Institutions of Public Information and the Problem of Regulatory Commitment

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Abstract

Can regulatory commitment be credible under *de-facto* non-independent regulation? When state and regulators collude, civil society actors can generate information and try to change voter strategy. Such public interest groups can thus aim at inducing party competition for a change in the regulatory set-up. In this paper we show using a game theoretical linked action situation approach that in the short run public information produced by public interest groups actually tends to reduce commitment, irrespective of a change in the set-up. This leads to what we call a 'low commitment trap'. We provide some indicative support to this claim through one instance of public monitoring of electricity in India. Yet, as we show, in the long-run this dilemma can be solved under a repeated game situation where state regulators make only public interest moves 'knowing' that a perennial commitment trap would otherwise be created. However, this is possible only when the institutional environment for information production is strong. We conclude that 'institutions of public information' - not independence – is the necessary condition for commitment.

Keywords: Credible Commitments, Independent Regulation, Institutional Environment, Linked Action Situations, Public Information

1. Introduction

Commitment is the core challenge of independent regulation in recently deregulated economies like India. In this paper we make a theoretical case for the influence of public information produced by public interest groups on regulatory commitment. In fact the analysis pursues the paradigm problem of institutional change which is all about how to bind players to agreements or how to credibly commit to enable complex contracting (North 1993). The general motivation for delegation by the government of regulatory powers to an independent agency is based on the principal-agent logic of transaction cost economics (Levy and Spiller 1994; Dubash and Rao 2008) which helps the principal, i.e. the government, solve commitment issues, overcome information asymmetries as well as insulate itself from the liabilities of unpopular policies (Thatcher and Stone Sweet 2002). Therefore, unless independent regulation is able to minimize the transaction costs which arise out of the commitment problem, its efficacy will be in doubt. India made its first attempts towards independent electricity regulation in the early 1990s. Some of the federal states went ahead unbundling the State Electricity Boards (the erstwhile monopoly in the entire electricity supply chain) and introduced management reforms. The regulators were mandated to take over the tariff policy function of the government and their prime goal was in balancing investor and consumer interests. However, reality turned out to be quite different. Although the government has lost control over tariff setting as a political tool, the regulators have also been unable to raise tariffs to attract investors (Dubash 2008). This is because there is in most occasions a strong government oversight over regulatory decisions. For example in Karnataka, as Dubash explains, the state government used executive orders to change the category applied for tariff rates for IT (information technology) consumers. Similar examples can be found in the instance of Andhra Pradesh (and other) regulators too (see case discussion below). Thus one of the main purposes of setting up regulators, which is to send credible signals for private investment rather than solely protecting consumer interests, is not served. Clearly, in this case, the commitment problem does not seem to have been resolved. How does public information produced by public interest groups impact this?

With a focus to address this, Section 2 discusses the problem of regulatory commitment in greater detail and the role of information. The basic elements of a formal stakeholder model of regulation are also discussed. In Section 3 we lay down the structure and explain the dilemma situation using ordinal, linked games within a framework known as the Network of Adjacent Action Situations (NAAS) concept. We further discuss the conditions under which this dilemma can be solved in the long run. We show that institutions of public information provisioning strengthen credible commitments. We also show that this condition leads to commitment in the long run, irrespective of regulation being independent. In section 4, we present some illustration of our predictions using an example from India. In section 5 we link our theoretical formulation with the empirical case and also discuss the necessary institutional conditions for production of public information. Section 6 ends with some general conclusions and implications of our research.

2.   Regulatory Commitment, Public Information and Stakeholder Models

Whether a regulatory design is adequate or not can be judged by the credibility of its commitments to investors as well as consumers, i.e. voters. Because the interests from either side are in conflict, regulation becomes inherently political. When consumers cannot exit the system in the event of being dissatisfied, they voice their protest through voting and other voice mechanisms, such as public discourse through media (Hirschman 1970). And if the investors are not sure about the safety of their investments, they do not make the required level of investments (Newbery 1999). Therefore the problem of regulatory commitment is central to understanding whether attempts for deregulation and competition will be successful or not in the developing context. The basic idea of having independent regulators can be described with the principal-agent logic, where the state, being a principal, delegates regulatory decision making to an agent, who can even take a politically unfavourable decision without implicating the principal. This helps the government, as the principal, solve commitment issues, but also to overcome information asymmetries through professional regulation, and to allow for unpopular policies (Thatcher and Stone Sweet 2002). Unlike in other principal-agent relations, however, the principal creates an agency that purposely resists interference from the

principal (Gilardi 2004). In other words, delegation is meant to reduce certain political transaction costs via solving the commitment problem (Majone 2001).

Yet when commitment is not successfully achieved through independent regulation, literature suggests that there is a need to move towards more stakeholder-based models of regulation (Dubash 2008). The 'responsive' and 'stakeholder' models of regulation (Ayres and Braithwaite 1992; Prosser 1999) predict the presence of a third actor apart from the regulator and the regulated who are an equal stakeholder in the decision process. This model is also known as tripartism. It is defined as a polity where active participation of civil society through public interest groups or NGOs is allowed. Ayers and Braithwaite present a game theoretic model of capture and tripartism and show the conditions under which harmful capture can be prevented, efficient capture can be encouraged and regulatory goals through democracy can be furthered. There are three requirements for this model to work: first, the public interest groups have to be given all the information the regulator has; second, the public interest groups have to be given an opportunity to participate directly in the negotiation process; third, they should have the same prosecution powers as the regulators. But these are *institutional* conditions.

The realization of these three theoretical institutional conditions seems to be more unlikely in those environments which *do not* favor regulatory independence. Logically speaking, the institutional environment which facilitates sharing of information, equal opportunity in decision making, and same prosecution powers to third actors, like the public interest groups, may as well not allow capture in the first place. Although an environment where information is no more private to the key decision makers could change the game through informed voters and the mechanism of party competition, these conditions are difficult to be met in most of the developing context. Therefore it is no surprise that the formal stakeholder model hardly exists (Dubash and Rao 2008).

Informally, however, a quasi-form of stakeholder engagement exists. Whenever any special interest move is suspected, public interest groups use an institutional mechanism, like filing of RTI (Right to Information) applications (in India), to produce information and amplify this through the media. This way public interest groups try to change the voter strategy (as *de-facto,* regulators are not independent from the government). Their aim is to bring about a regime change and hence a new regulatory

set-up which will generate more favorable regulation. But what impact does this process have on regulatory commitment? Do investors feel secure and confident? Regime change is not necessarily indicative of increased commitment as the new elected regulatory set-up could also renege on its pre-electoral promise. And if regime change is the only purported solution, then the whole point of having independent regulation seems redundant.

To answer some of the puzzles above, it is important to understand how regulatory commitment is linked to information production by public interest groups. In this paper, we try to do that through stylized games using linked action situations. We explain how this form of informal stakeholder engagement leads to a dilemma situation for the investors and creates a 'low commitment trap'. This however, is a short run phenomenon. We provide some tentative empirical illustration by briefly discussing a case of public monitoring of regulation in one region of India. We further argue that in the long run this dilemma can be solved under a repeated game situation where state regulators make public interest moves knowing that *otherwise* a persistent commitment trap will be created. We demonstrate that this is the case even though regulation is de facto not independent.

3. An Actor-Centered Game Based Illustration

Arguably, the most well-known form of the regulatory game tries to capture the conflict which arises over the sharing of rents between the investor and the regulator (Newbery 1999). There are two players in the game, the utility and the regulator, whose payoffs are affected by each other's strategies. The advantage of using a game structure to study interactions between rational agents is that their behavior can be observed under a situation when they know each other's strategies. However, the approach is limited by the difficulty to define the possibility set of the agents' actions and to include all the important aspects of interactions between the agents. For example, Newbery (1999) contends that there are a number of players whose actions may affect the investor's return (payoff), like the fuel suppliers, worker union, politicians, consumers, environmental groups, etc. But he includes only two players, the utility and the regulator as players in the game for the purposes of simplification and understanding a particular phenomenon, which in this case is commitment.

In Newbery's model the utility's payoff is given by the profit it earns $\pi_t = R_t - bQ_t - rK_t$, where R_t is the revenue, Q_t is the quantity sold and K_t is the tariff. The regulator's payoff is given by $U_t + \theta\pi_t$, where U_t is the consumer surplus, π_t is the investor profit, and θ is the weight on profits relative to consumer benefits. It is also assumed that $\theta < 1$ implies the regulators will serve the interests of the local consumers first, as compared to the investors, who may not serve as local voters. This also means that the regulator can behave opportunistically with respect to sunk investments. The sequence of the game is such that first the utility chooses capital, i.e. the amount of investment; then the demand is realized; then the regulator chooses a reward or tariff to be offered, and finally, the payoffs are realized. For this one shot game, assuming regulators have no legal restrictions on their freedom to decide whether to pay or not, Newbery finds out that in the Nash equilibrium regulators set price equal to the variable cost and the utility does not invest. However, when the game is repeated and the concept of sub game Nash equilibrium is used, the condition under which the utility has the best outcome of making positive investment is derived as $(1 - P)(c - b) > r$, where $(1 - P)$ is the probability of high demand, $(c - b)$ is the extra cost of losing out on the utility's investment and r is the level of investment. This condition means that a certain rate-of-return needs to be offered for the utility to be able to invest and this rate acts as a restraint on regulatory discretion and prevents opportunistic behavior. Such restraints are good for regulatory commitment, and the regulatory governance literature (Levy and Spiller 1994) too maintains that it is a critical aspect of the total regulatory design.

There are some limitations to the basic regulatory game explained above. Firstly, the number of agents is limited to only two, thereby restricting the scope of strategic interactions. While θ shows that the actions of the regulators are guided by its implication on the voting behavior, the voter is not considered to be an active player. The fact that electricity is very political in nature, being provided to all voters in a state, and especially in the developing context where satisfying basic needs and demand is still an unfulfilled objective, suggests that voting behavior cannot be overlooked to understand how regulation works. Similarly the government is not included as an active player, thereby overlooking the role of party competition. Secondly, there is an

assumption of information completeness. That is direct fallout of the fact that the regulatory process is not the basis of setting up the game. The purpose of this game is to find out when restraints on regulatory discretion are needed so as to increase commitment.

We try to extend the basic regulatory game with an actor-centered approach. The nature, structure, resources and interests of the actors do have an influence on the design and the outcomes of games (Klijn and Koppenjan 2000). Institutions determine how the game is played and may vary from one game to the other (Scharpf 1997). In short, games differ when actors and institutions differ. Therefore, the actor-centered institutional approach offers a more detailed possibility to study the strategic interactions between players in a regulatory game. This is so because the core assumption of actor-centered institutionalism is that any analysis of structures independent of the reference to the actors involved is incomplete and vice versa (Mayntz and Scharpf 1995). By maintaining a sharp distinction between institutions and observable action by actors, this approach combines methodological individualism and institutionalism (Scharpf 1997).

We use a linked action situation approach (Kimmich 2013) because we study the interactions between two games. Such an approach has been proposed with the concept of Networks of Adjacent Action Situations (NAAS), where "an action situation X_i is *adjacent* to Y if the outcome of X_i directly influences the value of one or more of the working components of Y" (McGinnis 2011). McGinnis built the concept as an extension of the Institutional Analysis and Development framework, based on the links between the seven sets of rules (Ostrom 2010) to identify related types of adjacent action situations. The NAAS concept has been demonstrated with several empirical cases (Lubell, Henry et al. 2010; McGinnis 2011; Dutton, Schneider et al. 2012). The approach can be extended to physical, informational, and actor linkages, and take into consideration causation and boundary conditions (Kimmich 2013). The network of linked action situations reveals the complexity of games that condition each other. The researcher has to analyse different types of outcome. While the outcome of the focal situation in our context is a certain level of regulatory commitment, the outcome of an adjacent situation is a working component of the focal situation (McGinnis 2011). This

outcome can be both physical in nature, or as in most cases, an institution. The underlying situation creating an institution can be the singular legislation of a law or a highly repetitive and long-lasting situation of reproducing habits and norms of behaviour. Especially in the case of the latter, the outcome is part of an underlying and persistent institutional structure that shapes the focal situation.

The Model

In this section we explain our game model using simple ordinal payoffs with three different actors in the regulatory process; the regulator (which includes both the regulatory agency and government, given our assumption of regulatory non-independence in a developing context), the generation utility (investor), and the voter. It is based on the party competition model of Scharpf (1997). In the first game, information about special interests is private and not known to voters. In the second game we introduce public information produced by public interest groups (PIGS) about the suspected special interest motives of the regulator.

We start with the regulator deciding to increase the production capacity in electricity generation. It expresses an interest that private investors should come and set up their own power plants (utilities) and produce electric energy which they should sell to distribution utilities on a long-term basis for a rate of return decided by it. Through this the government-cum-regulator aims to satisfy the median voter who will be happy to see that the peak demand is met. However, the government has two choices. Either it gives concessions (examples are captive coal mines or generous take-or-pay fuel contracts), which have an opportunity cost in terms of budgetary adjustments, or it does not give any special concession. Accordingly the utility decides whether and how much to invest. However, the key concern for the utility will be whether the regulator sticks to its commitments about concessions and rate of return so that their investments are secure and they can appropriate rents. The voter plays another game with the utility where it observes the move of the utility and decides to vote in or vote out the incumbent government based on whether it perceives reliable electricity at affordable prices. These two games are linked via the utility being present in both games and have

hence important feedback and causation effects. With this background we explain the game structure below:

<u>Set of players</u>

SR: State Regulator; includes combined decision making by state government and the regulatory agency
U: Utility; in this case the independent power producer (IPP) or the investor
V: Voters (consumers)

<u>Set of actions and choices</u>

SR: Invites private investment and either offers a Concession (*C*) or No-Concession (*NC*)
U: Decides to make high investment (Inv^h) or low investment (Inv^l)
V: Vote for (V^y) or Vote against (V^n) the incumbent government based on levels of investment by U

Stage 1: Private Information

<u>State Regulator (SR) and Utility (U) Game</u>

There is a set of legislated formal institutions where the government has to invite private investments through an open tender (competitive bidding) procedure. And the government can change the composition of the regulatory agency. This justifies our strong assumption that both government and regulatory agency have a common strategy. Therefore, SR represents the entire set of regulatory decision makers, including the government. In this game information is only shared between the players: regulator (SR) and utility (U), i.e. a privately owned electric company involved only in generation. SR and U also have common knowledge that V is unaware of any special interest motives, whereas their game plan has special interests. The preferences of both the players are written in an extensive form as shown in Fig. 1 along with the attached payoffs, which are ordinal preferences.

[Figure 1 (Investment game: regulators and utility) about here]

U prefers making high investment with concessions over high investment without concession: p (i_{high}; c) > p (i_{high}; ~c). Higher investment means higher revenues: p (i) = e^{x*i}. It prefers lower investments with some concessions than lower investments without

any concession: $p(i_{low}; c) > p(i_{low}; \sim c)$. It always prefers high investment over low investment $p(i_{high}) > p(i_{low})$.

<u>Utility (U) and Voter (V) Game</u>

In parallel, utility (U) and voter (V) also play a game. This is because the only way V can observe the actions of the regulator (SR) is through the level of investments U makes. V believes that the higher the level of investment, the higher will be the availability of electricity and the lower the prices. This game is illustrated in Fig. 2 where U prefers making high investment and government being voted in to being voted out. However, when it makes low investment it prefers the government being voted out so that there is new government and new SR. V clearly prefers high investment over low but cannot decide in either case whether to vote in or out. The payoff structures reflect this set of preferences.

[Figure 2 (Incomplete information voting game: utility and voter) about here]

We solve both games through backward induction, deriving the Sub-game Perfect Nash Equilibria (SPNE) and the game equilibrium. The equilibrium in the 'investment game' (see Fig. 1) is where the regulator offers concessions and the utilities make high investment. There is no single pure strategy equilibrium in the 'voting game' (see Fig. 2). The outcome could be both where utilities invest highly and the voters vote in or out the incumbent or utilities make low investment and voters voting in or out the incumbent. This is because the voter cannot observe the reasons for the low or high investment and her payoff from voting for (or against) the incumbent is the same. In addition, U receives the same payoff for his decision, as $p(i_{high}; c) + p(i_{low}; c) = p(i_{high}; \sim c) + p(i_{low}; \sim c)$, or $1+2 = 0+3$. Therefore, we see this indeterminate solution.

Stage 2: Information about special interests available to voters

The voter has now more public information about the regulatory process of private investment due to the presence of public interest groups. Its strategies are now informed by the fact that there could be special interests in awarding concessions, so it is cautious. V receives information of the move taken by SR, although this information is imperfect and also incomplete, because the payoffs are not known to V. It is very

important to remember that the assumptions we have on the information public interest groups produce will decide the outcome of the game.

We assume that the information is primarily biased against SR and V now thinks that:

a. There is rent seeking by utilities, through favored concessions from the government,

b. Tariffs will ultimately increase as generated electric energy will be sold outside their own regions.

In game theory, complete information refers to common knowledge of the game structure, including the payoff functions. Common knowledge itself can be defined even broader as a meta-axiom, where the axioms of logic and game theory, including the behavioral assumptions, are known by each player (Gilboa and Schmeidler 1988). In our case we are especially concerned with knowledge of the payoff functions. The game-theoretic literature has dealt with information concerning payoffs in different ways: The classical approach is Bayesian updating of priors (Heap and Varoufakis 2004). Gilboa and Schmeidler (1988) first proposed the concept of information-dependent games which states that information can change players' payoffs in non-cooperative games. An example given by the authors is gossip, where the information told to a player may change his utility of a certain move. We take a similar approach, where public information is the information known to all players involved. We simplify the role of information in the sense that the information made available to the public is "objective". An extension could also include social information, where information is not neutral, but can be *biased* in different ways and also used strategically. This would require modeling the bias of information, however. Public or social information can concern both the payoff of the player who the information is addressed to, as well as the payoff of other players involved in the same game.

New game in the next electoral cycle

The preferences of U remain the same but the preference ordering of V changes in the game between them for votes. This is due to the media-amplified information V receives from public interest groups. As V observes that U acquires some rents, V realizes that its own payoffs could be potentially better with putting the government

under pressure. So V feels that voting against will give it a higher reward. If U makes high investment V wants to vote against the incumbent government as it sees concessions as a form of special interest. If U makes low investment, V does not get improved electricity provision and also wants to vote the incumbent out. The new payoffs of the voter V* can be seen in Fig. 3.In the next time period, but within a short run context, the preference ordering of U will change, irrespective of regime change. U is a common player in both the games and has to make its decisions according to the potential outcomes of both games in which it is involved. The preference ordering of the new regulator, SR*, will remain same as it will employ the same strategy to invite investment. But U* will now clearly prefer low investment over high investment as it is not sure if the concessions will be overturned by a regime change. This will affect the viability of its investment project. The new payoffs of utility U* can be seen in Fig. 4. Applying the pure strategy Nash algorithm, we see that for the complete information voting game (see Fig. 3), the equilibrium is where the utility does not want to invest and the voters still want to vote out the incumbent.

[Figure 3 (Complete information voting game: utility and voter) about here]

The result can be explained as follows: the voter does not vote for the incumbent under low investment as this translates into reduced power availability. It also does not vote for the incumbent when the investment is high as it, even though not observing, at least believes that it is a special interest move. *This leads to a dilemma and is the source of the commitment problem.* Because of this dilemma, in the next period the preference ordering of U changes (see Fig. 4). It now values low investment more than high investment as it is in a dilemma that V will always vote against the incumbent if it believes the public information it receives from public interest groups. The equilibrium now is (see Fig. 4) where regulators do not offer any concessions and there is low investment by utilities. This, we call the *'low commitment trap'* arising out of the investment problem.

[Figure 4 (New period investment game: regulators and utility) about here]

In the next section we will illustrate our arguments through the example of People's Monitoring Group on Electricity Reforms (PMGER), an influential public interest group

in Hyderabad, India. We will discuss the case of their active public scrutiny of power purchase contracts between the private generation utilities and buyers.

4. The Case of Private Investment in Andhra Pradesh, India[1]

The Andhra Pradesh electricity sector has some resemblance to a form of quasi-stakeholder engagement because civil society activity is strong. This is due to the presence of PMGER[2], a public interest body which monitors the activities of the electricity regulator. PMGER also has a formal representation on the advisory board of the electricity regulator, but that is only formal in nature and has no significant policy influence. That is why we refer to it as quasi-stakeholder engagement. The main strategy of PMGER is filing of litigations against any moves by the utilities or the regulators to increase the tariff burden on the consumers. PMGER actively scrutinizes the power purchase agreements (PPAs) between private investor-backed independent power producers (IPPs) and the distribution utilities.

These power purchase contracts have strict 'take or pay' clauses which mean that any fuel risk is ultimately passed on to the consumers. This is a potential contractual hazard and indeed has led to multiple instances of renegotiations and amendments to the contract, as can be seen from the case of four major IPPs in Andhra Pradesh (see Table 1). This was because natural gas, which is the primary fuel for these private generation plants, was not available for the first eight years after the power contracts were signed (Ghosh and Kathuria 2011).

[Table 1 (Features of current Power Purchase Agreements, PPAs) about here]

Usually the IPPs enter into power purchase agreements, long term contracts ranging from 15-23 years with the state distribution utilities. Table 1 summarizes the important features and contractual evolution of 4 such IPPs[3], which faced huge delays in operation and have had to face contractual renegotiations several times even before operations began. These four IPPs were almost ready to generate electricity by 2005-06, but could not do so because there was no gas available from Gas Authority of India Ltd. (GAIL)[4] to them. Upon analyzing the whole negotiation process we observe that some of the key reasons why the contracts between the IPPs and the distribution utilities ran into rough

weather are transactional in nature. The shortfall of natural gas meant that the existing contracts were rendered incomplete and ineffective. To deal with this 'perceived' uncertainty, an 'alternate fuel' clause was introduced in the initial contract as it was known even during the drafting phase that there would be uncertainties about fuel supply in the future. But as per the 'take or pay' contract once the plant operation date is declared, the distribution utility gets locked in and has to buy the higher cost electricity generated by high cost alternate fuel or pay at least the fixed charges in the absence of any generation. But once gas became unavailable for generation purposes and there was indeed a need for alternative fuel, the distribution utilities objected to the alternative fuel clause and moved the regulators for ex-post amendments. The IPPs agreed to delete this clause on the condition that they would be allowed to sell 20% of their contracted capacity in the open market. This would enable them to recover the losses due to non-generation and earn net positive returns. However this meant that the already deprived distribution utilities would have to buy a portion of their own legitimate share from the open market at higher rates. These negotiations went through the regulatory process and the regulators, being the 'independent' authorities, decided on the final outcome. The next sub-section describes this briefly.

4.2 The role of civil society actors and regulatory decision

The PPAs, with the proposed amendments, along with the report of a state government appointed committee to look into the amendments, were submitted to the Andhra Pradesh Electricity Regulatory Commission (APERC) for approval on the 02.02.2009. The APERC then conducted - in the spirit of the 'law and philosophy' of electricity reforms - a series of public hearings, where all stakeholders, including public interest groups, discussed and debated the proposed amendments. In multiple hearings ranging over 10 months, all the parties presented their cases and debated over issues related to consumer welfare, contractual cost benefits and micro mathematics of the incentives. The public interest groups raised tough questions on the intent of the IPPs in trying to maximize their profits at the cost of loss to the consumers whereas the IPPs defended themselves on the basis of their stranded costs and high risks of future gas unavailability. In the meantime, gas supplies improved from April 2009 due to increased availability from the KG Basin and Reliance Industries Limited (RIL)

committing regular supply of gas to the IPPs. Finally, in a gas order dated 05.12.2009, the APERC overturned the appeals for amended agreements keeping in view the *'public interest at large'*.

The regulators further recommended some options to be reworked, which would allow the IPPs to cover up their losses without hampering consumer welfare. But as stated in Section 3, these PPAs are different from the privately ordered relational contracts. These are more of the nature of public contracts and hence subject to scrutiny by the third party public or private interest groups. In this case the regulatory process was constantly tracked and monitored by civil bodies, like PMGER and some other independent energy auditors and journalists.

At every stage of the amendments and fresh PPA proposals, there were objections filed by PMGER during the last 10 years. Moreover, the public hearings which covered the whole span of the year 2009[5] went back and forth with PMGER raising objections and the IPPs, distribution utilities and the regulators responding (Common-Order 2009). This whole process of public hearing of the case filed by PMGER was covered by the media. In the meantime, the Government of Andhra Pradesh appointed an independent committee to look into the amendments and it passed an order G.O. 135 (Government Order). This order overruled most of the objections raised by the PIGS and ruled in favor of the IPPs and distribution utilities. While 'respect(ing) and hold(ing) the observations of APERC in the highest esteem', the order claimed to supersede the authority of the regulatory commission in having the final word. In the public hearing subsequent to the passing of G.O. 135, the PIGS raised this issue and reminded the regulatory commission of its independent powers that "the APERC is a quasi-judicial authority and it cannot be directed to decide the matter in a particular manner" (Common-Order 2009; p.162).

In its final order, the regulatory commission '(in) view… (of) the legitimate interests of the various stakeholders, including the IPPs, DISCOMs (distribution companies, *added by the authors*), electricity consumers and general public interest at large' and having well taken the content of the objectors, overruled the G.O 135 and agreed to the amendments as proposed by PMGER. The regulators also cited various references from previous court orders (some brought to their notice by PMGER) to prove that the

government order was not binding and that they were independent in framing their own regulations and stated that 'APERC being an independent regulator cannot be influenced by any authority including the Government in the matter of balancing the interest of all the stakeholders by issuing directions by invoking section 108 of the Electricity Act, 2003' (Common-Order 2009; p.193). Finally, the regulatory commission *rejected* all those amendments which were *not* in tune with the *public interest* at large and accepted only those which matched the interests of the IPPs, the distribution as well as the electricity consumers at large.

We contend that this uncertainty surrounding the commitment of the regulator to protect their investment could well explain the current lack of enthusiasm in the levels of gas-based private investment in Andhra Pradesh. During the period from 2007-2012, there was private investment to the tune of 1275 Megawatt (MW) installed capacity in gas-based power plants in Andhra Pradesh, but for the period from 2012-2019, there is not even a single forthcoming private investment in Andhra Pradesh[6]. This is despite the fact that there have been huge discoveries of gas in the Krishna-Godavari basin off the coast of Andhra Pradesh. In fact the share of non-gas based private investment has also slumped in Andhra Pradesh. This is in sharp contrast to another Indian state, Gujarat, where the growth of IPPs has been quite high (Ghosh and Kathuria 2013).

5. Discussion: institutions for information production

5.1 Long run equilibrium

The case above shows how in Andhra Pradesh IPPs moved initially with high investments in response to concessions, like a generous 'take or pay' contract from the state regulators, in this case offered by the government of Andhra Pradesh and the regulatory agency APERC. This is consistent with our modeling in the first game. Eventually public information set in, which led to increased scrutiny of the regulators in the minds of the general public or the voters. In fact in 2004, the ruling regime in Andhra Pradesh was replaced by a new government which came into power on the promise of free electricity to farmers (Shah 2009). This eroded the credibility of the regulatory agency as far the investors and the urban consumers were concerned. This is consistent with our complete information voting game which has, in the current short

term, now changed the way investors perceive regulatory intervention. This has changed the payoffs of the utilities which now are not sure if their high investments based on earlier concessional contracts are secure. The regulatory process in the presence of third party actors like the PMGER, which produce information, has been inclined towards the '*public interest at large*' and has led to regulators reneging on their commitments, as in the case of 'alternate fuel' clause. The current state of investment in Andhra Pradesh is partly reflective of this 'low commitment trap' and follows the modeling pattern in our complete information, new period investment game.

To sum up, so far we have shown using a linked action situation approach that information produced by public interest groups changes the payoffs of the key actors in the investment and voting games and in fact leads to a fall in regulatory commitment, at least in the short run. This is because investors perceive that the incumbent regulatory regime will be voted out and concessions may be reneged upon. This means that *in the presence of public information, special interest moves by the regulatory regime will not be successful in attracting sustained investment*. We have given at least one instance of this through the example of private investment in power plants in Andhra Pradesh and its public monitoring. Albeit without much elaboration, we have also guided the readers (in an earlier footnote) to the problems of 2G spectrum auctions and captive coal mine allocation. However, greater empirical research is needed to substantiate or negate this prediction in other settings.

But what does it mean for commitment in the long run? Precisely because special interest moves will *not* be effective in the presence of public information, the only long run solution to overcome the commitment trap will be when, under a repeated game situation, the regulator's payoff changes in a way that it places higher values on public interest moves. But how will this happen? This outcome will result as long as *public information is produced* and helps voters know their payoffs better. With every special interest move being detected and regulatory regime being voted out repeatedly, the regulator's pay-off will change. It can be illustrated using the game structure as shown in Fig. 5. The regulator now attaches a lower value to concessions. The long run equilibrium in that case will be where utilities make high investment without special concessions but with assured stable and flexible contracts or vertical integration.

[Figure 5 (Long run equilibrium with public information) about here]

Fig.6 summarizes the relationship between commitment over time and public information. From the curve AB we can see that in the short (T_0) and medium term (T_M) regulatory commitment falls over time for a certain constant rate of information production. But in the medium term the commitment trap is broken and it starts to slope upwards in the longer term (T_L). The definition of medium term and long term is arbitrary for the moment (and actually needs to be empirically determined), ranging from one or two electoral cycles to even more. When the rate of information production increases the curve would become steeper as shown by the dashed line MN. The commitment trap would be overcome earlier and a higher commitment level will be reached quickly. However, when the institutional environment for information production is weak and information is generated at a slower rate, then the curve takes the shape of the dashed line CD, where the commitment trap is never broken and with time commitment keeps on falling.

[Figure 6 (Relationship of commitment with public information over time) about here]

5.2 Conditions for long run equilibrium: public information

This brings us to the key insight of the paper, which is that this long term equilibrium can be achieved only when the institutional environment is favorable for production of public information. So there needs to be laws which facilitate public interest groups to gather information from state agencies, and there needs to be a judiciary which protects those rights. In India, such an environment exists ever since the Right to Information Act (2005)[7] was enacted. Information produced through such a process is generally high quality (i.e. backed by data) and credible to the voters. Having said that more research on the impacts of information producing institutions like the 'right to information' on the levels of rent seeking, concessions and investment in public and private infrastructure provision like energy and telecommunications or on the way natural resources are managed or exploited like forestry, sand mining, coal mining and water

bodies, could substantiate the claim that public information could lead to stable public interest outcomes in the long run.

6. Conclusions

In pursuit of the bigger problem of how to generate credible commitments to bind players into agreements (posed by Douglass North and others) we have made an attempt to show what role institutions of public information can play in that. Using a linked action situation approach through a network of adjacent action situations (NAAS) we show a way in which public information could affect regulatory commitment by creating a 'low commitment trap' in the short run. This, however, can be solved in the long run under a repeated game situation where state regulators make public interest moves being aware that otherwise a trap will be created. We have thus demonstrated that even under de facto dependent regulation where the government and regulator act in collusion, regulatory commitment can evolve. This result counters the principal-agent logic that is often provoked when analyzing the role of independent regulation.

Our game models and the corroborative example of the public monitoring of electricity in Andhra Pradesh are indications that in the presence of public information, the state policy of offering special interest concessions does not necessarily lead to sustained higher investment. Active public interest actors help the voter know its own payoff better through increased public information. Therefore, the long run best response for state regulators will be to always make credible public interest moves. This is somewhat similar to the prediction by earlier literature that 'by choosing public interest oriented policies, the government will assure itself a moderately good outcome' (Scharpf 1997, p.186). But such prediction hangs on the stringent condition that political opposition opposes the moves by the incumbent and voters react each time. What we have shown is that even when this condition of active political opposition does not apply, the long run strategy of state regulators (the incumbent) would be to make public interest moves. However, the necessary condition for this is the presence of an institutional environment which facilitates the production of public information. We showed that in India this has been made possible by the RTI Act which allows public interest groups to access credible information on administrative and policy processes. However, follow up research is needed to empirically establish this relationship in various settings,

especially historical. A wider implication of this reasoning is that institutions of public information lead to strengthening of credible commitments.

Acknowledgements

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Tables

Table 1: Features of current Power Purchase Agreements (PPAs)

S.N	Name of the IPP	Entry Route	Capacity (MW)	Year of First PPA	Year of Final PPA	Year of COD#	Initial Allotment of Gas (MCMD)	Number of Renegotiations
1	GVK Ltd.	MoU	220	1998	2003	2006	1.1	2
2	Gouthami Ltd.	Bidding	464	1997	2003	2006	1.96	2
3	Konaseema Ltd.	Bidding	445	1997	2005	2007	1.60	3
4	Vemagiri Ltd.	Bidding	370	1997	2007	2006	1.64	3

Notes: # COD - Commercial Operation Date; MCMD: million cubic meters per day; MoU – Memorandum of Understanding

Source: (Ghosh and Kathuria 2013); various PPAs and APERC reports

Figures
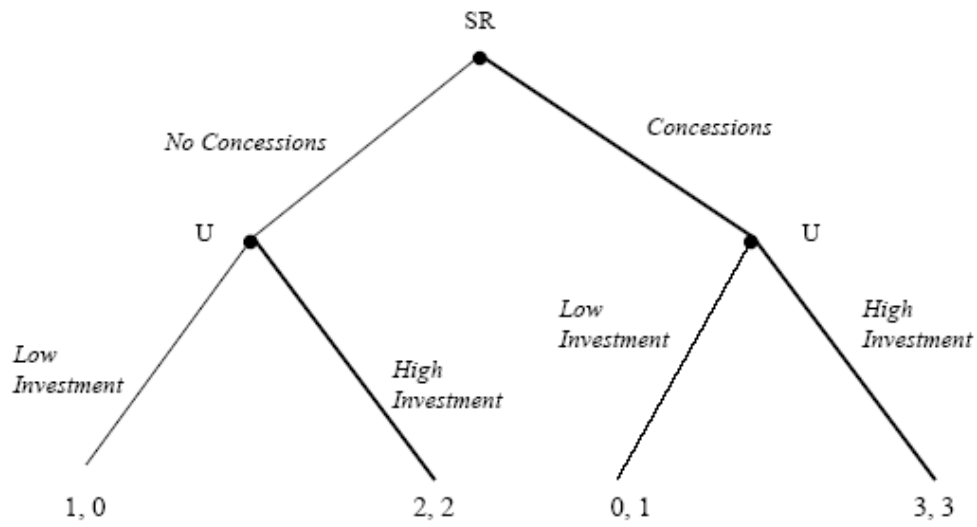
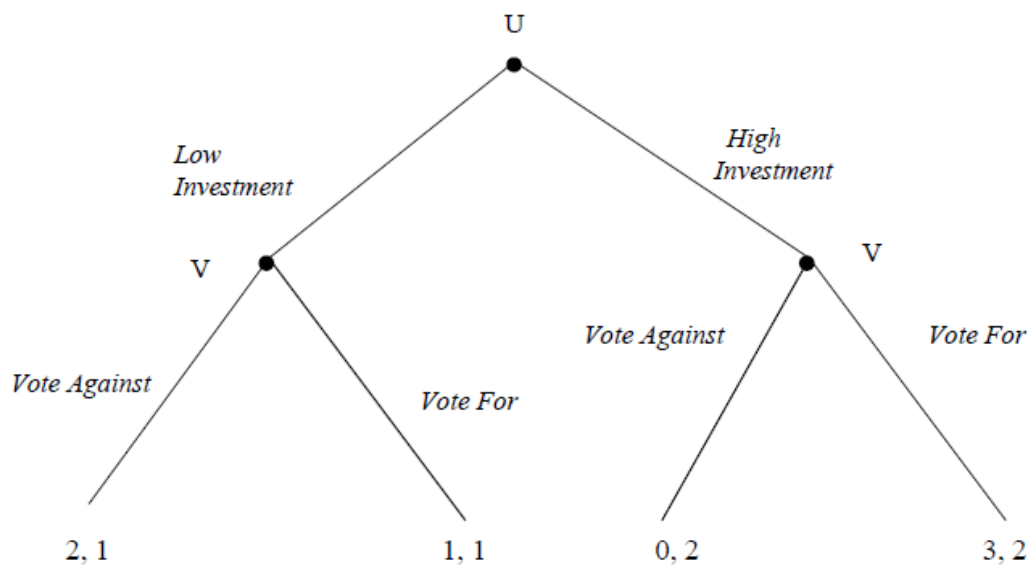**Fig. 1**: *Investment game: regulators and utility*

Fig. 2: *Incomplete information voting game: utility and voter*
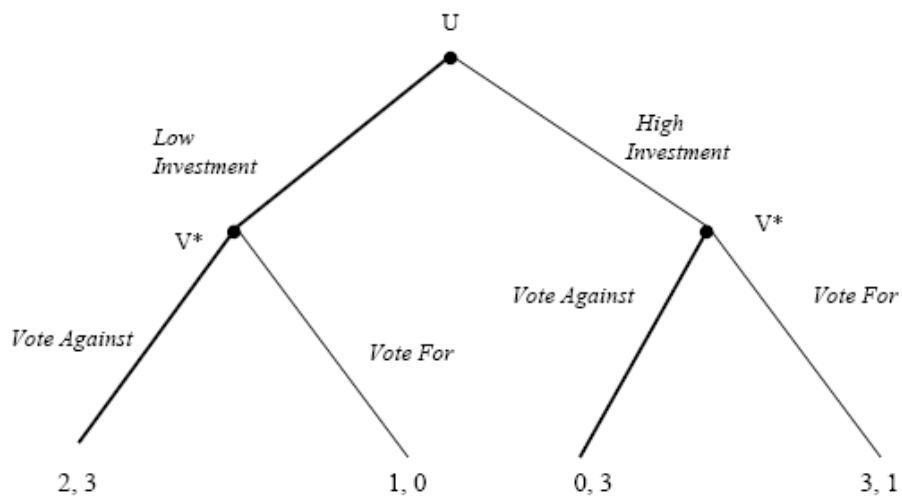
Fig. 3: *Complete information voting game: utility and voter*
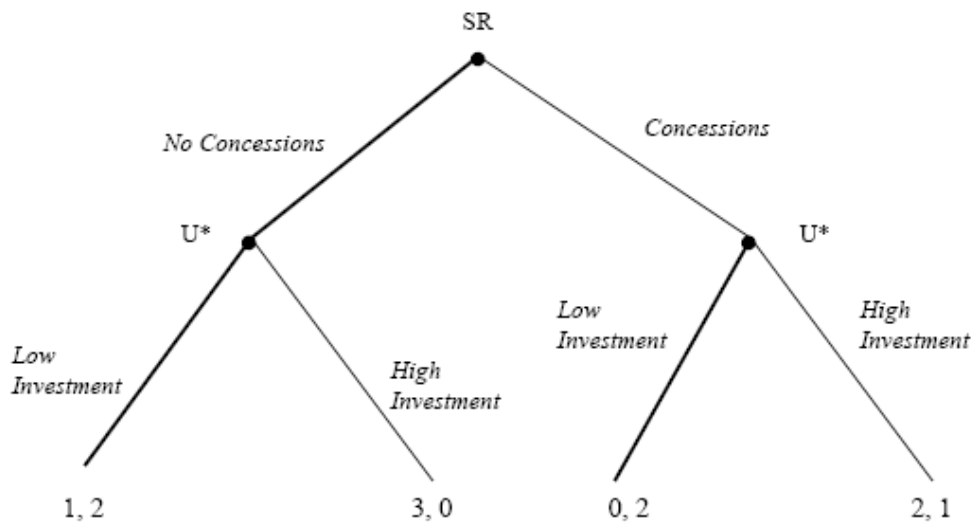

Fig. 4: *New period investment game: regulators and utility*
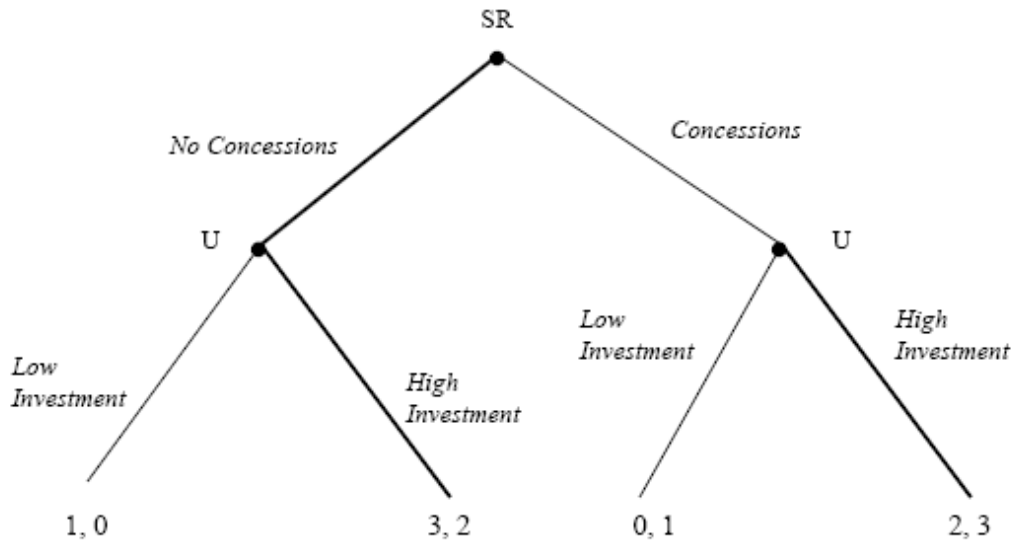
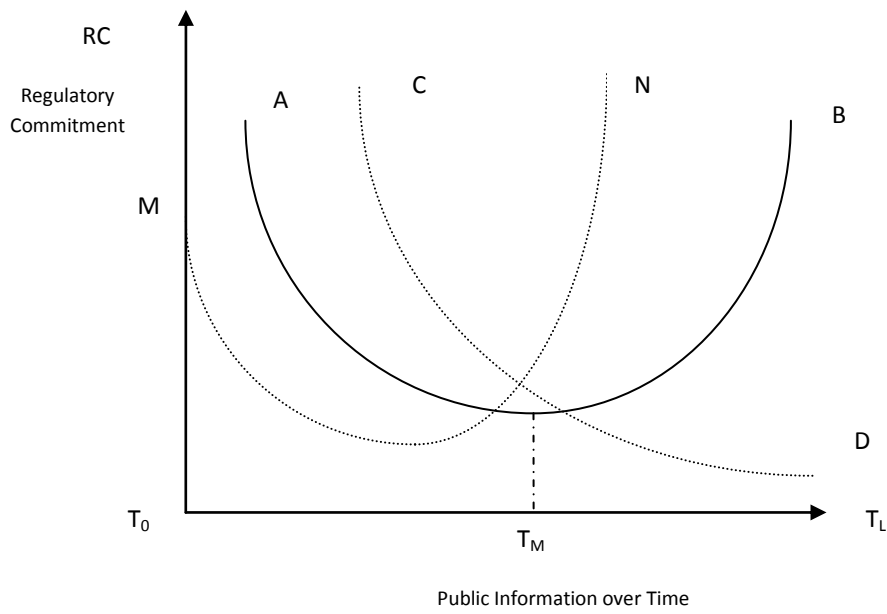**Fig 5**: *Long run equilibrium with public information*

Fig. 6: *Relationship of commitment with public information over time*

[1] We only present an indicative case of electricity regulation and investment in Andhra Pradesh, but recently there have been two other cases of private investment which suffered on similar counts. One is the 2G spectrum bandwidth auction failure (http://www.bbc.co.uk/news/business-20335147) ; and other, the allocation and subsequent de-allocation of private licenses of captive coal mines (http://businesstoday.intoday.in/story/coal-scam-coalgate-cag-analysis/1/187782.html). Readers are directed to the web-links for further details as it is beyond the scope of the paper. However, a common thread in all of these cases is the revoking of government (or regulator) awarded contracts ex-post the investment. This has a plausible effect on regulatory commitment.

[2] People's Monitoring Group on Electricity Regulation

[3] The detailed contractual and related information presented in this section is sourced from the individual Power Purchase Agreements (PPAs) and other records availed from the regulatory commission: Common-Order (2009) "O.P.No.9-12 dated 05-12-2009, Andhra Pradesh Electricity Regulatory Commission (APERC), Hyderabad."

[4] GAIL is the state-owned gas supplying agency in India.

[5] Between 04.03.2009 to 17.11.2009, 13 public hearings were conducted by the APERC (APERC Common Order, 2009).

[6] The information is based on the official report 'Power Scenario at a Glance, 2012' published by the Central Electricity Authority of India (CEA).

[7] Under the provisions of the Act, any citizen may request information from a "public authority" (a body of Government or "instrumentality of State") which is required to reply expeditiously or within thirty days. (http://rti.gov.in/)