reported that the costs of acquiring land dramatically exceeded its fair value with an official price offer of $50,000 per acre and "140 percent of an agreed-upon fair market value for homes to all private landowners, not just the first to accept the village's purchase offers," leading to a dramatic fall in credit rating of the village. The scenario indicates the presence of bureaucratic corruption and outside political interference as a cause for the acquisition of most of the plots except the last few whose owners declined the offer, leading to holdout that is similar to what we obtain in this paper.[9]

As illustrated by these case studies, land acquisition typically involve *outside interference* leading to agitations, and even political interventions, particularly in LDCs.[10] What are the reasons

[8]Foxconn is Taiwan's largest private employer, the main assembler of iPhones and other electronic products. Bloomberg News reported that since 2017 the company secured around USD 4.5 billion in incentives and infrastructure improvements from the state of Wisconsin, and in exchange promised 13,000 local jobs and a new manufacturing project worth USD 10 billion in Racine, Wisconsin (see https://www.bloomberg.com/news/features/2019-02-06/inside-wisconsin-s-disastrous-4-5-billion-deal-with-foxconn and https://www.bloomberg.com/news/articles/2019-01-30/foxconn-reconsidering-10-billion-u-s-lcd-plant-reuters-says). See also
https://www.bizjournals.com/milwaukee/news/2019/01/23/see-work-on-foxconn-plant-advance-while-land.html.;
https://www.theverge.com/2019/4/10/18296793/foxconn-wisconsin-location-factory-innovation-centers-technology-hub-no-news;
https://patch.com/wisconsin/mountpleasant/foxconn-eminent-domain-trial-starts-week;
https://eu.jsonline.com/story/money/business/2018/09/28/foxconn-holdout-landowners-win-reprieve-village-taking-property/1458109002/ and
https://www.wsj.com/articles/foxconn-tore-up-a-small-town-to-build-a-big-factorythen-retreated-11556557652/ and https://www.cnbc.com/2019/07/08/wisconsin-governor-says-foxconn-is-again-likely-to-miss-job-targets.html.

[9]Coercion in this case was longer-lived than in the theoretical framework we study. The whole process was based on negotiated outcomes (viz. government purchase for non-public uses but with intention to package the land as part of an investment incentive deal to attract Foxconn) and the local government eventually attempted to use eminent domain powers by including a road extension for 'public purposes' to complete the process. Since the road extension was perceived to serve Foxconn's private purposes as well, this resulted in a pending case against the village and its Community Development Authority. With outside help from the local society and other interest groups, the final round of negotiation between Foxconn and the last buyers remained an ongoing case as of July 9, 2019.

[10]While our focus is on land transactions beyond the scope of eminent domains, outside intervention and agitation can occur even where land acquisition is for national purposes. For example, in the UK, the HS2 rail project delivered by High Speed Two (HS2) Limited - a state owned company - has been subject to both political and community controversies, including protests by Extinction Rebellion and Stop HS2 NGOs questioning the project. Further to this, HS2 Rebellion protested against compulsory land purchases. Moreover, several landowners complained that the

behind such interference? The literature traces such interference to the imperfection of the institutional framework in LDCs, precisely to legal and political infirmities. In the legal dimension, weak property rights – particularly weak exchange rights – in land transactions form a critical bottleneck. This can be traced to out-dated land records, poor land surveys causing improper identification of *de facto* and *de jure* owners (Lindsay, 2012, Feder and Feeny, 1991, Ghatak and Mookherjee, 2014), and mis-classification of land quality (Ghatak et al., 2013).[11] These aspects of the land market, along with legal requirements that land sale must involve state-level bureaucracy (see Chakravorty, 2013, for the case of India), and the fact that accessing legal protection is costly, exacerbate bureaucratic corruption and results in higher transaction costs (on top of the existing high burden of due diligence costs, government-imposed transaction taxes and stamp duties).

Weak property rights, coupled with weak law enforcement can lead to actual/perceived inequities, creating a space for activist groups. Typically the party in power seems to support land acquisition, whereas the parties in opposition seem to oppose it. One can think of two related reasons for the ruling party's support. First, it has to compete for mobile capital (since it is relatively more accountable for industrialisation, job creation, etc.). Second, it may be in a better position to help reduce the associated high transaction costs. The party in opposition however may see a scope for electoral gains from political obstructionism (Rodden and Rose-Ackerman, 1997). Moreover, opposition may also be ideologically driven and spearheaded by interest groups, as mentioned above. Outside interference in this paper will therefore involve two entities: (a) one that opposes land acquisition and prevents its peaceful implementation, and (b) the other that helps economic agents fight against this opposition but engages in political rent-seeking in exchange.

How does an apolitical and profit-maximising industrial buyer of land respond to outside interference? How does he use the pro-acquisition party in his fight against opposition forces or existing bureaucratic bottlenecks, and how does that affect delay in industrialisation or welfare of the landowners? We borrow ideas from the discussion above and address these questions in the following theoretical framework.

We consider an economy with weak institutions (that promote bureaucratic corruption and allow for outside interference) comprising an apolitical industrial buyer seeking plots of land from several sellers. The profitability of the project depends on the number of plots acquired. There are two outsiders, called 'parties' F and A. Party F is in power and stands 'for' land acquisition while party A is out of power and stands 'against.' Party F can lower the transactions costs associated with land sale for both the buyer and the sellers by tackling bureaucratic corruption. Moreover, weak law enforcement allows A to possibly slow down the process through various means, legal or extra-legal, including violence. This enlarges the scope of F since it can also help overcome this opposition.

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compensation process had been cumbersome and that it did not reflect the market value of their properties.

[11]Such weak property rights crucially contribute to a thin land market in most LDCs (Binswanger et al., 1995). Alston et al. (2012) argued that, the absence of *de jure* property rights – as evident in frontier regions of several countries, including Australia, Brazil and the U.S. – led to problems in land acquisition. Further, in case of private bargaining, ill-defined property rights force buyers to deal with non-owners, possibly leading to conflict (Banerjee et al., 2007). Relatedly, in Brazil, there were conflicts between landowners and squatters over property rights (Alston et al., 2000).

The buyer rationally decides on the level of involvement of F in the process of land acquisition, and through F makes a take-it-or-leave-it offer to a specific number of sellers. The sellers are free to bypass party mediation and approach the buyer directly at a later stage (albeit transaction costs are higher then) provided F wins the contest against A so that the project is on. In this contest, F's strength is endogenous and depends on the number of sellers the buyer targets through F. We embed this interaction within a larger game where A decides on its level of opposition, with an increase in opposition making it costlier for F to fight. F decides on the rent it charges from the buyer in return for its participation in the process. Thus the extent of outside interference is endogenous in our framework, and is determined by deeper institutional parameters like the level of bureaucratic corruption and the ease of organising opposition.

We say that there is holdout if there is a positive probability that A manages to stop the project by reducing the number of sales in the initial phase of the acquisition process. The interesting feature of holdout in our model is that delay, if any, is buyer-induced and thus the central question is to characterise conditions under which it is in the buyer's best interests to delay the process. In particular, we examine how the magnitude of this buyer-induced holdout is related to the deeper institutional parameters of this economy, namely, the level of bureaucratic corruption, the ease of opposition and timing of elections that may tilt preferences of political parties towards political gains.

Our first set of results is a characterisation of the institutional environment in which the buyer finds it in his best interest to reduce the powers of F and make initial offers to only a limited number of sellers. Why does the buyer do this? First consider the late stage of the game where the level of opposition by A, and the rent being charged by F is fixed. As expected, we find that the equilibrium implements holdout whenever the per seller rent charged by F is significantly higher than the transactions costs due to bureaucratic corruption, which is intuitive since in that case acquiring too many plots through F may be very costly for the buyer. But then, why does not F charge a lower rent, given that doing so leads to a greater number of sellers under its control, thereby increasing party F's political clout? We find that the equilibrium involves holdout as long as opposing is relatively inexpensive for A, and/or A is sufficiently motivated to gain political power. In that case A provides significant opposition to land acquisition, so that the pro-acquisition party, i.e. F, is forced to charge a high political rent. This in turn ensures that there is buyer-induced holdout.

Our second set of results is on the effects of bureaucratic corruption on two measures of welfare, namely, buyer-induced holdout and aggregate seller utility. We find that while a fall in corruption *reduces* holdout when corruption is low, it necessarily *increases* it when corruption is high. Intuitively, a reduction in transactions costs has two effects, one direct, in that it increases a seller's incentive to sell her plot, and one indirect, in that it makes it less attractive for the buyer and the sellers to work through F since F responds to a decrease in corruption by increasing the political rent it charges. This in turn reduces party F's political clout in that a smaller number of sellers sell via political intermediation, making buyer-induced holdout more likely. If corruption is large to begin with, then the political considerations that drive the indirect effect becomes quite important, hence the indirect effect dominates. Further, an increase in bureaucratic corruption or a decrease in ease of opposition unambiguously hurt sellers.

We then argue that by and large, buyer-induced holdout is more likely to occur when elections are nearby and the concerned projects are large. We also find that seller welfare typically goes down for projects under acquisition in periods close to elections provided the projects are large. Finally, we find that an increase in bureaucratic corruption necessarily reduces the price of land that is sold through F and the dispersion in price across F-administered sales and direct buyer-sellers bargaining necessarily increases.

1.1 Related literature

Formal treatments of the holdout problem was developed in Cai (2000, 2003), Menezes and Pitchford (2004), Miceli and Segerson (2007) and Roy Chowdhury and Sengupta (2012).[12] These models typically examine a strategic bargaining framework with complementarity in the number of plots acquired. These two aspects generate a possible last-mover advantage, which can yield inefficiency in the form of delay, as demonstrated by Cai (2003), Menezes and Pitchford (2004) and Miceli and Segerson (2007). Roy Chowdhury and Sengupta (2012) however demonstrate that there exist equilibria that are asymptotically efficient whenever the bargaining protocol is transparent, so that inefficiency does not necessarily follow. For a comprehensive survey on the literature on land acquisition and holdout, see Saha (2017, Chapter 3).

While, in line with this literature, our paper also shows that inefficiency can obtain even under complete information, there are critical differences. In our framework, holdout is buyer-induced, with the buyer himself optimally choosing strategies so that holdout emerges. Further, holdout occurs despite the sellers having no intrinsic reason to prefer holdout, formally despite there being no technological complementarity among plots. Rather, holdout emerges because of institutional weaknesses that allow various parties to intervene in the process. Interestingly, note that we employ a 'bargaining protocol' which is transparent in the sense of Roy Chowdhury and Sengupta (2012), in that all offers are publicly observable. Nonetheless, in contrast to Roy Chowdhury and Sengupta (2012), we find that inefficiency continues to exist.

Although the correlation between bureaucratic corruption, politics and economic development is well accepted, the literature on this issue is divided. While one strand of the literature interprets corruption as an obstacle to economic development (see for example Blackburn et al. (2006)), the other argues that corruption may 'grease' the process of development, thereby facilitating beneficial trades and improving efficiency (see for example Levy (2007)). Turning to the empirical literature, there is anecdotal support for the latter viewpoint, at least in the context of LDCs (see Aidt (2009)). Moreover, while the literature on how inefficiencies in democratic institutions affect the level of corruption is limited, there is some evidence that the political environment affects the likelihood of successful development (see for example, Svensson (2005), Paldam (2002), Ades and Di Tella (1997) and Bardhan (1997)). The theory presented in this paper unifies these various strands in the context of land acquisition by providing conditions under which both these positions

[12] In the patents literature, Shapiro (2001) suggests that strategic holdout is a serious obstacle to R&D, and consequently long-run growth.

prevail. For example, we show that while a reduction in corruption reduces the holdout problem when corruption is not too large to begin with, it may increase holdout otherwise.

The remainder of the paper is organised as follows. Section 2 presents the model, Section 3 studies how economic decisions are shaped by the degree of outside interference emerging in the early stages of the framework, and how that induces buyer-induced holdout. This leads to Section 4 that studies how the two parties, foreseeing the actions of the buyer and the sellers, attempt to influence the outside interference climate. Section 5 contains how changes in the deeper parameters of our framework affects several variables of interest, including the level of buyer-induced holdout and the welfare of the sellers. The paper concludes in Section 7. All proofs are included in an appendix.

2 An institutional model of land acquisition

Local economy and the industrial project: A representative locality whose economy is based on land (agriculture, farming or forestry) consists of a continuum of sellers (of unit mass) holding identical plots of land all of which yield a non-negative return v to their owners in their current uses. A buyer B wishes to buy land in order to set up an industrial project that yields a revenue of $V(x) = \lambda x$, where $0 \leq x \leq 1$ is the fraction of plots used, and λ is the marginal productivity of land when used in the project.

Bureaucratic corruption: The process of land acquisition faces *bureaucratic corruption* in offices dealing with land transactions: any land sale between an individual seller and a buyer involves a transactions cost of $r_I \geq 0$, with the buyer bearing a fraction β, and the seller a fraction $1 - \beta$ of this cost, where β is exogenous to our analysis. We assume that $\lambda - v - r_I > 0$, so that the project is economically viable even after accounting for this bureaucratic corruption.

Outside interference: The buyer and sellers confront an interference process that involves two 'parties' with opposing incentives, one that is *for* land acquisition (called F), and the other that is *against* (called A). The outside interference process interacts with the process of land acquisition at the following levels: (i) if the project is to be undertaken in the area, land sale must involve F, as otherwise it becomes impossible for the buyer to overcome the opposition from A and (ii) r_I can be bypassed only if the sale is mediated by F.

Early offers and interference contest: The buyer specifies a plot price $q \geq 0$ and a fraction $0 \leq k \leq 1$ of the plots that he wishes to buy through party F, which then approaches a fraction k of the sellers with this price offer. If these k sellers agree to the buyer's offer (k, q) (intermediated by party F), then F wins the *interference contest* against A with probability $\pi(k) = k$. The formulation $\pi(k) = k$ is the celebrated Tullock lottery contest success function (see Corchon, 2007).[13]

Post-contest activity and late offers: If A wins the contest, the project is abandoned. Otherwise, these k sellers commit to sell their plots at a price q, and party F leverages its connections in the

[13]In Online Appendix 9 we work out the case for general functions for $\pi(k)$ (as well as $V(x)$) to show existence of buyer-induced holdout.

bureaucracy (e.g. in the office of land transactions) to ensure that the additional transaction cost r_I is waived. The remaining $1-k$ fraction of sellers can then approach the buyer by jointly entering a direct bargaining process with the buyer that results in a Nash-bargaining outcome on the residual surplus. This determines a plot price q_b at which all remaining $1-k$ plots are sold. As discussed earlier, each such transaction entails a transaction cost r_I due to bureaucratic corruption.

Payoffs of Sellers and the Buyer: If the project fails, then all sellers earn v and the buyer earns 0. Otherwise, if the project goes through and if k plots are acquired through early offers at price q (while the remaining are acquired at the bargaining price q_b), then the buyer's payoff is

$$\lambda - (q + r_P)k - (1-k)(q_b + \beta r_I),$$

while the payoff to an early seller is q and that to a late seller is $q_b - (1-\beta)r_I$.

Payoffs of F: For pure political gains, F wants to demonstrate its 'power' in the locality that we proxy by the probability $\pi(k)$ with which F succeeds in the contest with A. But political power is costly as it requires coordinating k sellers during the contest that generates a cost of $C(k) = ck^2$ for party F, $c > 0$.[14]. Institutional imperfections in the environment allow F to finance this cost through rent-seeking activities. In particular, we assume that F asks the buyer to pay a rent of r_P per unit of plot it administers provided the project goes through. Thus, F's return from political power is $\pi(k)$ while its return from rents, less contest-costs is $\pi(k)kr_P - ck^2$. F's utility is

$$\gamma\pi(k) + (1-\gamma)[\pi(k)kr_P - ck^2], \tag{1}$$

where $0 < \gamma < 1$ measures the relative importance of political power. We assume that the reservation payoff of party F is zero.

Payoffs of A: If $\pi(k)$ measures F's political power, then $1 - \pi(k)$ measures the political power of A in the contest. Again, for pure political reasons, A gets a direct return from power. From the utility function of F it follows that ceteris paribus, a higher level of c makes it costlier for F to win the political contest. Thus, by choosing a higher level of c, party A increases the *degree of opposition* and thereby increase its power. However, increasing c is costly for A and for simplicity we assume that the marginal cost of doing so is constant at $\alpha > 0$. The parameter α is related to *ease of opposition* so that lower values of α makes opposition easier. It has two possible interpretations. First, it is a measure of the robustness of the 'rule of law,' an institutional feature of the economy. Thus a higher α means better rule of law as that makes it harder for A to interfere with the process of land transaction once the project passes the interference stage. Alternatively it may mean that A has a smaller presence in the area under consideration (see Section 5.2 for more on this) and therefore less influence in the local land related bureaucracy. Like party F, the utility of A also has

[14]For presentational clarity and algebraic ease we will work with quadratic costs, in particular the cost function. The main results on existence of holdout reported here go through with general convex cost functions as proved in the online Appendix 9

two components, the direct political returns of $1 - \pi(k)$ and the costs incurred in acquiring it that amounts to $-\alpha c$. Thus A's utility is given by

$$\delta(1 - \pi(k)) - (1 - \delta)\alpha c, \tag{2}$$

where $0 < \delta < 1$ measures the relative importance of political power which in principle can be different from γ. A's reservation payoff is assumed to be zero as well. In Section 5 we will connect δ and γ to elections by assuming that their values are likely to be higher in during election times.

The environment described above yields a dynamic game of complete information, denoted by Γ_{α,r_I}, with a timeline depicted in Figure 1. We say that Γ_{α,r_I} generates *buyer-induced holdout* (of size $1 - k$) if in the sub-game perfect equilibrium (or simply, equilibrium) of Γ_{α,r_I} the buyer's offer (k, q) has $k < 1$.

5.pdf

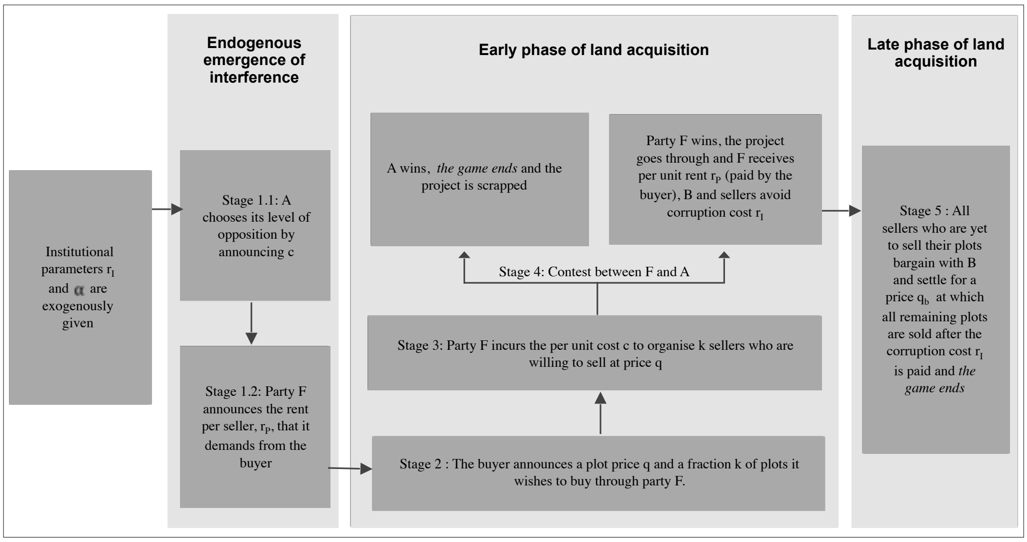

Figure 1: Timeline of the game Γ_{α,r_I}

3 Optimal land acquisition design and buyer-induced holdout

In this section we will take the interference variables (viz. r_P and c) as well as F's decision to participate as given, and examine the decisions made by the buyer and the sellers across the two phases of land acquisition.

3.1 Late phase of land acquisition

Suppose the game reaches Stage 5 with a fraction $0 \leq k < 1$ of sellers having already sold their plots. The remaining $1 - k$ fraction of sellers enter into bargaining with the buyer (although an artefact of our modelling framework, note that since $\pi(0) = 0$, to reach stage 5 with positive probability, it must be that $k > 0$), with the payoffs being the outcome of a symmetric Nash bargaining process involving the buyer on one side, and all remaining $1-k$ sellers on the other. The Nash program is:

$$\max_{q_b \geq 0}[\lambda - (1-k)(q_b + \beta r_I) - \lambda k][(1-k)(q_b - v - (1-\beta)r_I)]. \tag{3}$$

The following lemma is straightforward.

Lemma **1** *In the late stage suppose a fraction $1-k$ of sellers bargain with the buyer to sell their plots. Then the Nash bargaining price is $q_b = \frac{v+\lambda}{2} + r_I\left(\frac{1}{2} - \beta\right)$. Consequently, q_b is (a) increasing in v and λ, (b) decreasing in β, (c) increasing in r_I iff $\beta < \frac{1}{2}$, and (d) unaffected by α, r_P and k.*

We next turn to determining k and the first period price q.

3.2 Early phase of land acquisition: a first look at buyer-induced holdout

We begin with stage 2 where the buyer must decide on k and q. If an announcement (q,k) is accepted, then the payoff of each such seller is $\pi(k)q + (1-\pi(k))v$, whereas the payoff of any seller who delays sale equals $\pi(k)(q_b - (1-\beta)r_I) + (1-\pi(k))v$. Clearly, if he sets a price such that $\pi(k)q + (1-\pi(k))v < \pi(k)(q_b - (1-\beta)r_I) + (1-\pi(k))v$, then the sellers would prefer to wait and he cannot implement k. Thus, he would prefer to set the minimum possible price k such that, $\pi(k)q + (1-\pi(k))v \geq \pi(k)(q_b - (1-\beta)r_I) + (1-\pi(k))v$. Hence for any fixed target k of phase one sellers, we have

$$q(k) = q_b - (1-\beta)r_I. \tag{4}$$

The following lemma is then immediate.

Lemma **2** *The early and late phase prices of land are $q = \frac{\lambda+v}{2} - \frac{r_I}{2}$ and $q_b = \frac{\lambda+v}{2} + r_I\left(\frac{1}{2} - \beta\right)$ respectively, with $q < q_b$.*

Note that q and q_b are neither affected by any of the interference variables r_P and c, nor by the parameters γ and δ, nor by the rule of law (or ease of opposition) parameter α. As we shall later find, the effect of these parameters are manifested only in the size of buyer-induced holdout, i.e. $1-k^*$.

Given F's participation and Lemma 2, we now determine the buyer's optimal choice of k. The profit function of the buyer in stage 1 is

$$\Pi(k) = \pi(k)[\lambda - k(q + r_P) - (1-k)(q_b + \beta r_I)]. \tag{5}$$

Substituting $\pi(k)$, q and q_b in the above expression and simplifying further we obtain

$$\Pi(k) = \frac{1}{2}\left(2(r_I - r_P)k^2 + (\lambda - v - r_I)k\right). \tag{6}$$

Proposition 1 below demonstrates that buyer-induced holdout occurs whenever the political rent r_P is large. This proposition assumes of course that party F participates in the political process. Indeed, if c is too high so that F does not find it profitable to participate, then holdout appears trivially as the project gets scrapped with certainty.

PROPOSITION 1 *For an exogenously fixed political rent r_P, there is holdout in the land acquisition process if and only if r_P is significantly higher than the transactions costs, that is $r_P > r_I + \frac{\lambda - v - r_I}{4}$. The number of plots sold in the early stage is*

$$k^*(r_P) = \frac{\lambda - v - r_I}{4(r_P - r_I)}, \tag{7}$$

whenever $r_P > r_I + \frac{\lambda - v - r_I}{4}$, and $k^*(r_P) = 1$ otherwise. Moreover, the size of holdout increases in v and r_P, but decreases in r_I and λ.

From (7) it follows that in the continuation subgame that initiates economic activities, one obtains holdout in equilibrium whenever r_P exceeds $r_I + \frac{\lambda - v - r_I}{4}$. Why does not the buyer seek to acquire more plots in equilibrium? Intuitively, r_P measures the marginal cost of acquiring one more plot at the early stage, whereas the expression $r_I + \frac{\lambda - v - r_I}{4}$ measures the marginal benefit from doing so at $k = 1$. The expression $r_I + \frac{\lambda - v - r_I}{4}$ is intuitive as the first term, r_I, captures party F's contribution in reducing transaction costs, whereas the second part, $\frac{\lambda - v - r_I}{4}$, is a measure of party F's contribution in fighting A. In case we are in a continuation subgame where the demanded rent r_P exceeds the sum of these two contributions, there will be holdout. With the rent r_P being high, increasing the number of plots acquired is not profitable. Relatedly, why don't more sellers try to bypass the interference process and approach the buyer directly? The benefit of doing so is that she can obtain a higher price, whereas the cost is that she will have to pay the corruption costs herself and increase the probability of the project getting scrapped due to opposition. In equilibrium these two forces are balanced.

Proposition 1 generates several interesting and potentially testable hypotheses. If the locality has land with high value (i.e. v is high), either because of close proximity to a large city, or because of high fertility of land, then from Proposition 1 (see (7)) it follows that $k^*(r_P)$ is smaller. The effect is similar when the productivity of the industrial project is small. Consequently, Proposition 1 yields the following hypothesis: *urban vicinity, high land-fertility, and/or low project returns all make buyer-induced holdout more severe, and severity in turn reduces the chances of successful acquisition.* These predictions are also consistent with the basic thesis in Chakravorty (2013) that increased land value was central to the problems of land acquisition.

It is straightforward to demonstrate that our analysis is not dependant on the sellers being risk neutral. All results go through even in the presence of risk aversion. Next, how critical is the assumption that party F can help with reducing the transactions costs? To address this issue, consider a scenario where these transactions costs have to be borne by the buyer and the sellers even if the transactions are mediated by party F. In that case $q = q_b = \frac{v+\lambda}{2} - r_I(\frac{1}{2} - \beta)$, and $k^* = \frac{\lambda - v - r_I}{r_P}$. Thus the results are qualitatively similar in that holdout is still possible.

What if late stage price is settled through take-it-or-leave-it offers from the buyer? Then the second period price of land would be lower than under Nash bargaining. This would increase incentives of the buyer to reduce the number of period 1 offers, thus potentially increasing holdout. In any event, the basic result on the possibility of buyer-induced holdout is certainly not hostage to the exact price-settling protocol in the late stage.

4 Emergence of outside interference

We now study the effects of changes in the deeper parameters of the environment, r_I and α, on the level of holdout, and other variables of interest. In addition, endogenising r_P and c also serves as a robustness check for the preceding analysis.

4.1 Equilibrium rent for support

Suppose A has announced its degree of opposition by committing to some c, where $c \geq 0$. Party F now decides on the rent per seller, r_P, that it would demand from the buyer, taking the level of c as given. The level of r_P will of course determine the number of plots that the buyer will wish to acquire through F's mediation, which is something that party F factors in.

Let r_P^* denote the solution to the F party's problem. Further, let

$$\hat{r}_P := \frac{(1-\gamma)(2c - r_I)(\lambda - v - r_I) + \gamma r_I}{(1-\gamma)(\lambda - v - r_I) + \gamma} \text{ and } \bar{c} := \left(\frac{7}{8}\right) r_I + \frac{1}{8}\left(\frac{\gamma}{1-\gamma} + (\lambda - v)\right)$$

Proposition 2 below solves for the payoff-maximising choice of r_P, showing that, depending on the magnitude of c, the solution may or may not involve holdout.

Proposition **2** *Consider the continuation game initiated by A through a choice of opposition level c.*

(i) If $c \leq \bar{c}$, then $r_P^* = r_I + \frac{\lambda - v - r_I}{4}$, and there is no holdout*,*

(ii) If $c > \bar{c}$, then $r_P^* = \hat{r}_P > r_I + \frac{\lambda - v - r_I}{4}$, and there is holdout*.*

Proposition 2 is intuitive. Recall that party F derives its utility from two sources, political (defeating A) and economic (monetary gains from rents, net of costs of political contest). Whenever c, the degree of opposition from A is relatively weak (to be precise $c \leq \bar{c}$), the monetary benefits are sufficiently large so that the political benefits become relatively more attractive at the margin. In that case party F finds it optimal not to raise its demand for rent r_P by so much that the buyer's willingness to acquire land through party F is lowered. Thus it chooses the maximum rent $r_P^* = r_I + \frac{\lambda - v - r_I}{4}$ that ensures that there is no holdout (from Proposition 1 we know that the buyer finds it optimal to set $k^* = 1$). When c exceeds this cutoff, party F finds this low rent unsustainable and raises it beyond $r_I + \frac{\lambda - v - r_I}{4}$. This makes the buyer set a lower k^* and there is holdout.

4.2 Equilibrium opposition

The conditions that determine the extent of opposition from A will of course depend on the ease of opposition α, as well as δ, the political returns for party A. Proposition 3 below deals with this. Define two critical values:

$$c_f := r_I + \sqrt{\frac{\delta(\lambda - r_I - v)}{8\alpha(1-\delta)}} \text{ and } \bar{\alpha} := \left(\frac{\delta}{1-\delta}\right)\left(\frac{\lambda - r_I - v + \frac{v}{1-\gamma}}{(\lambda - r_I - v + \frac{\gamma}{1-\gamma})^2}\right).$$

Proposition 3 shows that there is holdout if and only if $\alpha < \bar{\alpha}$ and δ is sufficiently large.

Proposition 3 *(i) Suppose $\alpha \geq \bar{\alpha}$. Then there is no opposition in equilibrium, i.e. $c^* = 0$. (ii) Suppose $\alpha < \bar{\alpha}$. Then there exists $0 < \tilde{\delta} < 1$ such that if $\delta \leq \tilde{\delta}$ then $c^* = 0$, while if $\delta > \tilde{\delta}$ then $c^* = c_f$, with c_f (a) increasing in λ and decreasing in v and α and (b) decreasing in r_I if and only if $(\lambda - v) - r_I$ is sufficiently high.*

A strong rule of law and/or weak local presence of A – as captured by a high α so that ease of opposition is low – is of primary importance to A's decisions. If α is very high, A finds it optimal to not oppose at all. This is because to generate any delay via holdout, r_P has to be very large, which requires the level of c itself to be very high as well. With a large enough α this becomes unsustainable for A. While setting a high c becomes feasible for A when α falls, it should also be sufficiently motivated (that is δ should be sufficiently large). We have characterised a threshold value $\tilde{\delta}$ (obtained from (17) in the Appendix) such that A mounts significant opposition and there is holdout only when the marginal returns from this opposition is large ($\delta > \tilde{\delta}$).

How does the equilibrium political rent r_P^* get affected by the various parameters of the model? Corollary 1 deals with this.

Corollary 1 *Suppose $\alpha < \bar{\alpha}$ and $\delta > \tilde{\delta}$ so that there is holdout. Then the equilibrium rent r_P^* is given by*

$$r_P^* = \frac{(1-\gamma)\left(r_I + 2\sqrt{\frac{\delta(\lambda - r_I - v)}{8\alpha(1-\delta)}}\right)(\lambda - v - r_I) + \gamma r_I}{(1-\gamma)(\lambda - v - r_I) + \gamma}, \tag{8}$$

where r_P^* is

(i) monotonically increasing in λ and monotonically decreasing in v and α;

(ii) increasing in r_I if $(\lambda - v) - r_I$ is sufficiently high and decreasing otherwise.

It is straightforward to see that the rent per seller r_P charged by F is increasing in λ, and decreasing in α. Consider an increase in v. Following this, the buyer's initial price offer q (as well as q_b) must rise. This becomes economically infeasible for the buyer unless F provides room for the buyer by reducing r_P. These forces work in the exact opposite direction when λ increases. Hence for projects where land has high marginal productivity, rents are high as well. We now address the non-monotonicity of equilibrium rent in the degree of bureaucratic corruption r_I. Suppose r_I is large so that $(\lambda - v) - r_I$ is small. A further increase in r_I makes it too attractive for the buyer to buy out more plots today as a rise r_I increases the gap between q and q_b significantly. This increase in demand for F-administered sale gives room to party F to finance its war against A and earn enough returns from it so that it finds optimal to increase this demand optimally through a reduction in rent. On the other hand when r_I is small so that $(\lambda - v) - r_I$ is sufficiently high, the buyer does not dislike second period purchase except that it still requires a sufficient amount of F-administered sales in order to overcome the period 1 political hurdle. Party F can therefore coerce the buyer with a higher rent knowing that this would not force the buyer to reduce first period purchase significantly. Finally we demonstrate that Party F's equilibrium payoff is positive, so that F finds it optimal to participate. Note that F's payoff is zero at $k = 0$ and is increasing in

k whenever $r_P > c$. In equilibrium, $c^* = c_f$ and $r_P^* - c_f$ simplifies to

$$r_P^* - c_f = \frac{(3(1-\gamma)(\lambda - v - r_I) + \gamma)\left(\sqrt{\frac{\delta(\lambda - r_I - v)}{8\alpha(1-\delta)}}\right)}{(1-\gamma)(\lambda - v - r_I) + \gamma} > 0$$

since $0 < \gamma < 1$, $0 < \delta < 1$ and $\lambda > v + r_I$.

4.3 Equilibrium holdout

We are now in a position to report the equilibrium of the full game.

Theorem **1** *Let k^* denote the equilibrium fraction of land acquired through the intermediation of party F.*

(i) $k^* = 1$ *if either (a)* $\alpha \geq \bar{\alpha}$*, or (b)* $\alpha < \bar{\alpha}$ *and* $\delta \leq \tilde{\delta}$*; otherwise* $k^* = \frac{(1-\gamma)(\lambda - r_I - v) + \gamma}{8(1-\gamma)(c_f - r_I)} < 1$.

(ii) In the early phase, the fraction k^* of land is sold at price $q = \frac{\lambda+v}{2} - \frac{r_I}{2}$. In case party F wins the political contest against party A, then the remaining plots are sold in the late phase at price $q_b = \frac{\lambda+v}{2} + r_I(\frac{1}{2} - \beta)$; thus $q_b = q + r_I(1-\beta)$ so that $q < q_b$ for all $0 < \beta < 1$.

Theorem 1 provides an overview of the study so far. If it is hard for A to oppose, i.e. α is high, or A's ideological drive against industrialisation is not too strong, i.e. δ is small, then A will not oppose land acquisition at all. In that case the rent demanded by party F is small, thus the buyer buys all land using party F and the project takes place with probability 1. Otherwise, A offers significant opposition to land acquisition, which forces party F to charge larger rents. This induces the buyer to acquire a smaller fraction of plots through party F, thereby opening up the possibility of A winning the political contest with F and stalling the project. In such a situation, the price offered in the initial phase, i.e. q, is smaller than the eventual price q_b. Interestingly, all sellers end up with equal payoffs irrespective of whether the project is stalled (in which case each earn v) or whether it goes through (in which case early phase sellers earn q while the late phase sellers earn $q_b - r_I(1-\beta)$ where equilibrium equalises these two quantities). However, there is land-price dispersion like in the standard models of holdout, where prices offered to late sellers are higher. This dispersion increases with the degree of bureaucratic corruption but remains unaffected with ease of opposition unless the ease of opposition is small (viz. α large) in which case all land is sold at a single price. As expected of course, the degree of price dispersion is also affected by the bargaining power of the buyer vis-a-vis the sellers once they are free to negotiate the price without involving party F. In particular, as the sellers' power increases, the price dispersion increases.

5 Welfare

We are now in a position to examine the impact of changes in the deeper parameters of our framework – namely the degree of bureaucratic corruption (viz. r_I), the ease of opposition (viz. α) and the preference parameters of F and A (viz. γ and δ) – on two measures of welfare: delay in industrialisation (or the size of holdout) and welfare of the sellers.

5.1 Delay in industrialisation

How does an improvement in institutions affect the extent of holdout that slows the process of industrialisation? Theorem 2 deals with this.

Theorem **2** *Suppose that $\alpha < \bar{\alpha}$ and $\delta > \tilde{\delta}$, so that there is holdout.*

(i) The magnitude of holdout, i.e. $1-k^*$, is non-monotonic in the level of bureaucratic corruption, i.e. r_I; to be precise, $1-k^*$ is increasing in r_I if $r_I < (\lambda - v) - \frac{\gamma}{1-\gamma}$, but is decreasing in r_I otherwise.

(ii) The magnitude of holdout decreases monotonically with a decrease in the ease of opposition, i.e. an increase in α.

(iii) Further, if $r_I < (\lambda - v) - \frac{\gamma}{1-\gamma}$ so that a fall in corruption reduces holdout, a simultaneous fall in ease of opposition dampens this reduction; if $r_I > (\lambda - v) - \frac{\gamma}{1-\gamma}$ so that a fall in corruption increases holdout, a simultaneous fall in ease of opposition dampens this increase. Formally, $\frac{\partial(1-k^*)}{\partial r_I} > 0$ if $\frac{\partial^2(1-k^*)}{\partial\alpha\partial r_I} > 0$, while $\frac{\partial(1-k^*)}{\partial r_I} < 0$ if $\frac{\partial^2(1-k^*)}{\partial\alpha\partial r_I} < 0$.

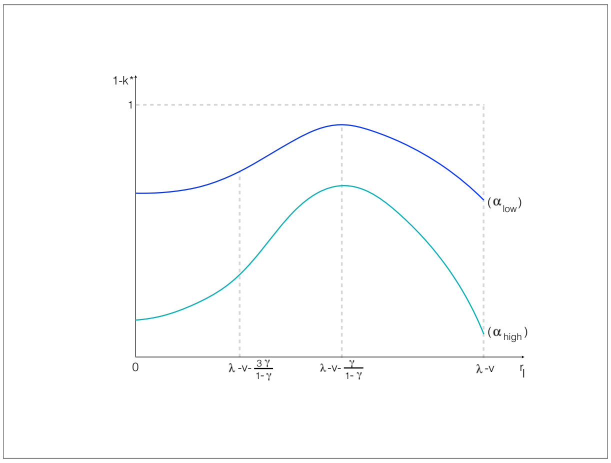

Figure 2: Size of holdout (viz. $1-k^*$) as a 'function' of degree of corruption r_I and ease of opposition α.

It is not true that institutional improvement in all directions can always reduce holdout. Theorem 2(i) shows that while an increase in bureaucratic corruption r_I increases holdout when r_I is small, it decreases holdout when r_I is large, so that the impact is non-monotonic. Why does the effect of a change in r_I depend upon whether corruption is large or small to begin with? Suppose bureaucratic corruption r_I increases. From Proposition 1, note that the direct effect of this change in r_I will be to increase holdout. Moreover, there is an indirect effect stemming from the fact that an increase in r_I induces party F to reduce the political rent charged by it, and consequently induces A to reduce the level of its political opposition c. This reduces the political space available to party F, and increases that for party A, so that holdout would tend to decrease. When party F is very highly motivated relative to the net returns from the project, i.e. $\lambda - r_I - v < \frac{\gamma}{1-\gamma}$ (which is likely to be the case for LDCs where r_I can be expected to be large), then the indirect effect will be large enough to overturn the direct effect, so that holdout decreases. Otherwise, the direct effect dominates, so that holdout increases. An increase in α on the other hand reduces the space for opposition since it increases the marginal cost of increasing c. Theorem 2(ii) suggests that this would reduce the magnitude of holdout, which is expected.

Theorem 2(iii) then demonstrates that the effect of a change in r_I on holdout is always enhanced when α increases. Thus, if there is a lot of existing bureaucratic corruption in the system (i.e. r_I is large), then reducing corruption increases holdout to a greater extent if the rule of law is robust so that opposing land acquisition is costly. Whereas if there is not much existing bureaucratic corruption in the system (i.e. r_I is small), then reducing corruption further reduces holdout to a greater extent if the rule of law is robust. Figure 2 provides a graphical representation of Theorem 2, plotting the relation between $1 - k^*$ and r_I for two values of α, where the observed inflection point at $\lambda - v - \frac{3\gamma}{1-\gamma}$ is easy to establish.

Finally, note that Theorem 2(i) and (ii) are both critically dependent on the fact that interference is endogenous. In case r_P and c are taken to be exogenous, then Proposition 1 shows that an increase in bureaucratic corruption necessarily increases holdout, which is exactly the reverse of our result in case of LDCs. The difference can be traced to the fact that with an endogenous r_P, an increase in r_I reduces the political space available to party F (as clarified while discussing Theorem 2(ii)), so that there is an additional channel through which r_I affects holdout. Further, with an exogenous r_P and c, the level of holdout does not depend on α at all.

Political motivations of party F and A (viz. γ and δ) also play an interesting role in Theorem 2 that is stated precisely in Corollary 2.

Corollary **2** *The level of holdout $1 - k^*$ is decreasing in γ, but increasing in δ. Further, $1 - k^*$ decreases with λ and v if and only if $r_I < \lambda - v - \frac{\gamma}{1-\gamma}$.*

Given Corollary 2, consider the effect of elections on the size of holdout. If we assume, as seems natural, that political motivations increase as elections approach (viz. both γ and δ rise), then there are two opposing effects on the size of holdout; while it would tend to decrease as F gets more motivated, it would tend to increase as A also gets more motivated. What is the net impact? We have the following corollary.

Corollary **3** *Suppose as elections approach, both γ and δ rise proportionately, that is $\frac{d\gamma}{\gamma} = \frac{d\delta}{\delta}$. Then the following is true: (i) If $2\delta(1-\delta) \leq \gamma(1-\gamma)$ then buyer induced holdout increases unambiguously, and (ii) If $2\delta(1-\delta) > \gamma(1-\gamma)$ then there exists a threshold value $\Lambda > 0$ such that buyer induced holdout increases if and only if $\lambda - v - r_I > \Lambda$.*

It is easy to verify that $2\delta(1-\delta) > \gamma(1-\gamma)$ whenever both γ and δ lie in the interval $[0.15, 0.85]$, so that Corollary 3(ii) holds. Thus over a 'large' range of parameter values, one would expect approaching elections to increase buyer induced holdout provided the net returns from the project (viz. $\lambda - v - r_I$) is large enough.

We recognise that data about institutional imperfections discussed above are hard to come by, and we leave such an important empirical study on holdout in land acquisition for future research. Nevertheless, Theorem 2 and Corollaries 2 and 3 allow us to undertake indirect empirical investigation on this form of holdout through the following testable hypotheses:

> *Hypothesis 1*: An increase in bureaucratic corruption, i.e. in r_I, increases holdout if the economy is relatively developed, i.e. the existing value of r_I is relatively small, but decreases holdout if the economy is underdeveloped, i.e. r_I is relatively large to begin with.
>
> *Hypothesis 2*: An increase in the ease of opposing land acquisition, i.e. a decrease in α, increases holdout.
>
> *Hypothesis 3*: The incidence of holdout is larger for larger projects, i.e. larger λ, as well as if land is more productive, i.e. larger v, provided bureaucratic corruption is large.
>
> *Hypothesis 4*: The incidence of holdout increases as an election becomes more imminent only for relatively productive projects.

5.2 Seller welfare

We next turn to an analysis of how institutional changes affect the welfare of the sellers. We have the following theorem.

Theorem **3** *Suppose that $\alpha < \bar{\alpha}$ and $\delta > \tilde{\delta}$ so that there is buyer-induced holdout. Then a rise in bureaucratic corruption r_I reduces seller welfare, while an increase in the ease of opposing land acquisition α increases it.*

Interestingly, the result obtains despite the facts that (i) a higher corruption always reduces period 1 prices q, and (ii) its impact on holdout depends upon the net productivity of the project. Intuitively, the extent of holdout is decreasing in r_I iff party F is very motivated, i.e. $\frac{\gamma}{1-\gamma} > \lambda - v - r_I$. In that case, holdout is unlikely to be too large in any case, so that the effect of any further decrease in the extent of holdout will be small. In the Online Appendix 9 we demonstrate that this result is critically dependent on the fact that interference activity is endogenised. We show that the result may in fact be reversed if this activity is frozen, in that an increase in r_I increases seller utility whenever the political rent paid to F is at an intermediate level! This underscores why it is important to explicitly model interference in this context. As for the case of holdout, we have the following two accompanying Corollaries for Theorem 3.

Corollary **4** *Sellers welfare is increasing in γ, the motivation of party F, and decreasing in the motivation of party A, i.e. δ. It is increasing in the value of the project λ, and the value of land v.*

Corollary 4 is intuitive. Sellers from more valuable regions are better off while higher is the buyer's marginal revenue from the project, the overall payments are higher. Similarly, if the pro-industrial party cares more about industrialisation than the costs of fighting the political contest, it helps the sellers while the opposite is true when it comes to the opposition party. Turning to elections, we have Corollary 5.

Corollary 5 *Suppose as elections approach, both γ and δ rise proportionately. Then the following is true: (i) If $2\delta(1-\delta) \leq \gamma(1-\gamma)$ then sellers' welfare decreases and (ii) If $2\delta(1-\delta) > \gamma(1-\gamma)$, then there exists a threshold value $\Lambda > 0$ such that sellers' welfare rises if and only if $\lambda - v - r_I < \Lambda$.*

Our conclusion therefore is similar to those drawn from Corollary 3. Corollary 5(ii) applies for a large range of parameter values, so that the imminence of elections should by and large increase sellers' welfare but only for relatively small projects.

6 Extensions

We then examine two variations of the baseline framework as robustness checks, arguing that our results are not qualitatively affected by these considerations.[15]

6.1 Wider specturm of political involvement

The underlying idea of the strategic framework studied in this paper is that the political fight between party A and party F begins in the early stage of the land acquisition process, whereas the late stage essentially involves bargaining between the buyer and remaining sellers, with neither party playing a strategic role. Putting party conflict in the early stage of course captures the idea that conflict decisions due to outside involvement are harder to reverse relative to bargaining decisions between buyers and sellers. Further, whichever side wins the fight in that stage is assumed to rule the rest of the game. Thus, if A wins, the game ends and there is no land acquisition at all. Similarly, if A loses, it leaves the scene.[16] While the structure of the game is quite broad in that sense, it is natural to ask if the results, in particular the existence of buyer-induced holdout, survive if one allows for a winning party F to get involved in the late stage as well.

Consider a scenario in which once the project passes through the early stage political battle, party F can get involved in the bargaining that takes place between the buyer and the remaining $1-k$ sellers. Of course in this case party F leverages its connections in local institutions to ensure that the additional transaction costs r_I are waived in this stage as well. In return, it asks for a per-unit rent of amount b that is to be shared between the buyer and the sellers in the proportion β and $1-\beta$ as was for the case of sharing r_I.

Suppose the game reaches Stage 5 and party F sets this rent b. Then the Nash program becomes

$$\max_{q_b \geq 0} [\lambda - (1-k)(q_b + \beta b) - \lambda k][(1-k)(q_b - v - (1-\beta)b)].$$

[15] We would like to thank an anonymous reviewer for both these extensions.

[16] Ruling out the possibility that a losing party can re-enter the contest can also be justified on grounds of realism. It is quite likely that at the local level, both parties are going to be fund constrained. Further, any party that loses a local level fight would find it hard to raise funds, even from its central high command. In the presence of such scarcity of funds, spreading out funds over multiple rounds of conflict may be sub-optimal especially if there are fixed costs of indulging in conflict. In fact, in case of party A, the only way it can remain involved in the process despite losing in the early stage is through pushing up the transaction cost r_I for the purchase of land in the late stage. But that involvement can be implicitly assumed while determining this cost to begin with. Hence it has no quantitative impact on the results we report.

Also, it is easy to see that in equilibrium, party F will set $b = r_I$ just to make all bargaining parties indifferent between paying r_I, or paying party F to avoid paying r_I. Hence, the two prices of land will remain as in the benchmark model (Lemma 2). It then immediately follows that with exogenous politics in the early stage (that is, when r_P and c are fixed), Proposition 1 remains intact.

Now consider the optimal demand for the first period rent by party F. The possibility of future involvement and the equilibrium behaviour in that continuation game changes F's period 1 payoff from (1) to

$$\max_{r_P} Z(r_P) = \gamma\pi(k^*) + (1-\gamma)[\pi(k^*)(k^* r_P + (1-k^*)r_I) - c(k^*)^2],$$

where k^* is as in Proposition 1. It is again routine to show that for c large enough, this rent is given by

$$r'_P = \frac{(1-\gamma)(\lambda + 3r_I - v)r_I + 2c(1-\gamma)(\lambda - v - r_I) - 4\gamma r_I}{(1-\gamma)(\lambda + 3r_I - v) + 4\gamma}.$$

Since the payoff function of A remains intact, the rest of the analysis is qualitatively identical. However, party F's new political rent in phase one (i.e., r'_P) can be higher or lower than the rent it asked in the original model (i.e., $\hat{r}_P$). For example, suppose $\gamma = 8/10$. Then $r'_P > \hat{r}_P$ if $\lambda - v + r_I > 10$ and $r'_P < \hat{r}_P$ if $\lambda - v + r_I < 10$. The broad message therefore is that the possibility of multiple interventions have no qualitative consequence for our main results.

6.2 Decentralised late-stage bargaining

We adopt the Nash bargaining protocol for the late stage game. This allows us to abstract away from any inefficiency in the late stage, ensuring that any inefficiency that arise in our framework is buyer-induced. It is however of interest to allow for a different bargaining protocol where the late stage sellers interact with the buyer individually, rather than as a group. In particular, it would be important to examine if, in the presence of late stage inefficiencies, buyer induced holdout survives or not.

To that end, suppose we make the extreme assumption that late stage bargaining breaks down completely, so that if the buyer succeeds in acquiring k plots of land via early stage bargaining, then he implements a project of size k.[17] Assuming that v is neither too large nor too small (viz. $\lambda - r_I > v > \frac{\lambda}{2}$, a condition that is non-empty if and only if $\lambda > 2r_I$), one can show that buyer induced inefficiency through holdout continues to hold in equilibrium.

Given that there is no agreement in the late stage, all sellers that reject an offer in the early stage has a payoff of v. Thus the buyer sets the price $q = v$ in the early stage. The buyer's payoff

[17]While we do not write down a micro-foundation for this assumption, the literature on one buyer many-seller noncooperative bargaining provides several examples of such bargaining breakdown. Roy Chowdhury and Sengupta (Proposition 4, 2012), for example, show that whenever the bargaining protocol is the secret offers one (Chatterjee and Datta (1998) call it the telephone offers protocol), the buyer has an outside option, and the common discount factor is large, there exists an equilibrium where the bargaining breaks down completely with the buyer exiting the game. Cai (2000, 2003), Menezes and Pitchford (2004) also examine one buyer multi-seller bargaining games that exhibit various degrees of inefficiency. It should be pointed out however that to the best of our knowledge all existing models are with a finite number of sellers, whereas we assume a continuum of sellers.

is given by

$$\Pi(k) = \pi(k)[\lambda - k(q + r_P)] = k[\lambda - k(v + r_P)]. \tag{9}$$

Given that $v > \frac{\lambda}{2}$, the optimal solution is given by

$$k^* = \frac{\lambda}{2(v + r_P)} < 1. \tag{10}$$

Thus whatever equilibrium value of r_P is obtained in this new formulation, there is always some degree of buyer-induced holdout.[18]

7 Conclusion

We develop a theoretical framework that allows us to study how institutional infirmities, in particular bureaucratic corruption and extra-legal interference from political parties (and motivated civil society organisations) affect land acquisition. We characterise conditions under which these imperfections generate a new form of holdout, where, given these institutional constraints, the buyer in his own interests designs the acquisition process in such a fashion that there is some chance that acquisition may fail. Further, we demonstrate that urban vicinity, high land-fertility or low project returns, all add to the chances that outside interference of this nature will cause the buyer to induce holdout. In addition, whenever the buyer induces holdout, one finds that the price of land sold during the early phase of the acquisition process is necessarily lower than what sellers obtain at a later stage.

Interestingly, an increase in bureaucratic corruption has a non-monotonic effect on holdout. We find that if institutions are weak to begin with, which is likely in LDCs, then a decrease in corruption may, in fact, increase holdout, a phenomenon we call immiserizing reforms, suggesting that LDCs may not have too much of an incentive to focus on institutional improvements. With a decrease in bureaucratic corruption, selling via party F is less attractive for the buyers, thus reducing party F's political clout, which in turn may increase holdout. When it comes to seller welfare we find that an increase in bureaucratic corruption always makes them worse off; however, while the sellers prefer that the opposition party be there, they also prefer that this opposition is not too strong. Further, proximity of elections makes holdout more likely whenever the projects are large.

Given the complexity of the issue, and the humanitarian tragedies involved, we point out that our theoretical construct is a first cut aimed at understanding the trade-offs involved between economic and political considerations, and, consequently, we refrain from providing any facile policy recommendations.

[18] We conjecture that holdout will continue to hold for values of v below $\frac{\lambda}{2}$, but that will require one to solve the entire game in order to find the required range of the parameters for which the equilibrium value of r_P exceeds $\frac{\lambda}{2} - v$. This is however beyond the scope of this exercise. Finally, the analysis on the two extreme cases of full efficiency and total late stage collapse suggest that holdout will continue to persist in intermediate cases where there is partial agreement over the remaining sellers. Again a full characterisation of such intermediate paths is beyond the scope of the present paper.

8 Appendix

Proof of Proposition 1: The buyer's objective in stage 2 is then to maximise $\Pi(k)$ by choosing k. The first order derivative of the buyer's profit function in (6) gives

$$\Pi'(k) = \frac{\lambda - v - r_I + 4k(r_I - r_P)}{2}, \tag{11}$$

where note that $\Pi'(0) = \frac{\lambda - v - r_I}{2} > 0$, and $\Pi'(1) = \frac{\lambda - v - r_I + 4(r_I - r_P)}{2}$. The FOC in case of an interior equilibrium is given by $k^*(r_P) = \frac{(\lambda - r_I - v)}{4(r_P - r_I)}$. Further, the second order derivative of the profit function gives

$$\Pi''(k) = 2(r_I - r_P),$$

so that $\Pi''(k) < 0$ if and only if $r_I < r_P$. Let $\tilde{k}(r_P)$ denote the choice of k that maximises $\Pi(k)$. For $r_P < r_I$, $\Pi(k)$ is increasing and convex. Thus $\tilde{k}(r_P) = 1$. Whereas for $r_P > r_I$, $\Pi(k)$ is concave. Thus $\tilde{k}(r_P) = \min\{k^*(r_P), 1\}$. $\square$

Proof of Proposition 2 Fix some $c \geq 0$ chosen by A. The lottery contest success function $\pi(k) = k$ means that the party F's problem is

$$\max_{r_P} Z(r_P) \equiv \gamma \tilde{k}(r_P) + (1 - \gamma)\tilde{k}(r_P)^2 (r_p - c). \tag{12}$$

Thus, $Z(r_P) = \gamma + (1 - \gamma)(r_P - c)$ in case r_P induces no holdout (i.e. $\tilde{k}(r_P) = 1$), and $Z(r_P) = \frac{\lambda - v - r_I}{16}[\frac{4\gamma}{(r_P - r_I)} + \frac{(1-\gamma)(\lambda - r_I - v)(r_P - c)}{(r_P - r_I)^2}]$ otherwise. Thus, for any r_P that induces hold out, we have that

$$\frac{dZ}{dr_P} = \frac{(\lambda - r - v_I)}{16(r_P - r_I)^3}[(1 - \gamma)(\lambda - r_I - v)(2c - r_I - r_P) - \gamma(r_P - r_I)]. \tag{13}$$

For ease of exposition we define $Y \equiv [(1 - \gamma)(\lambda - r_I - v)(2c - r_I - r_P) - \gamma(r_P - r_I)]$. Let $\hat{r}_P$ solves $Y(r_P) = 0$, so that $\hat{r}_P = \frac{(1-\gamma)(2c - r_I)(\lambda - v - r_I) + \gamma r_I}{(1-\gamma)(\lambda - v - r_I) + \gamma}$. Let

$$\bar{c} := Y|_{r_P = r_I + \frac{\lambda - v - r_I}{4}, k=1} = \left(\frac{7}{8}\right) r_I + \frac{1}{8}\left(\frac{\gamma}{1 - \gamma} + (\lambda - v)\right). \tag{14}$$

Note that $r_I < \bar{c}$. Also note that for any $r_P \leq r_I + \frac{\lambda - v - r_I}{4}$, from Proposition 1, the equilibrium does not involve any holdout and party F's utility is $\gamma + (1 - \gamma)(r_P - c)$, so that it is increasing in r_P. Thus it is sufficient to consider $r_P \geq r_I + \frac{\lambda - v - r_I}{4}$. To prove the first part of the proposition, suppose c is small, i.e. $c \leq r_I$. Consider r_P such that $r_P \geq r_I + (\lambda - v - r_I)/4$. We argue that $Z(r_P)$ is decreasing for all $r_P > r_I$ whenever the outcome involves holdout. Given that Y is decreasing in r_P, it is sufficient to establish this for r_P close to but greater than r_I. Since $Y|_{r_P = r_I} = 2(1 - \gamma)(\lambda - r_I - v)(c - r_I) \leq 0$, it follows that $Z(r_P)$ is decreasing for all r_P greater than, but sufficiently close to r_I. Thus F sets $r_P^* = r_I + \frac{\lambda - r_I - v}{4}$. From Proposition 1 it then follows that $k^* = 1$ and there is no holdout. So suppose c is large, i.e. $c > r_I$ and $4(1 - \gamma)\left(2(c - r_I) - \frac{\lambda - v - r_I}{4}\right) - \gamma \leq 0$ that implies $c \leq \bar{c}$. Note that $Y|_{r_P = r_I + \frac{\lambda - v - r_I}{4}} = \frac{\lambda - v - r_I}{4}\left(4(1 - \gamma)(2(c - r_I) - \frac{\lambda - v - r_I}{4}) - \gamma\right) \leq 0$. Consequently, in this case $Z(r_P)$ is also *decreasing* in r_P for all $r_P \geq r_I + \frac{\lambda - v - r_I}{4}$. Thus the outcome involves $r_P^* = r_I + \frac{\lambda - v - r_I}{4}$, and for same reasons there is no holdout. To prove the second part of the proposition, consider the case where $c > r_I$ and $4(1 - \gamma)\left(2(c - r_I) - \frac{\lambda - v - r_I}{4}\right) - \gamma > 0$. This implies $c > \bar{c}$ by the fact that $r_I < \bar{c}$. Recall that $Y|_{r_P = r_I + \frac{\lambda - v - r_I}{4}} = \frac{\lambda - v - r_I}{4}\left(4(1 - \gamma)(2(c - r_I) - \frac{\lambda - v - r_I}{4}) - \gamma\right)$. Consequently, in this case $Z(r_P)$ is *increasing* in r_P for $r_P = r_I + \frac{\lambda - v - r_I}{4}$. Thus $r_P^* > r_I + \frac{\lambda - v - r_I}{4}$. In particular, $r_P^* = \hat{r}_P$. We note here that the profit of the buyer remains positive for all values of $r_P^* = \hat{r}_P$. To see this consider the buyer's profit function when $r_P^* = \hat{r}_P$ given by $\Pi(k^*(r_P^*)) = \frac{\lambda - r_I - v}{8(r_P - r_I)}\left(\frac{\lambda - r_I - v}{4(r_P - r_I)}(r_I - r_P) + (\lambda - r_I - v)\right)$. Note that $\frac{\lambda - r_I - v}{8(r_P - r_I)}$ is positive for any $r_P > r_I$ and $\left(\frac{\lambda - r_I - v}{4(r_P - r_I)}(r_I - r_P) + (\lambda - r_I - v)\right) > 0$ as well since $\lambda > r_I + v$. Finally, note that as $r_P^* > r_I + \frac{\lambda - v - r_I}{4}$, from Proposition 1, $k^* < 1$ so that the outcome involves holdout. $\square$

Proof of Proposition 3: Let $L := \left(\frac{\delta}{2\alpha(1-\delta)}\right)\left((\lambda - r_I - v) + \frac{v}{1-\gamma}\right)$, and $X := \left((\lambda - r_I - v) + \frac{\gamma}{1-\gamma}\right)^2$. From Proposition 2 we know that in the region $c \leq r_I$ there is no holdout. Since $\alpha > 0$ it must be that $c^*|_{c \leq r_I} = 0$ in that region.

Similarly in the region $r_I < c \leq \bar{c}$ we have $c^*|_{r_I < c \leq \bar{c}} = 0$. This is because from Proposition 1 we know that for any $c \leq \bar{c}$ we have no hold out in which case A will save this cost. In both the above cases A's payoff equals 0. Now consider the case when $c > \bar{c}$. Here $r_P^* = \hat{r}_P$ and the consequent $k^*(r_P)$ is $k^*|_{\bar{c}<c<G} = \frac{(1-\gamma)(\lambda - r_I - v)+\gamma}{8(1-\gamma)(c-r_I)}$. Hence in this region, A's payoff in c is $D = \delta\left(1 - \frac{(1-\gamma)(\lambda-r_I-v)+\gamma}{8(1-\gamma)(c-r_I)}\right) - (1-\delta)\alpha c$. Now $\frac{dD}{dc} = \frac{\delta((1-\gamma)(\lambda-r_I-v)+v)}{8(1-\gamma)(c-r_I)^2} - (1-\delta)\alpha$, and $\frac{d^2D}{dc^2} = \frac{\delta((1-\gamma)(\lambda-r_I-v)+v)}{4(\gamma-1)(c-r_I)^3} < 0$ since $c > r_I$ in the case under study. Consider first the free solution from the FOC: $\frac{dD}{dc} = 0$. This yields two roots, namely $c = r_I \pm \sqrt{\frac{\delta(\lambda-r_I-v)}{8\alpha(1-\delta)}}$. Since we are in the zone $c > r_I$, it follows that the free solution must be

$$c_f = r_I + \sqrt{\frac{\delta(\lambda - r_I - v)}{8\alpha(1-\delta)}}. \tag{15}$$

Next note $c_f > \bar{c}$ if and only if $\left(\frac{\gamma}{1-\gamma} + (\lambda - v - r_I)\right)^2 < \frac{\delta(1-\gamma)(\lambda-r_I-v)+v}{\alpha(1-\gamma)(1-\delta)}$, that yields

$$\left(\frac{\gamma}{1-\gamma} + (\lambda - v - r_I)\right)^2 < \left(\frac{\delta}{\alpha(1-\delta)}\right)\left((\lambda - r_I - v) + \frac{v}{1-\gamma}\right). \tag{16}$$

Following the notations, Eq. (16) is equivalent to having $X < 2L$. Thus $c^* = c_f = r_I + \sqrt{\frac{\delta(1-\gamma)(\lambda-r_I-v)}{8\alpha(1-\gamma)(1-\delta)}}$ if and only if $X < 2L$ (that is equivalent to $\alpha < \bar{\alpha}$), provided the payoff to A is positive as otherwise it will never set a positive c. Now, A's payoff from c_f is positive if and only if

$$\delta\left(1 - \frac{\lambda - r_I - v}{4(r_P - r_I)} + \alpha r_I\right) > \alpha r_I + \sqrt{\frac{\alpha(1-\delta)\delta(\lambda - r_I - v)}{8}}. \tag{17}$$

It is straightforward to verify that there exists a $0 < \tilde{\delta} < 1$ such that the above inequality holds if and only if $\delta > \tilde{\delta}$. Thus for all such values of δ we have $c^* = c_f$ while for all $\delta < \tilde{\delta}$ we have $c^* = 0$.

Given Eq. (16) if $c_f \leq \bar{c}$ then it must be true that $\left(\frac{\gamma}{1-\gamma} + (\lambda - v - r_I)\right)^2 \geq \left(\frac{\delta}{\alpha(1-\delta)}\right)\left((\lambda - r_I - v) + \frac{v}{1-\gamma}\right)$. But this gives $X \geq 2L$ that is equivalent to $\alpha \geq \bar{\alpha}$. Then the constrained optimum $c^* = 0$ as there will be no eventuality with holdout. To prove the comparative static results, recall that $c_f = r_I + \frac{\delta(\lambda-v-r_I)}{8\alpha(1-\delta)}$. Clearly $\frac{\partial c_f}{\partial \alpha} < 0$; $\frac{\partial c_f}{\partial v} < 0$; $\frac{\partial c_f}{\partial \lambda} > 0$ and $\frac{\partial c_f}{\partial \delta} > 0$. Next, $\frac{\partial c_f}{\partial r_I} = \frac{\sqrt{\frac{2\delta(\lambda-v-r_I)}{\alpha(1-\delta)}}}{8(r_I+v-\lambda)} + 1$. Note that for given $\lambda - v - r_I > 0$ we have $\frac{\partial c_f}{\partial r_I} < 0$ if and only if $32(\lambda - r_I - v) > \frac{\delta}{\alpha(1-\delta)}$. □

Proof of Corollary 1 Recall that $r_P^* = \hat{r}_P = \frac{(1-\gamma)\left(r_I + 2\sqrt{\frac{\delta(\lambda-r_I-v)}{8\alpha(1-\delta)}}\right)(\lambda-v-r_I)+\gamma r_I}{(1-\gamma)(\lambda-v-r_I)+\gamma}$. Clearly $\frac{\partial \hat{r}_P}{\partial \alpha} < 0$. It is straightforward to verify that $\frac{\partial \hat{r}_P}{\partial \lambda} = \frac{\sqrt{2}(1-\gamma)((1-\gamma)(\lambda-v-r_I))+3\gamma)\sqrt{\frac{\delta(\lambda-v-r_I)}{\alpha(1-\delta)}}}{4((1-\gamma)(\lambda-r_I-v)+\gamma)^2}$. Note that $\frac{\partial \hat{r}_P}{\partial \lambda} > 0$ for any $0 < \gamma < 1$. Next, $\frac{\partial \hat{r}_P}{\partial v} = \frac{\sqrt{2}(\gamma-1)((1-\gamma)(\lambda-v-r_I))+3\gamma)\sqrt{\frac{\delta(\lambda-v-r_I)}{\alpha(1-\delta)}}}{4((1-\gamma)(\lambda-r_I-v)+\gamma)^2}$. Note that $\frac{\partial \hat{r}_P}{\partial v} < 0$ for any $0 < \gamma < 1$. Finally, we have $\frac{\partial \hat{r}_P}{\partial r_I} = \frac{\sqrt{2}\left((\gamma-1)((1-\gamma)(\lambda-v-r_I))+3\gamma)\sqrt{\frac{\delta(\lambda-v-r_I)}{\alpha(1-\delta)}} + 2\sqrt{2}((1-\gamma)(\lambda-v-r_I)+\gamma)^2\right)}{4((1-\gamma)(\lambda-r_I-v)+\gamma)^2}$. Then, $\frac{\partial \hat{r}_P}{\partial r_I} > 0$ if and only if $2\sqrt{2}((1-\gamma)(\lambda - v - r_I) + \gamma)^2) - (1-\gamma)((1-\gamma)(\lambda - v - r_I)) + 3\gamma)\sqrt{\frac{\delta(\lambda-v-r_I)}{\alpha(1-\delta)}} > 0$. Define $A := (1-\gamma)(\lambda - v - r_I) + \gamma)$ and $B := \sqrt{\frac{\delta(\lambda-v-r_I)}{\alpha(1-\delta)}}$. Then the above expression can be written as $\hat{r}_P r_I(A, B) := 2\sqrt{2}A^2 - B(1-\gamma)A - 2B(1-\gamma)\gamma > 0$. One can check that the function $\hat{r}_P r_I(A, B)$ is concave with two roots of A. We denote them as a_i for $i = 1, 2$ where a_i is as follows: $a_i = \frac{B(1-\gamma) \pm \sqrt{B^2(1-\gamma)^2 + 4.4\sqrt{2}B(1-\gamma)\gamma}}{4\sqrt{2}}$. Since we have $\lambda - v - r_I > 0$ and $0 < \gamma < 1$ by assumption, we always have $A > 0$. Thus $\frac{\partial \hat{r}_P}{\partial r_I} > 0$ whenever $A > a_i$ and $\frac{\partial \hat{r}_P}{\partial r_I} < 0$ whenever $A < a_i$. It is now routine to check whether both the roots are positive. For given $0 < \gamma < 1$ there is only one root of A that is positive and it is given by $a_2 = \frac{B(1-\gamma) + \sqrt{B^2(1-\gamma)^2 + 16\sqrt{2}B(1-\gamma)\gamma}}{4\sqrt{2}}$. Hence we have $\frac{\partial \hat{r}_P}{\partial r_I} > 0$ whenever $\lambda - v - r_I$ is significantly bigger than $\frac{\gamma}{1-\gamma}$ and $\frac{\partial \hat{r}_P}{\partial r_I} < 0$ whenever $\lambda - v - r_I$ is significantly smaller than $\frac{\gamma}{1-\gamma}$. □

Proof of Theorem 2, Corollary 2 and Corollary 3: we know that $k^* = \frac{(1-\gamma)(\lambda-r_I-v)+\gamma}{8(1-\gamma)(c_f-r_I)}$ if there is holdout where

$c_f = r_I + \sqrt{\frac{\delta(\lambda - r_I - v)}{8\alpha(1-\delta)}}$. Substituting c_f yields $k^* = \frac{\sqrt{2}((1-\gamma)(\lambda - r_I - v)+\gamma)}{4(1-\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}$. Now the comparative statics are as follows: $\frac{\partial k^*}{\partial \alpha} = \frac{\sqrt{2}(1-\delta)((1-\gamma)(\lambda - r_I - v)+\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{8\delta(\lambda - r_I - v)(1-\gamma)}$. Note that $\frac{\partial k^*}{\partial \alpha} > 0$ for given $0 < \gamma < 1$ and the assumption of $\lambda > r_I + v$. Next, $\frac{\partial k^*}{\partial \gamma} = \frac{\sqrt{2}}{4(\gamma-1)^2\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}} > 0$; $\frac{\partial k^*}{\partial \delta} = -\frac{\sqrt{2}\alpha((1-\gamma)(\lambda - r_I - v)+\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{8\delta^2(1-\gamma)(\lambda - v - r_I)}$. Note that $\frac{\partial k^*}{\partial \delta} < 0$ for given the assumption of $\lambda > r_I + v$. Finally, $\frac{\partial k^*}{\partial \lambda} = \frac{\sqrt{2}\alpha(\delta-1)((1-\gamma)(\lambda - r_I - v)-\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{8\delta(r_I + v - \lambda)^2(\gamma-1)}$. Note that given $0 < \gamma < 1$ and $0 < \delta < 1$, $\frac{\partial k^*}{\partial \lambda} > 0$ if and only if $(\lambda - v) - r_I > \frac{\gamma}{1-\gamma}$. Next, $\frac{\partial k^*}{\partial v} = \frac{\partial k^*}{\partial r_I} = \frac{\sqrt{2}\alpha(1-\delta)((1-\gamma)(\lambda - r_I - v)-\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{8\delta(r_I + v - \lambda)^2(\gamma-1)}$. Note that given $0 < \gamma < 1$, $0 < \delta < 1$ both $\frac{\partial k^*}{\partial v} < 0$ and $\frac{\partial k^*}{\partial r} < 0$ if and only if $(\lambda - v) - r_I > \frac{\gamma}{1-\gamma}$. Finally, the cross partial derivative of k^* with respect to the parameters α and r_I gives us $\frac{\partial^2 k^*}{\partial \alpha \partial r_I} = \frac{\sqrt{2}(1-\delta)((1-\gamma)(\lambda - r_I - v)-\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{16\delta(r_I + v - \lambda)^2(\gamma-1)}$. For given $0 < \gamma < 1$, $0 < \delta < 1$ and the assumption $\lambda > v + r_I$, we have $\frac{\partial^2 k^*}{\partial \alpha \partial r_I} > 0$ if and only if $(1-\gamma)(\lambda - r_I - v) - \gamma < 0$ that gives $\lambda - r_I - v < \frac{\gamma}{(1-\gamma)}$. This proves Theorem 2.

Next, $\frac{\partial k^*}{\partial \delta} + \frac{\partial k^*}{\partial \gamma} > 0$ iff $\frac{\alpha((\gamma-1)^2(r_I+v)+\gamma^2(1-\lambda)+\gamma(2\lambda-1)-2\delta^2+2\delta-\lambda)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{r_I + v - \lambda} < 0$. For given $0 < \delta < 1$ and the assumption $\lambda > r_I + v$ the above is true whenever $(\gamma-1)^2(r_I+v) + \gamma^2(1-\lambda) + \gamma(2\lambda - 1) - 2\delta^2 + 2\delta - \lambda > 0$. This simplifies to $-(\gamma-1)^2(\lambda - v - r_I) - \gamma(1-\gamma) + 2\delta(1-\delta) > 0$ and boils down to $2\delta(1-\delta) > (1-\gamma)^2(\lambda - v - r_I) + \gamma(1-\gamma)$. Let $L = \lambda - v - r_I$. This yields the following condition

$$2\delta(1-\delta) > (1-\gamma)((1-\gamma)L + \gamma). \tag{18}$$

Note that (18) is never satisfied when $2\delta(1-\delta) < \gamma(1-\gamma)$. So suppose otherwise. Then condition 18 holds if and only if $L < \Lambda := \frac{2\delta(1-\delta)-\gamma(1-\gamma)}{(1-\gamma)^2}$. The rest of the proof that yields Corollary 3 is now straightforward.

□

Proof of Theorem 3, Corollary 4 and Corollary 5: Recall that the equilibrium payoff of the local landowners under holdout (denoted by U_S below) is simply a markup over and above their reservation utility v. Straightforward calculations yield that

$$U_S = \pi(k)q + (1-\pi(k))v = \frac{\sqrt{2}((1-\gamma)(\lambda - r_I - v)+\gamma)}{4(1-\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}\left(\frac{\lambda - v - r_I}{2}\right) + v. \tag{19}$$

Given (19), it follows that $\frac{\partial U_S}{\partial \alpha} > 0$, so that sellers would prefer the ease of opposition α to be large. This is intuitive since with an increase in α, there is a decrease in holdout. A fall in bureaucratic corruption however unambiguously benefits the sellers. In particular, $\frac{\partial U_S}{\partial r_I} = -\frac{\sqrt{2}(3(1-\gamma)(\lambda - r_I - v)+\gamma)}{16(1-\gamma)\sqrt{\frac{\delta(\lambda - v - r_I)}{\alpha(1-\delta)}}} < 0$. Next, $\frac{\partial U_S}{\partial v} = 1 - \frac{\sqrt{2}(3(1-\gamma)(\lambda - v - r_I)+\gamma)}{16(1-\gamma)\sqrt{\frac{\delta(\lambda - v - r_I)}{\alpha(1-\delta)}}} > 0$ if and only if $\Delta = 9L^2 + L(6G - \frac{4J}{2\alpha}) + G^2 < 0$, where $L = \lambda - v - r_I$, $G = \frac{\gamma}{1-\gamma}$ and $J = \frac{\delta}{1-\delta}$. Clearly if $6G - \frac{4J}{2\alpha} > 0$ then Δ cannot be negative. Thus, we conclude that if $3\alpha\gamma/(1-\gamma) > \delta/(1-\delta)$, then $\frac{\partial U_S}{\partial v} < 0$. So suppose $3\alpha\gamma/(1-\gamma) < \delta/(1-\delta)$. Then, as Δ is convex in L, it follows that the two roots of the equation $\Delta = 0$ determines the bounds of L for which $\Delta < 0$ holds. The higher root of L is $\frac{(\frac{4D}{2\alpha} - 6G) + \sqrt{(\frac{4D}{2\alpha} - 6G)^2 - 36G^2}}{18}$ which can be easily shown to be negative. Given $L > 0$, there is no value of L for which $\Delta < 0$ holds. Hence $\frac{\partial U_S}{\partial v} > 0$. Also, $\frac{\partial U_S}{\partial \lambda} = \frac{\sqrt{2}(3(1-\gamma)(\lambda - v - r_I)+\gamma)}{16(1-\gamma)\sqrt{\frac{\delta(\lambda - v - r_I)}{\alpha(1-\delta)}}} > 0$ for any $\delta < 1$, $\gamma < 1$ since $\lambda - r_I - v > 0$. Next, $\frac{\partial U_S}{\partial \gamma} = \frac{\sqrt{2}\alpha(1-\delta)\sqrt{\frac{\delta(\lambda - v - r_I)}{\alpha(1-\delta)}}}{8\delta(1-\gamma)^2} > 0$ and $\frac{\partial U_S}{\partial \delta} = -\frac{\sqrt{2}\alpha((1-\gamma)(\lambda - v - r_I)+\gamma)\sqrt{\frac{\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{16\delta^2(1-\gamma)} < 0$. Finally, upon simplification, we obtain $\frac{\partial U_S}{\partial \gamma} + \frac{\partial U_S}{\partial \delta} = \frac{\alpha[(1-\gamma)^2(r_I+v)+\gamma^2(1-\lambda)+\gamma(2\lambda-1)-2\delta^2+2\delta-\lambda]\sqrt{\frac{2\delta(\lambda - r_I - v)}{\alpha(1-\delta)}}}{16\delta^2(1-\gamma)^2}$. Now $\frac{\partial U_S}{\partial \gamma} + \frac{\partial U_S}{\partial \delta} > 0$ if and only if condition 18 holds. This means if $2\delta(1-\delta) > \gamma(1-\gamma)$ and $L < \Lambda = \frac{2\delta(1-\delta)-\gamma(1-\gamma)}{(1-\gamma)^2}$ then $\frac{\partial U_S}{\partial \gamma} + \frac{\partial U_S}{\partial \delta} > 0$.

□

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9 Online Appendix

9.1 Holdout with general $\pi(k)$, $V(k)$ and $C(k)$ functions

In the paper we have found robust sufficient conditions for which $k^* < 1$ (what we called the incidence of holdout). We now show that this result is not hostage to the simplified linear functions for $\pi(\cdot)$ and $V(\cdot)$ or quadratic cost function $C(\cdot)$. We retain all the basic features of the original model to characterise the problem of holdout except that now the $\pi(\cdot)$, $V(\cdot)$ and $C(\cdot)$ functions are more general. In particular, we assume that $C(k) = ck^m, m > 1, c \geq 0$ while $V(\cdot)$ and $\pi(\cdot)$ are at least twice differentiable and strictly concave with the following properties: $\pi(0) = 0$, $\pi(1) = 1$, $\pi'(1) \geq 0$, and $\frac{\pi(k)}{k\pi'(k)} = \epsilon$, (i.e., $\pi(\cdot)$ exhibits constant elasticity, an example being $\pi(k) = k^\alpha$, $0 < \alpha \leq 1$); and $V(0) = 0$, $V(1) \geq V'(1)$.

In this general framework, one issue is that of ensuring participation by party F in equilibrium. Given (2), it can be easily verified that with zero reservation payoff for A, it will never set a c larger than $\frac{\delta}{\alpha(1-\delta)}$. Hence, given the cost function $C(k) = ck^m$, it follows that F's participation is guaranteed if its reservation payoff is $-\frac{\delta(1-\gamma)}{(1-\delta)\alpha}$, or lower. This is of course a departure from our earlier framework where the reservation payoff of party F was zero. One can however think of scenarios where, for F, not to not help industrial buyers at all, particularly in a developing country aspiring for economic growth, can be politically very costly. On the other hand not agreeing to oppose industrial projects (which is equivalent to setting $c = 0$) may not be that costly for A. Hence in such scenarios it may be natural to have an asymmetry in the reservation utilities of the two parties. We will assume that A's reservation payoff is zero while that of F is not above $-\frac{(1-\gamma)\delta}{(1-\delta)\alpha}$ which ensures F's participation. In any event, a binding reservation payoff of F will only reduce the cutoff value of c below which there is no holdout. Keeping that in mind we proceed by assuming full participation of F.

Let

$$\psi(k) = \frac{V(1) - V(k)}{1-k}.$$

Thus $\psi(0) = V(1)$ and $\psi(1) = V'(1)$. Note that given the concavity of $V(\cdot)$ function $\psi'(k) = \frac{\frac{V(1)-V(k)}{1-k} - V'(k)}{1-k} < 0$ and $\psi''(k) = \frac{-V''(k)(1-k)}{(1-k)^4} \geq 0$. Moreover $\psi'(0) = V(1)$ and $\psi'(1) = \frac{V''(1)}{2}$.

A buyer's direct bargaining with $1-k$ fraction of sellers in the second phase yields

$$q_b = \frac{\psi(k)}{2} + \frac{v}{2} + r_I\left(\frac{1}{2} - \beta\right).$$

We now determine the fraction of sellers k joining party F in stage 3 where the indifferent seller k is again given by $q(k) = q_b - (1-\beta)r_I$. Hence the profit function of the buyer in stage 2 is

$$\Pi(k) = \pi(k)[V(1) - k(q + r_P) - (1-k)(q_b + \beta r_I)].$$

Substituting q, q_b in the above expression we obtain

$$\Pi(k) = \pi(k)\left(V(1) - \frac{\psi(k)}{2} - \frac{v}{2} - \frac{r_I}{2} - k(r_P - r_I)\right), \tag{20}$$

so that $\Pi(0) = 0$ and $\Pi(1) = \frac{2V(1) - V'(1) - 2r_P + r_I - v}{2}$.

The buyer's objective in stage 2 is then to maximise $\Pi(k)$ by choosing k. Denote the optimal choice by $\tilde{k}(r_P)$. The first derivative of his profit function in (20) gives

$$\Pi'(k) = \frac{1}{2}(\pi'(k)(2V(1) - 2k(r_P - r_I) - \psi(k) - v - r_I) + \pi(k)(2(r_I - r_P) - \psi'(k))).$$

Let $\bar{\epsilon} = \frac{\pi'(k)/k}{\pi''(k)}$. Note that given the concavity of $\pi(\cdot)$ we have $\bar{\epsilon} \leq 0$. Moreover $\bar{\epsilon} = \frac{\epsilon}{1-\epsilon}$. Substituting ϵ in the first derivative of the buyer's profit gives

$$2\Pi'(k) = \pi'(k)(2V(1) - 2k(r_P - r_I)(1+\epsilon) - \psi(k) - v - r_I - \epsilon k\psi'(k)). \tag{21}$$

To obtain an interior solution for k and thereby getting holdout we need to show that $\Pi(k)$ has the following properties: $\Pi'(0) > 0$, $\Pi'(1) < 0$ and $\Pi''(\cdot) < 0$. Using the properties of $\psi(\cdot)$ equation (21) yields

$$2\Pi'(0) = \pi'(0)(V(1) - v - r_I) > 0,$$

and

$$2\Pi'(1) = \pi'(1)(2V(1) - 2(r_P - r_I)(1+\epsilon) - V'(1) - v - r_I - \epsilon\frac{V''(1)}{2}).$$

The necessary FOC for an interior equilibrium is as follows and this implicitly gives the value $k^*(r_P)$.

$$2V(1) - 2k^*(r_P - r_I)(1+\epsilon) - \psi(k^*) - v - r_I - \epsilon k^*\psi'(k^*) = 0. \tag{22}$$

Further the second order derivative of the profit function gives

$$2\Pi''(k) = \pi''(k)(2V(1) - 2k(r_P - r_I) - \psi(k) - v - r_I) + 2\pi'(k)(-2(r_P - r_I) - \psi'(k)) - \pi(k)\psi''(k).$$

Substituting ϵ and $\bar{\epsilon}$ in the above expression yields

$$2\Pi''(k) = \pi''(k)(2V(1) - \psi(k) - v - r_I - 2k(r_P - r_I)(1+\epsilon)(1+\bar{\epsilon}) - k\psi'(k)(\epsilon + \bar{\epsilon}(1+\epsilon)) - \epsilon\bar{\epsilon}k^2\psi''(k)). \tag{23}$$

Notice that given the concavity of $\pi(\cdot)$, $\Pi''(k) < 0$ if and only if $2V(1) - \psi(k) - v - r_I - 2k(r_P - r_I)(1+\epsilon)(1+\bar{\epsilon}) - k\psi'(k)(\epsilon + \bar{\epsilon}(1+\epsilon)) - \epsilon\bar{\epsilon}k^2\psi''(k) > 0$. Note that $2V(1) - \psi(k) - v - r_I > 0$ since $\psi'(k) < 0$ and given $\psi''(\cdot) \geq 0$, $\epsilon > 0$ and $\bar{\epsilon} \leq 0$ we have $\epsilon\bar{\epsilon}k^2\psi''(k) \leq 0$. Observe that $2k(r_P - r_I)(1+\epsilon)(1+\bar{\epsilon}) < 0$ whenever $r_P > r_I$ holds.

Consider the following set of conditions denoted by *Condition* $\mathcal{P}$:

- $\epsilon + \bar{\epsilon}(1+\epsilon) < 0$, and
- $2V(1) - V'(1) - v - r_I > 2(r_P - r_I)(1+\epsilon)(1+\bar{\epsilon}) + \frac{V''(1)k(\epsilon+\bar{\epsilon}(1+\epsilon))}{2} + \epsilon\bar{\epsilon}k^2\psi''(1)$.

This yields the following observation:

Observation 1 *Suppose Condition $\mathcal{P}$ holds. Then there is holdout if and only if the size of political rents is significantly higher than the size of legal rents, that is* $r_P > r_I + \frac{2V(1) - V'(1) - v - r_I - \epsilon\frac{V''(1)}{2}}{2(1+\epsilon)}$.

To see this suppose $r_P < r_I$ such that Condition $\mathcal{P}$ is violated. Then $\Pi(k)$ is increasing and convex. Thus $\tilde{k}(r_P) = 1$. Otherwise if Condition $\mathcal{P}$ holds then $\Pi(k)$ is concave. Hence $\tilde{k}(r_P) = \min\{k^*(r_P), 1\}$. $\square$

Given the above analysis we now move to the activity of party F. For a given $c \geq 0$ by A, the objective of party F is to

$$\max_{r_P \geq 0} Z(r_P) \equiv \gamma\pi(\tilde{k}(r_P)) + (1-\gamma)[\pi(\tilde{k}(r_P))\tilde{k}(r_P)r_p - c\tilde{k}^m(r_P)] \tag{24}$$

where $m > 1$ so that the cost is convex. In the main text we have used $m = 2$.

Thus in case when r_P induces no holdout so that $\tilde{k}(r_P) = 1$, then $Z(r_P) = \gamma + (1-\gamma)(r_p - c)$ and $Z(r_P)$ is increasing in r_P. In case when r_P induces holdout so that $\tilde{k}(r_P) = k^*(r_P)$, then

$$Z(r_P) = \gamma\pi(k^*(r_P)) + (1-\gamma)[k^*(r_P)(\pi(k^*(r_P))r_p - ck^{*(m-1)}(r_P))].$$

Note that for any $0 < \gamma < 1$ we have $Z(r_P) > 0$ if $r_P \geq \frac{ck^{*(m-1)(r_P)}}{\pi(k^*(r_P))}$.

Thus for any r_P that induces holdout, we have

$$\frac{\partial Z(r_P)}{\partial r_P} = \frac{\partial k^*(r_P)}{\partial r_P}(\pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon r_P)) - (1-\gamma)mck^{*(m-1)}(r_P)).$$

Recall that the interior equilibrium $k^*(r_P)$ is implicitly obtained from the necessary FOC of the buyer's profit function given in equation (22). Hence we take total derivative of this FOC to obtain

$$\frac{\partial k^*(r_P)}{\partial r_P} = \frac{2k^*(r_P)(1+\epsilon)}{-2(r_P - r_I)(1+\epsilon) - \psi'(k^*(r_P))(1+\epsilon) - k^*(r_P)\psi''(k^*(r_P))\epsilon} < 0,$$

since $2k^*(r_P)(1+\epsilon) > 0$ and $-2(r_P - r_I)(1+\epsilon) - \psi'(k^*(r_P))(1+\epsilon) - k^*(r_P)\psi''(k^*(r_P))\epsilon < 0$ for any $r_P > r_I$. Thus $\frac{\partial Z(r_P)}{\partial r_P} < 0$ if and only if $\pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon r_P)) - (1-\gamma)mck^{*(m-1)}(r_P) > 0$. For ease of exposition we define $Y \equiv \pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon r_P)) - (1-\gamma)mck^{*(m-1)}(r_P)$.

If r_P induces holdout then we denote the optimal choice of F by $\hat{r}_P$ that solves $Y = 0$. This implicitly gives $\hat{r}_P$

$$\hat{r}_P = \frac{c(1-\gamma)mk^{*(m-1)}(\hat{r}_P) - \pi'(k^*(\hat{r}_P))(\gamma + (1-\gamma)k^*(\hat{r}_P))}{(1-\gamma)\pi(k^*(\hat{r}_P))}.$$

Let

$$R_I = r_I + \frac{2V(1) - V'(1) - v - r_I - \epsilon\frac{V"(1)}{2}}{2(1+\epsilon)},$$

and

$$\hat{c} = \left(R_I + \frac{1}{\epsilon} + \frac{\gamma}{(1-\gamma)\epsilon k^*(\hat{r}_P)}\right)\frac{\pi(k^*(\hat{r}_P))}{mk^{*(m-1)}}.$$

Note that given the characteristics of $V(\cdot)$ and ϵ we have $r_I < R_I < \hat{c}$.[19]

Observation 2 *In each continuation game initiated by A through a choice of c, let r_P^* denote the optimal choice of party F.*

1. *If $c \leq \hat{c}$ and $Y|_{r_P=R_I} > 0$ then $r_P^* = R_I$, and there is no holdout,*
2. *If $c > \hat{c}$ and $Y|_{r_P=R_I} < 0$ then $r_P^* = \hat{r}_P > R_I$ and there is holdout.*

From Observation 1 we know that for any $r_P \leq R_I$ there is no holdout on the equilibrium path. Thus party F's utility is $\gamma + (1-\gamma)(r_p - c)$ and it is increasing in r_P. We now argue whether $Z(r_P)$ is decreasing for any $r_P > R_I$. To see this we first consider a small c such that $\frac{ck^{*(m-1)(r_P)}}{\pi(k^*(r_P))} \leq R_I$. If party F chooses any $r_P > R_I$ then $Y|_{r_P=R_I} = \pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon r_P)) - (1-\gamma)mck^{*(m-1)}(r_P)$. Consequently $Z(r_P)$ is positive at $r_P = R_I$ but is decreasing in r_P. Hence optimally party F sets $r_P^* = R_I$ for this region and there is no holdout. We next consider c is large such that $\frac{ck^{*(m-1)(r_P)}}{\pi(k^*(r_P))} > R_I$. If $Z(r_P)$ is increasing in this region, then party F optimally chooses $r_P^* > R_I$ for this region. From Observation 1 for any $r_P > R_I$ there is holdout, and the optimal r_P is then implicitly obtained from the necessary FOC. Note that if $Y|_{r_P=R_I} = \pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon R_I)) - (1-\gamma)mck^{*(m-1)}(r_P) > 0$, so that $Z(r_P)$ is decreasing then optimally party F sets $r_P^* = R_I$ and there is no holdout. Otherwise if $Y|_{r_P=R_I} = \pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon R_I)) - (1-\gamma)mck^{*(m-1)}(r_P) < 0$, so that $Z(r_P)$ is increasing in r_P, then optimally party F sets $r_P^* = \hat{r}_P$ and the outcome involves holdout. Note that for sufficiently large c such that $c > \hat{c}$ we have $\hat{r}_P > R_I$. Hence if $c > \hat{c}$ and $Z(r_P)$ is increasing in r_P (obtained from $Y|_{r_P=R_I} = \pi'(k^*(r_P))(\gamma + (1-\gamma)k^*(r_P)(1+\epsilon R_I)) - (1-\gamma)mck^{*(m-1)}(r_P) < 0$), then optimally party F sets $r_P^* = \hat{r}_P$ and the outcome involves holdout. This verifies Observation 2. □

Finally we consider the initiation of this whole game and find conditions under which A's equilibrium choice of c yields a SPE with holdout. A's objective is to

$$\max_{c \geq 0} D \equiv \delta(1 - \pi(\tilde{k}(r_P))) - (1-\delta)\alpha c, \tag{25}$$

where $\tilde{k}(r_P)$ is the buyer's optimal choice of k.

Observation 3 *Suppose $D|_{c=\hat{c}} > 0$ and $Y|_{r_P=R_I} < 0$. Then $c^* = \hat{c}$ and the outcome involves holdout.*

From Observation 2 we know that the region where $c \leq R_I$ there is no holdout. Since $\alpha > 0$ it must then be optimal for A to choose $c^*|_{c \leq R_I} = 0$. In this case A's payoff is 0. Now consider the region where $r_P > R_I$ that induces holdout. From observation 2 we know that for a large c such that $c > \hat{c}$ and $Y|_{r_P=R_I} < 0$ we have $r_P^* = \hat{r}_P$. Thus party $A's$ payoff in c is

$$D = \delta(1 - \pi(k^*(\hat{r}_P))) - (1-\delta)\alpha c,$$

[19] Note that here R_I corresponds to $r_I + \frac{\lambda - v - r_I}{4}$ and $\hat{c}$ corresponds to $\bar{c}$ in the linear $\pi(\cdot)$ and $V(\cdot)$ case.

and the necessary FOC: $\frac{\partial D}{\partial c} = 0$ implicitly gives the value of $\hat{c}(k^*(\hat{r}_P))$[20]. The party's payoff from choosing $\hat{c}(k^*(\hat{r}_P))$ is $D|_{c>\hat{c}} = \delta(1-\pi(k^*(\hat{r}_P))) - (1-\delta)\alpha\hat{c}(k^*(\hat{r}_P))$. Note that if $D|_{c>\hat{c}} > 0$ then party A optimally chooses $c^* = \hat{c}$. This holds true for α sufficiently close to 0. Now $\hat{r}_P > R_I$ if and only if

$$\hat{c} = \left(R_I + \frac{1}{\epsilon} + \frac{\gamma}{(1-\gamma)\epsilon k^*(\hat{r}_P)}\right)\frac{\pi(k^*(\hat{r}_P))}{mk^{*(m-1)}}.$$

Since $\frac{\partial k^*(\hat{r}_P)}{\partial \hat{r}_P} < 0$ the above holds true for sufficiently large $\hat{r}_P$. Since we are at the region when $c > \hat{c}$, we have $\hat{r}_P > R_I$. Hence we have sufficient conditions for holdout. □

9.2 Exogenous interference: a misleading specification for seller welfare

We begin with Seller utility. Consider a scenario where r_p and c are fixed. Recall that the sellers' payoff is $\pi(k)(qk + (1-k)(q_B - (1-\beta)r_I)) + (1-\pi(k))v$. Substituting the values of k^*, q and q_B from Sections 3.1 and 3.2 we get

$$U_S = \frac{\lambda - v - r_I}{4(r_P - r_I)}(\frac{\lambda - v - r_I}{2}) + v = \frac{(\lambda - v - r_I)^2}{8(r_P - r_I)} + v.$$

Now,

$$\frac{\partial U_S}{\partial r_I} = \frac{(\lambda - v)^2 - r_I^2 - 2r_P(\lambda - v - r_I)}{8(r_P - r_I)^2}.$$

Note that $\frac{\partial U_S}{\partial r_I} > 0$ if and only if $r_P < \frac{(\lambda-v)^2 - r_I^2}{2(\lambda - v - r_I)}$. Next recall that there is holdout whenever $r_P > r_I + \frac{\lambda - v - r_I}{4}$. Thus both these inequalities hold iff

$$\frac{(\lambda - v)^2 - r_I^2}{2(\lambda - v - r_I)} > r_P > r_I + \frac{\lambda - v - r_I}{4}.$$

It is routine to check that $\frac{(\lambda-v)^2 - r_I^2}{2(\lambda - v - r_I)} > r_I + \frac{\lambda - v - r_I}{4}$ for any parameter configuration. Thus, whenever r_P is neither too large, nor too small, an increase in bureaucratic corruption unambiguously improves seller utility.

□

[20] This corresponds to c_f in the linear $\pi(\cdot)$ and $V(\cdot)$ case.