The Economics of Regulation
(Economics 948)

Problem Set 3

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1. Verify each step in the Holmstrom example on p. 79 of his article.

2. A monopolist produces two goods with inverse demand functions $P_1(Q_1)$ and $P_2(Q_2)$, respectively. The aggregate cost function for the monopolist is given by $C(Q_1, Q_2)$. [You may assume that the cost function is separable.] In New York state, an economic consultant has recently proposed that the electric utilities be subject to an aggregate revenue cap constraint. Under this proposal, the utilities are allowed to charge whatever prices they desire subject only to the constraint that the revenue generated by the monopolist is no higher than R*. This form of regulation is known as revenue caps and has been increasing in popularity.

   a) Set up the monopolist's constrained maximization problem.

   b) Derive the optimal mark-up rule for the monopolist and provide the economic intuition for your findings.

   c) What is the interpretation of the Lagrange multiplier, λ, in this problem? What numerical bounds can you place on the value of λ?

   d) Provide an economic assessment of revenue cap regulation in terms of its effectiveness in limiting the market power of the monopolist. Would you support this form of regulation over alternative forms of regulation (e.g., price cap regulation)? Provide a careful economic analysis in support of your position.

3. A growing concern in the United States and in other countries is that regulated firms subject to price cap regulation (PCR) will have an incentive to cut back on service quality. Consider the following quotation:

> Price-cap regulation is about constraining margins. With low margins, the regulated firm has mild incentives to provide quality. It bears the full cost of the provision of quality and reaps a small fraction of its benefits to the extent that demand expansion is multiplied by a small margin. It is for this reason that price cap regulation is often accompanied by the introduction of measurements of new indicators of quality. (Jean-Jacques Laffont and Jean Tirole. *Competition In Telecommunications*, Cambridge MA: The MIT Press, 2000, p. 88.)

a) Suppose that the regulated firm produces a single product. The demand function is given by $Q(P, q)$, where P is price and q is quality with $Q_P < 0$ and $Q_q > 0$. For simplicity, assume that there are no fixed costs and marginal cost is constant and equal to c. In addition, let $C(q)$ denote the cost of quality for the firm with $C_q > 0$ and $C_{qq} > 0$. Suppose now that the firm is subject to PCR and the price-cap constraint is binding so that the firm chooses $P = \overline{P}$ in equilibrium. Prove that the statement in the above quotation is correct. That is, show that the firm's incentive to provision quality is increasing in the price-cost margin.

b) What does your analysis in part a) suggest about the responsibility that regulators might bear for degradation in service quality under PCR?