The Role of Regulatory Agencies in Developing Countries

A Game Theoretic Approach to the Regulation of Public-Private Contracts

Abstract

This paper addresses the question of the relative advantages of regulation by contract and regulation by agency. In practice, many regulatory systems fall between these two poles and developing countries have often experimented with hybrid mixes when liberalising utility sectors. Yet, the theoretical literature covers only the polar cases and does not address the hybrids. The paper sets out a simple game-theoretic model of government-firm interaction under a long-term public-private contract. It shows that if both government and firm have long time horizons, then the parties will be able to achieve a cooperative equilibrium in which they both comply with the contract. However, where the parties have short time horizons, both parties will have incentives to renege on the contract. If strong institutions exist, they may impose sufficient penalties on non-cooperative behaviour to achieve a cooperative equilibrium. The regulatory agency can play this role by raising the costs to the parties of non-cooperative behaviour. The model shows that in the absence of other supporting institutions, like a strong and independent judiciary, the regulator's role can be critical in achieving contract compliance.

The paper considers the results of the model against four original case studies of hybrid regulatory structures in the water sector in developing countries based on extensive field research. The case studies reveal that regulatory agencies in hybrid structures play multiple roles that promote cooperation between governments and firms. These roles include arbitrating between the firm and the government in the event of a shock, arbitrating between competing political interests, reducing the politicisation and increasing professionalism of tariff setting, and increasing transparency in government-firm interaction.

1 Introduction

There is a long-standing debate over the relative advantages of regulation by contract and regulation by agency. This debate is sometimes construed in geographical terms, contrasting the 'Anglo-Saxon' tradition of independent, discretionary regulatory agencies, and the 'French' or 'continental' model of specifying regulatory provisions in a public-private (PP) contract, although in practice, many regulatory systems fall between these two poles. Developing countries have experimented with these models and hybrid mixes when liberalising and restructuring utility sectors to allow private participation. Yet, the theoretical literature covers only the polar cases of regulation by contract and regulation by agency and does not address the hybrids. This paper takes a first step toward filling this gap. This effort is justified by the widespread use of hybrid models in developing countries.

This paper offers a first set of answers to this issue by setting out a simple model of government-firm interaction under a long-term PP contract. The model follows a game theoretic approach to understand bargaining between the two parties. I consider the findings of the model against four case studies of hybrid regulatory structures in the water sector in developing countries based on extensive field research in several South East Asian countries.[1] The case studies reveal that regulatory agencies in hybrid structures play multiple roles that support cooperation between governments and firms. These roles include arbitrating between the firm and the government in the event of a shock, arbitrating between competing political interests, reducing the politicisation and increasing professionalism of tariff setting, and increasing transparency in government-firm interaction.

In policy-making, the presumption has been until recently that PP contracts would lead to better welfare outcomes in the presence of a regulatory agency. This has been confirmed in several empirical studies (For example, Wallsten 2001). But recently, this view has been superseded by a 'pragmatic' stance, which sees regulation by contract and regulation by agency as viable

[1] Field research was conducted in Malaysia, Indonesia, China and the Philippines in 2004 through more than 100 semi-structured interviews with governments, firms, regulators and civil society groups. Evidence collected on concession contracts in Macau, Shanghai, Shenzhen (China), Selangor (Malaysia) and Batam (Indonesia) is not reported here for reasons of space.

alternatives.[2] In countries with weaker rule of law, preference has been given to regulation by contract, which is thought to reduce regulatory risks for the private investor. Unfortunately, this has resulted in contracts being implemented in circumstances where they are most likely to fail (Gómez-Ibáñez 2003). This paper does not argue against the use of contracts; instead, it argues that regulatory agencies can play a beneficial and even critical role in the implementation of PP contracts.

If developing countries are to meet the Millennium Development Goals, private finance and private management in utility sectors will be needed, and constructing a sound regulatory framework for PP contracts continues to be an important issue. Policies to create this framework must take into account the distinctive characteristics of the institutional environment in developing countries in order to be effective.

In this paper, I develop the intuition that regulation by contract is susceptible to opportunistic behaviour by both firms and governments as a result of the inherently voluntary nature of contracting (Williamson 1985). I show that if both government and firm have long time horizons, then the parties will be able to achieve a cooperative equilibrium in which they both comply with the contract. However, where the parties have short time horizons, both parties will have incentives to renege on the contract. If institutions are strong, they may impose sufficient penalties on non-cooperative behaviour to deliver a cooperative equilibrium. It is here that the regulatory agency plays a role in raising the costs to the parties of non-cooperative behaviour. In the absence of other supporting institutions, like a strong and independent judiciary, the regulator's role can be critical in achieving contract compliance.

In the next section, I offer a brief review of the literature from the fields of economics and political economy, addressing some key issues relating to the design and implementation of utility regulation in developing countries. The third section presents a simple model of interaction between governments and firms under a long-term PP contract using a rational choice, game theoretic framework, while the fourth section presents the effects of institutions characteristics on the outcomes of the game. The following sections of the paper introduce and present four case studies of concessions in the water sector in Asia and analyse these in the light of the model. Regulators are seen to play a variety of roles in constraining opportunism by governments and

[2] For example, this view was expressed in the presentations of World Bank staff at the World Water Week conference, Washington DC, February 2005.

firms. The final section concludes and develops some policy recommendations for the design of regulatory structures in developing countries.

2 Theoretical Framework

At the outset, it will be helpful to clarify what is meant by regulation: in the context of this paper, 'regulation' refers to rules enforced by a government agency to control economic activity. As such, it falls between indirect methods of control like taxes and subsidies and direct control through the ownership of market entities. Economic regulation encompasses rules governing price, output, and industry structure, with the aim of redressing the market failure of natural monopoly. In the absence of economic regulation, private providers of network utility services would be likely to exploit their monopoly position, at the expense of consumers. The discussion here focuses on economic regulation, although much of the literature can be applied also to other types of regulation.

The early literature on regulators developed in the US, which has a long history of private ownership in network industries. In the first half of the 20th Century, regulatory agencies were seen as agents of the public interest, protecting consumers from exploitation by monopolists (See McCraw 1975 for a review). Over time, however, critiques of regulation emerged. Stigler (1971) argues that the demand for regulation comes from industries and that regulation is designed and operated for their benefit. Regulatory agencies are 'captured,' in the sense that they regulate in the interests of the industries that they are intended to control. Posner (1972) refined the critique, arguing that capture by other groups was also possible. Peltzman (1976) formalised these ideas in a model of regulation that took into account the influence of both consumer and producer interests. These models are founded in a perspective of government agency behaviour founded in the traditions of public choice, associated with the names of Buchanan and Tullock (Buchanan and Tullock 1962),and Olson's collective action theory (Olson 1965). These theorists turned economic logic to the analysis of political phenomena and analysed government agencies as rational utility maximisers. This view of government informs the model that is developed in the next section.

Concerns about regulatory capture fed into Demsetz's influential paper, which showed how natural monopoly market failures could be addressed through 'regulation by contract' (Demsetz 1968). He argued that 'competition for the market' could be created by periodically re-bidding short-term monopoly contracts for service. Competitive tendering would ensure that prices were

set at competitive levels. Although this solution is theoretically satisfying, it has rarely been implemented in practice due to two main concerns: competition for contracts may be ineffective because of collusion or incumbency advantages; and under-investment, depending on the observability and transferability of investment. In any case, the government will have a continuing role in contract administration (monitoring, enforcing and bargaining over unspecified contingencies) (Vickers and Yarrow 1991). Instead, regulation by contract has usually taken the form of one-off, long-term contracts, long enough to allow investors to earn adequate returns on their capital investments. This leaves the problem of unspecified contingencies in the contract. Most contracts contain some kind of tariff adjustment formula or process, but as contracts are always incomplete, as we know from Williamson (1985), this can result in opportunistic renegotiation.[3]

The literature on regulation developed in the US, and naturally focused on regulation in the context of the specific institutional environment of that country. The institutions of rule of law, separation of powers, checks and balances, democracy, a fair and competent judiciary etc. were taken for granted. Government agencies may have operated as rational utility maximisers, but they did so within the constraints imposed by these institutions. The crucial role of these institutional constraints was not addressed in the literature for another two decades, until the work of Levy & Spiller (1994). Their paper distinguishes between two basic types of political institutions: parliamentary and presidential and their argument runs like this: in parliamentary systems with alternating majority governments, laws are easy to implement or reverse so the government will not be able to show commitment to a stable regulatory regime through primary law. In this case, governments should sign contracts with the private providers which can be enforced through ordinary commercial law. In presidential systems, laws are difficult to pass so the government can show commitment to a stable regulatory system by passing a primary law to create a discretionary regulatory body. Although this article made an important contribution to the debate, its narrow focus on one particular institutional dichotomy underestimated the manifold ways in which institutions impose constraints on public and private actors.

Laffont (2005) is the first work to consider the implications of institutions for regulation in a systematic way and to draw attention to the salient differences between developed and developing

[3] Renegotiation of infrastructure PP contracts is extremely common. See: Guasch, J. L. (2004). Granting and renegotiating infrastructure concessions : Doing it Right. Washington, D.C., World Bank.

countries in this regard. He draws attention to the following characteristics of developing countries:

- sanctity of contracts;
- quality of the judicial system
- monitoring costs associated with the quality of auditing and accounting mechanisms
- transparency in the financial system
- cost of public funds
- corruption.

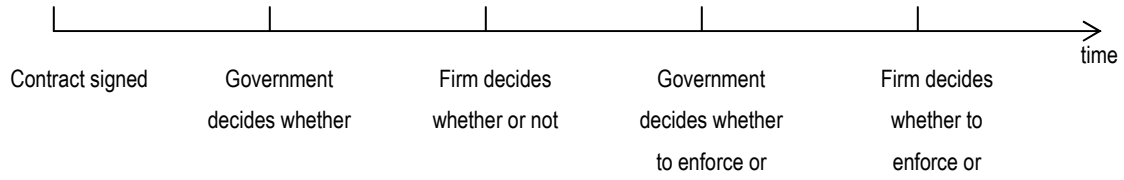
Other potentially significant attributes of developing countries drawn from the growth and infrastructure literatures include: protection for property rights (Acemoglu and Johnson 2003); the rule of law (Rigobón and Rodrik 2004); political stability, policy credibility and the existence of a sound regulatory framework (Easterly and Serven 2003); bureaucratic quality and the timing of elections (Guasch, Laffont et al. 2003). This is already a long list of attributes and the patterns of interaction between institutions add to the complexity of this analysis. Initially, it is therefore useful to approach the regulation-institution relationship qualitatively, to draw out which institutions affect regulation in particular cases.

Given these attributes of developing countries, would we expect a regulatory agency to help or hinder the implementation of a PP contract? Some of these attributes will undermine any regulatory structure (weak rule of law, corruption, high monitoring costs, lower bureaucratic quality). Others are likely to be more problematic for a pure regulation by contract system (poor quality of the judicial system, poor enforcement of property rights). In the next section, I present a model of government-firm behaviour where there is no regulatory agency, and where other institutions impose only weak constraints on opportunism by the parties, to show how regulation by contract can result in a non-cooperative equilibrium. I then explain why a regulator agency can help to relieve this problem.

3 The PPC Game

In this section, I set out a simple model of the interaction between the government and the firm. The PPC (public-private contract) game is played by two agents, the government and the firm. They play consecutively, in two rounds. Figure 1 shows the moves in the game.

Figure 1: Timing of Moves in the PPC Game



The model is based on the following assumptions:

(1) The players are unitary actors

(2) The players are both rational utility-maximising agents

(3) The game is played with full information.

(4) Players have a positive discount rate, δ, i.e. $0 < \delta < 1$. A pay-off of 1 at time t is valued more than a pay-off of 1 at time t+1

(5) The player with the higher discount rate is able to capture all the surplus, where no other constraints are in place. This assumption follows the result of Rubinstein's model of non-cooperative bargaining (Rubinstein 1982).

The following welfare functions are for the government and firm respectively:

$$U_{ga} = f\,[\delta_g\,(A_t) + \delta_g\,\Delta\,(B_t, C_t)$$

$$U_{fa} = f\,[\delta_f\,(A_t) + \delta_f\,\Delta\,(B_t, C_t)$$

Where:

$t = 1 \ldots n$

U_{ga} (U_{fa}) is the utility to the Government (Firm) from project A;

A_t (B_t) is the stream of returns from project A (B) in time t;

δ_g (δ_f) is the discount rate of the Government (Firm).

Following earlier models of regulation (Peltzman 1976), the government's utility depends on electoral support from voters and on financial support from special interest groups.[4] The model assumes that increases in consumer tariffs are unpopular with the public, and so reduce electoral

[4] Government here refers to the political leadership rather than the bureaucracy. In Peltzman's model, the politician maximises power (M) where M(p,Π) where p is price and Π is profit. M decreases with high prices and increases with high profits. The politician will choose the level of regulation that maximises M.

support. Higher tariffs may also be unpopular with influential business interests, in which case these interests may reduce their financial support to the government. Improvements in service coverage and quality are assumed to be popular with the general public and with business interests. Thus the government's utility in the contract is the net utility from unpopular tariff increases and popular service quality improvements. The firm's utility is taken to depend on the returns on investment.

An important aspect of these welfare functions is the critical role played by the discount rate. If the firm's discount rate is very high, reflecting the fact that the firm places little value on returns gained far in the future, the firm will face a low total pay-off from cooperating under the contract. Likewise, if the government has a high discount rate, it does not value political gains made far in the future, and so will gain from not cooperating under the contract.

This property of the model reflects the particular structure of pay-offs from public-private infrastructure projects. In the early years of the contract, the firm will typically make sizable capital investments but will have low revenues. The firm will expect to make most its returns in the later years of the contract when capital investment is low and revenues are high. The government faces a similar pattern of utility pay-offs: in the early years of the contract, tariffs will be increased but it will take several years before capital investment feeds through into improvements in service quality that are felt by customers. This is the heart of the cooperation problem, which is illustrated in the two iterations of the model.

Figure 2 represents total utility pay-offs from the entire contract. Here, both parties maximise their utility by cooperating with each other. The implication is that, if the parties have sufficiently long time horizons, then they will be able to cooperate without the need for institutional constraints. Working through the game by backwards induction, we can see that easily that the players' optimal outcome is through full cooperation. The lower outcomes from non-cooperation imply that the parties have missed out on the gains they would have made: the firm would have earned a return on its investment and the government would have benefited from political pay-offs from improved quality of service.

The situation represented in Figure 3 shows the very different results when only the initial years (we can take this to mean the period until the first periodic review if there is one, or the first five years) of the contract are considered. Here, the government faces negative utility because it is

obliged to take the unpopular action of raising tariffs, and the firm has a negative return on investment because it is making large capital investments. If the parties consider only the first period, then, we will find a non-cooperative equilibrium in which both renege on their obligations. This would mean that the government would refuse to make promised tariff increases (or make them lower than expected) and the firm would cancel (or reduce) its capital investment plan.

The allocation of pay-offs for the options is explained in detail in Annex 1. The important point to note is that the cooperative equilibrium is achieved when the players have long time horizons, but where their time horizons are short, the players will settle in a non-cooperative equilibrium. In the latter case, institutions can constrain non-cooperative behaviour by imposing penalties on the parties. Regulatory agencies are one of the institutions that can effectively constrain behaviour and the range of ways in which they may do this is also addressed in the next section.

Figure 2: Long-Term Pay-Offs

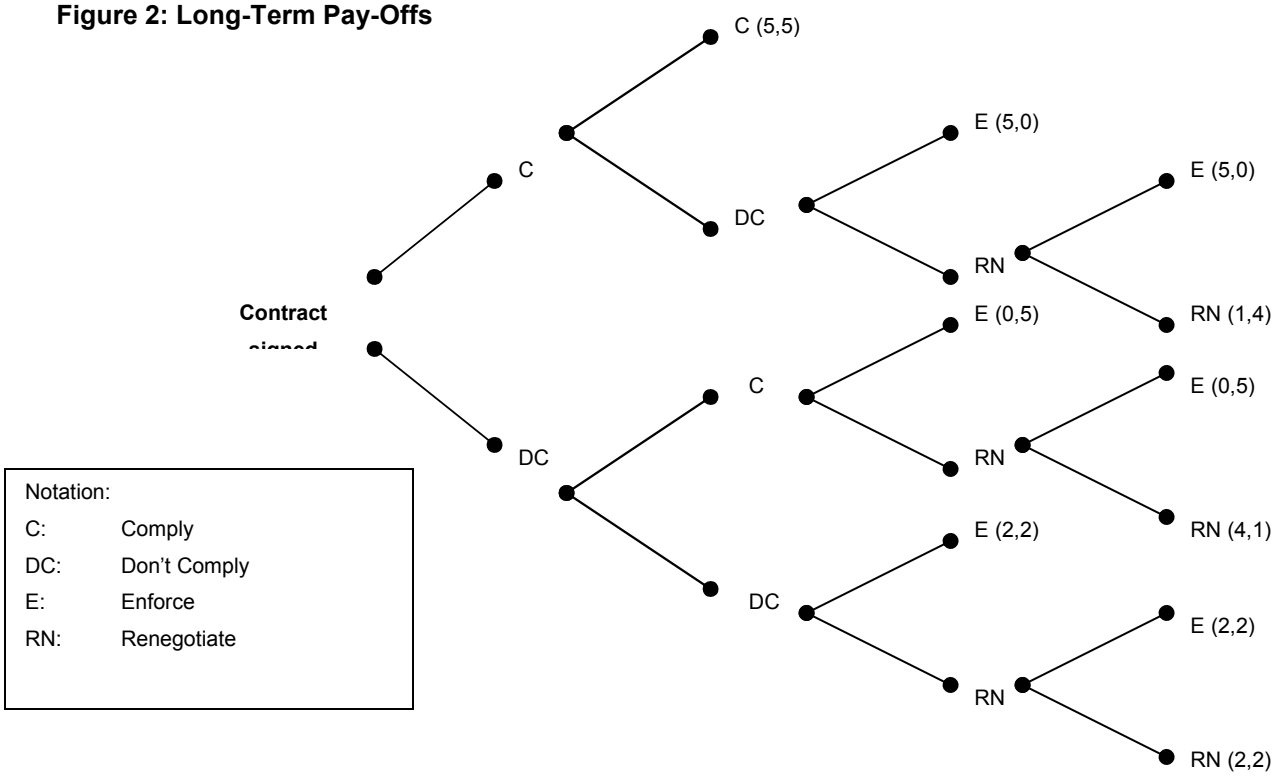
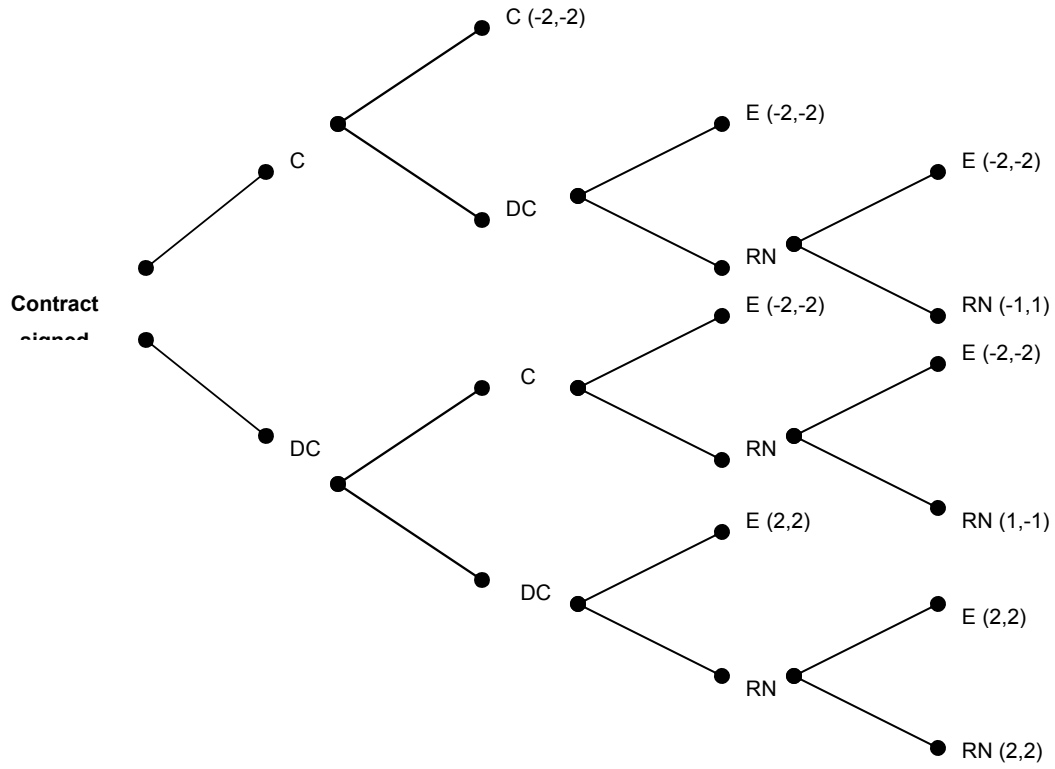


Figure 3: Short-term Pay-Offs



4 Institutions

In the context of economic regulation, we focus on formal institutions, those codified or embodied in physical form. We may go further to distinguish between the institutional environment – the fundamental political, social and legal rules that establish the basis for interaction between individuals and organisations – and institutional arrangements, or organisations, which are the structures within which individuals or groups cooperate of compete (North and Thomas 1973).

Institutions become relevant when the actors do not have long enough time horizons to reach the cooperative equilibrium. Institutions influence the behaviour of the actors through two channels: first, through constraints, by imposing penalties on the parties for non-cooperative behaviour. Second, institutions matter because they affect the time horizons of the actors.

Focusing first on direct constraints, we can identify rule of law and the quality of judicial institutions as factors of prime importance. In an environment where the rule of law is weak, the cost to the parties of reneging on a contract is low. Similarly, in an environment where judicial enforcement is biased, incompetent, corrupt or inefficient, if the cost of trying to enforce a contract is high and the expected benefits of securing a favourable legal judgement (if enforcement of judgements is weak) are low, the parties will face few constraints on uncooperative behaviour. Despite ongoing efforts, many developing countries have weak judicial institutions.

Under the Levy & Spiller frame of analysis, judicial institutions are all important in constraining opportunistic behaviour by the government. However, other types of institutions can complement or replace their role. Other institutions that effectively place constraints on uncooperative behaviour include the separation of powers and checks and balances in the political system. These will be important in imposing constraints on the behaviour of the government, as will the structure and quality of the bureaucracy. Effective constraints on the political leadership are not exclusive to either presidential or parliamentary systems. It is important here to distinguish between the powers of actors on paper, and the way in which these systems actually operate. The effectiveness of constraints will depend on a range of historical, political and other factors that are particular to a country, rather than to a formal structure. For the purposes of this analysis, the way the system actually operates is more important than the allocation of powers on paper. Thus we should not expect to see a consistent difference between presidential and parliamentary systems

but we would expect to see consistent differences between countries which overall have weaker constraints on the political leadership, and those where the political leadership operate under strong constraints.

At the sector-specific level, the regulatory structure is of central importance, not just for its role in monitoring the implementation of the contract, but in constraining opportunistic behaviour of the parties under the contract. A regulatory agency may raise the costs of non-cooperation through several channels:

- If the agency has a statutory responsibility for monitoring the implementation of the contract, then its reputation and thus utility will be linked with compliance of both parties with this contract. The regulatory agency may therefore monitor the behaviour of both government and firm, not in terms of its direct benefits to the parties at any one time, but in terms of compliance with the original contract. Stronger regulators may have powers to bring legal actions or impose penalties on the parties in the event of non-compliance.
- If the regulator has only limited statutory powers, it may have an incentive to encourage public participation through information dissemination, public hearings etc, which will increase the effective power of the regulatory agency in relation to other branches of government or the regulated firms.
- The regulator can play a role in adjudicating between the parties in the case of a dispute or a change in the operating environment requiring the amendment of the contract. In countries where judicial remedies for disputes are not effective, the regulator offers an alternative mechanism.
- The regulator can enhance the legitimacy of a contract signed by one government, after a change in the political leadership. This is particularly important in countries where corruption levels are high.
- The regulator can act as an adjudicator between different agencies of government.
- A national level regulator can reduce the transactions costs of regulation by monitoring multiple contracts in the same sector (or even in several sectors).

The discussion above shows that both governments and firms may have incentives to renege on their contractual commitments in the absence of constraining factors. We would therefore expect that: regulatory agencies will play a more important role in weaker institutional environments and in situations of conflict between the parties, or between political agencies; and regulatory agencies with the power to impose penalties on both parties will be more effective in constraining

uncooperative behaviour. The four case studies presented in the next section show how regulators do in fact play a valuable role in supporting cooperation under these conditions.

5 Empirical Evidence

In this section, I illustrate the model with case studies of PP contracts in the water sector in three developing Asian countries: Philippines, Malaysia and Indonesia. The water sector is well suited to the analysis of economic regulation as it comes close to an archetypal natural monopoly. The bulk of costs in providing the services are incurred in distribution, so there is very little scope to introduce competition to the sector, and economic regulation must be considered as a permanent arrangement.

Global experience with water regulation encompasses regulation by agency, regulation by contract and their hybrids. In the UK, for example, tariffs for fully privately owned companies are set by an autonomous national regulatory agency, while in the US, tariffs are set by state-level Public Utility Commissions, which follow procedures set out in administrative law. A handful of countries in Latin America have also created national level autonomous agencies to regulate the sector. But most developing countries have opted for a contract model, either with or without a dedicated monitoring and implementation agency.

The information in this section was collected through an extensive programme of field interviews, conducted over the course of 2004. Interviews were conducted with representatives of government, firms, the regulator and civil society groups and overall, more than 100 interviews were conducted. The interviews were semi-structured and designed iteratively, to allow information collected in earlier interviews to be cross-checked with others. A list of interviewees is given in Annex 2.

The case studies exemplify the different roles played by regulators in different institutional environments:

- Manila (Philippines) is a case of a regulator constraining opportunism by the parties during contract renegotiations;
- Johor (Malaysia) is an example of a regulatory agency in a stable institutional environment being created to pool scarce resources at the national level and harmonise the quality of regulation across the country;

- Subic (Philippines) demonstrates how a regulatory agency can adjudicate in conflictual relations between political leaders; and reduce short-term electoral pressures on the government to keep tariffs low.
- Jakarta (Indonesia) shows how a regulator with very limited powers can nevertheless play a role in arbitrating between the parties in disputes and increasing transparency surrounding the contract.

Of the four cases, three have undergone a transformation in the role of the regulator over the life of the contract.

- In Jakarta, the regulatory agency was created in the first round of contract renegotiation at the behest of the firms. The regulator's role has been strengthened subsequently through decrees.[5]
- In Subic, the regulator was created in a first round of renegotiation and was strengthened in a second round of contractual amendments.
- In Johor, legislation was passed in 2006 to create a national level regulator for water. This agency will replace state-level non-autonomous regulators.

The clear trend in this group of cases is towards establishing new regulatory agencies and giving more power and autonomy to existing regulators. This suggests that contracting parties are valuing regulation more highly than before.

6 Subic Bay

6.1 Time horizons, pay-off functions & institutional constraints

Subic Bay area is a former US Army Base in the Philippines, which was converted into an economic development zone in 1992. It is governed by the Subic Bay Metropolitan Authority (SBMA), which has a charter, granting it special administrative status. Its charter grants it authority over regulatory, taxation and other matters, and gives it the power to award PP contracts for infrastructure independently of central government policies and laws. The SBMA is headed by the Administrator, who is appointed directly by the President. As a result, the Administrator's pay-off function is not directly affected by electoral popularity. However, the investors within the zone constitute an influential interest group at the national level and can appeal directly to the President to overrule the decisions of the Administrator in the zone. The investors used this

[5] This fits with Stigler's argument that regulation is demanded by firms (Stigler 1971).

influence early on in the life of the concession to except themselves from tariff increases. This demonstration reinforced the weight of business interests in the Administrator's welfare function.

After the 1998 Presidential election, the Administrator of the SBMA was replaced by the newly elected President. He sought to build up his own authority by calling into question the tariff adjustment process under the concession. Because he belonged to an opposing political camp to his predecessor, the costs of undermining the contract were lower, as he was able to cast doubt on the legitimacy of the contract. The new Administrator refused to accept the review process that had been conducted under the previous Administrator and initiated his own review.

The Subic concession covers the neighbouring city of Olongapo, as well as the Bay area. Olongapo is a typical municipality with an elected Mayor and the Mayor's pay-off function is affected by both electoral popularity and lobbying by interest groups, as we would expect. The Mayor's sensitivity to tariff increases, for example, was demonstrated in 1998 when the Mayor refused to allow new tariffs to be implemented in the city. An extra complication in the politics of the Subic contract derives from the relationship between the political leadership in the two areas. When the contract was first signed, the Administrator and Mayor were married, which contributed to cooperation between the two political entities. When the Administrator was replaced, the Mayor was reelected and the relationship between the entities became highly acrimonious, but the water concessionaire was responsible for serving both jurisdictions. When tariff adjustments were finally approved by the SBMA under its new leadership, the City government refused to implement the tariffs and issued an injunction against the water company to prevent the tariffs being introduced. The firm reacted by cutting its capital investment programme.

Legal mechanisms play an important role in the Philippines' institutional structure. The threat of legal action or legal action itself is widely used by private parties to resist administrative actions (US Department of State 2005). In Subic, 'Temporary Restraining Orders' have been used by the parties involved to block the implementation of tariff increases and other aspects of the concession. However, these legal cases have been subject to counter-claims. The outcome has been to delay the implementation of tariff increases and the firm has reacted by holding back its capital investment plan.

6.2 Regulatory provisions in the contract

The main features of the regulatory structure are set out in the contract and amendments to the contract. The regulatory system has been modified several times (Interviews: Fairclough, De Vera). The contract specified a rate of return on investment of 24 percent for the firm over the life of the contract, but as of 2005, the private investors had not yet drawn any dividends.

Initially, the SBMA monitored the contract and was meant to review tariffs and approve any adjustments for both the City and the Bay area on an annual basis, based on financial and operational reports submitted by the company, but this system broke down after the change in leadership in the SBMA.

These problems in the initial years of the contract led the water company and the city government to seek to renegotiate the concession to modify the regulatory structure. The Olongapo government wanted to ensure that it played a role in the tariff-setting process and the water company wanted to reduce the discretion of the SBMA in the timing and extent of the tariff increases. This led to the creation of a regulatory body in 2000. The Regulatory Board (RB) is formally an agency of the SBMA and is accountable to SBMA but the SBMA and Olongapo City both appoint two members each to the Board (Interview: N.Santos). The Board members select their own Chairman.

At the time it was set up, the role of the RB was to conduct the annual tariff review and make a recommendation to the SBMA, which would give final approval on tariff changes. Subsequently, the Administration recognised the need for tariff increases if the firm is to carry out adequate capital investment, but wanted to distance itself from being directly responsible for tariff increases (Santos, de Vera). The firm wanted the RB's autonomy to be strengthened to reduce the risk that the SBMA would suppress tariffs for political reasons. As a result, the contracting parties agreed an amendment to the contract in 2004 that allows the RB make final decisions on tariffs, after conducting public hearings (Interview: Gaza).

6.3 Role of the regulator

The Subic Bay concession case shows a shift from pure contract-based regulation to hybrid regulation and demonstrates how, under the hybrid structure the regulatory agency contributed to stability and cooperation in the implementation of the PP contract, as we would expect in a weak institutional structure with political instability leading to short time-horizons. The regulator serves

multiple purposes which allow the contract to function more effectively. Firstly, the RB allows the resolution of conflicting interests on the part of the SBMA and Olongapo City. The representatives of the two political entities are able to negotiate compromises within the RB, reducing the risk that either of the entities will refuse to implement the tariff determination. The appointment of RB members by political leaders leads to some politicisation of the board, but it also increases political commitment to the implementation of the tariff determination.

Secondly, by empowering the regulatory body to determine tariffs, the SBMA leadership has sought to distance itself from unpopular decisions to raise tariffs. Over time, the leadership hopes to benefit from investor approval for high quality infrastructure provision. Thirdly, the autonomy of the RB has reduced regulatory risks for the firm. Since the creation of the RB, tariff reviews have taken place annually in accordance with the terms of the contract (Interview: Gaza).

7 Johor

7.1 Political time horizon & institutional constraints

The Malaysian political system is characterised by greater political and institutional stability than the other two countries discussed in this paper. The ruling coalition, the Barisan Nasional, has been in power at the national level since independence. In the State of Johor, in the south of the Malaysian peninsula, UMNO (United Malays National Organisation) has been returned in four rounds of elections since 1990. Johor has the second highest GDP after the capital region (Government of Malaysia Economic Planning Unit 2001) and business groups are politically influential (Interview: Mahmood). Consumer groups and other non-governmental organisations cooperate with the government and are not active critics of government policies (Interview: Ping).

This high degree of political stability gives the government a relatively long time horizon but as the standard of service for water services is comparatively high and coverage is 98 percent (Malaysian Water Association 2003), there is less scope for gaining extra political support from improving the quality or reach of services. The more pressing concern for the government has been the financial status of the water utility. By the early 1990s, Johor had become heavily indebted to the Federal Government for capital investment projects in the water sector and the Federal Government restricted Johor's access to further federal funds. (Interview: Ng). By awarding a concession contract, the State government sought to reduce its debt repayment burden from loans incurred under public ownership and to shift liabilities to bulk water suppliers to the private sector (Interview: Sa'ari).

Malaysia has a relatively fair and transparent judicial system compared to other countries in the region[6], although the independence of the judiciary to make judgements against the government has been called into question by commentators (Ho Khai Leong 2003: 13-15) and by practitioners (Interview: Zahdi). However, Malaysia's good reputation with investors in terms of the rule of law and respect for contracts may act as an effective constraint on arbitrary actions by the political leadership at the national level. A similar phenomenon exists at the state level in states like Johor which are keen to attract foreign investment.

In Malaysia, the capital market also plays a role in constraining opportunistic behaviour. The concession company in Johor is a listed company and therefore must comply with financial reporting requirements. This increases the level of transparency about the firm's financial performance, which can help the firm to convince the government and the public that the firm is not earning unreasonable profits. It also demonstrates to the government the relationship between the level of tariffs and the firm's ability to raise finance to carry out capital investment (Interviews: Alwi, Zahdi).

7.2 Regulation under the contract

Prior to the award of the PP contract, the water utility was corporatised, i.e. restructured as a separate entity under commercial law. At the time of the corporatisation, a sector regulator, BAKAJ (Badan Kawal Selia Air Johor), was created, within the State Administration. BAKAJ is exclusively a monitoring body, and it does not have the power to set tariffs or approve investment plans. Its statutory powers were not extended at the time of the privatisation, but its access to information improved as a result of the reporting requirements on the firm (Interviews: Idris, Ng). Tariff and investment plan decisions are taken by the Economic Planning Unit, a department within the state bureaucracy, based on the ROR band of 14-18% specified in the contract. Tariff increases are approved by the state assembly (Interviews; Zahdi, Sa'ari).

During the concession, relations between the private company and the State Government have been generally cooperative (Interviews: Saari, Zahdi, Idris). The firm has had to lobby the administration for tariff increases, presenting arguments directly to the assembly and conducting public information tours to pre-empt opposition to increases from households (Interview: Zahdi).

[6] See: International Country Risk Guide (2005). ICRG Risk Indices.

Periodic tariff increases have been approved in accordance with the provisions of the contract, but have been lower than originally envisaged, partly because the firm has managed to lower costs (Interview: Zahdi). An interest group representing manufacturing industry appealed to the state government to overrule a tariff increase in 2001 and a compromise solution was negotiated that capped prices for high-volume industrial users.

The state level regulatory structure will be superseded by federal level developments. In 2006, new laws were passed passing control over water issues and ownership of water assets from the state to the federal level. The laws also provide for the establishment of a national level economic regulatory agency, to take over tasks currently carried out by state governments, and the creation of an asset holding company to manage the assets. The national regulator and asset holding company are intended to resolve the sector's financial problems and to harmonise tariffs and quality of service across the country (The Edge 23 Jan 2006). The implementation of these new laws will require the termination or radical restructuring of the Johor contract. One option being considered is to replace it with an operations and management contract. The concession company has expressed its willingness to go along with this plan (Interview: Zahdi), but as of mid-2006, it was not clear what the Federal government's approach to existing contracts would be. Despite this uncertainty, the concessionaire has continued to raise finance and to carry out capital expenditure, while trying to position itself favourably to bid for any future contracts tendered by the federal government (Interview: Zahdi).

7.3 Role of the regulator

The Johor contract shows how a cooperative equilibrium can be achieved due to a supportive institutional framework, where the regulatory agency has little role. As we would expect from the model, the role of the regulator is less important when the parties have sufficiently long time horizons, because they then have an incentive to cooperate, even in the absence of constraints. Nevertheless, the federal government has identified the need for more professional and independent economic regulation and so if shifting regulatory powers to a single agency. This reflects an intention to reduce local political intervention in tariff setting and to concentrate skilled human resources.

Political stability, prevailing rule of law and fewer information asymmetries as a by-product of the functioning capital markets combine to ensure that the Johor government has a sufficiently long time-horizon to achieve a cooperative equilibrium. The firm recognises this and so is willing

to engage in capital investments that will ensure the quality of the service in the future. The possibility that the firm will have to re-tender for a contract as part of the national level restructuring creates incentives for the firm to demonstrate its willingness to cooperate and to operate efficiently.

8 Jakarta

8.1 Time horizons, pay-off functions & institutional constraints

Indonesia has undergone dramatic political and institutional upheaval during the period that the Jakarta water concession contracts have been operational. Between 1997 and 2006, the country was transformed from the highly centralised, authoritarian regime of Suharto to a decentralised regime with a nascent democracy and multiple competing centres of power under four different presidents. However, some factors have remained constant in Indonesia's political economy, like the influence of business interests on policy and regulation (Robison and Hadiz 2004).

The impact of these changes on incentives and constraints has inevitably been very broad. On the one hand, the fragmentation of power has imposed greater constraints on the agencies of the central government as they are no longer able to enforce policies or rules without the cooperation of other agencies (Robison and Hadiz 2004). On the other hand, the new system has relieved the constraints on local governments, autonomous government agencies and public corporations, as they are no longer under the control of the central government (Interviews: Hilwan, Widya). Democracy in Indonesia is in the early stages of development so it is difficult to judge the degree to which electoral support influences policy. During the crisis period, leaders were certainly very sensitive to public opposition to tariff increases, as electricity price increases sparked riots in Jakarta (Bird 1999), but subsequently utility tariffs have not been a critical issue for the general public (Interview: Sukhsmaningsih).

Other institutional constraints on opportunistic behaviour in Indonesia are weak: the judiciary has a reputation for bias and corruption and private firms have found it impossible to secure and enforce judgements against expropriation by the government during the crisis ((Robison and Hadiz 2004).[7] As the Suharto regime was perceived to have been highly corrupt, privatisation contracts awarded by the regime were discredited and the reputation of public officials with the

[7] World Bank Investment Climate data finds a 60% confidence rate in Indonesia's judicial system, and 90% of cases for overdue payments unresolved.

public was enhanced by disregarding the contracts (Interviews: Tutuko, Roswita). Accounting and auditing standards are also weak (Interviews: Weitz, Lanti, Anwar) which increases the degree of information asymmetry between the contracting parties and makes it easier to disguise non-cooperative behaviour.

Instability in the institutional framework and in the new political institutions has led to a high degree of political turnover, suggesting that politicians will have short time-horizons. This is a sharp contrast to the situation in Indonesia before the crisis. Suharto had been in power since 1967 and his leadership position was thought to be very secure (Bertrand 1997). Firms believed that they could ensure favourable regulatory treatment by establishing partnerships with Indonesian firms with close links to the regime (Interviews: Rogers, Skelcher). After Suharto's departure, these partnerships became a liability and opened the firms to accusations of corruption (Harsono 2003).

8.2 Regulation under the contract

Under the contracts, contract monitoring and tariff-setting was the responsibility of the former public utility, Pam Jaya, which was also the contract signatory on the government side, and the owner of the water supply assets. This agency would propose tariffs, based on a ROR of 22.4%, and the Governor of Jakarta (an appointed position under the Suharto regime, an elected position since decentralisation reforms) would approve these. However, these contract provisions were not implemented: the economic crisis hit Indonesia and the Governor announced that no tariff increases would take place between 1998 and 2001. Pam Jaya does not have the power to overrule the Governor, so instead it engaged in renegotiations with the firms.

In the context of the renegotiation, the firms sought the creation of a Regulatory Body separate from Pam Jaya that would be able to monitor the implementation of the concession by both government and private contracting parties. However, the firms were concerned about the competence and neutrality of a new regulatory agency and so they deliberately circumscribed its powers. The RB's legal basis is grounded in the provisions of the revised contracts and in a decree issued by the Governor in 2001 (Gubernur Propinsi Daerah Khusus Ibukota Jakarta 2001), but there are inconsistencies within the contract, and between the contracts and the decree with regard to the functions of the regulator (Interview: Lanti). The revised contracts made provision for the RB to play some role in monitoring the concessionaires, and some role in the resolution of disputes but Pam Jaya remains primarily responsible for the core regulatory functions of

performance monitoring and periodic reviews (Perusahaan Daerah Air Minum Daerah Khusus Ibukota Jakarta and Pam Lyonnaise Jaya 2001).

Since its creation, both private and government parties have sometimes chosen to bypass the regulator in preference for bilateral negotiations in their disputes, but on other occasions they have actively engaged with the regulator to dissolve tensions and to find alternative resolutions to the problem. (Interviews: Bouvier, Lanti, Weitz). The RB, meanwhile, has sought to build a role for itself and has drawn on links with the federal government and its role as the representative of consumer interests to bolster its influence (Interview: Lanti). In 2005, the RB's was strengthened by a second decree from the Governor, under which the RB was given the role of advising the Governor on consumer tariffs (Interivew: Lanti).

8.3 Role of the regulator

The Jakarta RB provides an example of the positive role that an autonomous agency can play, even when its powers are heavily circumscribed. From the game, we would expect that the role of the regulator would be important in weak institutional environments. This is borne out in the case study in which the RB acted as an arbiter in disputes and as a channel for consumers' opinions. However, the regulatory agency does not have the power to impose penalties on the contracting parties, which limits its effectivness.

Despite the RB's limited powers, and the tendency of the parties to bypass the RB in disputes, it has played a valuable role as a broker or facilitator in the negotiations between Pam Jaya and the firms. In 2003, talks over the periodic review came to a halt when the parties could not agree on figures for capital expenditure. The RB took the initiative in securing external consultants to advise on the review. However, one of the parties refused to cooperate with the consultants by providing information which undermined the credibility of the advice and led the parties to reject the recommendations of the consultants. The RB has played the role of arbiter on subsequent occasions, chairing meetings between the parties on the periodic review. This has been helpful in getting some of the parties to come to an agreement (Interviews: Krieg, Bouvier).

The regulator has also begun to play a role in increasing transparency in the concession by interacting with consumer groups (Interviews: Lanti, Anwar). The contracting parties do not have weak incentives to disclose financial information to the public because they rely on information asymmetries to strengthen their bargaining power in negotiations. The RB, by contrast, can

enhance its own role in the regulatory system by positioning itself as the representative of the public in relation to the concessions. Gradually, by demanding more information from the contracting parties and channelling information on service quality from consumers, the RB may be able to narrow information asymmetries.

9 Manila

9.1 Time horizons, pay-off functions & institutional constraints

The Philippines' political institutions are modelled on the US Presidential system and are characterised by checks and balances. The weakness of political parties and the personality-focus of elections interact with the institutional structure to give rise to strict constraints on the actions of the executive. During elections, presidents may campaign with highly populist policies, but as they are only able to serve a single term of 6 years, the pressure of electoral popularity may be weak in the later years of the president's term. These attributes interact with the role played by powerful business interest groups, which exercise considerable influence in the political system through financial support, media coverage and personal links, leading to highly particularist policy-making (Hutchcroft 1998).

These business interests are dominated by a small number of families with connections in politics and business, which have managed to retain their influence throughout the post-independence period (Roces 2000). Two of these families, the Lopez family and the Ayala family, were the original majority owners of the water concessions for Manila. As a result, the position of these families in the economic and political life of the Philippines, has had direct effects on the implementation of the water PP contract. Firstly, the concessions have received much more attention from civil society and the media as a result of their involvement, much of which has been critical (Interview: Sangster). Actions taken by the government have been heavily scrutinised for evidence of corruption or bias. Secondly, the affairs of the family businesses have been inextricably tangled with events in the concessions.[8]

[8] Two examples will give the flavour of these interactions: Noli de Castro, a newscaster on the Lopez television news channel, ABS-CBN, was Gloria Macapagal-Arroyo's vice presidential running mate in the 2004 election; the Lopez's energy distribution business, Meralco, was forced to pay back taxes after a ruling by the Supreme Court, which brought the group to the verge of bankruptcy. The Lopez group was therefore unable to meet their liability for corporate guarantees under the water concession contract.

Judicial institutions play an important role in economic and political life in the Philippines, although the confidence level of investors in the courts is 66 percent.[9] Legal remedies are often used in commercial disputes and in disputes between public and private entities, but many contractual disputes are not resolved in the courts.[10]

In the Philippines, corruption does not only affect the implementation of PP contract through the expect channels of higher transactions costs. It also creates strong disincentives for officials to take decisions. This is because the Philippines has strict ant-graft laws which make government officials personally liable for decisions taken during their term in office. Under the provisions of the 1960 Act,[11] officials can be tried for corruption for actions which favour one private party over another, or are harmful to the government. This legislation has made government officials extremely reluctant to take decisions without approval from the highest political level (Interviews: Ortega, Sangster, Beatrix). In the case of a PP contract, this means that it is more difficult to amend a contract in order to restore the financial viability of a concessionaire after a negative shock, as this may be seen as favouring the firm and being 'harmful to the government.'

9.2 Regulatory provisions in the contract

The Manila concession contracts employ a hybrid regulatory structure. The provisions regarding adjustment of tariffs and performance criteria in a periodic review are set out in the concession contract. Tariffs are calculated on the basis of an 'Appropriate Discount Rate' set with reference to the firm's business proposals and to international comparators. In addition, the contract provided for the establishment of a Regulatory Office (RO), which is responsible for monitoring the concession and implementing the periodic review in line with the provisions of the contract. This hybrid model addressed concerns of investors that the regulator should not have discretionary powers and that contract monitoring should not be the direct responsibility of a government department (Dumol 2000). A drawback with this structure was that the RO was set up within the MWSS (Metropolitan Waterworks and Sewerage System), the former public utility and contract signatory on the government side. This structure undermined the RO's ability to take independent decisions, as its decisions have to be approved by the MWSS Board before they can

[9] The World Bank's Investment Climate Survey reports confidence levels in the judiciary system. The Philippines score of 66% compares is the same as the regional average, and higher than the global developing country average of 59%. See: http://www.enterprisesurveys.org/

[10] The Investment Climate survey reports that 84% of cases for overdue payments do not reach resolution in the Philippines, which compares to a developing country average of 69% and a regional average of 57%.

[11] The Anti-Graft and Corrupt Practices Act (1960) specifically includes partial behaviour in relation to licenses and concessions in the definition of corrupt practices.

be implemented (Interviews: Ortega, Sakai). The influence of the former public utility in the concessions has been a continuing concern for the firms (Interviews: Beatrix, Sangster).

The role of the RO became controversial soon after the award of the contracts, when one of the concessionaires, Maynilad Water Services (serving the West zone of the city), faced severe financial difficulties. Maynilad had substantial foreign currency liabilities, which doubled when the Peso devalued during the Asian financial crisis. The Chief Regulator at the time engaged in negotiations with the concession to amend the contract. However, other officials felt that this went beyond the scope of authority of the regulator and the Chief Regulator handed over responsibility of the renegotiations to the political leadership (Interview: Esguerra). These renegotiations have been protracted and politically contentious, and ended in the government buying back a majority stake in the concession company in 2005.

The RO has successfully implemented the East concession, including the first periodic review (Interviews: Sakai, Rivera). However, it has been unable to fulfil its role in determining and enforcing tariff adjustments for the West concession. During the renegotiations, the RO tried to proceed with the periodic review, but its determination was ignored by the firm and it bedcame irrelevant in the light of negotiations between the parties (Interviews: Sakai, Medalla, Tirona).

9.3 Role of the regulator

The Philippines institutional environment gives rise to short time-horizons and risk averse politicians and public officials, so we would expect the regulator to be able to play a key constraining role in this case. In contrast to the other case studies discussed here, the regulatory agency for the Manila water contracts had a distinct sphere of authority right from the start of the contract. This gave it scope to penalise some non-cooperative actions by the contracting parties, but as its own legal basis is in the contract, its powers to limit or to conclude renegotiations are weak.

The design of the regulatory institutions was shaped by the International Finance Corporation (IFC, part of the World Bank Group), who was acting as advisors to the government for the concessions and took into account international best practice at the time (Dumol 2000). The regulator's scope for discretionary decision-making was deliberately constrained in the terms of the contracts in order to provide reassurance to the private investors. This constraint on the

regulator was reinforced by the anti-graft legislation, which discourages officials from taking responsibility for decisions.

Could the RO have played a positive role in negotiating an amendment to the contract with the West concessionaire and reduced the transactions costs of the renegotiations process, if it had been given the power to do so? There are a number of reasons to think that it might: firstly, the RO had more information about the financial and operating performance of the concession than other government agencies, leading to lower information asymmetries in the renegotiation and potentially limiting the scope for opportunism on the part of the firm; secondly, the regulator's reputation is tied to the successful implementation of the contract. When the West concessionaire failed to meet its contractual obligations, this would have had a negative impact on the reputation of the regulator, and would have given the RO incentives to conclude an amendment to the contract. The political leadership and other government officials, on the other hand, had incentives to delay any decision on renegotiation to avoid any negative effects, such as public disapproval or liability to corruption charges. Other political agencies like the MWSS, government departments or the executive itself are risk averse, because the potential penalty associated with a wrong decision in the Philippines is much higher than the potential penalty associated with a delay, or failure to take a decision. Finally, the regulator is not subject to electoral pressures that would lead it to prioritise short-term over long-term outcomes of the concession.

10 Conclusion & Policy Recommendations

This paper set out to show why *hybrid regulation* combining a long-term contract with a regulatory agency can lead to better outcomes from PP contracts than pure *regulation by contract* in weak institutional environments. The findings do not necessarily imply that developing countries should create discretionary regulatory agencies, as the absence of institutional constraints will be associated with other problems political and judicial institutions impose few constraints. However, the case studies have shown that even regulatory agencies with heavily circumscribed powers can contribute to the effectiveness of the regulatory regime.

In three of the four case studies presented here, the contract has been amended to set up a regulator and to transfer some certain powers and functions to the new agency. Hybrid contracts have been criticised as increasing the potential for conflict are for creating confusion. However, I have shown here that regulatory agencies can play a valuable role in reducing the potential for

opportunism by the contracting parties. We should not therefore be surprised to see regulatory agencies being created to complement contracts.

The role of the regulatory agency stems from the nature of contracts as voluntary. In a pure contract model, the two parties can always agree to renegotiate the contract if it is in their interests to do so. The game model showed how it always will be in the interests of the parties to do so when their time horizons are short, because PP contracts typically involve costs for both parties in the initial years. Benefits take longer to emerge, so only parties with long time horizons will have incentives to cooperate. A regulatory agency, on the other hand, may be structured in such a way that it has incentives to enforce the original contract, even when both contracting parties will lose out from implementation in the short-term. Ideally, the regulator would have the power to impose penalties on the contracting parties for non-cooperation, and its objectives would be defined in terms of ensuring compliance with the contract.

The regulatory agency's role is particularly valuable where other institutional constraints are not adequate to constrain opportunistic behaviour. In countries where accounting and auditing mechanisms, supervision by financial markets and monitoring by organised civil society groups takes place, the role of the regulator is less critical. However, these conditions are not met in many developing countries, where transparency is low and enforcement mechanisms are weak. In these countries, the regulator can help to increase transparency and act as a channel for the expression of consumer interest. Neither the government or firm has an incentive to increase transparency or participation, but the regulator can use these to strengthen its own position within the institutional structure.

The cases above also show that the regulator can play a valuable role as arbiter between conflicting interests. These conflicts may be between different public agencies or political leaders, or they may be between In order to fulfil this function, the regulator must be a separate agency from the contract signatories, whether the contract signatory is a government minister or a public utility company.

In some cases, regulators with adequate skills and resources may be able to play a role in helping the contracting parties to adjust to shocks, again if the reputation of the regulator depends on the smooth operation of the contract. The regulator may have better access to information about the effect of the shock on the firm, allowing it to construct a more appropriate amendment while

preserving the incentives embodied in the original contract, but without a direct interest in redistributing benefits between the contracting parties.

None of these points contradicts the very real concern that the regulator may be captured by government or private interests. However, the focus here is on hybrid regulatory structures in which the powers of the regulatory body are constrained by the provisions of the contract. Certainly, if the regulatory agency begins to play a role in the renegotiation of contracts, then there will be scope for discretion in its activities. But even there, a regulator with responsibility for ensuring the smooth operation of the contract will have an incentive to adjust a contract when a shock occurs. Without the regulatory agency, one party may act opportunistically by delaying any agreement for an amendment. In a pure contract regime, the other party may have too little bargaining power to force through an amendment.

These arguments imply that hybrid regulation offers advantages over pure contract regulation, especially in countries where institutional constraints on opportunistic behaviour are lower. Hybrid regulation may be seen as a transitional measure, while other institutions are strengthened, but the long periods of time needed to affect institutional changes means that the creation of a regulatory agency charged with ensuring the implementation of the contract will be a valuable investment in the success of PP contracts.

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Annex 1: Structure of the PPC Game

The PPC Game

This game theoretic presentation of the interaction of public and private actors in a long-term contract for utility services draws on the application of game theory to negotiation and arbitration of Brams (2003) and the non-cooperative bargaining theory of Rubinstein (1982).

Structure of the game

The PPC Game involves the interaction of the government and the firm in a 2-player, multi-stage game. I show the outcomes of the game under three sets of conditions:

1. A single-play game representing the entire period of the contract (e.g. 25 years.[12]). In this version of the game, cumulative pay-offs to the parties for all years in the duration of the contract are shown. [Figure 2]
2. A single-play game representing the initial years of the contract (i.e. the period before the first renegotiation, on average less than two years into the contract term, or the period before the first 'comprehensive tariff reviews,' often set at 5 years.[13] [Figure 3]

The game proceeds in four steps after the contract is signed. First Government decides whether it will comply (C) or not comply (DC) with the terms of the contract. This can be understood as representing the government's decision of whether or not to raise tariffs in line with the contract, for example. It could also be understood as the government's decision whether to maintain or reverse a tariff increase already granted under the contract. The firm then decides whether or not to comply (C, or DC). This can be understood as representing the firm's decision of whether or not to carry out the capital investment programme specified in the contract. In contracts that have requirements for service outcomes (like coverage or volume of treated water supplied), rather than explicit investment requirements, we can understand the firm's compliance as carrying out adequate capital investment to meet the specified service outcomes. Alternatively, we can conceive of the firm's compliance decision as whether to pay any concession fees that are due. Together, these decisions will determine the total utility generated in the relevant time period, which will then be distributed as pay-offs to the two players.

In the subsequent stages of the game, the parties bargain over how this utility is to be divided between them. In Stage Three, the government chooses between (E) – to enforce the contract, or (RN) – to renegotiate the contract. In the final stage of the game, Stage Four, the firm decides

[12] See Chapter 2 for a description of the typical structure of a concession contract

[13] Again, see Chapter 2 for a description of comprehensive tariff reviews. Five years is usually considered to be a suitable planning period for a utility.

whether to enforce or renegotiate. The moves are shown in Table 1. Although the government moves first every time, and the firm moves last, the game would yield the same results if the order in which the players moved were reversed.

Table 1: Summary of Moves in the PPC Game

Stage	Player	Decision
1	Government	Comply or Don't Comply
2	Firm	Comply or Don't Comply
3	Government	Enforce or Renegotiate
4	Firm	Enforce or Renegotiate

Description of the Game

Long-term Pay-offs

Initially, I consider a single-play version of the sequential game, in which the game represents the entire duration of the contract. The extensive form of the game is illustrated in Figure 6.

Looking at Figure 2, we see that the equilibrium outcome is achieved when both parties cooperate and achieve pay-offs of (5,5). We find the equilibrium by ruling out the other branches of the decision tree. Say the government decides not to comply, and the firm also does not comply. At the interim pay-off of (2,2), both parties can hold out for the same amount of time, and their bargaining power is unchanged. But neither party receives more than (2,2) in this branch. The Firm can achieve a higher pay-off by complying with the contract instead, so we can rule out this branch of the decision tree.

Looking at the neighbouring branch of the tree, we see the pay-offs if the Government does not comply, but the Firm does. Government will receive an interim pay-off of (7,-2). At this interim outcome, the government will be able to hold out longer than the firm, and so it will have a stronger bargaining position. Government will choose to renegotiate in Step 3, as enforcement yields a zero pay-off for the Government. If the firm agrees to a renegotiation, the government will be able to appropriate most of the surplus, leaving the Firm the lowest possible positive pay-off (4,1). However, the Firm would be better off enforcing the contract, and so will choose to enforce. We see that if the Government chooses not to comply in Step 1 of the game, the Firm will choose to comply and enforce, leaving the Government with a pay-off of (0). Thus the

Government will be better off complying in Step 1, and we can rule out both the right-hand branches of the decision tree.

If the Government complies, and the Firm does not comply, the Firm will get an interim pay-off of (-2,7). The Firm will be able to hold out for longer at this stage in the game and so can increase its bargaining power in a renegotiation. If the Government agrees to the renegotiation, the Firm can appropriate most of the surplus and achieve pay-offs of (4,1). However, the Government will choose to enforce the agreement, leaving the Firm with a pay-off of (5,0). The Firm will therefore choose to comply with the agreement, ruling out this branch of the game. We are left with the left-hand branch of the game, in which both parties comply with the agreement and achieve an equilibrium from which neither has an incentive to depart.

We assume for now that the contract can be enforced. If the contract is enforced, the player(s) who has not complied with the contract loses his surplus. The extra surplus is transferred to the compliant party. If both parties are non-compliant, then the surplus is divided between them according to the original distribution of pay-offs. No further penalties are imposed. This represents a situation of 'first party enforcement' in which one of the two parties actively seeks enforcement. We consider the implications of introducing third party enforcement below.

Figure 2 shows that over the life of the contract, pay-offs to both players are positive, and are modelled as equal.[14] It is assumed here that the parties' have equal bargaining power in the original negotiation before the contract is signed, so they would agree a contract with equal pay-offs for both parties. If the Government raises tariffs ('C'), but the Firm does not invest ('DC'), then over the life of the contract the Government will suffer a negative pay-off, while the Firm will be able to take dividends from the initial years of the project and will end up with a higher pay-off over its lifetime. If the Firm invests ('C'), but the Government does not raise tariffs ('DC'), then the Firm will not be able to pay off its debts or take dividends and will end up with a negative pay-off, while the Government gains political support from the higher level of political pay-offs from improved service without suffering the consequences of having to raise tariffs. If neither side complies with the contract, i.e. the Government does not raise tariffs *and* the Firm does not invest, then the two sides will protect themselves from negative pay-offs but will achieve

[14] 'Equal' here implies only that the outcome is at the same level in the preference orderings of the two parties, e.g. an outcome is the second best outcome for both Government and Firm. It does not imply that the parties would place an equal monetary value on the utility pay-off.

a lower level of pay-offs than if they had both cooperated, referred to earlier as a 'welfare-reducing' equilibrium.

If both parties have positive discount rates, they will prefer pay-offs sooner to pay-offs later, the Game will terminate if the players cannot raise their pay-offs by continuing to play. Thus if both players cooperate, neither can raise his own pay-off by continuing to play, and so the Game will terminate at Stage 2, after both parties have decided whether or not to comply with the contract, without proceeding to Stages 3 & 4.

Figure 2 shows that there is a single equilibrium of full compliance (C,C) delivering pay-offs of (5,5) to the parties. It is interesting to note that this equilibrium is independent of the quality of contract enforcement. Even if the contract cannot be enforced, the parties will still choose to comply with the contract as this delivers them the highest total pay-offs from the contract. The equilibrium result in this game suggests that it will be rational for the Government and the Firm to comply with their own contractual commitments, even in the absence of any external enforcement mechanism. Integrating reputational effects also does not change the equilibrium away from the full cooperation equilibrium; nor does the repetition of the Game (which would correspond to a contract that can be renewed).

If the parties are rational and have access to full information, and value pay-offs throughout the life of the concession (i.e. they have very low discount rates), they should therefore always comply with the contracts they have agreed to. Yet, empirical evidence shows that non-compliance is common. The explanation lies in the timing of pay-offs and the discount rates of the players, as Figure 3 illustrates.

Short-term Pay-offs

In Figure 3, the pay-offs relate only to the initial years of the contract. As noted above, costs are incurred by both parties in these initial years. For the government, raising tariffs has an immediate negative impact on political pay-offs, while the benefits of improved service quality take time to show through. Thus the pay-offs to both sides from compliance are negative, (-2,-2) in the game illustrated in Figure 3. Here we assume that the game is played only once, and consider the outcomes depending on the level of enforcement.

If both parties comply, the highest pay-offs they can achieve are (-1,-1), as would be the case in a renegotiation which reduces the contractual obligations for both parties. If one party reneges, and

is able to use its bargaining power to renegotiate, it can still only achieve a maximum pay-off of (1), but only if the other party agrees to renegotiation. Instead, the other party will maximise its utility by enforcing the contract to achieve a non-negative pay-off, leaving the parties with (0,0). The parties can achieve their best utility outcomes (2,2) by not complying with the contract, and this is the equilibrium of the game. [15]

However, in this version of the game, the quality of external contract enforcement is critical in determining the equilibrium outcome. With only first and second party enforcement, the parties will achieve their highest outcomes with non-compliance and non-enforcement. If an external party can enforce the contract, and impose penalties on the parties that do not comply, then a fully compliant equilibrium can be reached, as illustrated below.

The comparison of Figures 2 and 3 demonstrates the critical role of time horizons in determining the behaviour of the government and firm under a long-term contract, and the importance of the effectiveness of enforcement mechanisms where discount rates are relatively high. In the long-run, it is in the interests of the parties to comply with the contract in order to get the maximum pay-offs, but in the short-run, the rational choice for both parties is not to comply with the contract.

Bibliography

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[15] If this is a repeated game, then the non-cooperative equilibrium may be dominated by the cooperative equilibrium. This will be the case if the parties view the game as repeated indefinitely. This may be an appropriate way to model a contract for 50-100 years with the possibility of renewal at the end of that period, as for the concession in Barcelona, Spain.

Annex 2: List of Interviews Conducted

Name	Location	Position	Organisation	Date
Abidin, Zainal	Shah Alam	Director	Selangor Water Monitoring Dept	3 March 2004
Adam bin Abdul Hamid	Johor Bahru	Councillor, Public works and Utilities	State of Johor Executive Council	10 Feb 2004
Agustin, Angel	Manila	Regulator Customer Services	Metropolitan Waterworks and Sewerage Services Regulatory Office	2 June 2004
Agustin, Rina	Jakarta		Kimpraswil (Department of Settlements and Regional Infrastructure)	10 Sept 2004
Alikpala, Ramon	Manila	Executive Director	National Water Resources Board	3 June 2004
Anderson, Carey	Hong Kong	Chairman, Former Asia Business Director of Thames Water	China Water Company	7 April 2004
Andrews, Charles	Manila	Principal Water and Sanitation Specialist	Asian Development Bank	26 May 2004
Anwar, Alizar	Jakarta	Consultant	Jakarta Water Regulatory Body	6 August 2004
Arriens, Wouter	Manila	Lead Water Resources Specialist	Asian Development Bank	26 May 2004
Beatrix, Marc	Hong Kong	Development Director	Suez Environnement Asia	13 May 2004 14 May 2004
Bernardo, Romeo	Manila	Partner	Bernardo Associates	5 June 2004
Berthelot, Jean	Hong Kong	North East Asia Regional Manager	Natexis Banques Populaires	20 April 2004
Bouvier, Christian	Jakarta	Finance Director	Pam Lyonnaise Jaya	10 Sept 2004
Brenner, Werner	Jakarta	Management and Financial Advisor	PERPAMSI (Association of Indonesian Water Utility Companies)	25 August 2004
Burrell, Alix	Singapore	Director Project Finance Asia	BNP Paribas Singapore	16 March 2004
Cases, Philip	Manila	SAVP, Regulatory Affairs Group	Maynilad	2 June 2004
Chan Ngai Wen	Correspondence	Director	Water Watch Penang	1 February 2004
Chatib, Benny	Jakarta	Finance Officer	Jakarta Water Regulatory Body	9 Sept 2004
Clarke, Steve	Hong Kong	Country Manager, China Executive Director	Suez Environnement Asia Sino-French Holdings	19 April 2004
Cruz, Macra	Manila	Deputy Administrator	Metropolitan Waterworks and Sewerage Services Corporate Office	27 May 2006
de Guzman, Elaine	Manila	Chief Power Market Development Div.	Department of Energy	17 June 2004
de Vera, Antonio	Manila	Chairman	Subic Bay Water Regulatory Board	16 June 2004
Esguerra, Jude	Manila	Researcher	Institute for Popular Democracy	24 May 2004
Fabella, Raul	Manila	Dean, School of Economics	University of the Philippines	25 May 2004
Fairclough, Graham	Manila	Executive	Subicwater	12 June 2004
Fernandez, Jun	Manila	Director	Leighton Contractors	8 June 2004

Flor, Mai	Manila	Director Business Development	Ondeo Philippines	8 June 2004
Frauendorfer, Rudolph	Manila	Urban Development Specialist	Asian Development Bank	2 June 2004
Gaza, Jomar	Telephone	Legal Counsel	Subic Bay Metropolitan Authority	15 June 2004
Hilwan	Jakarta	Department of Construction and Investment	Kimpraswil (Department of Settlements and Regional Infrastructure)	31 August 2004
Johnson, Richard	Johor Bahru	Consultant to SAJH, Head of Operations	Thames Water (Malaysia)	4 February 2004
Krieg, Thierry	Jakarta	President Director	Pam Lyonnaise Jaya	24 August 2004
Lamacq, Sophie	Hong Kong	Regional Manager, South China	Veolia Water Asia	19 April 2004
Lanti, Achmad	Jakarta	Chairman	Jakarta Water Regulatory Body	11 August 2004 23 August 2004
Lazaro III, Angel	Manila	Former Chief Regulator	Metropolitan Waterworks and Sewerage Services Regulatory Office	16 June 2004
Lee Hock Guan	Singapore	Fellow	Institute of S.E.Asian Studies, Singapore	13 February 2004
Lee Koon Yew	Kuala Lumpur	Deputy Director	JKR (Public Works Dept) Water supply branch	4 March 2004
Leow Chi Pa	Kuala Lumpur	Director	JKR (Public Works Dept) Water supply branch	4 March 2004
Madinsa, Jaseni	Telephone	Chief Engineer	PBA Holdings (Penang water utility)	15 March 2004
Mahmood bin Haji Ismail	Johor Bahru	Branch Manager	Federation of Malaysian Manufacturers, Johor branch	6 February 2004
McCormack, William	Singapore	Partner	Shearman & Sterling Singapore	11 March 2004
McIntosh, Arthur	Manila	Consultant	Asian Development Bank	27 May 2004
Medalla, Felipe	Manila	School of Economics	University of the Philippines	11 June 2004
Mohammad bin Alwi	Johor Bahru	Chief Financial Officer	SAJ Holdings (Johor concessionaire)	19 February 2004
Mohd.Idris Kaparawi	Johor Bahru	Director	Badan Kawal Selia Air Johor (Johor water regulator)	11 February 2004
Ng Ching Hai	Johor Bahru	Director Planning and Technical	SAJ Holdings (Johor concessionaire)	19 February 2004
Novari Lis	Jakarta	Head Planning Division	Perusahaan Daerah Air Minum Jakarta (Pam Jaya)	26 August 2004
Ortega, Homer	Manila	Member	Metropolitan Waterworks and Sewerage Services Board of Trustees	5 June 2004
Polloso, Estrellito	Manila	Finance Director	Metropolitan Waterworks and Sewerage Services Corporate Office	5 June 2004
Poltak, Situmorang	Jakarta		Association of Indonesian Water Works contractors of Jakarta (AKAINDO)	18 August 2004
Razali bin Abdul Aziz	Johor Bahru	Chief Operating Officer	Equiventures	12 February 2004
Redman, Carl	Macau	Director Customer Relations	Macao Water Company	08 April 2004
Reyes, Alfredo	Manila	Member	Metropolitan Waterworks and	8 June 2004

			Sewerage Services Board of Trustees	
Rivera, Perry	Manila	Group Director Regulation and Planning	Manila Water	28 May 2004
Rogers, Terry	Singapore	Retired (former Director Asia)	Thames Water International	16 August 2004
Roswita	Jakarta	Consultant	Perusahaan Daerah Air Minum Jakarta (Pam Jaya) (retired)	1 Sept 2004
Sa'ari Mohd. Nooh	Johor Bahru	Deputy Director	UPENJ (Economic Planning Unit, Johor State)	7 February 2004
Safwan, Achmad Djiddan	Jakarta		KOMPARTA	18 August 2004
Sakai, Randolph	Manila	Acting Regulator Finance	Metropolitan Waterworks and Sewerage Services Regulatory Office	2 June 2004
Sangster, Colin	Hong Kong	Chief Financial Controller	Suez Environnement Asia	13 May 2004 14 May 2004
Santos, Eduardo	Telephone	Chief Regulator	Metropolitan Waterworks and Sewerage Services Regulatory Office	9 June 2004
Santos, Nathaniel	Manila	Member	Subic Bay Water Regulatory Board	10 June 2004
Schmidbauer, Stephan	Hong Kong		Bayerische Landesbank	20 April 2004
Sikar, Sjahrun	Jakarta	Thames Water Country Representative, Indonesia	Thames Water International	25 August 2004
Siregar, Kumala	Jakarta	Customer Relations Dir.	Pam Lyonnaise Jaya	24 August 2004
Skelcher, Gary	Singapore	Asia Director (former TPJ)	Thames Water International	16 August 2004
Subramaniam	Kuala Lumpur	General Manager	PUAS (Selangor water distribution company)	4 March 2004
Sukarma, Risyana	Jakarta	Water and Sanitation Specialist	Water & Sanitation Program, SE Asia	10 Sept 2004
Suksmaningsih, Indah	Jakarta	Chairperson	YLKI (Indonesia Consumers Association)	04 August 2004
Tirona, Salvador	Manila	CFO	Maynilad	02 June 2004
Tutuko, Kris	Jakarta	Technical Director	Perusahaan Daerah Air Minum Jakarta (Pam Jaya)	12 August 2004
Valahu, Philippe	Singapore	Regional Manager Asia	Multilateral Investment Guarantee Agency	16 March 2004
Weitz, Almud	Manila	Urban Economist	Asian Development Bank	27 May 2004
Wermert, Stephen	Manila	Senior Structured Finance Specialist	Asian Development Bank	26 May 2004
Widya, Salusra	Jakarta	DG of Human Settlement and Housing	Badan Perencanaan Pembangunan Nasional (Indonesian National Development Planning Agency)	7 Sept 2004
Wind, Philippe	Macau	Chief Executive Officer	Macao Water Company	8 April 2004
Woodcock, Jim	Jakarta	Water and Sanitation Specialist	Water & Sanitation Program, SE Asia	6 Sept 2004
Yamamura, Shigeru	Jakarta		Japan Bank for International Cooperation	3 Sept 2004

Yniguez, Cesar	Manila	Consultant		17 June 2004
Yoong Jih Ping	Johor Bahru	President	Johor Consumers Association	10 March 2004
Zahdi, Ahmad Jamil	Johor Bahru	Chief Executive Officer	SAJ Holdings (Johor concessionaire)	19 February 2004
Zainuddin bin Mohd. Ghazali	Johor Bahru	Director Operations	SAJ Holdings (Johor concessionaire)	15 March 2004
Zhang Ming	Manila	Infrastructure Sector Coordinator	World Bank	3 June 2004
Zulkifli bin Ibrahim	Telephone	Asst Director Operations and Maintenance Unit	Water Supply Dept. Negeri Sembilan	2 March 2004