

Negotiating with a Consumer Advocate in Public Utilities Regulation

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Abstract: Over the past 25 years, the practice of negotiated settlements (or stipulations) has come to increasingly replace the rate-of-return regulation used by US and Canadian regulators to set rates of public utilities firms. In spite of its prevalence, this practice has been largely neglected by economists. The consensus in recent research is that the motivations for parties to settle a rate case are different from that in litigation. Consequently, a new theory is required to analyze such agreements. This paper formulates a two-stage model to examine the effect of such settlements on consumers when they are represented by a consumer advocate. In the first stage, the advocate and firm bargain simultaneously over the shares of the firm's revenue and the firm's future cost according to a Rubinstein alternating-offers bargaining procedure. If a settlement is reached then the game ends with a negotiated settlement. If there is disagreement, the game moves to the second stage. Here, the regulator determines the shares of the firm's revenue for each party. In the full-information case, settlement is always better than regulation because any regulation outcome can be replicated with settlement. When there is imperfect information, the consumer always benefits from a negotiated settlement if the consumer advocate's preference is identical to the consumers'. The paper also shows that when bargaining, sometimes the consumer is no better off with a consumer advocate with an identical preference than another whose preference is not the same. This result has implications for the delegated bargaining literature. Some policy prescriptions are suggested at the end.

I. Introduction

Rate-of-return (ROR) regulation has long been a popular means of regulating the earnings of public utilities in the US and Canada. Under ROR regulation, the regulator sets the prices charged by the utility to ensure a revenue that allows the utility to recover its costs and earn a fair rate of return on its "rate base". The utility's rate base is the book value of the firm's capital investment. What constitutes the rate base, the return the firm is allowed to earn on its rate base

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and exactly what constitutes a fair return are all determined by the regulatory public commission after a process of formal hearings.

Increasingly, this long-established procedure of setting base rates is being replaced by a new regulatory technique.² This technique is *negotiated settlement* or *stipulation*. Negotiated settlement entails the firm, the consumers and other interested parties (or their representatives) agreeing upon reasonable prices and other issues, and submitting the agreement to the regulator for approval.

Traditionally, the regulator determines base rates after the firm, consumer advocate (the consumer representative) and other interested have filed their testimonies and all witnesses have been cross-examined at the hearing. In negotiated settlements, it is the firm, the consumer advocate and other parties who decide the rates. The regulator needs only to approve the agreement for the rates to be implemented. The critics of negotiated settlement argue that negotiated settlements transfer decision-making power from the regulator to the firms and large consumers. They worry that all consumers may not be protected in these settlements. The settlement process by its very nature means that the compromises that helped to secure agreement are not made fully public. Even if they are made public, consumers may lack the sophistication to grasp all the implications of such an agreement. Consumer interests are more at risk when they are represented by an agent whose preferences may not be identical to theirs and may have their own motives for reaching settlement. In spite of these potential drawbacks to

² Littlechild (2009a) shows the growth of the negotiated settlement practice at the Florida Public Service Commission (FPSC). Wang (2004) and Doucet and Littlechild (2009) show the increase of the same practice at the Federal Energy Regulatory Commission (FERC) and the Canadian National Energy Board (NEB) respectively.

negotiated settlements, regulatory commissions encourage this type of regulation by their actions and some have even given explicit support.³

In spite of the growing use of this regulatory instrument, little formal analysis of negotiated settlements has been undertaken.⁴ The consensus of existing research is that the main advantage the settlement process provides is that more than one issue can be decided simultaneously as a total package. This allows for potential trade-offs between issues resulting in beneficial outcomes for all parties. These trade-offs are not possible in regulation where the regulator decides each issue separately. The studies also agree that the main reasons why a plaintiff and a defendant come to a settlement before trial in a legal dispute (saving the time and cost of a trial, and reducing the uncertainty from a trial verdict) are not important when the parties of a rate case are deciding to settle. For this reason, models which analyze settlements in litigation literature⁵ are not ideally suited for an investigation of negotiated settlements in regulation. A new model is required to analyze the latter based on the predominant reason why public utilities firms, their consumers and other interested parties settle a rate case.

This paper uses the observations of past research on negotiated settlements in regulation to construct a model that investigates whether consumers can benefit from such agreements even when they are represented by a consumer advocate whose preferences differ from theirs. The paper formulates a two-stage model. In the first stage, the consumer advocate and the firm bargain simultaneously over the shares of two amounts according to a Rubinstein infinite-horizon alternating-offers bargaining game. One of these amounts represents the firm's

³ "It is the policy of the law to encourage and favor the compromise and settlement of controversies when such settlement is entered into fairly and in good faith by competent parties, and is not procured by fraud or overreaching...It is in the interest of the state as well as the parties themselves that there should be an end to litigation." 10 Fla. Jur 2d *Compromise, Accord and Release*, 9.

⁴ For a survey of the existing legal and economic literature on negotiated settlements see Littlechild and Doucet (2006).

⁵ For example, Bebchuk (1984) and Reinganum and Wilde (1986).

overearnings or shortfall relative to the approved revenue set in the last rate case. This amount establishes the rate consumers are to pay. The second amount is a result of other items such as the firm's depreciation and amortization policy, revenue-sharing plans, and future behaviour of the parties frequently found in these types of agreements. These items serve as a mechanism for the firm to retain the future earnings it would otherwise have to give up to the consumer in ROR regulation. The paper models these retained future earnings of the firm as a reduction of the perceived future cost (the second amount) of operating under a ROR regulation regime. If negotiations fail then the regulator determines the shares of the overearnings or shortfall going to both parties.

The central finding is that if the regulator's decision is common knowledge and the consumer advocate represents the consumer's preference accurately then negotiated settlements always lead to Pareto-improving outcomes for the consumer. In fact, in such a situation there would be no regulation stage at all. The simple intuition is that the negotiated settlement process can provide Pareto-improving outcomes because it allows trade-offs between issues unlike regulation. If the regulatory decision is known beforehand then any such outcome can be replicated in the settlement stage itself if no other better solution is feasible for both parties. But if the consumer's preferences diverge from the advocate's then there is a possibility that such agreements may harm the consumer for certain values of the overearnings (or shortfall) and future cost. For other values, however, the advocate will act in the best interest of the consumer even if he does not perfectly represent the consumer's preferences. The results are then used to explain the observations of previous studies and several policy steps for the regulator are recommended in order to safeguard consumer welfare.

The model is a delegated bargaining model. It is shown that in some situations the consumer (the principal) is no better off during bargaining by employing an advocate (an agent) who internalizes her payoff function rather than another who does not. Since Schelling (1956),

there has been a literature on how a principal may benefit by selecting an agent with different preferences to bargain on his behalf. Examples include Rogoff (1985), Jones (1989), Persson and Tabellini (1994), Segendorff (1998), Brueckner (2000), Klumpp (2009) and Harstad (2010). The principal's motive for choosing such an agent in all these models is the same. By employing an agent who is a tougher bargainer than himself, the principal credibly commits to a stronger bargaining position. If negotiations do not break down, the principal is able to gain a bigger reward than by self-representation. Extending this logic, it seems obvious that a principal will prefer to hire an unselfish agent (who internalizes some of the principal's utility function) than a selfish agent (who only cares about his own utility). Indeed, some models (for example, Sliwka 2007)⁶ assume that the principal is always better employing an unselfish agent. Lammers (2010) shows that the principal may want to hire a selfish agent if the job requires bargaining with a third party. Lammers (2010) contends an unselfish agent who internalizes some of the principal's utility also has a tendency to internalize some of his bargaining opponent's utility. This will make a selfish agent a tougher bargainer and a better choice. In this paper, a perfect consumer advocate (who has the same utility function as the consumer) is always a tougher bargainer than a selfish one (whose payoff function diverges from the consumer's). The perfect representative is "tougher" in the sense that he will accept a smaller share of the firm's costs in exchange for the same share of overearnings (or shortfall). The analysis shows that when bargaining simultaneously over two pies, the consumer (the principal) sometimes can do no better by hiring a perfect advocate (the agent) rather than a selfish one. Unlike Lammers (2010), no behavioural assumptions are required to prove this result.

The analysis proceeds as follows. Section II discusses related literature on negotiated settlement and analyzes the motives for those involved in the process to reach a mutually satisfactory agreement. Section III describes the formal model. Section IV reports the results.

⁶ Although in Sliwka (2007) the work the agent is employed to do is not restricted to bargaining.

Section V develops the policy implications of the formal analysis. Section VI concludes with suggestions for future research.

II. Why do parties settle?

A natural tendency is to compare the settlement process in regulation to that in litigation. In the economic literature of litigation, parties prefer to settle because trials are costly, their verdicts uncertain and they take time (Cooter and Rubinfeld 1989). These are sometimes the reasons given by the parties themselves in a rate case.⁷ But studies on negotiated settlements in regulation (Wang 2004; Doucet and Littlechild 2006; Littlechild 2009a,b) argue that these are not the primary reasons why a utility and other parties involved in a rate case settle.

Littlechild (2009b) in his more detailed look at the stipulations determining base rates of electric companies at the FPSC estimates that the costs saved by settling is at most slightly over one-fourth of the total cost of the full regulation process. It is unlikely that cost savings are the main reason for utilities to settle when these settlements determine the outcome of revenues “four orders of magnitude greater than the regulatory costs saved” (Littlechild 2009b). He says that this is also true of the Office of Public Counsel (OPC) in Florida which is responsible for representing consumers in regulatory formal hearings. The OPC would not be concerned about saving the cost of a formal hearing⁸ when the revenues that are at stake are worth “hundreds of millions of dollars” to consumers.⁹ Time also does not seem to be a major motivating reason for settlements. Littlechild (2009a, b) state that discussions of settlement between parties begin after a rate case is initiated at the FPSC and, after testimonies are filed and counter-filed. A settlement

⁷ See footnote 11 of Littlechild (2009b). Wang (2004) also states that the FERC also often claims that rate certainty and the legal costs saved are the advantages of the settlement process.

⁸ According to Littlechild (2009b), it costs OPC around \$100,000 to bring a case in front of the regulator.

⁹ Wang (2004) also states that the legal costs saved from avoiding a rate hearing at the FERC are too small a factor for a gas pipeline company and its customers to settle.

is reached frequently just before the hearing is meant to take place. In the case of electric company rate cases, the expected duration of a hearing would be a week or two, and the FPSC would give its ruling shortly afterwards (Littlechild 2009b). This implies, according to Littlechild (2009b), that the time saving from a settlement would be small and the uncertainty would also be resolved in a matter of weeks. This is partly corroborated by Chakravorty (2011) in which the payoff functions of the consumer advocate and the firm during rate cases at the FPSC are estimated using the same dataset as Littlechild (2009a, b). The study suggests that saving the time of a formal hearing is important in neither the advocate's nor the firm's decision to settle.

In his study of rate cases of the major interstate gas pipeline companies at the FERC, Wang (2004) agrees that uncertainty about the regulatory decision is not a likely reason that parties settle rate cases. Wang (2004) suggests that the regulatory decision is more predictable than a trial outcome in a court of law. He further observes that in the settled rate cases of gas pipeline companies at the FERC, the regulatory decision –had the case gone for hearing–is “indirectly observable”, if not “directly observable”.¹⁰

Because the most important motivating factors that cause parties to settle during litigation are not the same as in rate cases, this paper attempts to develop a model which is better suited to analyze such agreements than models which analyze settlements in litigation literature. The model is based on the predominant reason why public utilities firms, their consumers and other interested parties settle a rate case. Wang (2004), Doucet and Littlechild (2006, 2009) and Littlechild (2009a, b) all agree that the chief reason why parties in a rate case prefer settlement is

¹⁰ Some of the settlements in Wang (2004)'s sample were contested. To judge whether the contesting parties had a valid reason for contesting, the FERC had to consider the outcome of the rate case if they had not been settled and report it. Because the alternative regulation outcome is available for these contested settlements, Wang (2004) says the regulation outcome is “directly observable” for these cases.

that settlements achieve more desirable outcomes for all involved than the formal-hearing process.

Why are the parties able to achieve more desirable outcomes in settlement than by regulation? These outcomes are shown to be possible in Wang (2004) because the settlement process is more flexible than the rigid regulation process. If there is more than one issue to be determined by the regulator, a formal hearing means the regulator decides these issues separately. Wang (2004) calls this an “issue-by-issue merits determination procedure”. The regulator is not legally bound to adjudicate in this manner. By the Supreme Court ruling in *Federal Power Commission v. Hope Natural Gas Company*, the FERC can make a valid regulatory decision even after making a material error in deciding one of the issues as long as the final rate order “cannot be said to be unjust and unreasonable”. In spite of the Hope decision, regulators like the FERC try not to make any material error in any of their rulings. Wang (2004) says there are two reasons for this. The first reason, as noted by Krieger (1995), is that many courts believe the final decision is necessarily invalid if there is a material error in any issue. Wang (2004) gives the example of the Public Service Commission of Wisconsin which tried to give a ruling without making findings of fact on rate base or rate of return. The commission cited the Hope decision to justify their order. The commission’s decision was found to be arbitrary and unlawful by the Wisconsin Supreme Court.¹¹ The second reason as stated by Noll (1971) is that sometimes the only threat of the regulator’s decision being overturned is the charge of improper agency procedure. Therefore, the regulator “has a strong incentive to make certain of its procedural position” (Noll 1971). The regulator is more susceptible to appeals if it makes a material error in determining any issue.

¹¹ *Commonwealth Telephone Company v. Public Service Commission*, 252 Wis 481 (1948).

The settlement process on the other hand allows a trade-off between issues and allows the parties to come to a better outcome for all by allowing the parties to focus on the “total package”. Because the settlement agreement is formulated by the main contesting parties themselves, the chance of appeal against a regulatory order approving it is minimized. The technique is further enhanced by the fact that the parties obviously know their preferences better than the regulator. The parties can agree to terms in whose favour the regulator may not rule because it is unsure whether the parties will prefer such an outcome. For example, Littlechild (2009b) reports that some FPSC staff members would recommend a settlement even when they estimated that the regulated rate reduction would be larger because consumers valued immediate gains.¹²

Wang (2004)’s view seems to be supported by the experience of Littlechild and Doucet (2009) at the NEB. Littlechild and Doucet (2009) study negotiated settlements of toll cases of major pipeline companies at the NEB. The Board would analyze each proposed item independently in a settlement to see whether it was “just and reasonable” just as it would do in a formal hearing. It would take out any item of settlement which it deemed not “just and reasonable” before approving it. The pipeline companies and the parties did not like this “cherry-picking” and during the period 1985 to 1995, there were only three fully-negotiated settlements. The NEB changed its approach in 1994 and announced that it would either accept or reject a settlement in its entirety. The Board now determined the reasonableness of a settlement by the reasonableness of the process rather than by the reasonableness of the outcome. After this change of policy, there was a significant rise in the number of negotiated settlements at the NEB. In fact apart from four cases, all major gas and oil pipeline companies’ tolls have been set by settlement from 1995 to 2010. This again shows that the main difference between the settlement process and regulation as perceived by the pipeline companies and their customers was that

¹² This is from the settlement signed by the OPC and the Florida Power and Light Company (FPL) in 1999.

settlement allowed parties to decide issues (tolls and base rates being among them) as a total package.

Wang (2004) constructs a two-stage model to show how the settlement process yields a better outcome for a firm and its consumer by allowing a trade-off between issues. In the first-stage, the firm and its consumer bargain simultaneously over the shares of two pies of fixed size 1. If they come to an agreement the game ends with settlement. At any period of this bargaining, the respondent of an offer may opt for litigation in which case the game moves on to the second stage. In this stage, the regulator decides the shares of both the fixed pies independently according to the Nash bargaining solution of the firm and consumer. Wang (2004) shows the settlement outcome Pareto dominates the litigation outcome. But for a deeper understanding of the settlement process and to determine whether consumers may be hurt from it a more detailed look at what issues are decided and an understanding of how interests of parties are represented during negotiations is needed. Also Wang (2004)'s model does not explain why negotiations sometimes break down and the case goes to regulation.¹³

The only danger to parties in settlements is that their interests may be misrepresented at the bargaining table. Therefore, it is important to identify the parties and their agents, and to investigate whether there is a possibility that an agent may misrepresent its principal's preferences. The main purpose of this paper is to see whether the final consumer may be harmed by settlement and if so, in what circumstances this will happen. So the paper focuses on the role

¹³ In Wang (2004)'s complete and perfect information model, there is never any regulation (or litigation as he calls it) though this is not stated explicitly by the author. Because the firm and consumer know what they will get in the second stage of litigation, they can come to the same outcome in the first settlement stage itself if there is no Pareto-improving alternative.

of the consumer advocate as the representative of the final consumer in the negotiations with and regulatory proceedings against a public utility firm.^{14,15}

To examine if there is a possibility that the consumer advocate may misrepresent the consumer's preferences, we must see how the particular parties involved (the consumer, the firm, the consumer advocate and the regulator) benefit from settlement over regulation. Littlechild (2009a, b) identifies the benefits the parties receive in negotiated settlements regarding base rates at the FPSC. These settlements are signed by the public utilities firm whose base rates are in question, the OPC and other interested parties.

The main benefit that consumers get from these stipulations at the FPSC is the lower rates they have to pay. Littlechild (2009b) examines how these rate reductions differ from the rate change that would have occurred if the case was not settled. Littlechild (2009b) concludes that for the customers of Florida's investor-owned electric companies the rate reductions, refunds and revenue-sharing from settlements were greater or earlier than those which would have been achieved by regulation. He estimates that three-quarters of the benefits would not have been achieved without settlement. In some rate cases, even when the FPSC staff estimated that the rate reduction from the regulatory ruling may be higher than the stipulated rate reduction the settlement was still approved by the FPSC on the basis that it would provide "immediate" and "substantial" benefits to consumers.¹⁶ The staff said that this would be more preferable to the consumer. Littlechild (2009b) also argues-- unlike Wang (2004) --that the

¹⁴ The consumer advocate and the firm are not the only parties involved during negotiations and formal hearings. Other interested parties include large consumers, firm competitors and a wide variety of other interests. The paper, however, focuses on the role played by the consumer advocate and the firm during negotiations and regulation. Littlechild (2009b) reports that according to transcripts of the hearings the OPC "made most of the running, with other parties indicating they supported OPC's position on many issues."

¹⁵ It must also be noted that there is another possibility of a principal-agent analysis with the firm management representing the interests of the firm shareholders. This is briefly indicated in Littlechild (2009a) footnote 25.

¹⁶ This is from Littlechild (2009b)'s examination of the stipulation signed by FPL and the OPC in 1999.

certainty of the settled rate reduction was another benefit to consumers. Settlements with rate reductions were concluded even at those times when the FPSC had a known policy of applying overearnings of electric companies to write off assets rather than for consumer rate reductions.

After stating what benefits consumers get from negotiated settlement, Littlechild (2009b) examines the reasons why firms agree to settlements that result in lower rates and increased refunds relative to those required by FPSC regulation. He makes a detailed study of the negotiated settlements signed by the OPC and four of the five investor-owned electric companies in Florida.¹⁷ Littlechild (2009b) finds that there are two main ways that stipulations create benefits for utilities. One, by settlement the OPC can commit to act in certain ways that fall outside the FPSC's jurisdiction. Littlechild (2009b) calls these commitments on conduct. Two, the OPC is willing to make concessions that the FPSC is unwilling to make. Two such concessions identified in these settlements are giving more discretion to the utility in its accounting policy and revenue-sharing. The revenue-sharing arrangements found in the settlements indicate a move from the traditional ROR regulation towards incentive regulation. The question of how these benefits specifically translate into gains for the firms is important because it may be possible that these gains come at the expense of the final consumer. To explore this, Littlechild (2009b)'s findings are examined in greater detail below.

In the commitments to conduct category, Littlechild (2009b) talks about stipulated agreements where the OPC promises an action in return for a rate reduction or refund. This action may be the withdrawal of opposition in another forum such as opposition to a firm merger. More important, the OPC and the firm both agree not to initiate a rate case for a substantial period of time. Wang (2004) refers to this as "rate moratorium". Wang (2004) admits

¹⁷ The four companies were Florida Power and Light Company (FPL), Florida Power Corporation (FPC) which is now Progress Energy Florida (PEF), Tampa Electric Company (TECO) and Gulf Power Company (GPC). The fifth investor-owned electric company, Florida Public Utilities Company (FPUC), did not participate in any settlement during the period of study.

that it is hard to estimate what the firm specifically gains here. He says that the benefits for the firm depend on demand and cost uncertainty, inflation, interest rates and the effect the settlement has on firm incentives and subsequent behaviour. What he means is that in the period that neither party can file a rate case, the benefit to the firm lies in a portion of operating revenue that it retains. This is the portion that may have been considered overearnings by the regulator and its amount is dependent on the uncertain factors he lists.¹⁸ There is also another way the firm can profit which neither Littlechild (2009b) nor Wang (2004) explores if the OPC agrees not to initiate a case for a given period. Apart from operating revenue, the firm has income from other sources such as renting of its poles, sale of appliances and the renting of its properties. During regulation, the regulator sometimes has the discretion to subtract this other income component from the revenue requirement of a firm when calculating rates. By agreeing not to initiate a case the OPC allows the firm to keep all of its revenue from all its other operations for the duration of the settlement period. The agreement also motivates the firm to increase these operations which it may not have done otherwise.

The other benefits to firms that Littlechild (2009b) discusses are inter-related. These consist of allowing the firm more flexibility in its accounting policy and revenue-sharing. Both these concessions by the OPC to the firms are departures from FPSC policy and the FPSC staff expressed their concerns about them. Littlechild (2009b) uses the FPSC staff's reservations to examine how these settlement outcomes might have differed from the regulator's rulings. One of the stipulated items against which the staff protested was the greater discretion given to the firm in its depreciation and amortization policy than the FPSC would have allowed. The advantage to the firm is that depreciation is a non-cash expenditure and can be manipulated. The staff complained that "the design of depreciation rates, and the resultant rate base, will no longer reflect the matching principle [matching capital recovery with consumption over an asset's

¹⁸ Wang (2004) says this is effectively price-cap regulation.

service life], but rather, the degree of variability in the company's revenue" (Littlechild 2009b). This will allow the firm to "meet internal corporate goals such as targeted level of growth" (Littlechild 2009b). There is another use of a flexible depreciation policy for the firm. It must be looked at in conjunction with the other new innovation found in settlements—incentive regulation. From 1986 to 1999, earnings-share arrangements were made in several negotiated settlements. This incentive regulation would supersede the usual ROR regulation for the duration of the settlement period. For example, in 1996 FPSC approved a settlement between the OPC, the Florida Industrial Power Users Group (FIPUG) and TECO (Order No. PSC-96-0670-S-EI). In the settlement, TECO agreed to an earnings-sharing plan whereby 60% of the net revenue that contributed to a ROE over a specified level would be deferred to the next year's revenue in 1996 and 1997. In 1998, any remaining deferred revenue from 1996 and 1997 plus any net revenue that contributed to a net ROE over 12.75% would be refunded to TECO's customers.¹⁹ This kind of arrangement along with the more flexible accounting policy enables the firm to increase depreciation (consequently decreasing its ROE) in future years when its revenue is high. Thus, it can recover that portion which it would have had to give up to its consumers had the FPSC's more conservative accounting policy been followed. The OPC might have caught on to this, because Littlechild (2009b) reports that it wanted "a more objective scheme, less subject to manipulation of costs, one that was quicker and easier to maintain".²⁰ A Revenue Sharing Incentive Plan was specified in four settlements with FPL and PEF made from 1999 to 2005. This plan consists of base revenue thresholds instead of ROE levels within which one-third of the revenue would go to the firm and two-thirds to the consumers. Any revenue in excess of the revenue cap accrues entirely to the consumer. The firms however did have an

¹⁹ This plan was extended to 1999 by Order No. PSC-96-1300-S-EI.

²⁰ The FPSC certainly did perceive the possibility of the manipulation of the utility's ROE : "It is clear, by adjusting the level of equity maintained at the utility level, that the Company could affect the amount of earnings subject to sharing and deferral."(Order No. PSC-98-0802-FOF-EI).

authorized ROE range “for all regulatory purposes” (Littlechild 2009b) but it was not to be used for the revenue-sharing mechanism. The staff was concerned that the ROE was now meaningless for surveillance purposes and estimated that the firms would earn above the upper limit of the ROE range. They also estimated that these earnings would continue to grow and noted there was no earnings cap (Littlechild 2009b). This also suggests that with revenue-sharing in settlements, the firm is allowed to retain a part of its future revenue which it could not have done if the case went for regulation.

Another advantage that revenue-sharing gives the firm is that prospective investments, which otherwise would have needed FPSC approval, are included in the rate base. Before a new investment by the utility, the FPSC must find that the investment is “prudent” and “used and useful” (Littlechild 2009b) before including it in the firm’s authorized rate base. Littlechild (2009b) talks about two settlements that removed this function of the Commission. In one of them,²¹ an investment was included in the rate base without a formal hearing of the issue. The final capital cost was included in the rate base and the entire operating expense of the new investment in the net operating income of the firm. In the incentive regulation embodied in the settlements, the regulator does not have to pay attention to the firm’s investments. But this incentive regulation regime is only valid over the period specified in the settlement. If in the future a rate case went for regulation then the revenue requirements for the utility would be determined with the new investments now included in the base rate.

Littlechild (2009b) mentions a few other firm benefits in settlements. As part of their more flexible accounting policy, firms were allowed to petition for storm cost recovery in case their storm damage reserve proved insufficient in the future instead of increasing the annual accrual for the reserve. Littlechild (2009b) also briefly mentions that some of the settlements

²¹ The negotiated settlement TECO signed with the OPC in 1996. The investment was the addition of a new Integrated Gasification Combined Cycle unit to TECO’s Polk Power station.

allowed new costs of the firm to pass on to the consumers through fuel adjustment and other such clauses instead of base rates. The regulator may not have required consumers to pay these costs. Fuel costs accounted for 13 to 38 percent of the total operating revenue of FPL, PEF and TECO in 2009 and around 46 percent of GPC's operating revenue in 2008.²² A closer examination is required to see how much of the operating cost of firms is passed on by these clauses²³ to the consumer through settlements.

The paper models the firm's stipulated benefits as future cost savings of the firm. The firm expects that some of its revenue will be refunded to its consumers by the regulator in the future. The firm sees this as a future cost of its operations in a ROR regulatory regime. If the OPC agrees not to file a rate case in a stipulation or agrees to a revenue-sharing plan (whereby the firm can keep revenue over its authorized ROE), then the firm can retain this expected future "overearning" for the duration of the settlement period. Similarly, there is a chance that the regulator may not include a firm's new investment in the rate base. This is another expected future cost of the firm which is saved by settlement when the OPC agrees to its inclusion in the rate base.²⁴ New costs of the firm which are passed on to the consumer automatically via fuel adjustment and other such clauses in settlements are also the firm's future cost savings.

It is the job of the consumer advocate to represent the consumer during negotiations and formal hearings. In Florida, it is the statutory duty of the OPC to represent the citizens of Florida. Therefore, the consumer advocate should only sign agreements which are beneficial to the consumer. Littlechild (2009a) states that "presentation and appearance are additional considerations". This means that the advocate not only wants lower rates for consumers but he

²² Source is company annual reports.

²³ Perhaps the reason why Littlechild (2009b) did not examine such clauses in more detail is because the impact of fuel adjustment and other clauses was not included in the FPSC database (Footnote 8 Littlechild, 2009a).

²⁴ The stipulated firm benefits can equivalently be modeled as receiving future revenue that would have accrued to the consumers in a ROR regulatory regime.

also wants to be seen achieving these lower rates. As seen from the above analysis, it is difficult to identify the exact gain the firm makes from the settlement. The identification problem will be greater for an average consumer who may lack the sophistication to fully interpret the concessions made to the firm. The most easily understood item of the settlement is the present rate reduction or increase. Littlechild (2009a) says a rate reduction represents “good news” for the advocate’s principal²⁵ and is an observable signal that the advocate is doing a good job. The advocate may be tempted to give up more future income than the consumer would otherwise want in exchange for a present rate reduction if the future loss is unobservable to the consumer at the time of the settlement.²⁶ The present show of good job performance leads to better chances of re-appointment and longer term as advocate. This can happen especially if the firm collects the cost of the present rate reduction at a future date beyond the advocate’s tenure in office or if his tenure is uncertain.²⁷ Here lies the divergence between the consumers’ preferences and their agent’s, and the possibility that the consumer’s preferences may not be accurately represented at the negotiation table. Chakravorty (2011) finds that in the rate cases at the FPSC, the consumer advocate seemed to give more weight to the size of the present rate reduction than on future consumer welfare in his decision to settle. This suggests that there is the possible existence of negotiated settlements that the consumer would oppose.

The FPSC must make its regulatory decision by balancing the needs of the utility and its shareholders with the needs of the consumers. But the regulator would also want to minimize

²⁵ Littlechild (2009a) also talks about how a stipulated rate reduction is also good news for the firm’s shareholders. A stipulated rate reduction as opposed to a regulated rate reduction signals to the shareholders that the rate reduction is manageable and the relationship with the regulator is good. The present paper does not study this principal-agent relationship.

²⁶ Littlechild (2009a) mentions there may be a difference in interests of the parties with respect to calculating of the value of a settlement. The consumer advocate may want to maximize and make public the undiscounted nominal dollar value of the rate reduction whereas the firm will be more interested in the real present discounted value.

²⁷ The Public Counsel of Florida is appointed and re-appointed every year. Littlechild (2009b) states that negotiated settlements in the Florida electricity sector typically determine rates for three to four years ahead. Some implications of the clauses of these settlements last even longer.

the criticism of its regulatory decision from all parties involved and insulate itself from further legal appeal against its decision.²⁸ As mentioned previously, the settlement process can provide a means of achieving this objective. That is why, says Littlechild (2009a), the FPSC has adopted “almost invariably” every settlement given to it. From the FPSC’s point of view, a negotiated settlement limits criticism from the parties involved and the chances of further legal appeal.

The next section models two types of rate cases. The first is an earnings-review case. An earnings-review case is initiated by the regulator, sometimes at the request of the consumer advocate, in the belief that the firm has earned above its revenue requirement and a rate reduction might be in order. The second type is a company-request case. This is a case initiated by the firm when it believes a rate increase is necessary. In the earnings-review case, it is assumed that the firm has earned more than its approved revenue and a rate case has already been initiated. The model has two stages. The first stage is the Settlement Stage. Here, the consumer advocate and the firm bargain simultaneously over the share of the overearnings and the share of the firm’s constant future cost that the consumer and the firm are to bear. This simplified model assumes that the consumer advocate, the firm and the regulator all know the amount of overearnings and the total future cost of the firm.²⁹ This total future cost represents the firm’s expected future cost of ROR regulation discussed above. These are the two pies whose shares are being negotiated. The negotiations follow a standard infinite-horizon alternating-offers bargaining procedure (Osborne and Rubinstein 1990). If an offer during this stage is accepted then the game ends in a negotiated settlement. But if the advocate and the firm disagree and cannot come to an agreement then the game eventually moves to the second stage of regulation. In the Regulation Stage which represents the formal hearing, the regulator decides the parties’ shares of the firm’s overearnings and the game ends. The company-request case is modelled in

²⁸ See Joskow (1974).

²⁹ As will be seen it is not required that the regulator know the total future cost of the firm.

the same way. The only difference is that now the firm's revenue falls short of its approved revenue and it initiates a case to recover the shortfall. In the Settlement Stage, the consumer advocate and firm bargain over how much of the applied-for shortfall the firm is to receive along with the payment shares of the firm's future cost.³⁰ The regulator determines how much of the shortfall the firm is allowed to recover in the Regulation Stage.

III. The model

A rate case is initiated when the firm earns more than its approved revenue (an earnings-review case) or less than its approved revenue (a company-request case). The profit function of the firm before the game begins is:

$$\pi_f = R - c_0 - \phi^f c_1 . \quad (1)$$

In (1), R is the revenue of the firm, c_0 is the operating and maintenance cost of the firm, c_1 is the future cost of the firm and ϕ^f is the firm's discount factor of future costs. As discussed in the last section, c_1 may be the amount of expected future revenue the firm will have to give up to the consumer, expected future cost of a new investment or a new future cost of the firm which it expects to incur under ROR regulation. The revenue of the firm R can be split into two components depending on whether the firm has earned over or under its approved revenue. If the firm has earned more than its approved revenue, then R is:

$$R = R_a + e_1, \quad (2)$$

where R_a is the firm's approved revenue as determined in the last rate case and e_1 is the amount of revenue that the firm earns in excess of R_a . If the revenue is below R_a then R is:

³⁰ Again in this simplified model it is assumed that the shortfall that the firm applies to the regulator to get back and the total future cost of the firm is known to the consumer advocate, the firm and the regulator. In reality, in a company-request case the firm does request a rate increase amount when filing a case so this is known to the parties.

$$R = R_a - e_2, \tag{3}$$

where e_2 is the amount of revenue by which R falls short of R_a . It is assumed that the regulator sets R_a such that:

$$(A1) \quad R_a \geq c_0.$$

(A1) reflects the fact that the regulator will not allow a firm's revenue to be below its operating and maintenance cost. Such a revenue level would cause the firm financial distress.³¹ The regulator does not set R_a taking into account the firm's future costs, c_1 . The reason for this is the nature of c_1 considered here. It is either a future cost that the regulator cannot presently observe³² or a future cost that the regulator determines the firm should solely bear.³³

The regulator initiates an earnings-review case if the firm earns over R_a . In such a case, the firm's revenue R is given by (2). Alternatively, if the firm earns below R_a , the firm files a company-request case with the regulator. Here, R is expressed by (3). The first stage of the model which is the Settlement Stage begins after the rate case is initiated.³⁴

In the Settlement Stage of the earnings-review case, the consumer advocate and the firm simultaneously bargain over the share of e_1 each party is to receive and the share of c_1 each party is to pay. x is the part of e_1 that goes to the consumer and y is the share of c_1 that the

³¹ If R_a in the last rate case was set by a negotiated settlement instead, then it is assumed that the firm would not agree to a revenue below c_0 .

³² It is probable that c_1 is only observable to the firm. But during the Settlement Stage, the firm will make known c_1 to the consumer advocate as one of the amounts to be bargained in the Settlement Stage. Consequently, c_1 will be known to the consumer advocate at the beginning of the Settlement Stage.

³³ The firm can always initiate a rate case when in future c_1 is incurred. If c_1 causes the firm financial distress then c_1 becomes part of c_0 at the time of the future rate case.

³⁴ Littlechild (2009a) reports that negotiations between parties begin after the rate case has been initiated and testimonies filed. Settlements are usually concluded just days before the formal hearing. Wang (2004)'s experience at FERC suggests a similar case timeline.

consumer has to pay. This implies that $e_1 - x$ and $c_1 - y$ are the corresponding shares of the firm. Therefore, $x \in [0, e_1]$ and $y \in [0, c_1]$ in an earnings-review case. The only difference in the company-request case is that the parties bargain over the shortfall e_2 instead of e_1 . Consequently, x and $e_2 - x$ are the shares of e_2 that go to the consumer and the advocate respectively and $x \in [0, e_2]$ in a company-request case.

The firm's payoff is represented by its profit function in the earnings-review case and the company-request case. These are shown by (4a) and (4b) respectively:

$$\pi_f(x, y) = \delta^t [R_a - c_0 + (e_1 - x) - \phi^f (c_1 - y)] \quad (4a)$$

$$\pi_f(x, y) = \delta^t [R - c_0 + (e_2 - x) - \phi^f (c_1 - y)] . \quad (4b)$$

In (4a) and (4b), $\delta \in [0,1]$ is the discount factor for each period t in the Settlement Stage. δ should not be confused with ϕ^f . The firm uses δ to discount its profit in each successive period of bargaining within the Settlement Stage. In contrast, ϕ^f is the firm's discount factor of a future cost that is incurred past the Settlement Stage. Therefore, it must be that $\delta > \phi^f$. The consumer's utility in both the earnings-review case and the company-request is:

$$U_c(x, y) = \delta^t (x - \phi^c y). \quad (5)$$

In (5), ϕ^c is the consumer's discount factor of future costs.³⁵ The relation between ϕ^c and ϕ^f is assumed to be:

$$(A2) \quad \phi^c \leq \phi^f .$$

(A2) assumes that firms are at least as patient as the consumer.³⁶

³⁵ ϕ^c and δ are not the same for the same reason ϕ^f and δ are not related. Also, $\delta > \phi^c$.

It is assumed that the consumer advocate is only concerned about the share of e_1 in an earnings-review case or e_2 in a company-request case that he can obtain for the consumer. This is because the value of x is the only observable signal of the advocate's job performance. The consumer will perceive a higher value of x as a better job done by the advocate and this will increase his chances for re-appointment.³⁷ Therefore the utility function of the consumer advocate is:

$$u_A(x) = \delta^t x . \quad (6)$$

During negotiations with the firm and the regulatory formal hearing, it is assumed that the advocate maximizes a weighted function of his own utility function and the consumer's.³⁸

$$U_A(x, y) = \alpha u_A(x) + (1 - \alpha) U_c(x, y), \quad (7)$$

where $\alpha \in [0,1]$ is the weight the advocate assigns to his own utility function. (7) can be simplified to (8):

$$U_A(x, y) = \delta^t [x - (1 - \alpha)\phi^c y]. \quad (8)$$

The model assumes that the consumer advocate and the firm know the other's payoff function. Such symmetry of information may reflect the parties' repeated interactions over time, for example.³⁹ The consumer, however, has no knowledge of the consumer advocate's or the firm's

³⁶ A natural choice of ϕ^f would be $\frac{1}{1+i}$ where i is the interest rate.

³⁷ The idea of the agent's re-employment chances affecting his bargaining behaviour is not new. Cai (2000) develops a two-phase bargaining model in which there is an election after the first phase. This model explains the unnecessary extension of strikes by labour union leaders as a result of their re-election concerns. Cai (2000) shows that when the principal does not know the total size of the surplus over which the bargaining occurs, a tough agent may want to intentionally delay the bargaining to signal his "toughness". This leads to inefficiency in equilibrium.

³⁸ This weighted payoff function is like the one used by Charness and Rabin (2002).

³⁹ In Florida, one Public Counsel's tenure was 25 years during which he concluded settlements and was involved in rate cases repeatedly with the same major Florida public utility firms.

payoff functions. The assumption is that the typical ratepayer of a utility is not aware of the details of a rate case. The consumer can only observe x and not y after the game ends. y is a cost that the consumer must pay in future and therefore, he cannot observe it at present.

The bargaining follows an infinite-horizon standard alternating-offers procedure. The consumer advocate proposes a division of the pots in even periods $t = 0, 2, 4, \dots$. The firm makes corresponding proposals in odd periods.⁴⁰ The player has two options when responding to an offer: (1) accept the offer in which case the game ends in a negotiated settlement or (2) reject the offer and make a counteroffer in the next period of bargaining. Option (1) implies that the regulator approves any settlement that it is presented.⁴¹ The disagreement vectors of the bargaining game in the first stage are the expected payoffs the parties will receive in the Regulation Stage. Because the rate case has already been initiated, if there is perpetual disagreement between the advocate and firm then the Settlement Stage would eventually end and the Regulation Stage would begin. The result would be the regulation payoffs for all parties.⁴²

In the Regulation Stage, the regulator must decide the partition of e_1 between the parties in the earnings-review case and the partition of e_2 in the company-request case. The regulator must make this division without putting the firm in financial distress. This means the regulator must choose x subject to the constraint that the firm's revenue after regulation must not be below c_0 . The regulator does not choose y . According to the two categories of stipulated firm benefits of Littlechild (2009b), either the regulator cannot set y or it has already set y at 0 by its policy in a previous rate case. In both instances y remains equal to 0 as it did before the rate case

⁴⁰ In the limit $\delta \rightarrow 1$, it does not matter to the outcome which player makes the first offer.

⁴¹ Littlechild (2009a) reports that the FPSC "almost invariably adopted" all settlements put to it. Between the years 1976 to 2002, only one settlement was overturned. This settlement was approved in 1989 after one item that the FPSC opposed was removed from the agreement.

⁴² This is consistent with Cooter and Rubinfeld (1989) who say that the disagreement vector or threat point (as they call it) in the settlement stage will be the expected trial verdict.

was filed. The regulator chooses x by maximizing a weighted function of the firm's profit and the consumer's utility function⁴³ subject to the constraint that the firm's after-regulation revenue is not less than c_0 . In the earnings-review case, the regulator's constrained maximization problem is:

$$\text{Max}_x W(x) = \beta U_c(x, 0) + (1 - \beta)\pi_f(x, 0) \quad (\text{P1})$$

$$\text{s. t. } R_a + e_1 - x \geq c_0.$$

And in the company-request case, it is:

$$\text{Max}_x W(x) = \beta U_c(x, 0) + (1 - \beta)\pi_f(x, 0) \quad (\text{P2})$$

$$\text{s. t. } R + e_2 - x \geq c_0.$$

In the constrained maximization of (P1) and (P2), $\beta \in [0,1]$ is the weight that the regulator attaches to the consumer's utility function. The regulator sets x according to its duty of balancing the needs of the firm's customers with those of its shareholders. Uncertainty of the regulatory decision is introduced in the model by assuming that the consumer advocate and firm do not know the value of β . They do, however, have beliefs about β 's value. These beliefs are represented by the probability density functions $g(\beta)$ and $f(\beta)$ for the advocate and firm respectively. The corresponding probability distribution functions are $G(\beta)$ and $F(\beta)$.

IV. Results

This section is divided into two parts. In subsection A, the model is solved for the earnings-review case and then it is solved for the company-request case in subsection B.

⁴³ When $y=0$, the consumer advocate's weighted utility function is the same as the consumer's. So the regulator could as well as be maximizing a weighted function of the consumer advocate's weighted utility function and the firm's profit.

The earnings-review case

In the Regulation Stage, the regulator has to choose x to solve the constrained maximization problem (P1). Because in an earnings review case $R = R_a + e_1$ and $x \in [0, e_1]$, (A1) implies that the constraint in (P1) will hold trivially. The regulator's problem then becomes:

$$\text{Max}_x W(x) = \beta x + (1 - \beta)(e_1 - x) . \quad (\text{P1a})$$

Differentiating $W(x)$ with respect to x provides:

$$W'(x) = 2\beta - 1 . \quad (9)$$

(9) reveals that $W'(x) \leq 0$ if $\beta \leq 0.5$ and $W'(x) > 0$ if $\beta > 0.5$. Therefore, the solution of (P1a), x^r , is:

$$x^r = 0 \text{ if } \beta \leq 0 \quad (10a)^{44}$$

$$x^r = e_1 \text{ if } \beta > 0. \quad (10b)$$

(10a) and (10b) show that the regulator will award the entire e_1 to the party it weights most during regulation. Therefore, the firm's after-regulation profit, π_f^r , is:

$$\pi_f^r = R_a - c_0 + e_1 - \phi^f c_1 \text{ if } \beta \leq 0.5 \quad (11a)$$

$$\pi_f^r = R_a - c_0 - \phi^f c_1 \text{ if } \beta > 0.5 . \quad (11b)$$

In the Regulation Stages of both the earnings-review case and company-request case, the advocate's weighted utility function and the consumer's utility function is the same. Because $y = 0$ during regulation, the advocate strives to acquire as much of e_1 as he can. This is also best

⁴⁴ It is assumed that the regulator allows the status quo before the rate case to stand (i.e. the firm retaining all of its overearnings) when $\beta = 0.5$ (or equivalently, when $W'(x) = 0$).

for the consumer when $y = \mathbf{0}$. The advocate's after-regulation weighted utility function, U_A^r (and therefore also the consumer's after-regulation utility, U_C^r), is:

$$U_A^r = U_C^r = 0 \text{ if } \beta \leq 0.5 \quad (12a)$$

$$U_A^r = U_C^r = e_1 \text{ if } \beta > 0.5 . \quad (12b)$$

From (11a), (11b), (12a) and (12b), we can arrive at the negotiating parties' beliefs concerning the regulatory decision. The firm's expected after-regulation profit, $E_f(\pi_f^r)$, and the payoff it expects the advocate will get from regulation, $E_f(U_A^r)$, are given by (13) and (14) respectively:

$$E_f(\pi_f^r) = F(0.5)e_1 + R_a - c_0 - \phi^f c_1 \quad (13)$$

$$E_f(U_A^r) = [1 - F(0.5)]e_1 . \quad (14)$$

Similarly, the consumer advocate's expected after-regulation weighted utility, $E_A(U_A^r)$, and the after-regulation profit the consumer believes the firm will get, $E_A(\pi_f^r)$, are given by (15) and (16) respectively:

$$E_A(\pi_f^r) = G(0.5)e_1 + R_a - c_0 - \phi^f c_1 \quad (15)$$

$$E_A(U_A^r) = [1 - G(0.5)]e_1 . \quad (16)$$

These expected payoffs $[E_A(U_A^r), E_f(\pi_f^r)]$ serve as the disagreement vectors in the Settlement Stage.

In the Settlement Stage, let (x_A, y_A) represent the equilibrium offer of the consumer advocate and let (x_f, y_f) be the equilibrium offer of the firm. The necessary condition for a

subgame perfect equilibrium (SPE) is that each party is indifferent between accepting and not accepting the other's offer. This equilibrium condition is given by (17):

$$R_a - c_0 + (e_1 - x_A) - \phi^f(c_1 - y_A) = \max[\delta\{R_a - c_0 + (e_1 - x_f) - \phi^f(c_1 - y_f)\}, E_f(\pi_f^*)] ,$$

$$x_f - (1 - \alpha)\phi^c y_f = \max[\delta\{x_A - (1 - \alpha)\phi^c y_A\}, E_A(U_A^*)] . \quad (17)$$

We solve for (x_A, y_A, x_f, y_f) in (17) without considering the expected regulation payoffs (the expected disagreement vectors). The result is then compared with the expected regulation payoffs to see whether any one of the parties prefers regulation instead. If at least one of the parties' expected disagreement vector is higher than its settlement payoff and both parties believe each has a better chance of the regulatory decision being in its favour (i.e. $G(0.5) < F(0.5)$) then there is disagreement. This leads to the Regulation Stage where the regulator decides the rate case.

In equilibrium, it must be the case that if $x_A < e_1$ then $y_A = c_1$. If this were not the case, then the advocate could increase x_A and reduce y_A . This would make the advocate better off without reducing the firm's profit. Similarly, if $x_f < e_1$ then $y_f = c_1$. In short, all possible tradeoffs between the two parties must have occurred in equilibrium. The result is that the possible equilibrium offers fall into four categories:⁴⁵

- (i) $x_A < e_1, y_A = c_1$ and $x_f < e_1, y_f = c_1$,
- (ii) $x_A < e_1, y_A = c_1$ and $x_f = e_1$,
- (iii) $x_A = e_1$ and $x_f < e_1, y_f = c_1$,
- (iv) $x_A = e_1$ and $x_f = e_1$.

⁴⁵ The proof of this is provided in Appendix A.

The category of the equilibrium offer will depend on the pair (e_1, c_1) . It can be shown that:⁴⁶ (a) the equilibrium offers fall into category (iv) when $\frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq \delta e_1 - (1-\alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}$; (b) they fall in category (iii) when $\frac{\delta(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} < e_1 - (1-\alpha)\phi^c c_1 \leq \frac{R_a-c_0}{\delta}$; and (c) they fall into category (i) when $e_1 - (1-\alpha)\phi^c c_1 > \frac{R_a-c_0}{\delta}$. If there is a SPE in the Settlement Stage, it occurs in the first period of bargaining itself. This means in period $t = 0$ the firm accepts the advocate's proposal and the case is settled. Because the consumer advocate's offer is accepted, the SPE partition of the pots is:

$$(x, y) = [e_1, \frac{\delta\phi^f e_1 + (1-\alpha)\phi^c\phi^f c_1 - (1-\alpha)\phi^c(R_a-c_0)}{(1+\delta)(1-\alpha)\phi^c\phi^f}] \text{ if } \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq \delta e_1 - (1-\alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}, \quad (18a)$$

$$(x, y) = [e_1, \frac{\delta(1-\delta)e_1 + (\phi^f - \delta(1-\alpha)\phi^c)c_1 - (1-\delta)(R_a-c_0)}{\phi^f - \delta^2(1-\alpha)\phi^c}] \text{ if } \frac{\delta(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} < e_1 - (1-\alpha)\phi^c c_1 \leq \frac{R_a-c_0}{\delta}, \quad (18b)$$

$$(x, y) = [\frac{(R_a-c_0+e_1) + \delta(1-\alpha)\phi^c c_1}{1+\delta}, c_1] \text{ if } e_1 - (1-\alpha)\phi^c c_1 > \frac{R_a-c_0}{\delta}. \quad (18c)$$

In the limit as $\delta \rightarrow 1$, (18a), (18b) and (18c) become:⁴⁷

$$(x, y) = [e_1, \frac{\phi^f e_1 + (1-\alpha)\phi^c\phi^f c_1 - (1-\alpha)\phi^c(R_a-c_0)}{2(1-\alpha)\phi^c\phi^f}] \text{ if } \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_1 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}, \quad (19a)$$

$$(x, y) = (e_1, c_1) \text{ if } \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} < e_1 - (1-\alpha)\phi^c c_1 \leq R_a - c_0, \quad (19b)$$

$$(x, y) = [\frac{e_1 + (1-\alpha)\phi^c c_1 + R_a - c_0}{2}, c_1] \text{ if } e_1 - (1-\alpha)\phi^c c_1 > R_a - c_0. \quad (19c)$$

The resulting payoffs of the advocate, firm and consumer (U_A^*, π_f^*, U_c^*) from the equilibrium offers in (19a), (19b) and (19c) are:

$$[\frac{\phi^f e_1 - \phi^f \phi^c(1-\alpha)c_1 + (1-\alpha)\phi^c(R_a-c_0)}{2\phi^f}, \frac{\phi^f e_1 - \phi^f \phi^c(1-\alpha)c_1 + (1-\alpha)\phi^c(R_a-c_0)}{2\phi^c(1-\alpha)}, \frac{\phi^f e_1(1-2\alpha) - \phi^f \phi^c(1-\alpha)c_1 + (1-\alpha)\phi^c(R_a-c_0)}{2\phi^f(1-\alpha)}]$$

$$\text{if } \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_1 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}, \quad (20a)$$

⁴⁶ The proof is provided in Appendix B.

⁴⁷ Because $\alpha \in [0, 1]$ and $\phi^c \leq \phi^f$, $0 \leq \frac{(1-\alpha)\phi^c}{\phi^f} \leq 1$. This implies $\frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} \leq R_a - c_0$.

$$[e_1 - (1 - \alpha)\phi^c c_1, R_a - c_0, e_1 - \phi^c c_1] \text{ if } \frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} < e_1 - (1 - \alpha)\phi^c c_1 \leq R_a - c_0, \quad (20b)$$

$$\left[\frac{e_1 - (1-\alpha)\phi^c c_1 + R_a - c_0}{2}, \frac{e_1 - (1-\alpha)\phi^c c_1 + R_a - c_0}{2}, \frac{e_1 - (1+\alpha)\phi^c c_1 + R_a - c_0}{2} \right] \text{ if } e_1 - (1 - \alpha)\phi^c c_1 > R_a - c_0. \quad (20c)$$

Because $(1 - \alpha)\phi^c c_1$ is the firm's future cost as valued in the advocate's weighted utility function, $e_1 - (1 - \alpha)\phi^c c_1$ term in the ranges of (19) and (20) is the difference between the firm's present overearnings and the present value discounted future cost of the firm as perceived by the advocate. The value of this expression is the advocate's weighted utility level if he receives all of e_1 but the consumer must pay all of c_1 in exchange. It serves as a relative measure of the sizes of the two pots (e_1, c_1) .

We can make some observations about the SPE outcomes in the Settlement Stage. The trade-off during bargaining is driven by the different valuation of c_1 by the advocate and the firm. As previously discussed, in all possible SPEs, either all of e_1 or all of c_1 (or both) is transferred to the consumer. For low values of e_1 relative to c_1 , $e_1 - (1 - \alpha)\phi^c c_1$ will be small. In this case, all of e_1 , but not all of c_1 is transferred to the consumer. The firm would like to transfer the remaining units of c_1 to the consumer. But because there is relatively less of e_1 , the firm has run out of units of e_1 to use as payment for the transfer of these remaining units of c_1 . This is why in the range where $e_1 - (1 - \alpha)\phi^c c_1$ is lowest $\left(\frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1 - \alpha)\phi^c c_1 \leq e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}\right)$, the solution is in category (iv) $x_A = e_1$ and $x_f = e_1$. We can call the range $\frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1 - \alpha)\phi^c c_1 \leq e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}$ the *low-e range*. Similarly, when e_1 is high relative to c_1 , the SPE involves the transfer of the entire amount c_1 but not all of e_1 . Consequently, the solution falls in category (i) $x_A < e_1$, $y_A = c_1$ and $x_f < e_1$, $y_f = c_1$ in the range where $e_1 - (1 - \alpha)\phi^c c_1$ is highest $(e_1 - (1 - \alpha)\phi^c c_1 > R_a - c_0)$. We can name this range the *high-e range*.

Between the ranges where $e_1 - (1 - \alpha)\phi^c c_1$ takes its lowest and highest values, there is an intermediate range: $\frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} < e_1 - (1 - \alpha)\phi^c c_1 \leq R_a - c_0$ (we can call this range the *medium-e range*). The SPE solution in this range involves the total transfer of e_1 and c_1 to the consumer. It is possible in the medium-e range therefore to have multiple equilibria where e_1 is the same but the value of c_1 is different (or equivalently, multiple equilibria with the same c_1 but different e_1 values). The existence of this range is another outcome of the fact that the advocate and the firm value c_1 differently. During bargaining, exactly $\frac{(1-\alpha)\phi^c}{\phi^f}(R_a - c_0) + (1 - \alpha)\phi^c c_1$ units of e_1 are required to exhaust all the units of c_1 .⁴⁸ If another unit of c_1 is added then to transfer this unit to the consumer, the firm needs to transfer an additional $\frac{[\phi^f - (1-\alpha)\phi^c](R_a - c_0)}{\phi^f}$ units as well to the consumer.⁴⁹ But what if with the incursion of another unit of c_1 , the firm has less than $\frac{[\phi^f - (1-\alpha)\phi^c](R_a - c_0)}{\phi^f}$ units of e_1 available for exchange? When this is the case, it is still in the best interest of the advocate and the firm (without considering the Regulation Stage) to transfer all of e_1 and c_1 to the consumer.⁵⁰ These are the SPE outcomes represented in the medium-e range. It should be noted that if the parties valued c_1 the same (i.e. $\phi^f = (1 - \alpha)\phi^c$) then no such range would exist. The only SPE solutions of the Settlement Stage would fall into

⁴⁸ This can be seen from the fact that to find the relevant range where the solution falls into category (iv) $x_A = e_1$ and $x_f = e_1$ ($y_A \leq c_1$ and $y_f \leq c_1$), the answer is $\frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_1 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}$. We can then re-arrange the upper limit of this range to get $e_1 \leq \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} + (1-\alpha)\phi^c c_1$.

⁴⁹ The range where solutions fall into category (i) $x_A < e_1$, $y_A = c_1$ and $x_f < e_1$, $y_f = c_1$, is $e_1 - (1-\alpha)\phi^c c_1 > R_a - c_0$. Re-arranging this range we get $e_1 > R_a - c_0 + (1-\alpha)\phi^c c_1$. Therefore, if the solution falls into category (iv) and all the units of e_1 and c_1 are exactly transferred to the consumer and then an additional unit of c_1 is incurred, then the firm needs $(R_a - c_0 + (1-\alpha)\phi^c c_1 - \frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - (1-\alpha)\phi^c c_1) \frac{[\phi^f - (1-\alpha)\phi^c](R_a - c_0)}{\phi^f}$ units of e_1 to transfer this unit of c_1 as well.

⁵⁰ This will be true as long as $e_1 > (1 - \alpha)\phi^c c_1$ for the consumer advocate and $\phi^f c_1 > 0$ for the firm.

category (i) or category (iv). This is because the one unit of e_1 would be transferred to the consumer for one unit of c_1 .

The full-information case with a perfect consumer advocate

A special case is examined before considering more general results. In this full-information case, the advocate and the firm already know the regulator's decision before the game begins. Also, the consumer advocate in this case is a perfect representative of the consumer, so $\alpha = 0$. When there is full information the expected disagreement vectors in the equilibrium condition (17) become the regulation payoffs both parties know they are getting if the game moves to the Regulation Stage. In such a setting, the game would never go to regulation. If there were no mutually beneficial outcome in the Settlement Stage, the parties would agree to the regulation outcomes in the Settlement Stage itself. The game would always end in a negotiated settlement. Because $\alpha = 0$, no agreement would be to the detriment of the consumer. This leads to our first proposition.

Proposition 1: *In the full-information case, if the parties' preferences are accurately represented in the Settlement Stage (i.e. $\alpha = 0$), negotiated settlements will always result in Pareto-improving payoffs for all parties relative to ROR regulation in rate cases.*

Proposition 1 is the outcome of the fact that any outcome in the Regulation Stage can be replicated in the Settlement Stage with the added possibility of more mutually desirable outcomes for all parties.

Bargaining results in the Settlement Stage

Two propositions concerning the bargaining procedure in the Settlement Stage are now presented. The implications of these propositions hold beyond the context of negotiated

settlements in public utilities regulation. The propositions are applicable for any situation of delegated bargaining where parties simultaneously bargain over two pies.

Proposition 2: *In the Settlement Stage of the bargaining process, the consumer may not be harmed if the preferences of the consumer advocate differ from its own (i.e., if $\alpha > 0$).*

The outcome reflected in Proposition 2 arises in the present model when (e_1, c_1) are such that $e_1 - (1 - \alpha)\phi^c c_1$ falls in the medium-e range.

When $\alpha = 0$ in (7), the consumer advocate's preferences coincide with those of the consumer's. When $\alpha = 1$, the advocate bargains seeking to maximize only his own utility function. As α increases, the advocate puts more weight on his utility function and less on the consumer's during negotiations. Therefore, as α increases we say that the advocate's and consumer's preferences diverge. Given certain relative sizes of (e_1, c_1) and the magnitudes of the other parameters in the model,⁵¹ $e_1 - (1 - \alpha)\phi^c c_1$ may remain entirely in the medium-e range as α increases from 0 to 1. This will be the case when $\frac{\phi^c(R_a - c_0)}{\phi^f} + \phi^c c_1 < e_1 \leq R_a - c_0$. In this situation, even as the advocate places greater weight on his own utility (i.e. α increases), the equilibrium partitions of the pies remain the same ($x = e_1$ and $y = c_1$). The consumer is unharmed because he gets the same x and pays the same y during bargaining regardless the value of α . The medium-e range represents the values of (e_1, c_1) for which it is optimal for the advocate to receive all of e_1 in exchange for the payment of all of c_1 and it is optimal for the firm to propose this offer.

This situation can also occur if the parameters are such that as α increases from 0 to 1, $e_1 - (1 - \alpha)\phi^c c_1$ moves from the low-e range to the medium-e range. The condition for this is

⁵¹ The other parameters being R_a , c_0 , ϕ^c and ϕ^f .

$c_1 > \frac{R_a - c_0}{\phi^f}$. In such a case, initially as α increases, the consumer is worse off because the advocate agrees to higher shares of c_1 that the consumer would have to pay. But after α rises to equal $1 - \frac{\phi^f e_1}{\phi^c(R_a - c_0 + \phi^f c_1)}$ and $e_1 - (1 - \alpha)\phi^c c_1$ moves into the medium-e range, any further increase in α will not hurt the consumer. Similarly, if $R_a - c_0 < e_1 < R_a - c_0 + \phi^c c_1$, initially an increasing α will not harm the consumer as $e_1 - (1 - \alpha)\phi^c c_1$ will remain in the medium-e range. But as soon as α becomes greater than $1 - \frac{[e_1 - (R_a - c_0)]}{\phi^c c_1}$ (i.e. when $e_1 - (1 - \alpha)\phi^c c_1$ falls into the high-e range) an increase in α will be to the detriment of the consumer because the advocate will start to accept a higher share of c_1 for the same e_1 level.

Proposition 2 is valid if the medium-e range is not vacuous. This range characterizes equilibrium settlement solutions where there may be multiple values of y for the same x or vice versa. It is easy to think about settlements when (e_1, c_1) are such that $e_1 - (1 - \alpha)\phi^c c_1$ falls in the low-e or high-e ranges. It is natural to expect that the firm only agrees to settle if for a higher share of e_1 the consumer advocate is willing to pay a higher share of c_1 . Or alternatively, the consumer advocate agrees to bear a larger burden of c_1 in exchange for a larger share of e_1 . The question is are there negotiated settlements that are characterized by the model when $e_1 - (1 - \alpha)\phi^c c_1$ falls in the medium-e range. Such stipulations have been concluded at the FPSC. In May 1996, the FPSC approved a settlement (Order No. PSC-96-0670-S-EI) signed by TECO, the OPC and the FIPUG in a TECO earnings-review case. The settlement allowed a \$25 million refund to TECO's customers as well as a rate freeze till December 31, 1998. In return, the OPC and FIPUG agreed not to seek a rate reduction until December 31, 1998, an earnings-sharing plan for three years (1996, 1997 and 1998) and "to negotiate in good faith" (attachment of the actual settlement in Order No. PSC-96-0670-S-EI) regarding the regulatory treatment of the Polk Power Station and Port Manatee site investment and expenses. The refund that TECO's

customers eventually got from the earnings-sharing plan was \$11, 226, 598 (Order No. PSC-99-2007-PAA-EI). In October 1996, the FPSC approved another settlement between TECO, the OPC and the FIPUG (Order No. PSC-96-1300-S-EI). This settlement provided an additional \$25 million refund to TECO’s customers and extended the freeze on TECO’s rates to December 31, 1999. In return, the OPC and the FIPUG agreed to an earnings-share plan for 1999 (the result was an ultimate refund to TECO’s customers of \$6, 307, 427 Order No. PSC-01-2515-FOP-EI), allowed the actual final capital cost⁵² of the Polk Unit to be included in the rate base for all regulatory purposes, and also allowed TECO to include the full-operating expense of the Polk Unit in the calculation of its net operating income for all regulatory purposes.^{53,54} Comparing the two settlements that TECO signed in 1996,⁵⁵ it seems that the OPC agreed to burden the consumer with more of TECO’s future costs in the second settlement for the same share of overearnings (\$25 million). If we include the refunds that the consumer received from the earnings-sharing plan then it seems that the Public Counsel obligated the consumer pay more of TECO’s costs for less of the firm’s earnings in the second settlement. This corresponds to the settlement equilibrium when $e_1 - (1 - \alpha)\phi^c c_1$ fall in the medium-e range.

(19a)-(19c) imply that a more “selfish” advocate (i.e. one with a higher α) will end up with a share of e_1 that is equal to or even less than a less “selfish” advocate (i.e. an advocate with a lower α). In the low-e range, the advocate will get the same share of e_1 (which is the entire

⁵² This came to an amount equal to one percent above the capital estimate of \$506,165,000 plus related estimated working capital of \$13,029,000.

⁵³ This was estimated to be \$20, 582, 000 net of Department of Energy (DOE) funding for the first year.

⁵⁴ Additionally, OPC and the FIPUG did not seek a earnings-review case during the duration of the settlement. This was probably one of the terms of the settlement like the May 1996 one. I could not check it as the settlement document was not available online.

⁵⁵ Both settlements were agreed during the tenure of the same Public Counsel and in the same year. We can therefore assume that α remained unchanged for both settlements.

amount e_1) for every value of α . Once in the high-e range, the advocate's share of e_1 will actually decrease as α increases (as is evident from (19c)). This is the case because the advocate must incur $\frac{1}{(1-\alpha)\phi^c}$ units of c_1 for every unit of e_1 to remain at the same utility level. If α increases, then the advocate will accept more units of c_1 for every unit of e_1 . As a result, the firm can make the advocate accept an offer with a lower share of e_1 for the same level of c_1 when α increases. Ironically, the advocate can secure a higher share of e_1 in the SPE of the Settlement Stage when he is less interested in doing so. This additional illustration of the "tough bargainer" principle is stated in Proposition 3.

Proposition 3: *In the Settlement Stage, the share of e_1 the consumer advocate secures for the consumer increases when he weights the consumer's preferences higher than his own (i.e. when the value of α is lower than $1 - \alpha$).*

The imperfect information case

Whether the parties receive the payoffs in (20a)-(20c) depend on their beliefs about the regulator's decision. We now investigate when rate cases are settled and whether there is a possibility that some cases may be settled against consumer interests.

The advocate and the firm will agree to a settlement only if it is mutually beneficial. An additional assumption made is that if a party's expected regulation payoff equals its settlement payoff, then the party prefers to settle. This means the advocate will want settlement if $U_A^* \geq E_A(U_A^r)$ and similarly, the advocate will want it when $\pi_f^* \geq E_f(\pi_f^r)$. We first look at what happens in the high-e range. The results are equally applicable to the low-e and medium-e ranges.

The advocate wants to settle when $U_A^* \geq E_A(U_A^r)$ and the firm wants to settle when $\pi_f^* \geq E_f(\pi_f^r)$. In the range $e_1 - (1 - \alpha)\phi^c c_1 > R_a - c_0$, these two inequalities imply that the advocate and the firm want settlement when their beliefs $G(\cdot)$ and $F(\cdot)$ are such that:

$$G(0.5) \geq \frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1}, \quad (21)$$

$$F(0.5) \leq \frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} + \frac{c_1[\phi^f - \phi^c(1-\alpha)]}{e_1}. \quad (22)$$

(21) and (22) imply that for a settlement equilibrium with the payoffs shown in (20a)-(20c) to take place, it must be that $F(0.5) \leq G(0.5)$.⁵⁶ The condition means that each party would want to settle when they believe that the regulatory decision will be more favourable to the other.⁵⁷ It is important to note that rates may be set by negotiated settlement even if one of the inequalities (21) and (22) do not hold. However, the partitions of e_1 and c_1 will not be those shown in (19a)-(19c). For instance, suppose that inequality (21) is violated but (22) holds. In the first period of the Settlement Stage, the advocate will make an offer which amounts to a payoff of $G(0.5)e_1 + R_a - c_0 - \phi^f c_1$ for the firm. The firm will accept this offer if $F(0.5) \leq G(0.5)$. The firm expects $F(0.5)e_1 + R_a - c_0 - \phi^f c_1$ from regulation and because the advocate offers more, it will accept. The case will end in settlement. The outcome would be a negotiated settlement where the payoffs to the advocate and firm would be $[1 - G(0.5)]e_1$ and $G(0.5)e_1 + R_a - c_0 - \phi^f c_1$ respectively. However, if $F(0.5) > G(0.5)$ then the case will end in regulation.⁵⁸

When the advocate makes an offer in the first period, the firm will decline expecting more from regulation. There will be disagreement until the Regulation Stage begins. The same is true if only condition (21) is violated but $F(0.5) \leq G(0.5)$. When condition (22) is violated but

⁵⁶ Note that it must be $\frac{c_1[\phi^f - \phi^c(1-\alpha)]}{e_1} \geq 0$ because $\phi^f \geq \phi^c(1-\alpha)$.

⁵⁷ The analogous result in Cooter and Rubinfeld (1989) is that the plaintiff and the defendant would want to settle when they are both “pessimistic” about their chances at trial.

⁵⁸ Again this corresponds to the result of Cooter and Rubinfeld (1989) where parties go to trial if they are “optimistic” about their chances.

(21) holds then the advocate will want settlement. He will make the offer in (19c) in the first period of bargaining. The firm will reject this and offer $[1 - F(0.5)]e_1$ in the second period. The advocate will then deduce $F(0.5)$ from this offer and understand that the firm expects more from the regulatory decision than its payoff shown in (20c). The advocate will accept the firm's offer if $F(0.5) \leq G(0.5)$. The result will be another settlement where the payoffs of the advocate and firm will be $[1 - F(0.5)]e_1$ and $F(0.5)e_1 + R_a - c_0 - \phi^f c_1$ respectively. Only if both inequalities (21) and (22) are satisfied, the payoffs shown in (20a)-(20c) are the stipulated payoffs. If both (21) and (22) are violated then it must be that $F(0.5) > G(0.5)$ and the case ends in regulation.

Littlechild (2009a) reports that a formal hearing is scheduled 5 months after a rate a case is initiated at the FPSC. After testimonies have been filed and counter-filed, discussions among parties begin usually after the first month. A settlement is often concluded a short time before the formal hearing is scheduled (sometimes even on the night before). If no agreement is reached then the formal hearing begins. Littlechild (2009a) observes that there is much less incentive to settle after the hearing begins. This description of the settlement process suggests that the parties can deduce what the other expects from regulation during the discussions before the formal hearing. Like the model, if the parties cannot agree, the case eventually goes to regulation.

Both Littlechild and Doucet (2006) and Wang (2004) claim that the regulatory decision is more predictable than any trial verdict. This implies that in our model $G(0.5)$ and $F(0.5)$ should nearly be equal. In the high- e range, is it possible to have the settlement shares as shown by (19c) when $G(0.5) = F(0.5)$? The answer is yes. In such a case it must be that

$$\frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} \leq F(0.5) \leq \frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} + \frac{[\phi^f - (1-\alpha)\phi^c]c_1}{e_1}.$$

This case corresponds to the case when the advocate and firm have the same expectation about the regulatory decision (perhaps because it is predictable) but both prefer the outcome that can only be reached by settlement.

As mentioned before, the results for the high-e range are applicable to the low-e and medium-e ranges. In the low-e range, the values of $G(0.5)$ and $F(0.5)$ for which the advocate and the firm would want to settle with the payoffs shown in (20a) are:

$$G(0.5) \geq \frac{\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c (R_a - c_0)}{2\phi^f e_1}, \quad (23)$$

$$F(0.5) \leq \frac{\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c (R_a - c_0)}{2\phi^f e_1} + \frac{[\phi^f e_1 - (1-\alpha)\phi^c (R_a - c_0) + (1-\alpha)\phi^c \phi^f c_1][\phi^f - \phi^c(1-\alpha)]}{2e_1(1-\alpha)\phi^c \phi^f}. \quad (24)$$

In (24) we know $2e_1(1-\alpha)\phi^c \phi^f \geq 0$ and $\phi^f - \phi^c(1-\alpha) \geq 0$. Because the range under consideration is $\frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_1 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}$, $\phi^f e_1 - (1-\alpha)\phi^c (R_a - c_0) + (1-\alpha)\phi^c \phi^f c_1$ is also non-negative. This implies the second term on the right-hand side of (24) is non-negative. In the medium-e range, the advocate and the firm would want the stipulated outcomes of (20b) when both inequalities (26) and (27) hold:

$$G(0.5) \geq \frac{(1-\alpha)\phi^c c_1}{e_1}, \quad (26)$$

$$F(0.5) \leq \frac{(1-\alpha)\phi^c c_1}{e_1} + \frac{[\phi^f - \phi^c(1-\alpha)]c_1}{e_1}. \quad (27)$$

The second term on the right-hand side of (27) is non-negative because $\phi^f - \phi^c(1-\alpha) \geq 0$.

The next question examined is, given the advocate's beliefs, when should he settle knowing it will be beneficial to the consumer. The advocate always acts in the consumer's interests if he settles whenever $U_c^* \geq E_A(U_c^r)$. Because $E_A(U_c^r) = E_A(U_A^r)$, this condition

becomes $U_c^* \geq E_A(U_A^r)$. This means that in the high-e range, the advocate always acts in the best interests of the consumer given his beliefs if he settles when:

$$G(0.5) \geq \frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} + \frac{\alpha\phi^c c_1}{e_1}. \quad (28)$$

Because $\frac{\alpha\phi^c c_1}{e_1} \geq 0$ and $G(0.5)$ is bounded from above by 1, comparing (21) and (28) there are at least as many values of $G(0.5)$ for which the consumer advocate would settle as there is if he was only agreeing to settlements beneficial to the consumer. More specifically, for values of $G(0.5)$ where $\frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} < G(0.5) \leq \frac{e_1 + (1-\alpha)\phi^c c_1 - (R_a - c_0)}{2e_1} + \frac{\alpha\phi^c c_1}{e_1}$, the advocate will enter into agreements with the firm which he believes will harm the consumer. This is also true in the low-e and medium-e ranges. If the advocate was only concerned about consumer welfare then he should only settle for the outcomes (20a) in the low-e range when:

$$G(0.5) \geq \frac{\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c (R_a - c_0)}{2(1-\alpha)\phi^f e_1}. \quad (29)^{59}$$

And similarly, the consumer advocate should only conclude agreements with outcomes (20b) if he was only concerned about consumers in this range when:

$$G(0.5) \geq \frac{\phi^c c_1}{e_1}. \quad (30)^{60}$$

(28), (29) and (30) demonstrate that the consumer advocate can agree to settlements which the consumer would not want if they shared the same belief about the regulatory decision. This belief is represented by $G(0.5)$. Proposition 4 summarizes these observations.

⁵⁹ Note that because $0 \leq (1-\alpha) \leq 1$, $\frac{\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c (R_a - c_0)}{2(1-\alpha)\phi^f e_1} \geq \frac{\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c (R_a - c_0)}{2\phi^f e_1}$.

⁶⁰ Again, since $1 \geq (1-\alpha) \geq 0$, $\frac{(1-\alpha)\phi^c c_1}{e_1} \leq \frac{\phi^c c_1}{e_1}$.

Proposition 4: *Suppose $G(\beta)$ represents the belief about the regulatory decision of both the consumer and the consumer advocate. Also suppose the consumer advocate's preferences differ from the consumer's (i.e., $\alpha > 0$). Then there exists a range of $G(0.5)$ in which the consumer advocate will settle, contrary to the wishes of the consumer.*

It should be noted that, by construction, when $\alpha = 0$ the range of $G(0.5)$ in which the advocate wants to settle coincides with the range in which the consumer would want him to settle. That is, when $\alpha = 0$, the consumer advocate always acts in the way the consumer wants.

Note also that an increase in α relaxes constraints (22) and (24).⁶¹ This happens because as α rises the advocate is willing to take a smaller share of e_1 for the entire c_1 or a larger share of c_1 for the same e_1 in the SPE settlement equilibria (19a) and (19c). This means a larger profit for the firm in (20a) and (20c). Consequently, there are more values of $F(0.5)$ for which the firm will want the stipulated outcomes of (20a) and (20c).

Proposition 5: *The range of $F(0.5)$ for which the firm wants settlement will be non-decreasing when the consumer advocate weights his preference more than the consumer's during negotiations (i.e., when α is more than $1 - \alpha$).*

In Proposition 3, we saw that the advocate may actually receive a smaller share of e_1 as α increases. Factoring in the firm's expected gain from regulation, we find that the advocate may not actually end up with a larger share of e_1 with a lower α . There are more values of $F(0.5)$ for which the firm will agree to the negotiated outcomes of (20a) and (20c) when α is larger. Hence, a larger concern for the consumer (embodied in a smaller α) does not always result in a larger share of e_1 if the firm believes it can gain more in regulation. A bigger α may have made the firm

⁶¹ It has no effect on constraint (27).

agree to the stipulated outcome and subsequently, the advocate may have ended up with a higher share of e_1 than the regulatory decision would allow.⁶²

The company-request case

The analysis of a company-request case is analogous to the earnings-review case. To avoid repetition, the details of the analysis and the results are only explained when they differ from the earnings-review case.⁶³

In the Regulation Stage, the regulator's problem is:

$$\text{Max}_x W(x) = \beta x + (1 - \beta)(e_2 - x) \quad (\text{P1b})$$

$$\text{s. t. } R + e_2 - x > c_0.$$

There can be two subcases of the constrained maximization problem (P1b). The first case is when $R \geq c_0$. In this situation, the constraint in (P1b) is non-binding. The analysis of this subcase is identical to the earnings-review case. The only difference is that in the equilibrium condition and results, R and e_2 should substitute R_a and e_1 respectively. The more interesting subcase is when $R < c_0$. The constraint in (P1b) is binding when $R < c_0$. This is the subcase that one should find more prevalent in reality.⁶⁴ It is usually when the revenues of a firm are not

⁶² An increase in α also loosens constraints (21) and (26). It loosens (23) only if $\phi^f c_1 > R_a - c_0$. Nevertheless, the result that when α increases it makes the firm more amenable to the stipulated outcomes of (20a) and (20c) still stands.

⁶³ All of the propositions stated in the earnings-review case hold for the company-request case as well.

⁶⁴ This is corroborated by the data of Littlechild (2009a). The utilities were granted an average of 52.2% of the rate increase they had requested in the 76 company-request cases which went to regulation between the years 1976 and 2002.

enough to cover operating and maintenance expenditures that the firm files a company-request case. Therefore, it is this subcase that we examine in more detail.⁶⁵

When $R < c_0$ the solution, x^r , to (P1b) is:

$$x^r = 0 \text{ if } \beta < 0.5 \quad (30a)$$

$$x^r = R + e_2 - c_0 \text{ if } \beta \geq 0.5 . \quad (30b)^{66}$$

The regulator maximizes $W(x)$ by making the consumer pay the entire shortfall e_2 to the firm when it weights the firm's profit function more than the consumer's utility (i.e., when $\beta < 0.5$).⁶⁷ When it weights the consumer's utility more (i.e., when $\beta \geq 0.5$), it maximizes $W(x)$ by determining that the consumer should make no payments to the firm. But the regulator is restricted by the financial-distress constraint of (P1b) whereby the firm needs at least $R - c_0$ to stay in business. Therefore, when $\beta \geq 0.5$, the regulator makes the consumer pay the minimum amount that it must which is $R - c_0$. This means the consumer retains $R + e_2 - c_0$ of the shortfall e_2 that the firm had applied to get. The resulting after-regulation profit for the firm is:

$$\pi_f^r = R + e_2 - c_0 - \phi^f c_1 \text{ if } \beta < 0.5 \quad (31a)$$

$$\pi_f^r = -\phi^f c_1 \text{ if } \beta \geq 0.5 . \quad (31b)$$

⁶⁵ As already stated, the analysis and results for the case $R \geq c_0$ are identical to the earnings-review case. The only difference is that R_a and e_1 must be replaced with R and e_2 for the corresponding analysis and results in the $R \geq c_0$ subcase.

⁶⁶ Again it is assumed that the regulator allows the status quo to stand when $\beta = 0.5$. In the company-request case, the status quo is not to make the consumer any amount to the firm. But because the firm needs to at least avoid financial distress, the consumer is made to pay the minimum possible when $\beta = 0.5$. This minimum possible amount is $-c_0$.

⁶⁷ In the company-request case as well, the advocate's weighted utility function is the same as the consumer's utility function when $y = 0$.

The advocate's after-regulation weighted utility function which is equal to the consumer's after-regulation utility function is:

$$U_A^r = U_c^r = 0 \text{ if } \beta < 0.5 \quad (32a)$$

$$U_A^r = U_c^r = R + e_2 - c_0 \text{ if } \beta \geq 0.5 . \quad (32b)$$

The above after-regulation payoffs imply that the firm's expected after-regulation profit and what it expects the advocate's weighted utility function will be after regulation are:

$$E_f(\pi_f^r) = F(0.5)(e_2 + R - c_0) - \phi^f c_1 , \quad (33)$$

$$E_f(U_A^r) = [1 - F(0.5)](e_2 + R - c_0) . \quad (34)$$

The advocate's beliefs about regulation can also be expressed by what he expects the firm's after-regulation profit to be and his own expected weighted utility function:

$$E_A(\pi_f^r) = G(0.5)(e_2 + R - c_0) - \phi^f c_1 , \quad (35)$$

$$E_A(U_A^r) = [1 - G(0.5)](e_2 + R - c_0) . \quad (36)$$

Like the earnings-review case, $[E_A(U_A^r), E_f(\pi_f^r)]$ are the disagreement vectors of the bargaining game of the Settlement Stage.

The necessary condition for a SPE in the Settlement Stage is identical to the earnings-review case (17). The points of difference are that R_a and e_1 need to be replaced with R and e_2 and also, $[E_A(U_A^r), E_f(\pi_f^r)]$ are defined by (36) and (33). The SPE equilibrium offers (x_A, y_A, x_f, y_f) are found exactly the same way as the earnings-review case. In the limit $\delta \rightarrow 1$, the SPE division of the pots (without considering the disagreement vectors) are:

$$(x, y) = [e_2, \frac{\phi^f e_2 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c(R-c_0)}{2(1-\alpha)\phi^c \phi^f}] \text{ if } \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_2 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} , \quad (37a)$$

$$(x, y) = (e_2, c_1) \text{ if } \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} < e_2 - (1-\alpha)\phi^c c_1 \leq R - c_0, \quad (37b)$$

$$(x, y) = \left[\frac{e_2 + (1-\alpha)\phi^c c_1 + R - c_0}{2}, c_1 \right] \text{ if } e_2 - (1-\alpha)\phi^c c_1 > R - c_0. \quad (37c)$$

This implies the resulting payoffs (U_A^*, π_f^*, U_c^*) from the offers (37a)-(37c) are:

$$\left[\frac{\phi^f e_2 - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c(R-c_0)}{2\phi^f}, \frac{\phi^f e_2 - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c(R-c_0)}{2\phi^c(1-\alpha)}, \frac{\phi^f e_2(1-2\alpha) - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c(R-c_0)}{2\phi^f(1-\alpha)} \right]$$

$$\text{if } \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_2 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f}, \quad (38a)$$

$$[e_2 - (1-\alpha)\phi^c c_1, R - c_0, e_2 - \phi^c c_1] \text{ if } \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} < e_2 - (1-\alpha)\phi^c c_1 \leq R - c_0, \quad (38b)$$

$$\left[\frac{e_2 - (1-\alpha)\phi^c c_1 + R - c_0}{2}, \frac{e_2 - (1-\alpha)\phi^c c_1 + R - c_0}{2}, \frac{e_2 - (1+\alpha)\phi^c c_1 + R - c_0}{2} \right] \text{ if } e_2 - (1-\alpha)\phi^c c_1 > R - c_0. \quad (38c)$$

Like the earnings-review case, we can call the ranges $\frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_2 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f}$, $\frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} < e_2 - (1-\alpha)\phi^c c_1 \leq R - c_0$, and $e_2 - (1-\alpha)\phi^c c_1 > R - c_0$ the low-e range, the medium-e range and the high-e range respectively.⁶⁸ The main difference between the company-request case and the earnings-review case is that some of the stipulated payoffs shown in (38a)-(38c) will never be agreed between the parties in their relevant ranges. This is because the consumer advocate will always expect a higher after-regulation utility. To see this, we will examine each of the three ranges of (38a)-(38c) in turn. As in the earnings review case, the advocate will want the stipulated payoffs in (38a)-(38c) when $U_A^* \geq E_A(U_A^r)$ and the firm when $\pi_f^* \geq E_f(\pi_f^r)$. Therefore, in the high-e range, the advocate and firm settle with the SPE partitions (37c) when:

$$G(0.5) \geq \frac{1}{2} + \frac{(1-\alpha)\phi^c c_1}{2(R-c_0+e_2)}, \quad (39)$$

⁶⁸ Analogous to the earnings-review case, $e_2 - (1-\alpha)\phi^c c_1$ can be seen as a measure of the relative sizes of e_2 and c_1 .

$$F(0.5) \leq \frac{1}{2} + \frac{(1-\alpha)\phi^c c_1}{2(R-c_0+e_2)} + \frac{[\phi^f - (1-\alpha)\phi^c]}{R-c_0+e_2}. \quad (40)$$

From (39) and (40), we find it is possible for the stipulated payoffs of (38c) to be negotiated as long as both inequalities hold. In this range as well, the advocate always acts in the consumer's interests if he agrees to the payoffs of (38c) when:

$$G(0.5) \geq \frac{1}{2} + \frac{(1+\alpha)\phi^c c_1}{2(R-c_0+e_2)}. \quad (41)^{69}$$

In the medium-e range, the advocate will want to agree to the stipulated payoffs of (38b) when:

$$G(0.5) \geq \frac{R-c_0+(1-\alpha)\phi^c c_1}{R-c_0+e_2}. \quad (42)$$

Because $R < c_0$ in this range of (e_2, c_1) , it means $e_2 < (1-\alpha)\phi^c c_1$. This implies for (42) to hold, it must be that $G(0.5) > 1$. This is not possible as $G(\cdot)$ is a probability distribution and cannot be greater than 1 at any point. Consequently, we find that the advocate will never want to settle for the payoffs (38b). The firm would want to settle for the payoffs in (38b) when:

$$F(0.5) \leq \frac{R-c_0-\phi^f c_1}{R-c_0+e_2}. \quad (43)$$

$R - c_0 + e_2$ is non-negative because $R + e_2 = R_a$ and $R_a \geq c_0$ by (A1). Also, because $R < c_0$ and $\phi^f c_1 > 0$, $R - c_0 - \phi^f c_1$ is negative. This means that $F(0.5)$ has to be smaller than some negative number for (43) to hold. Because $F(\cdot)$ is a probability distribution and it can never be

⁶⁹ Again we see from (39) and (41) that if $\alpha = 0$, then the inequalities become identical. That is the advocate always acts in the best interest of the consumer.

less than 0 at any point, (43) will never hold. In other words, the firm will always fancy its chances with the regulator than settle for its payoff in (38b).⁷⁰

The consumer wants the stipulated payoffs (38a) in the low-e range when:

$$G(0.5) \geq 1 - \frac{\phi^f e_2 - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c (R-c_0)}{2\phi^f (R-c_0+e_2)}. \quad (44)$$

Now the numerator of the second term on the right-hand side of (44) is negative in the range

$$\frac{(1-\alpha)\phi^c (R-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_2 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c (R-c_0)}{\phi^f}.$$

The denominator of this term is non-negative because $2\phi^f (R - c_0 + e_2) > 0$. Consequently, for (44) to hold it must be that $G(0.5) \geq 1$. In

this range, the advocate may want the stipulated payoffs (38a) only if $G(0.5) = 1$ (as $G(0.5)$

cannot take higher values). Even when $G(0.5) = 1$, the advocate is indifferent between the

stipulated payoff (38a) and his expected after-regulation utility. The firm will want its stipulated

profit in (38a) when:

$$F(0.5) \leq \frac{\phi^f e_2 + \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c (R-c_0)}{2(1-\alpha)\phi^c (R-c_0+e_2)}. \quad (45)$$

In the range being considered, it is possible for (45) to hold. Therefore, the firm may want to

settle with the (38a) outcomes in this range.⁷¹

It is clear that the consumer advocate will not want the stipulated outcomes in (38a)⁷² and (38b). This means the advocate never wants an outcome that can only be reached in the

⁷⁰ The advocate would be always acting in the best interest of the consumer if he settled for the payoffs (38b) when $G(0.5) \geq \frac{R-c_0+\phi^c c_1}{R-c_0+e_2}$. But in this range $e_2 < \phi^c c_1$. Therefore, $G(0.5)$ would have to be more than 1 for the consumer to benefit from settlement. Because this is not possible, the consumer would never want the stipulated payoffs (38b) either.

⁷¹ The advocate, if only acting in the best interest of the consumer, should settle for (38a) in this range when $(0.5) \geq 1 - \frac{\phi^f e_2 - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c (R-c_0) - 2\alpha\phi^f e_2}{2\phi^f (R-c_0+e_2)}$. This implies that like the case of the advocate, the consumer wants the advocate to sign the agreement only when $G(0.5) = 1$. Even then, the consumer is indifferent between its stipulated payoff and its expected regulation payoff like the advocate.

⁷² As already discussed, it is possible that (38a) may be a valid settled outcome if $G(0.5) = 1$ in the model. But for the sake of exposition this is ignored for the moment. Nothing valuable is lost in discussion with this oversight.

Settlement Stage when $e_2 - (1 - \alpha)\phi^c c_1$ falls in the range $e_2 - (1 - \alpha)\phi^c c_1 < R - c_0$. This range can be re-arranged to:

$$e_2 - (R - c_0) < (1 - \alpha)\phi^c c_1. \quad (46)$$

The left-hand side of (46) is the maximum amount of e_2 that the advocate can retain. This is because the firm knows that if the case goes to regulation then it will definitely acquire $R - c_0$ of e_2 from the regulatory ruling. $(1 - \alpha)\phi^c c_1$ on the right-hand side (46) is the discounted loss the advocate makes from making the consumer pay the entire c_1 amount. It can be seen from (46) that the maximum gain the advocate can make in retaining as much as e_2 as possible is less than the loss (as perceived by the advocate) of the agreement to pay all of c_1 . Consequently, the advocate would never agree to any stipulated outcome in this range where the SPE of the Settlement Stage entails the payment of the entire c_1 .^{73,74}

Proposition 6: *In a company-request case, there is no negotiated settlement and the case goes to regulation if $G(0.5) < F(0.5)$ and e_2 is sufficiently small relative to c_1 .*

In the dataset of Littlechild (2009a), 26 out of 91 earnings-review cases ended in a negotiated settlement between 1976 and 2002 in Florida. In contrast, only 6 out of 82 company-request cases were settled. According to the data, company-request cases rarely end in a stipulated agreement between the consumer advocate and firm. Let us examine whether the present model predicts this empirical finding. Recall that the stipulated outcome (38c) is possible

⁷³ It is possible that even in the range $e_2 - (1 - \alpha)\phi^c c_1 < R - c_0$, the advocate is willing to take e_2 in exchange for a lower share of c_1 . But in the range where this candidate solution is a SPE (i.e. $\frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq e_2 - (1-\alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R-c_0)}{\phi^f}$) the advocate's payoff is $\frac{\phi^f e_2 - \phi^f \phi^c (1-\alpha)c_1 + (1-\alpha)\phi^c(R-c_0)}{2\phi^f}$ which is negative. The advocate would never agree to this.

⁷⁴ For a stipulated outcome to be possible, e_2 has to be large enough to offset the loss from the payment of c_1 . This can be seen in the fact that (38c) is a possible stipulated outcome. It is valid in the range $e_2 - (1 - \alpha)\phi^c c_1 > R - c_0$ (the high-e range).

if the inequalities (39) and (40) hold. That means a negotiated settlement is possible when the pair (e_2, c_1) satisfies $e_2 - (1 - \alpha)\phi^c c_1 > R - c_0$. This is the high-e range where e_2 is relatively larger in magnitude to c_1 . Therefore, experience suggests it is rare that e_2 is large relative to c_1 in company-request cases. Because e_2 is the already-incurred shortfall and the open-ended and uncertain nature of c_1 as described by Littlechild (2009b), e_1 being smaller than c_1 seems plausible.⁷⁵ In spite of Proposition 6, negotiated settlements can still be concluded in the low-e and medium-e ranges albeit with different payoffs than shown by (38a) and (38b). The cases will be settled if $G(0.5) \geq F(0.5)$ i.e. both parties think the other has a better chance of winning if the case goes for regulation.⁷⁶ The case goes to the regulator if $G(0.5) < F(0.5)$ or, in other words, both parties believe that they have a better chance of claiming the entire pie e_2 during regulation. The Florida experience suggests that usually $G(0.5) < F(0.5)$ in company-rate cases.⁷⁷ One reason for this could be that in the low-e and medium-e ranges, both parties know there is no mutually beneficial outcome which can only be reached by settlement. Consequently, the firm will only file a company-request case when it believes it has a high chance of winning (i.e. high $F(0.5)$) the entire shortfall e_2 in a regulatory formal hearing. Another reason could be that because both know no mutually beneficial solution exists that can only be reached in the Settlement Stage, they do not even bother to sit down at a negotiating table. Because there are no negotiations, the belief of each party (i.e. $G(0.5)$ and $F(0.5)$) cannot be revealed to the other during the bargaining process. So the possibility of a negotiated settlement when $G(0.5) \geq F(0.5)$ is lost.

⁷⁵ Additionally, the advocate's belief that the probability he will lose if the case goes for regulation must be high (at least 50%) for the stipulated payoffs (38c) to occur. This can be seen from (39) where $G(0.5)$ has to be equal to or higher than $\frac{1}{2}$ (because $\frac{(1-\alpha)\phi^c c_1}{2(R-c_0+e_2)} \geq 0$) for a negotiated settlement.

⁷⁶ This is also true for the high-e range.

⁷⁷ From inequalities (21), (22), (24), (25), (27) and (28), we see that the stipulated outcomes (20a)-(20c) are possible in an earnings-review case even when $G(0.5) < F(0.5)$.

V. Policy implications

A negotiated settlement cannot be put into effect without the approval of the regulator. It is the regulator's duty to balance the needs of all involved in the rate case. One of the main advantages of settlement is that the formulators know their preferences better than the regulator.

Consequently, any outcome agreed among all relevant parties in a negotiated settlement is superior to any regulatory decision. This is true as long as all parties are represented reliably by their agents during negotiations. Hence, in the negotiated-settlement process, the regulator's duty translates into making sure that all the involved and affected parties' interests are properly represented.

It was assumed if an agreement was reached by the advocate and the firm in the Settlement Stage then the rate case ended with the agreement as settlement. It was, therefore, assumed that the regulator automatically approved all the settlements put to it.⁷⁸ But inequalities (23), (26), (29) and (41) show that settlements can be concluded between the advocate and firm which are disadvantageous to the consumer. For this reason, it is the job of the regulator to preclude such settlements.

In the past, regulators such as the NEB in Doucet and Littlechild (2009) and the FPSC staff in Littlechild (2009b) have approached this problem by trying to estimate the gains and losses the customer would make by the settlement outcome. On the basis of this estimation, the regulators decide whether to approve the settlement. In the context of the model, it means they have tried to estimate ϕ^c . A simplifying assumption of the model was that the future cost of the firm c_1 was known to the advocate and the firm. In reality, it is very difficult to estimate c_1 . c_1 is

⁷⁸ This indeed seems to be the case in Florida between 1976 and 2002. Littlechild (2009a) states "In practice, Florida PSC has almost invariably adopted negotiated settlements put to it." (p. 103). Littlechild (2009b) reports that the FPSC staff stopped objecting to accounting flexibility in settlements when it was clear that the FPSC, in spite of staff reservations, would adopt such settlements as long as these agreements procured significant rate reductions and freezes for consumers.

a cost incurred in the future (most of the time, incurred as a stream of future costs) and is dependent on a number of uncertain variables. Even the firm, the party with the best information regarding c_1 , may not know the exact value of c_1 . Therefore, along with the estimation of ϕ^c , regulators have tried to estimate c_1 . Apart from the difficulty of these particular estimations, the disadvantage of this approach is that it undermines one of the main benefits that the regulator can gain from the negotiated-settlement technique. This benefit is that the regulator does not need to actively arbitrate the case because a superior regulatory outcome can be reached because via settlement the preferences of the parties are better represented than any ruling by the regulator (provided that consumer preferences are accurately represented). Arbitration requires the regulator to identify the gains and losses to all parties of a rate change. This involves trying to estimate their preferences. When the regulator analyzes a settlement by trying to simulate the preferences of a consumer, it is acting just as it would have done in a regulatory formal hearing. The regulator may just as well have waived the negotiation process and moved directly to regulation.

Even if the regulator could accurately estimate ϕ^c and c_1 , this method of trying to protect consumer interests in the negotiated-settlement process may not work in regulation. In the eyes of the parties this regulatory strategy amounts to Wang (2004)'s "issue-by-issue merits determination procedure" used by the regulator in the Regulation Stage. The consumer advocate and the firm will *perceive* that the regulator is taking a decision according to *its preference* if it disallowed an agreement. This would be true even if the regulator takes the right decision to protect the consumer after correctly estimating ϕ^c and c_1 . Therefore, such a regulatory policy will reduce the parties' incentive to settle. Why should the parties expend their efforts to settle if their agreement is rejected on the grounds that it does not produce a decision that is in line with the regulator's preferences? In such a case, the parties might as well wait for the regulator's ruling and skip the Settlement Stage altogether. One implication of this is that for the negotiated-

settlement technique to function smoothly, approval of the settlement by the regulator must be automatic or, at least, very likely. This is one of the reasons why the FPSC, in spite of staff objections, approved nearly all the settlements put to it between the years 1976 and 2002.

Littlechild (2009a, b) claim that the reason for the almost-universal approval of settlements is that the FPSC wanted to avoid conflict with the consumer advocate and minimize criticism from all other involved parties. In my opinion, as long as the FPSC wanted regulation to go on by negotiated settlement it had to approve all settlements presented to it. This is true even if the Commission was only concerned by consumer and shareholder welfare and not criticism from the involved parties. It is up to the regulator to decide if it prefers regulation by negotiated settlement or deems it more important that it should examine the just and reasonableness of every stipulated term before giving approval. The latter choice comes at the risk of jeopardizing the whole settlement process itself.

The most effective we can ensure that no negotiated settlement harms consumers is to limit the divergence between consumer and advocate preferences. In the above model this means to minimize α . When $\alpha = 0$, the advocate signs only those settlements which he thinks are beneficial to the consumer. Policies that will make α as close to 0 as possible must then be implemented. One such policy is to make long tenures for consumer advocates once appointed.⁷⁹ A short term in office with uncertain re-appointment possibilities will tend to make an advocate more interested in procuring the most visible results in a short period of time. If the costs that the advocate agrees to in return for these results are borne by the consumer beyond the advocate's certain period of tenure, the advocate has more incentive to agree to them. A longer term period should decrease this tendency.

⁷⁹ The Public Counsel of the OPC in Florida is appointed and re-appointed every year by the Joint Committee of Public Counsel Oversight, a state Congress committee.

The general policy that the regulator should follow in trying to reduce α is to increase the transparency of settlements. The terms of a settlement between parties in a legal dispute should be kept private. But there is no reason that should be the true with the negotiated settlements of rate cases. The terms of a settlement should be known to the parties involved and one such party are the consumers of the public utility firm. The implications of the settlements should be made clear to these consumers. The regulator should facilitate in making these settlements more transparent so that the consumers themselves can judge whether their agent is doing a good job or whether a replacement is necessary. One way this can be done is for the regulator to publish regular reports on the job performance of the advocate.⁸⁰ This report should list every settlement signed by the advocate in his term in office and their cumulative effect on the rates that the consumer are paying. Such a policy will significantly reduce α close to 0. Once this has been achieved, the regulator can be sure that any settlement presented to it is advantageous to all involved and approve it automatically.

VI. Conclusion

This paper investigated whether negotiated settlements might harm consumers. We found that such harm can arise if the preferences of consumers and their advocate diverge. It seems that the regulator is aware of this but the present methods used to prevent such agreements by estimating future consumer costs are not conducive to the smooth functioning of this regulatory technique. The best way to facilitate settlements that benefit the consumer is for the regulator to implement steps so that the advocate internalizes the consumer's utility function. This can be done by extending the advocate's term in office (though in Florida, only the state legislature can do this and not the regulator) as well as active monitoring of his performance. Once the consumer's

⁸⁰ The FPSC does publish a news release after a settlement is made between parties. This news release is published at the time the settlement is concluded and it consists of a cursory list of the terms. In my opinion, this is not enough to make the average consumer fully grasp the consequences of the agreement.

preference is the same as the advocate's then the regulator can be certain that the advocate is acting in the best interests of the consumer at least given the advocate's beliefs about the regulatory decision. If additionally, the parties know the regulator's decision then no rate case will go to regulation. This is because any order by the regulator can be replicated by the parties themselves during the Settlement Stage. Because regulatory rulings are said to be predictable, it may be the case that the advocate and the firm will know how the regulator will rule before the rate case in many instances. This implies that there is full information or near full information in many rate cases. Littlechild and Doucet (2009) discuss the Generic Cost of Capital decision at the NEB in 1994. This decision allows for an automatic mechanism by which the return on common equity for each pipeline is determined on an annual basis. It is viewed as an important measure for facilitating settlements at the NEB because it reduces the uncertainty of the regulatory decision and aligns the regulatory expectations of all parties. It would be interesting to see whether any other such mechanism can reduce the uncertainty and enhance the settlement process.

The Public Counsel in Florida is appointed by a Florida Congress committee. But this institutional set-up is not common to all states. In some states, the advocate is appointed by the governor. In 19 US states, there is no consumer advocate. The Public Service Commission staff is supposed to represent the interest of the consumer in these states. An interesting future direction of research could be to investigate which of these institutional frameworks yield the best outcome for the consumer.

There has been much debate whether the growth of negotiated settlements has reduced the regulator to the passive role of a facilitator from the proactive decision-maker that it is in conventional regulation. This study shows there certainly are advantages of negotiated settlements over traditional ROR regulation. But it calls on the regulator not to be a passive facilitator but to be an active monitor of such agreements so that all involved can benefit.

Appendix A: Proof that the only candidate solutions to (17) are (i), (ii), (iii) and (iv)

Let the profit function of the firm equal a constant A :

$$R_a - c_0 + (e_1 - x) - \phi^f(c_1 - y) = A. \quad (1A)$$

Totally differentiation (1A) with respect to x we get:

$$\frac{dy}{dx} = \frac{1}{\phi^f}. \quad (2A)$$

Let the consumer advocate's weighted utility function equal a constant B :

$$x - (1 - \alpha)\phi^c y = B. \quad (3A)$$

Totally differentiation (3A) with respect to x we get:

$$\frac{dy}{dx} = \frac{1}{(1-\alpha)\phi^c}. \quad (4A)$$

(2A) shows that the advocate must offer to increase y by $\frac{1}{\phi^f}$ units in order to increase x so that the firm earns the same amount of profit. For the consumer advocate to remain on the same utility level we see from (4A) that for a gain in x , y must increase by $\frac{1}{(1-\alpha)\phi^c}$ units. Because $\frac{1}{(1-\alpha)\phi^c} > \frac{1}{\phi^f}$, it is always optimal for the advocate to offer $x_A = e_1$ or $x_A < e_1$ and $y_A = c_1$ (depending on the sizes of e_1 and c_1). A similar argument can be made to show that it is always optimal for the firm to offer $x_f = e_1$ or $x_f < e_1$ and $y_f = c_1$. This implies that the possible equilibrium offers fall into the four categories (i), (ii), (iii) and (iv).

Appendix B: Proof that the SPE partitions of e_1 and c_1 are (18a), (18b) and (18c)

To prove (18a), (18b) and (18c), we examine which of the four candidate solutions (i), (ii), (iii) and (iv) solve (17).

Candidate solution (i): $x_A < e_1, y_A = c_1$ and $x_f < e_1, y_f = c_1$

Candidate solution (i) implies that the equilibrium condition (17) becomes:

$$R_a - c_0 + (e_1 - x_A) = \delta[R_a - c_0 + (e_1 - x_f)] \quad (1B)$$

$$x_f - (1 - \alpha)\phi^c c_1 = \delta[x_A - (1 - \alpha)\phi^c c_1]. \quad (2B)$$

Solving equations (1B) and (2B) for x_A and x_f , we get:

$$x_A = \frac{(R_a - c_0 + e_1) + \delta(1 - \alpha)\phi^c c_1}{1 + \delta} \quad (3B)$$

$$x_f = \frac{\delta(R_a - c_0 + e_1) + (1 - \alpha)\phi^c c_1}{1 + \delta}. \quad (4B)$$

For (3B) and (4B) to be a valid solution, it must be that $0 \leq x_A < e_1$ and $0 \leq x_f < e_1$. Because of (A1), $\alpha \in [0, 1]$ and, δ and ϕ^c being discount factors (i.e. both these parameters are between 0 and 1), it must be that $x_A \geq 0$ and $x_f \geq 0$.

For $x_A < e_1$, it must be that $e_1 - (1 - \alpha)\phi^c c_1 > \frac{R_a - c_0}{\delta}$ and, for $x_f < e_1$, it must be that $e_1 - (1 - \alpha)\phi^c c_1 > \delta(R_a - c_0)$. Therefore, the SPE partition (x, y) in the range $e_1 - (1 - \alpha)\phi^c c_1 > \frac{R_a - c_0}{\delta}$ is $[\frac{(R_a - c_0 + e_1) + \delta(1 - \alpha)\phi^c c_1}{1 + \delta}, c_1]$. This proves (18c).

Candidate solution (ii): $x_A < e_1, y_A = c_1$ and $x_f = e_1$

Candidate solution (ii) implies that the equilibrium condition (17) becomes:

$$R_a - c_0 + (e_1 - x_A) = \delta[R_a - c_0 - \phi^f (c_1 - y_f)] \quad (5B)$$

$$e_1 - (1 - \alpha)\phi^c y_f = \delta[x_A - (1 - \alpha)\phi^c c_1]. \quad (6B)$$

Solving equations (5B) and (6B) for x_A and y_f , we get:

$$x_A = \frac{[\delta\phi^f - (1-\alpha)\phi^c]e_1 - \delta(1-\delta)(1-\alpha)\phi^c\phi^f c_1 - (1-\delta)(1-\alpha)\phi^c(R_a - c_0)}{\delta^2\phi^f - (1-\alpha)\phi^c} \quad (7B)$$

$$y_f = \frac{\delta(1-\delta)(R_a - c_0) + \delta c_1[\delta\phi^f - (1-\alpha)\phi^c] - (1-\delta)e_1}{\delta^2\phi^f - (1-\alpha)\phi^c}. \quad (8B)$$

For (7B) to be a valid solution it must be $0 \leq x_A < e_1$. $x_A < e_1$ implies:

$$e_1 - (1-\alpha)\phi^c c_1 < \frac{(1-\alpha)\phi^c(R_a - c_0)}{\delta\phi^f}. \quad (9B)$$

For (8B) to be a valid solution it must be $0 \leq y_f \leq c_1$. $y_f \leq c_1$ implies:

$$e_1 - (1-\alpha)\phi^c c_1 \geq \delta(R_a - c_0). \quad (10B)$$

From (9B) and (10B), we see that for candidate solution (ii) to be a valid solution it must be that:

$$\begin{aligned} \delta(R_a - c_0) &< \frac{(1-\alpha)\phi^c(R_a - c_0)}{\delta\phi^f} \\ \Rightarrow \delta^2 &< \frac{(1-\alpha)\phi^c}{\phi^f}. \end{aligned} \quad (11B)$$

In the limit $\delta \rightarrow 1$, (11B) becomes:

$$1 < \frac{(1-\alpha)\phi^c}{\phi^f}. \quad (12B)$$

Because of (A2) and $\alpha \in [0,1]$, the inequality (12B) cannot exist. This means that candidate solution (ii) cannot be a possible solution to (17).

Candidate solution (iii): $x_A = e_1$ and $x_f < e_1, y_f = c_1$

Candidate solution (iii) implies that the equilibrium condition (17) becomes:

$$R_a - c_0 - \phi^f(c_1 - y_A) = \delta[R_a - c_0 + (e_1 - x_f)] \quad (13B)$$

$$x_f - (1 - \alpha)\phi^c c_1 = \delta[e_1 - (1 - \alpha)\phi^c y_A]. \quad (14B)$$

Solving equations (13B) and (14B) for x_f and y_A , we get:

$$x_f = \frac{[\phi^f - \delta(1 - \alpha)\phi^c]\delta e_1 + (1 - \delta)(1 - \alpha)\phi^c \phi^f c_1 + \delta(1 - \delta)(1 - \alpha)\phi^c (R_a - c_0)}{\phi^f - \delta^2(1 - \alpha)\phi^c} \quad (15B)$$

$$y_A = \frac{\delta(1 - \delta)e_1 + c_1[\phi^f - \delta(1 - \alpha)\phi^c] - (1 - \delta)(R_a - c_0)}{\phi^f - \delta^2(1 - \alpha)\phi^c}. \quad (16B)$$

For (15B) to be a valid solution it must be that $0 \leq x_f < e_1$. $x_f \geq 0$ implies:

$$[\phi^f - \delta(1 - \alpha)\phi^c]\delta e_1 + (1 - \delta)(1 - \alpha)\phi^c \phi^f c_1 + \delta(1 - \delta)(1 - \alpha)\phi^c (R_a - c_0) \geq 0. \quad (17B)$$

Because of (A1), (A2), $\alpha \in [0,1]$ and, δ , ϕ^c and ϕ^f being discount factors (i.e. these parameters are between 0 and 1), all the three terms on the left-hand side of (17B) are nonnegative. Hence, inequality (17B) is satisfied.

$x_f < e_1$ implies:

$$e_1 - (1 - \alpha)\phi^c c_1 > \frac{\delta(1 - \alpha)\phi^c (R_a - c_0)}{\phi^f}. \quad (18B)$$

For (16B) to be a valid solution it must be that $0 \leq y_A \leq c_1$. $y_A \geq 0$ implies:

$$\delta(1 - \delta)e_1 + c_1[\phi^f - \delta(1 - \alpha)\phi^c] - (1 - \delta)(R_a - c_0) \geq 0. \quad (19B)$$

(A1), (A2), $\alpha \in [0,1]$ and, δ , ϕ^c and ϕ^f being discount factors imply that the first two terms on the left-hand side of (19B) are positive and the third term is negative. In the limit $\delta \rightarrow 1$, (19B) becomes:

$$c_1[\phi^f - (1 - \alpha)\phi^c] \geq 0. \quad (20B)$$

The left-hand side of (20B) is nonnegative. Therefore, in the limit $\delta \rightarrow 1$ inequality (20B) exists.

$y_A \leq c_1$ implies:

$$e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{R_a - c_0}{\delta}. \quad (21B)$$

From (18B) and (21B), we see that for candidate solution (iii) to be a valid solution:

$$\begin{aligned} \frac{\delta(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} &\leq \frac{R_a-c_0}{\delta} \\ \Rightarrow \frac{(1-\alpha)\phi^c}{\phi^f} &\leq \frac{1}{\delta^2}. \end{aligned} \quad (22B)$$

In the limit $\delta \rightarrow 1$, (22B) becomes:

$$\frac{(1-\alpha)\phi^c}{\phi^f} \leq 1. \quad (23B)$$

(23B) implies that candidate solution (iii) is valid in the limit $\delta \rightarrow 1$ because of (A2) and $\alpha \in$

$[0,1]$. Consequently, the SPE partition (x, y) in the range $\frac{\delta(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} < e_1 - (1-\alpha)\phi^c c_1 \leq \frac{R_a-c_0}{\delta}$ is

$[e_1, \frac{\delta(1-\delta)e_1 + [\phi^f - \delta(1-\alpha)\phi^c]c_1 - (1-\delta)(R_a-c_0)}{\phi^f - \delta^2(1-\alpha)\phi^c}]$. This proves (18b).

Candidate solution (iv): $x_A = e_1$ and $x_f = e_1$

Candidate solution (iv) implies that the equilibrium condition (17) becomes:

$$R_a - c_0 - \phi^f(c_1 - y_A) = \delta[R_a - c_0 - \phi^f(c_1 - y_f)] \quad (24B)$$

$$e_1 - (1 - \alpha)\phi^c y_f = \delta[e_1 - (1 - \alpha)\phi^c y_A]. \quad (25B)$$

Solving equations (24B) and (25B) for y_A and y_f , we get:

$$y_A = \frac{(1-\alpha)\phi^c\phi^f c_1 - (1-\alpha)\phi^c(R_a-c_0) + \delta\phi^f e_1}{(1+\delta)(1-\alpha)\phi^c\phi^f} \quad (26B)$$

$$y_f = \frac{\delta(1-\alpha)\phi^c\phi^f c_1 - \delta(1-\alpha)\phi^c(R_a-c_0) + \phi^f e_1}{(1+\delta)(1-\alpha)\phi^c\phi^f}. \quad (27B)$$

For (26B) to be a valid solution it must be that $0 \leq y_A \leq c_1$. $y_A \geq 0$ implies:

$$\delta e_1 - (1 - \alpha)\phi^c c_1 \geq \frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1 - \alpha)\phi^c c_1. \quad (28B)$$

$y_A \leq c_1$ implies:

$$e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{(1-\alpha)\phi^c(R_a - c_0)}{\delta\phi^f}. \quad (29B)$$

Similarly, for (27B) to be a valid solution it must be that $0 \leq y_f \leq c_1$. $y_f \geq 0$ implies:

$$e_1 - \delta(1 - \alpha)\phi^c c_1 \geq \delta\left[\frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1 - \alpha)\phi^c c_1\right]. \quad (30B)$$

$y_f \leq c_1$ implies:

$$e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{\delta(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}. \quad (31B)$$

For candidate solution (iv) to be a valid solution, inequalities (28B), (29B), (30B) and (31B) must hold. Because $\delta \in [0,1]$, (28B) implies that (30B) will hold and (31B) implies (29B) will hold.

Multiplying both sides of (31B) with δ we get:

$$\delta e_1 - \delta(1 - \alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}. \quad (32B)$$

Because $\delta \in [0,1]$, we can write:

$$\delta e_1 - (1 - \alpha)\phi^c c_1 \leq \delta e_1 - \delta(1 - \alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}. \quad (33B)$$

We see from (28B) and (33B) that candidate solution (iv) is a valid solution in the range

$$\frac{(1-\alpha)\phi^c(R_a - c_0)}{\phi^f} - 2(1 - \alpha)\phi^c c_1 \leq \delta e_1 - (1 - \alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a - c_0)}{\phi^f}. \text{ This means the}$$

SPE partition (x, y) in the range $\frac{(1-\alpha)\phi^c(R_a-c_0)}{\phi^f} - 2(1-\alpha)\phi^c c_1 \leq \delta e_1 - (1-\alpha)\phi^c c_1 \leq \frac{\delta^2(1-\alpha)\phi^c(R_a-c_0)}{\phi^f}$ is $[e_1, \frac{\delta\phi^f e_1 + (1-\alpha)\phi^c \phi^f c_1 - (1-\alpha)\phi^c(R_a-c_0)}{(1+\delta)(1-\alpha)\phi^c \phi^f}]$. This proves (18a).

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