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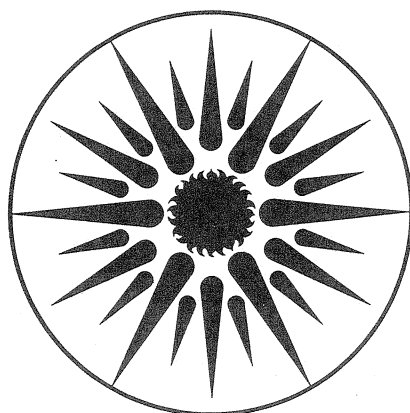
UNIVERSITY OF CALIFORNIA

ENERGY & ENVIRONMENT DIVISION

Review of Performance-Based Ratemaking Plans for U.S. Gas Distribution Companies

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ENERGY
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2 Performance-Based Ratemaking as an Alternative to Traditional Regulation

2.1 A Definition and Simple Model of Performance-Based Ratemaking

The most common strategy employed by PBR mechanisms is to weaken the link between a utility's regulated prices and its costs. This decoupling is done either by decreasing the frequency of rate cases and/or by employing external measures of cost for the purposes of setting rates. PBR mechanisms are developed with the recognition of the information asymmetry between the regulator and the regulated utility. Thus, while it may be possible to conduct even more complex regulatory proceedings to improve utility prices,¹ costs, and performance, such methods are assumed to be infeasible (or would require excessive regulatory costs) and are not considered a type of PBR. Instead, PBR places an emphasis on ratemaking methods that improve performance *without* resorting to micromanagement.

The discipline of economics has produced a large literature on incentive regulation for public utilities. In this paper, the term *incentive regulation* is used to refer to the economics literature and *PBR* is used to refer to mechanisms that have actually been proposed for public utilities. Thus, PBR may be considered to be a subset of the ratemaking mechanisms that have been examined in the incentive regulation literature. It is also important to note that the actual practice of incentive regulation is considerably behind the theory. That is, many incentive mechanisms proposed have not been implemented or even seriously proposed and PBR does not include these more theoretical proposals. However, the basic theory of incentive regulation is useful for understanding the rationale behind PBR. In this regard, two economists, Laffont and Tirole (1993), present a simple but powerful model of incentive regulation and PBR:

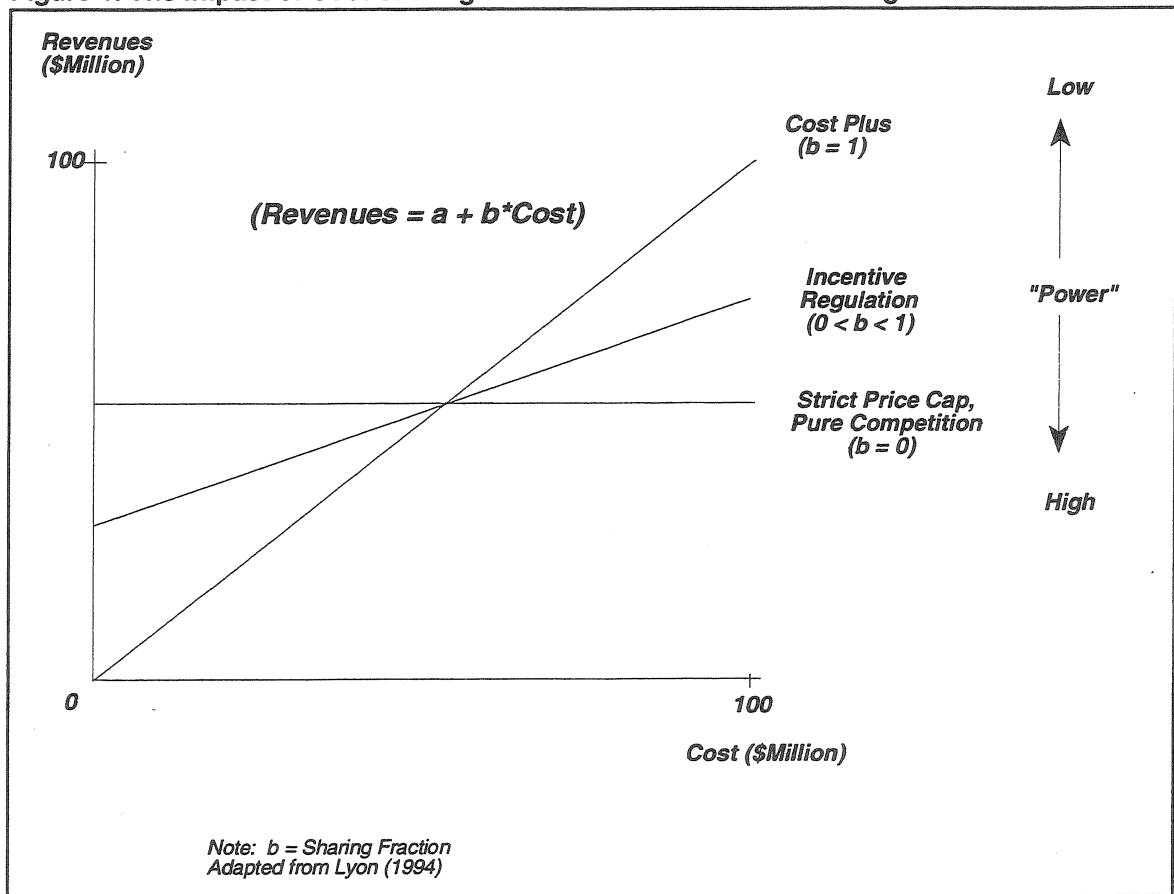
$$Revenues = a + b \cdot Costs \quad (1)$$

where:

Revenues = actual (*ex post*) revenues received
a = fixed payment, set *ex ante*
b = *ex ante* sharing fraction, $0 < b < 1$
Costs = *ex post* costs

¹ By *improved* rates, we mean rates that accurately reflect the cost of a utility service delivered in an efficient manner.

Figure 1. The Impact of Cost Sharing on the Power of an Incentive Regulation Mechanism



Regulation becomes “incentivized” when a firm is given the financial incentive to minimize costs for a given good or service. The equation shows a relationship between *ex post* revenues and costs based on two parameters set *ex ante*, a and b . Laffont and Tirole show that a firm’s incentive to minimize costs is inversely proportional to the magnitude of the sharing fraction, b . In other words, a firm’s risk for cost overruns, and its ability to keep any cost savings, increases as b decreases. Laffont and Tirole call high- b plans *low-powered* and low- b plans *high-powered* (Figure 1). COS/ROR regulation with frequent rate cases may be thought of as setting $b = 1$ and is, thus, a low-powered incentive mechanism. Fixed price contracts, COS/ROR regulation with infrequent rate cases, or price or revenue indexing represent various forms of medium- to high-powered incentive regulation; they increase the portion of revenues received through payments set *ex ante*, and decrease the portion of payments determined *ex post*. Purely competitive markets, where the seller of a product or service cannot influence the market’s price, represents another situation where the incentive powers are high. Because of this, PBR is often described as a way of making utility regulation mimic some of the incentives that operate in an unregulated competitive market.

to be reviewed by staff and other intervenors. This mechanism may be best described as COS/ROR with little or no regulatory lag.

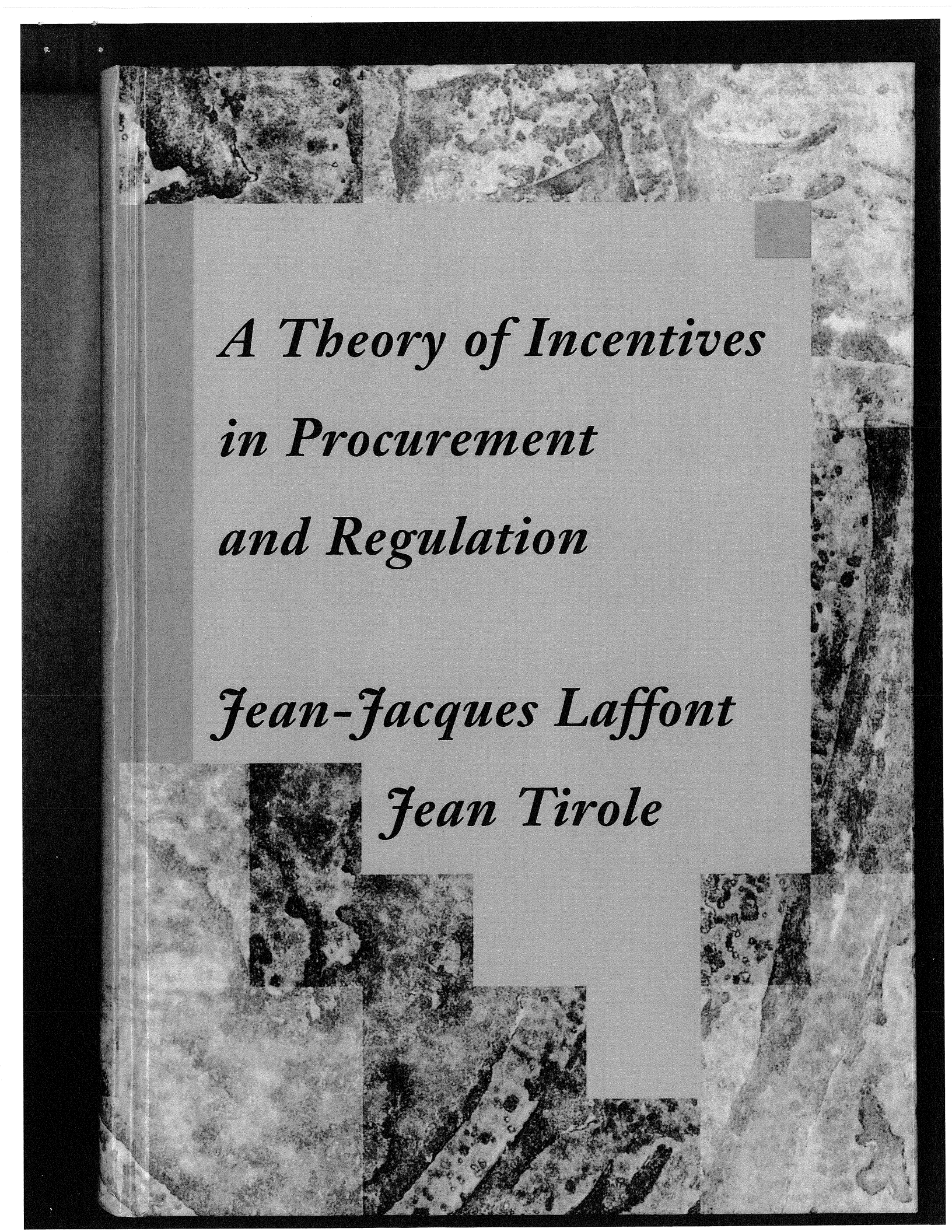
Earnings Sharing Mechanisms: A Popular Adjunct to Base Rate Incentive Plans

Earnings sharing mechanisms track actual earnings and share with ratepayers any earnings that fall below or exceed certain thresholds. Mechanically this is done by accruing the excess or shortfall earnings in a tracking account and adjusting future rates to amortize the balance in the account. Earnings sharing mechanisms are not a separate form of PBR; rather, they may be seen as a mechanism that supplements the basic incentive ratemaking mechanism. By sharing earnings with ratepayers, earnings sharing mechanisms can dilute a utility's incentive to improve productivity. In theory, it is better to set an aggressive productivity target than to give ratepayers a share of excess profits.¹⁴ Despite their ability to reduce the power of the incentive mechanism, earnings sharing mechanisms are popular. Both of the broad procurement incentive mechanisms and four of the five base-rate incentive mechanisms include earnings sharing mechanisms. Earnings sharing mechanisms are popular because they provide insurance against "unacceptable" outcomes that could result from a mechanistic incentive ratemaking process. Extraordinarily high earnings can result not from exemplary performance but from poorly selected throughput or productivity targets. Even if large profits *are* deserved, they can lead to customer backlash that may lead to an incentive mechanism's demise. Conversely, a utility that performs poorly will naturally try to suspend the mechanism and seek rate relief. PUCs, which have obligations to preserve the financial integrity of the companies they regulate, cannot easily ignore such requests.

Of the five base rate incentive plans reviewed in this report, only Wisconsin Gas's does not include an explicit earnings sharing mechanisms (Figure 4). Because Wisconsin Gas's plan does not include an earnings sharing mechanism, shareholders would absorb all variation in earnings while the incentive ratemaking plan is in effect. Figure 4 shows that there is considerable variation in the way utilities propose to construct earnings sharing mechanisms.¹⁵ Each of the five utilities is fully at risk when earnings initially fall below the benchmark. Further, the four utilities that have explicit earnings sharing mechanisms have identified floor earnings at which they either receive automatic rate relief or are allowed to file for suspension of the incentive ratemaking plan. Such floors or suspensions are denoted with an "R" in Figure 4. Two of the utilities with earnings sharing mechanisms (PG&E and BUG) have mechanisms that would make ratepayers automatically share in losses before the

¹⁴ In contrast to the efficiency loss potential argued here, Gasmi et al. (1994), using simulated data on regulated firms, argue that there is little or no loss in total welfare as a result of earnings sharing mechanisms and that earnings sharing mechanisms increase the consumer's share of total welfare gains.

¹⁵ SDG&E's proposed earnings sharing mechanism is defined in terms of return on ratebase. Figure 4 restates SDG&E's mechanism in terms of ROE assuming that debt costs are fixed and the company's debt-to-equity ratio is 1.0.



*A Theory of Incentives
in Procurement
and Regulation*

Jean-Jacques Laffont

Jean Tirole

own objectives and must be given incentives to implement the goals of the political principals.¹⁰

Thus the intent behind not letting an administration write long-term contracts with suppliers seems to be to limit externalities across administrations: By not letting the current administration bind future ones, the law reduces the efficiency of contracts but increases the accountability of each administration. Similarly the prohibition of transfers from the government to regulated firms could be traced to a fear that regulators might abuse this instrument. The procedural requirements are meant to restrain secret deals between the agency and the industry or other interest groups, to generate information for the political principals and to allow them to react to proposed policies; they are instruments for the control of agencies. Thus the study of "hierarchical regulation," as it pertains to the governance of multitiered regulatory and political structures, should be a central piece of the agenda for the new regulatory economics.

1.2 Regulatory Instruments and Incentive Schemes

Regulators use accounting and demand data to monitor a firm's performance. *Accounting data* are mainly the firm's aggregate cost or profit. Many incentive schemes are based on cost data (section 2 discusses commonly used schemes in more detail). A typical procurement contract has the government reimburse a fraction $b \in [0, 1]$ of the firm's monetary expenditures C . We will adopt the convention that the government pays the firm's cost and then pays a net transfer t to the firm:

$$t = a - bC,$$

where a is a "fixed fee" and b is the fraction of costs born by the firm (alternatively, one could adopt the convention that the firm pays for its cost and that the government reimburses a fraction $1 - b$ of the cost and gives a fee a); b is the *power* of the incentive scheme. There are two common polar cases of such linear schemes:

1. The *cost-plus-fixed-fee* or *cost-plus* contract ($b = 0$). The firm does not bear any of its cost. The cost-plus contract is an extremely low-powered incentive scheme.
2. The *fixed-price* contract ($b = 1$). The firm is residual claimant for its cost savings. The government does not de facto reimburse any of the costs; it pays only a fixed fee. The fixed-price contract is an extremely high-powered incentive scheme.

Linear contracts with a slope b strictly between 0 and 1 are called "incentive contracts." Real-world contracts are often linear, but some have

10. Politicians should actually be given incentives to seek social welfare as they themselves have their own goals and are not perfect agents for the voters.

nonlinear features such as a ceiling on transfers from the government or a guarantee that the firm will not lose money. (Those contracts are then often piecewise linear. Another example of a piecewise linear contract is a managerial stock option, which rewards the manager linearly in the value of the firm beyond some threshold.)

Cost data play a similar role in some regulated industries' profit-sharing schemes such as the sliding scale mechanisms (in which prices are adjusted to move the firm's rate of return partly toward a target rate of return) or the related partial overall cost adjustment mechanisms (in which prices move up and down less than proportionally with changes in costs). Cost data also play an important role in cost-of-service (or average-cost-pricing) regulation, whereby (in theory) the regulator chooses prices so as to equate revenue from charges to consumers and cost.

Allocating aggregate cost among projects or product lines is generally considered difficult. On the one hand, several costs (facilities, machines, management, accounting, marketing, etc.) may be common to several activities. The firm can manipulate accounting procedures to reallocate costs to its advantage. On the other hand, the managers can also assign their best engineers to or exert their supervisory or cost-reducing effort in those activities with a smaller fraction of reimbursed cost. The "fully distributed cost schemes" used in some industries represent an attempt to allocate aggregate cost among activities. Their basic defect is that they use mechanical rules to determine the distribution of joint costs (e.g., allocation of joint costs proportionally to outputs). Such schemes are orthogonal to the efficiency concern of charging prices that reflect marginal costs; furthermore they introduce perverse incentives in the pattern of cost reduction.

Subcosts are sometimes used in formal incentive schemes when the accounting manipulations and input allocations are thought not to affect their measures too much. These subcosts can be "external," such as those of raw material, subcontracting, or the workers' hourly wage. Or they can be "internal" in the sense that they represent the performance of a cost center (design, manufacturing, distribution).

The *demand data* on which contracts can most easily be based are prices and quantities. To these must be added some verifiable dimensions of quality. For instance, there have been attempts to create objective measures of the punctuality and quality of services of Amtrak passenger trains.¹¹ Regulatory contracts with an electric utility can be based on the number of outages. Other commonly used demand data are delays in procurement, number of repeat buyers, number of customer complaints, and product image among customers. Note that formally the verifiable dimensions of quality can be treated as quantities of fictitious goods.

11. See, for example, Baumol (1975).