



Regulatory Economics: Twenty Years of Progress?*

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Abstract

In the 20 years since the Center for Research in Regulated Industries' Eastern Conference has been in existence there have been numerous changes in regulatory economics and regulation. This paper provides a review of the major changes seen from our own perspective. We review some of the major developments in theory as well as key developments in the theory and practice of incentive regulation. We are critical of some of the theory as well as the effectiveness of deregulation.

* This paper was inspired by the contributions at the Eastern and Western Conferences and the *Journal of Regulatory Economics (JRE)*. To thank each individual who has participated in these conferences would be impossible. The paper is dedicated to them. We would also like to thank the members of our program committees, who have provided wonderful insights over the years and played a major role in the success of the programs. We single out a few of our academic colleagues for their sterling contributions to the program. Horace J. De Podwin was the Dean of the Graduate School of Management at the time of the first conference. Without his support in the early days the program would never have got off the ground. Over the last 20 years he has provided able counsel—a pilot who helped guide the Center through some stormy waters. William Kovacic first appeared on the scene in Monterey in 1988 early in his academic career. Since then he has made a major contribution to the program with his economic analysis of legal issues, whose contributions have recently received further recognition with his appointment as General Counsel of the Federal Trade Commission. In addition, he has provided advice and encouragement to the Center. The Center is proud to have the participation of such a distinguished counselor and legal scholar. The programs have benefited from the able and thoughtful assistance of Linda Brennan, who played an indispensable role as Administrative Assistant and Assistant Director of the Center and Assistant Editor of the *JRE* from 1989–1999. Jeremy Guenter has continued in this tradition since 2000, making his own distinctive contribution notably the regulatory economics literature database available to all on the Center's website: <http://www.rci.rutgers.edu/~crrl>.

1. Introduction

In 1982 the first Conference of the Rutgers University Center for Research in Regulated Industries Advanced Workshop in Public Utility Economics and Regulation was held at Mohonk Mountain House, New Paltz, New York. The conference brought together academics, company economists, rates and regulatory managers, and commission staff. The format followed a common academic practice with papers being chosen from abstracts by a committee, which was a representative sample of the whole. In the same academic tradition the papers were subject to the comments of discussants. Publication was encouraged although no specific outlet or promise of publication was given. Over the years, many papers that had been presented at the conferences were published. Subsequently, the first Western Conference was held in Monterey, California, in 1988 and has been held annually ever since. In 1989 the *Journal of Regulatory Economics* first appeared. In 1990 the Center's first postal conference took place at Coton House, Rugby, England. This 20-year period has been a very active period for the Center. This activity has been a reflection of the considerable activity that has taken place more generally in the field of regulation, regulated industries and regulatory economics.

The purpose of this paper is to review and analyze some of the major developments in regulated industries, regulatory theory and practice over these 20 years. We must emphasize that the paper is written from our own personal perspective, which has been very much enhanced by the interaction and learning achieved from our participation in these conferences. We have benefited considerably from the participants at these conferences over the years. We offer this paper as a salute to all who have participated in these conferences over the years as they made it all possible.

Section 2 reviews the background in which regulatory change has taken place and provides motivation for the paper. Section 3 provides a brief evaluation of theoretical developments over the period.¹ Section 4 examines some of the major events that have occurred in practice. Our approach is intended to be rather general and uses specific industries and legal rulings for illustrative purposes only. Detailed analysis of legal issues and the major industries is provided in the papers by William Kovacic, William Hogan, Almarin Phillips, Martin Collette and Jeffrey Leitzinger. Finally, in section 5 we provide some implications for the future of regulation and regulated industries.

2. Background and Motivation

The regulatory scene in the early 1980s differs significantly from what we see today. The change that has taken place in the last twenty years is ostensibly greater than that of the previous 80 years. Take telecommunications as a prime example. In 1982 the world's largest company, American Telephone & Telegraph controlled around 80% of the access

¹ In sections 2 and 3 we attempt to perform essentially the same task as Faulhaber and Baumol (1988), although in a more specialized manner. We are looking for "practical products of theoretical research" in the field of regulatory economics.

lines and over 90% of the long distance traffic. In addition, it was, through its Western Electric subsidiary, a large manufacturer of telecommunications equipment ranging from handsets to cables to central office equipment. Its research arm, Bell Labs, was one of the premier research and development organizations in the world, employing leading scientists and spawning Nobel laureates. However, as Phillips (2001) and Kovacic (2001) will explain in more detail, trouble was afoot. The Justice Department had waged war on AT&T with a landmark antitrust suit that was settled with the Divestiture by AT&T of its local telephone companies. What was AT&T became seven local companies, the baby Bells or Regional Bell Holding Companies (RBOCs) and AT&T. What remained of AT&T consisted of long distance, Bell Labs and Western Electric, subsequently renamed AT&T Technologies. The industry has changed dramatically since then with the RBOCs consolidating into four companies, with the almost unthinkable happening with GTE merging with Bell Atlantic to become Verizon.

The changes in this industry have been dramatic because of the changes in the technology. In 1982 what existed in extremely rudimentary form are now ubiquitous—personal computers, optical fiber, the Internet and wireless technology. Fax was considered a big deal in 1982. It is now ubiquitous but of much less significance than it was in the early 1990s when it probably peaked. Wireless technology has become widespread and cheap enough to compete with wireline technology with AT&T becoming a major player along with Verizon. The developments in telecommunications have, indeed, been startling making it hard to recognize the industry of 20 years ago.

The gas industry has been subject to considerable change over the last 20 years as Collette and Leitzinger (2001) demonstrate. The changes have been in institutions, market structure and regulation. The process began in the 1970s with a concern over take-or-pay contracts.² In the ensuing regulatory changes of the 1980s and early 1990s, traditional long-term contracting was replaced by shorter-term contracts and risk hedge instruments benchmarked on new spot markets, and driven by new market intermediaries and the increasingly real-time information of the digital economy.

Deregulating the electric utility industry has proved to be exceedingly challenging as Hogan (2001) examines in some detail. Major change in the industry has taken place over the last 20 years. The first major change to affect the industry was the Public Utility Regulatory Policies Act of 1978 (PURPA). This set in motion a process whereby generators other than vertically integrated utilities would be allowed to sell power into the grid, *inter alia*, requiring utilities to purchase such power at prices that utilities deemed to be excessive. With PURPA, the independent generation industry was effectively born. This led to dramatic changes in the industry but hardly to a resolution of its problems as the mess in California dramatically illustrates.

Other network industries, including water and postal services, have gone through similar changes, as economists have touted the benefits of better pricing, ownership and governance structures. Many of the changes that have taken place have done so under the umbrella or deregulation. One major problem with the term deregulation is that it is used and applied in a very loose manner. The “de” prefix itself is open to considerable

2 The problems of take-or-pay contracts fall under the general category of stranded costs.

interpretation. Deregulation does not mean that regulation is abolished, just as deflation does not necessarily imply removal of all of the air from the tires or bringing the economy to a dead stop. The very flexibility of the term, deregulation, is one source of many of the problems when it comes to bringing it about in practice and achieving its objectives. In reality, deregulation is consistent with almost any change in regulation and can mean whatever its proponents want it to mean.

In the eyes of economists, the objectives of deregulation are generally laudable if the idea is to obtain the benefits of competitive entry and in the process avoid some of the inefficiencies of monopoly and the transactions costs and other inefficiencies of the associated regulation. Ideally, we would like to believe that deregulation implies reducing regulation. However, given its history, even this low standard is difficult to attain. The practice of deregulation is such that almost any regulatory change can be passed off as deregulation. Add to the mix that regulation is now generally considered undesirable and deregulation desirable, we have a fertile ground for the creation of all sorts of mischief in the name of deregulation.

If deregulation were only striving for the benefits of competitive entry it would at least be well defined and consistent. It would amount to abolishing regulation. It would amount to a realization that regulation had had its day for the industry concerned and that superior governance structures existed, namely, competition. In practice, deregulation is rarely interpreted in this manner because politicians, pressure groups and regulators are not willing to abandon certain features that have become the very essence of regulation. In particular, cross subsidy and consumer protection are often seen as the distinguishing features of regulation. Yet, it is these features of regulation that make deregulation so problematical or even unattainable. Let us now consider these major obstacles in more detail.

The original rationale for regulation in the minds of economists was the desire to avoid monopoly inefficiency. From a societal point of view the original objective was to protect the consumer from monopoly exploitation. The notion of *justum pretium* or “just price” has a long history in the common law and underlies much statute law including statutes governing monopoly. However, the practice of regulation became more than this as elected representatives realized its considerable potential for providing them with opportunities of taxation and subsidization that had distinct advantages relative to the usual taxes and subsidies. Redistribution by regulation lacked the transparency and therefore the accountability of traditional methods of taxation and subsidy. From the government’s point of view, this was a huge advantage and provides a potentially convincing explanation of why deregulation is often a failure. Politicians preach deregulation while simultaneously retaining the redistribution mechanism that regulation provides.

For politicians, regulation is first and foremost about redistribution. The avowed objective of regulation is to protect consumers from price gouging by a firm with monopoly power. This in itself is a form of redistribution in that it redistributes the monopolist’s profits to the consumers. This notion is *prima facie* reasonable and is not likely to be generally unacceptable to economists. The problem is that achieving this apparently simple objective of redistribution of monopoly rents by government sets in motion a number of forces. Given that government in a democracy is subject to the will of

people some of the people will attempt to influence government to make the redistribution work in their favor. Indeed, the act of monopoly regulation sets in motion the rent seeking process, a term first coined in Tullock's (1967) path breaking paper. Rent seekers will devote considerable resources to obtaining a share of the monopoly rents of which government now has taken control through the regulatory process.

The nature of the deregulation process has resulted in a piecemeal and selective implementation of changes and reforms. Essentially the approach has been to adopt changes that seem to be the most easily implemented without addressing some of the fundamental underlying problems. This and the failure to recognize the role of rent seeking has led to a failure to think through the consequences of regulatory changes as we will see in the remaining sections of the paper.

3. Developments in Theory

Two decades ago regulatory economics had just completed some major strides. In part, this had been as a result of a major investment made in economics by the Bell System. Notable in this was the founding in the spring of 1970 of *The Bell Journal of Economics and Management Science*, which became the *Bell Journal of Economics* in the spring of 1975 which begat the *Rand Journal* in the spring of 1984, immediately following the Divestiture. AT&T apparently saw no significant benefit in continuing its major effort in regulatory economics, which had ostensibly been a costly failure memorialized in the Divestiture. The divestiture of the *Bell Journal* to Rand and the gutting of its premier economics group at Bell Labs might be seen as two casualties in the failure of some outstanding economic brainpower and innovative research to carry the day for Bell.

In many ways the research of the 1970s and 1980s was inspired in a significant way by the resources ploughed into microeconomics by AT&T. Take the *Bell Journal*.³ Money appeared to be no object. As two young faculty in the 1970s, when young faculty in business schools were paid significantly less in real terms, we were impressed to receive what appeared to be princely sums for refereeing, not to mention the additional fees paid to us for our 1976 article on peak-load pricing. The *Bell Journal* had no difficulty attracting extremely talented editors and contributors including already distinguished scholars like William Baumol, Walter Oi, Richard Posner, George Stigler, William Vickrey, Oliver Williamson, and others. Perhaps even more important was that the *Bell Journal* attracted many young economists, such as Elizabeth Bailey, John Panzar, Robert Willig, and David Sibley, whose work in the 1970s and 1980s played a major role in the evolution of regulatory economics. Together the visibility of regulated industries and the quality of the researchers involved made regulatory economics the most important subspecialty of industrial organization.

Before the founding of the *Bell Journal* regulatory economics was extremely

3 Henceforth we will not distinguish between the two appellations but will use this term to refer to either *The Bell Journal of Economics and Management Science* or the *Bell Journal of Economics*.

undeveloped. There was the seminal work of Averch and Johnson (1962),⁴ the marginal cost pricing debate for monopolies of the 1940s and 1950s, which itself became specialized into the peak-load pricing debate through the work of Boiteux (1949), Steiner (1957) and Williamson (1968). These contributions all provided the context for the research that the *Bell Journal* fostered in the 1970s. Peak-load pricing in the early 1980s was extremely well developed in theory. Ramsey pricing was given a new lease on life by Baumol and Bradford (1970), the Bell Labs economists, including Rohlfs (1979), and others including Sherman and George (1979), and continues as a source both theoretical and practical inspiration for analyzing and designing regulatory institutions.

All of these developments were outgrowths of already established theory. However, the theory of contestable markets, due primarily to Baumol et al. (1982) and some related development, which began in the 1970s, did not have such roots. They were original in a way that the other developments were not. They also lacked the pedigree of the other developments and were for that reason less constrained. Perhaps for this reason the authors of contestability had very high hopes for the impact of their work.⁵ Despite its detractors, some of whom admit its importance, the work has become one of the landmarks in regulatory economics. Even a leading detractor states: “The major part of the analysis of it is an analysis of multiple products and joint costs, which is already gaining wide acceptance” (Shepherd 1984, p. 572). Indeed, their analysis of issues of costs, multiproduct pricing and cross subsidy has had and continues to have a major impact on the discipline. As a result of this work cross subsidy is well defined in terms of the burden test—a cross subsidy does not occur if the revenue from a product is between its incremental cost and its stand-alone costs.

Around the mid 1980s a change took place in the theoretical regulatory economic and this was the incorporation of the principal-agent theory, mechanism design theory and information economics into regulatory economics. This began with the work of Baron and Myerson (1982). The work was an outgrowth of the work on principal-agent theory in the 1970s (e.g., Ross 1973 and Groves 1973), which, indeed, offered major insights into issue of corporate governance. The problem is, as we noted in Crew and Kleindorfer (1986), that its insights have little to offer when carried over into designing institutions or mechanisms that can be applied to regulatory problems, as they exist in practice. This is not the view of theorists in this area. Indeed, the work of Baron and Myerson spawned a new industry in regulatory economics, the culmination of which can be found in the treatise by Laffont and Tirole (1994).

Theorists employing this “new” approach were highly critical of the earlier work, which they perceived as having little value as it missed the critical problem of incentives. This can be noted in the work of Laffont and Tirole (1993). “In the policy arena discontent was expressed with the price, quality, and cost performance of regulated firms and

4 We intentionally use the word seminal to describe A-J. Although many authors have sought to discredit this paper it is one of the most highly cited and influential papers in regulatory economics.

5 They were rebuked by Shepherd (1984, p. 572) “a new theory of industrial organization” which “will transform the field. . .” (Baumol et al. 1982, xiii). Shepherd failed to note that these were the words of Elizabeth Bailey in the Foreword!

government contractors ... More powerful incentive schemes were proposed and implemented, deregulation was encouraged ... [but] regulation theory largely ignored incentive issues.” (Laffont and Tirole 1993, xvi) Previous regulatory theory, they argued, “... did not meet the standards of newly developed principal-agent theory, whose aim is to highlight the information limitations that impair agency relationships. Furthermore the considerably simplified formal models that assumed away imperfect information were less realistic in that they implied policy recommendations that require information not available to regulators in practice.” While we accept that these criticisms certainly have some validity, we argue that the contributions that replaced them were at least as limited in their applicability and fell far short of the expectations created by their authors. Ironically, a principal reason for this is precisely the reason raised above by Laffont and Tirole in ushering in the new theory, namely, a heavy reliance by such schemes on information that is not available to regulators.

Indeed, the entire mechanism design literature, beginning with Baron and Myerson (1981) and strongly promoted by Laffont and Tirole, is based in one way or another on assumptions like common knowledge that endow the regulator with information that he cannot have without a contested discovery process that always leaves him in a state far short of the level of information assumed in these theories. Common knowledge is the Achilles heel of mechanism design theory.⁶ Why is it that extending the traditional principal-agent theory to regulatory economics is so problematical? When a principal and agent are involved in a private transaction, there is not a fundamental problem with the principal designing incentive systems for the agent based on an assumed “common knowledge” by the principal about the agent’s costs or preferences. In private transactions, the principal bears the costs of any error in his assumptions.⁷ Contrast this with a regulator with responsibility for the price and quality of an essential good. If the regulator is wrong in his common knowledge assumptions about the agent (the regulated firm), it is consumers or the regulated firm that bear the consequences. The anticipation of

6 By “common knowledge,” we are referring to the standard assumption of much of the mechanism design literature that the regulated firm actively reveals its type (e.g., its cost or other key parameters), knowing that the regulator will set regulatory parameters (e.g., the allowed rate of return in cost-of-service regulation or the X factor in price-cap regulation) based on the revealed type of the firm. The common knowledge assumption presumes that the regulator and the firm take as incontestable knowledge the probability distribution of possible revealed types, with regulatory design contingent on this common knowledge distribution. We include in our broad criticism of this assumption also weaker forms of this that allow the regulator to simply declare *ex ante* the distribution of revealed types, whether or not the regulated firm agrees to it. Any such declaration, unless agreed to by the regulated firm, can and would be contested, since different assumptions about this distribution naturally lead to different regulatory incentive systems under the standard Bayesian Incentive Bargaining approaches used in this literature. To put it plainly, the regulated firm definitely cares about what the regulator claims to be the actual distribution of potential types and would attempt to influence the accepted definition of this distribution if it were a central aspect of regulatory design. If such a distribution is a central feature of a design problem, a theory that simply takes it as a given, without modeling the process that would accompany its adversarial determination, is fundamentally flawed.

7 In particular, the models and applications in Laffont and Tirole (1993) that treat private procurement contracts remain significant contributions to the literature of contracting.

these consequences will clearly give rise to strategic interactions, both in theory and practice, that may have fundamental effects on what common knowledge assumptions are legitimate, and on the ultimate consequences of these for the outcomes of regulation. Theories that fail to address these strategic interactions leave a gaping hole in interpreting the results of any such theory. In particular, lifting the common knowledge assumption from a private principal agent framework to the regulatory context leads to major problems because it leaves open how this common knowledge distribution will be determined. Note that in the traditional principal-agent theory the contracting agent is free to take or leave the principal's offer (which must therefore satisfy an individual rationality constraint), but under regulation this does not apply in the case of the firm which may have considerable sunk costs at risk and cannot simply pull up stakes if the firm does not find the regulator's assumptions acceptable.

The promise of these mechanism-design-style theories was ostensibly considerable. They promised none other than the holy grail of X-efficiency, something previous regulation had manifestly failed to deliver. X-efficiency, however, was only achieved if two conditions—aside from the basic assumptions criticized above—were met. The first condition was that achievement of the promised X-efficiency required that the regulator concede some information rents to the firm.⁸ The second condition was what is referred to in mechanism design theory as commitment. This is the notion that the presence of information rents would not present a problem to the regulator and that, as a result, he was committed to his original agreement with the firm. In other words, the *ex post* appearance of excess profits would not cause the regulator to renege on his commitment to the original incentive scheme. Why this would not be a fatal flaw in the whole scheme was never considered. The new theory promised efficiency as long as the regulator is prepared to allow information rents. Theorists, however, never understood the impossibility of this in practice. No regulator can even admit that it allows the firm to retain information rents let alone commit to such a practice. For the regulator this is a congenital problem of far greater magnitude than has been recognized in economic theory.^{9,10} How do these rents differ so much from the old style monopoly rents that would make them acceptable to the regulator when it was monopoly rents that were the principal motivation of regulation in the first place? Thus, the promise of X-efficiency was hedged with conditions, which, we argue, make the theory of little significance for real world regulation, as subsequent events have shown.

Of course, all theory makes simplifying assumptions, which depart from reality in one way or another. The key, at least for normative economic models, is that the assumptions made should not give rise to fundamental infeasibilities when implementing the results of the theory in practice. An apparent case in which this has not been true is the case of regulatory theory derived from the mechanism design literature. In effect, the theory

8 These rents arose from the information advantages of the firm relative to the regulator.

9 Loeb and Magat (1979), and Vogelsang and Finsinger (1979) implicitly rely on this same notion of commitment.

10 In Crew and Kleindorfer (2001) we recognize the importance of commitment and its effect on incentives and analyze the constraints on regulatory commitment.

proceeds by ignoring an immutable institutional constraint, namely that neither commitment nor its associated information rents are reasonable assumptions. Other than being a rich source of classroom exercises, this theory seems to have found no takers in practice. A consideration for the reasons underlying this failure may provide useful insights for the future innovations needed in development and application of regulatory theory. While we admire the elegance of the theory of mechanism design applied to regulation, we conclude that it may have led to some misleading policy implications and that overall its contribution is small. In its defense it does provide insights into the role of information as a source of monopoly rents, which is a potentially valuable insight.

Another major development in economic theory over the last twenty years has been the progress made in auction and bidding theory and in experimental economics. Auctions and bidding have been applied extensively in regulatory applications as illustrated in the two special issues of *JRE* in May and July, 2000 (see Salant 2000). Although economists now have a much better understanding of auctions and bidding, the applications have not been without their problems as the California electricity generation market illustrates. However, unlike the mechanism design literature, the bidding, auctions and experimental economics literature offers considerable potential in regulatory economics. These innovations do not mean that franchise bidding along the lines of Demsetz (1968) is going to replace traditional regulation or that bidding will result in radical changes in regulation. They do, however, provided regulatory economists with some powerful tools, which may result in a number of promising applications.

Twenty years ago, concerns over access pricing were a practical issue in telecommunications. With the Divestiture these concerns increased significantly. However, theoretical contributions to address the problem of access pricing came later. Access to an essential or bottleneck facility is the issue. The problem is compounded when the owner of the essential facility is also selling to final consumers in competition with the other firms. An example would be long distance telephone companies purchasing access from local phone companies to complete their calls. The local companies themselves might be also providing long distance service. This is the case, for example, with British Telecom, and a few jurisdictions for RBOCs. The efficient component pricing rule (ECPR) was one of the first attempts by economists to address the issue of efficient access pricing. Among the leading exponents of ECPR are Baumol and Sidak (1994).¹¹ The idea of ECPR can be summarized as in Baumol and Sidak (1994, 178):

$$\begin{aligned} \text{Optimal input price} = & \text{the input's direct per-unit incremental cost} \\ & + \\ & \text{the opportunity cost to the input supplied of the} \\ & \text{sale of a unit of input.} \end{aligned}$$

The problem with ECPR arises from the second term on the right-hand side. If this could be determined on the basis of a readily observable price in a competitive market, then

11 The idea seems to have originated over twenty years ago in Willig (1979).

ECPR would be an efficient rule. However, it is precisely because of the bottleneck facility that such a competitive price cannot be determined. ECPR then comes down to allowing the bottleneck supplier the monopoly rents that he was earning when he was the only vertical integrated monopolist. As most monopolists are regulated, this presumably comes down to allowing him the regulated return that he would have obtained. The application of ECPR can be illustrated by means of the following simple illustrative example.

If there are two homogeneous products x_1 and x_2 each having two production stages:

$$MC_{ij} = \text{Marginal Cost of product } i \text{ in stage } j$$

We assume for simplicity that $MC_{11} = MC_{21} = 8$ and $MC_{12} = MC_{22} = 2$ and stage 1 is the “access” input for each product.

Ramsey markups of 1.5 and 1.25 are applied to give prices of 15 and 12.5 for product 1 and 2 respectively. If the regulated monopolist has a monopoly in market 1 then ECPR would imply that entrants would be charged 10.5 for the access input. If he has cost lower than 2, he can undercut the monopolist in market 2 and take this market from the monopolist.

Most access pricing problems encountered in the real world are much more complicated than this. For example, products are differentiated and one of the products does not necessarily remain a robust monopoly. Thus, it may be possible to undercut the incumbent in the monopoly market thereby undermining the incumbent’s financial viability. In the area of access pricing it is apparent that significant progress has been made in understanding some of the complexities involved and in developing solutions to the problem. A particularly promising approach seems to be what Laffont and Tirole (1996) have referred to as “global price caps.”¹² The idea is intriguingly simple aiming to avoid some of the complexities and information. Access is treated as a final good rather than as an intermediate good and is included in the computation of the price cap. In addition, “Weights used in the computation of the price cap are exogenously determined and are proportional to the forecast quantities of the associated goods.” (Laffont and Tirole 1996, 243). Laffont and Tirole explore the possibilities of forming a hybrid of ECPR and global price caps, which may offer benefits in terms of weight setting and protection against anti-competitive practices. Such a hybrid approach may provide a means of achieving a transition to the global price cap, which has considerable advantages summarized by Laffont and Tirole (1996, 254) as “A global price cap penalizes increases in both access prices and final prices and induces the [regulated firm] to price discriminate very much the way an unregulated firm would do, except that the entire price structure is brought down by the cap.”

While significant progress in the theory of access pricing has been made, a considerable amount of further development is required particularly if it is going to contribute to the practical policy debate, which is the subject of the next section. Interest continues in access pricing as illustrated by Armstrong’s (forthcoming) tour de force on access pricing and

12 The term is an excellent one. Crew and Kleindorfer (1994) proposed the same basic idea but unfortunately not the term. Laffont and Tirole (1994) first floated the idea.

interconnection. Many problems remain, some of which are addressed by Armstrong, including two way interconnection—an important problem for Internet service providers. Other issues include structural separation of access from the rest of the business and divestiture of access monopolies. Finally, access pricing is part of a much larger problem of the role and obligations of incumbent network industries under deregulation to which we will now turn briefly.

Microeconomic theory over the last 20 years has supported deregulation. However, it has done so in a piecemeal fashion. Consideration of the impact of entry on the obligations of incumbents has left much to be desired. Incumbents have as regulated monopolists faced universal service obligations (USO), default service provider obligations and have been the vehicle for the propagation of many subsidies. While the understanding of the nature of such obligations has been the subject of considerable study, for example, the USO in the postal sector as illustrated in Crew and Kleindorfer (1999, 2001a, 2001b), the bigger picture of the impact and nature of deregulation is still undeveloped as will be illustrated in the next section. For example, a major problem exists in linking notions of access pricing to the problem of funding universal or default service obligations.

Addressing the default service obligation is arguably one of the most difficult problems faced in regulatory economics.¹³ A price cap for a distribution utility with a default service obligation creates a certain dissonance. Is the energy purchased treated as a simple pass through with this component of the bill varying with the purchases in the spot market? Or is the distribution utility required to line up long-term contracts to provide guaranteed prices? In either case the default service provider is on to a losing proposition. If it insists on only making purchases in the spot or short-term market and is allowed a straight pass through the value to consumers of the default service obligation is minimal since they are absorbing all the risks. If the distribution company sets up long term contracts to guarantee prices then if prices fall it loses customers and is stuck with high priced long term contracts, which will prove costly to it under a price cap. Competition in such markets is very difficult to achieve when distortions like the default service obligation are included. The problem is not well understood and awaits a workable solution.

4. Developments in Practice

One of the lessons of the last 20 years for regulatory economics is the importance of practice. Many practical problems drive theory in this field, which is as it should be since regulatory economics is even more grounded in practice than most economics. Indeed, most of the theoretical problems raised in section 3 arose out of problems being faced in the practical world of regulation. Regulatory economics is an area of economics that is enhanced by practice and most of the important theoretical developments are likely to arise out of practice. Thus, in this section we intend not only to evaluate some the

13 We argue below that this is at the heart of the California electricity crisis. This is a current problem. A long-standing problem of arguably equal importance is the problem of auto insurance in New Jersey, which originated over 20 years ago and shows little sign of being resolved. See Worrall (2001).

developments in practice that have occurred but also some ways in which practical problems may lead to advances in theory.

One healthy change that began over twenty years ago was that economists in particular and more generally society as a whole became more skeptical about the Nirvana view of government. There has been a greater willingness to allow markets to function without interference by the government. It has become more recognized that certain functions need not be performed by government and may safely be left to markets. This kind of thinking has driven in part the deregulation movement. However, deregulation's likely primary driver is the division and redistribution of the monopoly rents. Large customers are attempting to gain at the expense of small customers. Understanding this may be a first step to understanding the changes in practice in the last 20 years and why some of them have disappointed.

The growth in regulatory economics over the last twenty years illustrated by the increasing literature has led to a change in the role of economists. Companies probably employ fewer regulatory economists since the depletion of AT&T's regulatory economics staff in the mid 1980s, but consultants and the demand for regulatory economists has continued to grow as economists partake of the feeding frenzy in litigation. While regulatory economics has advanced significantly over the last 20 years and while the numbers of regulatory economists has grown significantly, the same may not necessarily be true for economists whose pronouncements and testimony has been subject to greater scrutiny and skepticism. In some ways consultant economists are at risk of becoming perceived in the same way as lawyers, namely as hired guns. Kovocic (2001) addresses such issues in more detail with the law's treatment of economists as expert witnesses.

Access pricing and how to structure network industries were in their infancy 20 years ago. Interest in structure became intense with the AT&T Divestiture. It came nowhere close to resolving the problems and in telecommunications the debate over access pricing and structure continues unabated. Some mixed success has been achieved in access pricing in the gas industry as indicated by recent developments analyzed in Collette and Leitzinger (2001).¹⁴ The postal sector is an unlikely success story. The United States Postal Service (USPS) is often criticized as a moribund public enterprise. Its role and that of its regulator, the United States Postal Rate Commission (PRC), in opening up parts of the postal value change to access is a major success story. Postal worksharing—a postal term of art referring to activities like presorting, bar-coding and drop shipments—has been a major success in the postal sector as illustrated in numerous papers, for example, Kolin (2000) and Mitchell (2000a). This seems to be one aspect of the postal sector pricing practices, which USPS, large mailers and the PRC all seem to agree is working well

Twenty years ago the theory of peak-load pricing was well developed. Since then it has been successfully applied in many areas not just in network industries. In some ways, given the head start that peak-load pricing had in network industries the progress has been disappointing in these industries relative to elsewhere. Peak-load pricing in other industries, notably airlines and hotels, has become successful largely because of advances in computing, telecommunications and the Internet. The airlines, by employing techniques

14 See also Doane and Spulber (1994).

like artificial intelligence, have successfully combined peak load pricing with price discrimination. The main device used for price discrimination is flexibility in travel schedules. The business *travel* requires flexibility in these travel plans. He may need to travel at a moment's notice. His plans may change or the business gets concluded more quickly and he wishes to return early. He normally travels during the business week. Thus, airlines find means of identifying business travelers. The lower price tickets must be purchased in advance—usually at least 7 days—and cannot be changed without penalty. In addition, a Saturday night stay is required. The airlines have found relatively straightforward ways of identifying the travelers with lower demand elasticity and prevent transfer and arbitrage thus making price discrimination highly successful. The airlines successful techniques of price discrimination are combined with peak load pricing not in the way peak load pricing is normally employed, namely in real time. Peak load pricing was traditionally time of day or combined time of day and seasonal pricing. (For example, electricity might be charged at a lower price at night and weekends.) For airlines this would appear to translate into last minute fares with people who were prepared to wait at the airport getting empty seats at low prices. The argument would be that given that an additional passenger could be put on the aircraft at essentially zero marginal cost that a low (off peak) price could be offered. With the greater understanding of price discrimination such last minute cheap fares would not be attractive to the airlines. Because of the tendency of business travels to change plans and to be last minute the airlines may not wish to sell remaining seats to standby passengers. They might prefer to leave them unfilled in case a full fare business traveler shows up. In addition, because of their rather sophisticated yield management techniques and their frequent flyer programs, standby passengers are of much less importance. In many ways frequent flyer programs are the ultimate peak load-pricing device. More of them can be made available on flights that have low load factor. The airlines can estimate weeks and even months ahead how full a given flight is likely to be. If the flight is running light the airline changes the mix of seats. For example, it can add more frequent flyer seats. It can even add these last minute in some cases, as they are also an effective device for price discrimination in that few business flyers would donate their miles back to the company and the vast majority of companies would think it laughable that they should do so.¹⁵

The airlines have benefited from deregulation in that they have been able to take into account two of the basic ideas of microeconomic theory, namely, price discrimination and peak load pricing and combine them in a reasonably sophisticated way. The application of these two techniques has resulted in off-peak consumers benefiting with the result that many small customers have received low priced fares. Load factors have increased—fewer empty seats—and service has generally been reduced in quality. By contrast business customers have probably been made worse off. Given the airlines' ability to identify their low demand elasticity they have paid the higher prices. This has been particularly true for small business, as many large customers and the federal government have made special deals with the airlines.

15 Except for Uncle Sam, who is totally devoid of humor! Uncle Sam and not federal government employees gets the miles. Uncle Sam has not yet got round to treating miles as taxable income.

A similar story could be told about the hotel industry, which employs many of the same techniques, including frequent guest programs, corporate, government, weekend and a host of special rates. The industry has not been as successful as the airlines in gaining acceptance of non-refundable rooms in the ubiquitous way that airlines have done so with non-refundable tickets. One approach has been to require guarantees by credit card with cancellation penalties 24–72 hours prior. This is a means of identifying the lower elasticity of the business customer. However, there may exist more competition among hotels making this approach more difficult to achieve. Similarly, the frequent guest programs may not promote as much loyalty as frequent flyer programs as the potential rewards to consumers are normally less.

The success of peak load pricing in these two industries, neither of which is rate regulated, stands out in some ways in contrast to the regulated network industries. The latter had a distinct head start in peak load pricing and almost all of the economic theory had been written with them in mind. Moreover, the potential benefits from peak load pricing were significant in electricity and telecommunications. It is interesting why the network industries, especially electricity, failed to capitalize on its head start with peak load pricing. Several things were in place for success including innovations in metering that meant that more sophisticated and lower cost time of day meters were now available. These could be employed with smaller customers. One problem is that the metering or transactions costs were still high relative the successful applications in the airline and the hotel industries. In addition, electricity still remained regulated limiting its potential profits from innovative pricing and reducing its flexibility in pricing. Furthermore, economists did not show much interest in the nuts and bolts of applying peak load pricing.

All of these considerations were important in determining why airlines and hotels were more innovative and faster adopters of rather sophisticated peak load pricing and price discrimination schemes. Of special interest is the greater ability of airlines to benefit from the technological change in information processing. For the airlines the transactions costs of operating these extensive price discrimination/peak load pricing schemes were relatively low in relation to the rewards. This does not mean that it is not possible to be successful without such schemes. Southwest operates very differently from the other airlines making minimal use of these techniques and manages to be a highly successful airline.¹⁶ However, the lesson is clear that the transactions/metering cost innovations that have had such a large impact on airline pricing have not yet occurred in electricity.

Undoubtedly, the failure to run with the ball of peak load pricing has cost the electric utility industry. Nowhere is this more apparent than in California. If the companies and the California Public Utilities Commission had begun instituting a major upgrading program for metering it is likely that the crisis could have been lessened if not averted. Peak load pricing would have sent some of the right signals to consumers. Real time pricing would have sent the precise signals. Moreover, a long-term program with the sanction of the CPUC would have made renegeing much more difficult.

The California electricity crisis and the failure to implement peak load pricing is part of

16 It has a low transactions cost frequent flyer program and a simplified rate structure compared to the majors.

a more general failure of deregulation, namely piecemeal implementation. Policies have been adopted because they are relatively easy to adopt, while other policies that were necessary for success were not followed. It is this piecemeal approach and failure to understand the larger picture that explains many of the problems with deregulation generally and in particular the problems in California.

In principal, the California restructuring appeared to be a promising development. It seemed to apply some of the recent theoretical developments and to offer the potential for greater competition and incentives for the California utilities to become more X-efficient. The implementation failed because it was piecemeal, ignored evidence from elsewhere and showed little concern for the nuts and bolts. We argue that if you fail to take these three considerations into account deregulation or restructuring is going to fail or at best provide essentially zero net benefits. Let us see how the California approach made these three serious errors. Starting with the nuts and bolts California failed to introduce significant amounts of peak load pricing or smart metering particularly to the smaller customers. This meant that the price signals received in the wholesale market were not transmitted to final consumers. Another area of nuts and bolts was forecasting. California has built little capacity yet at the time of restructuring in 1998 any forecasts of capacity shortages were ignored. This is surprising since the low elasticities of most electricity has been common knowledge for many years. In the event of shortage elementary economics says that price must rise to very high levels. Moreover the experience of the United Kingdom with a similar bidding system was that market power was easily exploited. All of these lessons were ignored and the industry went headlong into purchasing all of its electricity on the spot or short-term market.

Very little attempt was made to hedge against risk. Indeed, elementary lessons about managing risk were ignored.¹⁷ You can hedge against risk by choosing among different fuels. You can hedge further hedge against risk by entering into contracts of varying duration. A distribution company that is at all concerned about risk would have a portfolio of generation contracted for at various maturities. It might at the one extreme own some generation of its own. In like vein it might enter contracts for physical bilaterals with generators providing for power at a guaranteed price over a number of years. The portfolio would also include forward contracts and options to purchase power months or weeks ahead. Finally, some power would be purchased a few days ahead, or a day ahead or in the spot market. Unfortunately, the utilities concentrated in the very long market, the generation they still owned and the short term and spot markets, ignoring the options in the middle particularly physical bilaterals. When demand started to outstrip supply the spot and short-term markets hit the roof and claims were made about generators exploiting the market power that the bidding system gave them. This should have surprised nobody since the experience of a similar type of power pool with generators making bids had revealed how easy it was to exploit market power. Since the utilities had agreed to a price cap this

17 Fernando and Kleindorfer (1997) provide an overview of risk management for electric power. For a distribution company, the emphasis is on determining an optimal portfolio of contracts, including forwards, capacity and demand-side options, to balance the costs of such instruments against the volatility of spot market purchases and non-performance due to shortages.

lead to huge deficits and the ultimate declaration of bankruptcy on April 7, 2001 by Pacific Gas and Electric.

The California disaster shows not only a lack of understanding of some basic lessons of economics but also the dangers of piecemeal and ill-conceived deregulation. Although the utilities were no longer provided with a monopoly in the sale of power almost all of the obligations that they faced when they had a monopoly still continued. Their monopoly now consisted only of the wires, which effectively meant small and medium sized companies. Any customer who was willing and able to connect at transmission voltage could bypass their systems. Similarly, any customers worth supplying by others would be taken leaving the distribution utilities with the least profitable customers since they had default service or carrier of last resort obligations.

The California problem will be with us for a long time. It has already cost the State of California, the utilities and consumers many billions of dollars and the outflow will continue. It will correct itself eventually when the State runs out of money—the utilities are already broke—and finally consumers are forced to pay the full freight. This may not prove to be as bad by then as the current policy will have hastened a recession in the State making it more severe and thus reducing the demand for electricity. Altogether, California is a black eye for deregulation and for economists. As regulatory economists we have to take our lumps over California and learn our lessons, which is the aim of the next section.

5. What Next?

Because our critique was intended to be provocative, it may have oversimplified some issues and may come across too pessimistically. Undoubtedly, considerable progress has been made in the last 20 years. It is important to build on this for the future. Failure to learn the right lessons can set regulation and regulatory economics back. One lesson not to learn as a result of the California experience is that tougher regulation is required, for example, a return to command, control or cost of service and extensive expansion of public ownership. The lesson to learn is that returning to the old ways may be difficult. New property rights have been created, which will be defended vigorously by the new owners. Regulating the California generators will be fought tooth and nail by the generators. Alternative approaches including vigorous application of the antitrust laws and the addition of new capacity perhaps under public ownership or even by the utilities after their solvency has been restored. Changes in pricing at the retail level, including residential and commercial customers will need to be part of the process. These may involve application of some of the old ideas of peak load pricing. Making use of the new financial instruments and competitive bidding process should still be a part of a reformed system. Such devices have much to offer in terms of efficiency and risk sharing.

Another lesson is that more must be understood about the deregulatory process. This should start from the public choice insight on rent seeking. The deregulation game is an attempt to secure or redistribute the monopoly rents that exist in regulated industries. The California experience shows how badly things can go wrong if the rent distribution is disturbed too severely. In part, this stemmed from a failure to understand the incompatibility of restructuring with the continuation of an onerous default service

obligation. The problem of the default service obligation and the USO is that deregulation calls for allowing entry but the complexity of doing so while assuring that the incumbent responsible for default service is not towed under in the process is significant. This is a major problem, which is currently unsolved. For now it implies caution. For the postal sector where major restructuring of the kind in telecommunications and electricity has not taken place, this means deciding what changes to make in the USO before changes in the conditions of entry and other restructuring are allowed to take place.

The final lesson that we draw is that the expectations for deregulation should be revised downward drastically and that further deregulation should be undertaken with caution. Indeed, there may be a return to old style regulation in some areas, mostly likely in California. In other industries, for example, telecommunications it may be necessary to adopt very different policies, for example, requiring divestiture of the local wires. Local service is dominated by very large companies. If they divested their wires-only operations all of the remaining pieces would still be large enough to take advantage of scale economies. In conclusion, although a lot of interesting research and many interesting developments have taken place over the last twenty years, much remains to be done. Regulators, managers in regulated companies, policy makers, pundits and academic researchers have many problems to address in regulatory economics, at least for the foreseeable future.

References

- Armstrong, M. 2001 (forthcoming). "The Theory of Access Pricing and Interconnection." In *Handbook of Telecommunications Economics*, edited by M. Cave, S. Majumdar, and I. Vogelsang. North Holland.
- Averch, H., and L. L. Johnson. 1962. "Behavior of Firm Under Regulatory Constraint." *American Economic Review* 52: 1053–1069.
- Baron, D., and R. Myerson. 1981. "Regulating a Monopolist with Unknown Costs," *Econometrica* 50: 911–930.
- Baumol, W. J., and D. Bradford. 1970. "Optimal Departures from Marginal Cost Pricing." *American Economic Review* 60(June): 265–83.
- Baumol, W. J., J. C. Panzar, and R. D. Willig. 1988. *Contestable Markets and the Theory of Industry Structure*, Revised Edition. New York: Harcourt, Brace, Jovanovich, Publishers.
- Baumol, W. J., and J. G. Sidak. 1994. *Toward Competition in Local Telephony*. Cambridge, MA: MIT Press and Washington: AEI.
- Boiteux, M. 1949. "La tarification des demandes en point: application de la theorie de la vente au cout marginal." *Revue Generale de l'electricite* 58(August): 22–40.
- Crew, M. A., and P. R. Kleindorfer. 1994. "Pricing, Entry, Service Quality, and Innovation under a Commercialized Postal Service." In *Governing the Postal Service*, edited by J. G. Sidak. Washington, DC: The AEI Press.
- Crew, M. A., and P. R. Kleindorfer. 1996. "Incentive Regulation in the United Kingdom and the United States: Some Lessons." *Journal of Regulatory Economics* 9(no. 3, May): 211–225.
- Crew, M. A., and P. R. Kleindorfer (Eds). 1999. *Emerging Competition in Postal and Delivery Services*, Boston, MA: Kluwer Academic Publishers.
- Crew, M. A., and P. R. Kleindorfer (Eds.) 2000. (Eds) *Current Directions in Postal Reform*, Boston, MA: Kluwer Academic Publishers.
- Crew, M. A., and P. R. Kleindorfer. 2001. "A Critique of the Theory of Incentive Regulation: Implications for the Design of Performance Based Regulation for Postal Service." In *Future Directions in Postal Reform*, edited by M. A. Crew, and P. R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

- Collette, M., and J. Leitzinger. 2002. "A Retrospective Look at Wholesale Gas: Industry Restructuring," presented at CRRRI's 20th Annual Eastern Conference, May 25, 2001, *Journal of Regulatory Economics* 21(1).
- Doane, M., and D. Spulber. 1994. "Open Access and the Evolution of the U.S. Spot Market for Natural Gas." *Journal of Law and Economics* 37(2): 477–517.
- Demsetz, H. 1968. "Why Regulate Utilities?" *Journal of Law and Economics* 11(April): 55–65.
- Faulhaber, G. R., and W. J. Baumol. 1988. "Economists as Innovators: Practical Products of Theoretical Research," *Journal of Economic Literature* 26(2): 577–600.
- Fernando, C. S., and P. R. Kleindorfer. 1997. "Integrating Financial and Physical Contracting in Electric Power Markets." In *The Virtual Utility*, edited by S. Awerbuch, Boston, MA: Kluwer Academic Publishers.
- Groves, T. 1973. "Incentives in Teams." *Econometrica* 41(4): 617–631.
- Hogan, W. 2002. "Electricity Market Restructuring: Reforms of Reforms," presented as CRRRI's 20th Annual Eastern Conference, May 25, 2001, *Journal of Regulatory Economics* 21(1).
- Kolin, M. 2000. "Worksharing, Residential Delivery, and the Future of the USO." In *Current Directions in Postal Reform*, edited by M. A. Crew, and P. R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.
- Kovacic, W. 2002. "Economic Regulation and the Courts 1982 to 2001: Ten Cases That Made a Difference," presented at CRRRI's 20th Annual Eastern Conference, May 25, 2001, *Journal of Regulatory Economics* 21(1).
- Laffont, J.-J., and J. Tirole. 1993. *Theory of Incentives in Procurement and Regulation*. Cambridge, MA: M.I.T. Press.
- Laffont, J.-J., and J. Tirole. 1996. "Creating Competition Through Interconnection: Theory and Practice." *Journal of Regulatory Economics* 10(3): 227–256.
- Loeb, M., and W. A. Magat. 1974. "A Decentralized Method of Utility Regulation," *Journal of Law and Economics* 22(October): 58–73.
- Mitchell, R. W. 1999. "Postal Worksharing: Welfare, Technical Efficiency and Pareto Optimality." In *Emerging Competition in Postal and Delivery Services*, edited by M. A. Crew, and P. R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.
- Phillips, A. 2002. "What It Was Like, What Happened, and What It's Like Now: Development in Telecommunications Over Recent Decades," presented at CRRRI's 20th Annual Eastern Conference, May 25, 2001, *Journal of Regulatory Economics* 21(1).
- Rohlf, J. 1979. "Economically Efficient Bell System Prices." *Bell Laboratories Discussion*, Paper No. 138.
- Ross, S. A. 1973. "The Economic Theory of Agency: The Principal's Problem." *American Economic Review* 63(2): 209–214.
- Salant, D. 2000. "Auctions and Regulation: Reengineering of Regulatory Mechanisms." *Journal of Regulatory Economics* 17(3): 195–204.
- Shepherd, W. G. 1984. "Contestability vs. Competition." *American Economic Review* 74(4): 572–587.
- Sherman, R., and A. George. 1979. "Second-Best Pricing for the U.S. Postal Service." *Southern Economic Journal* 45(3): 685–95.
- Steiner, P. O. 1957. "Peak Loads and Efficient Pricing." *Quarterly Journal of Economics* 71(November): 585–610.
- Tullock, G. 1967. "The Welfare Costs of Tariffs, Monopolies and Theft." *Western Economic Journal* 5(June): 224–32.
- Vogelsang, I., and J. Finsinger. 1979. "A Regulatory Adjustment Process for Optimal Pricing by Multiproduct Monopoly Firms." *The Bell Journal of Economics* 10(Spring): 157–171.
- Williamson, O. E. 1966. "Peak Load Pricing and Optimal Capacity under Indivisibility Constraints." *American Economic Review* 56(September): 810–827.
- Willig, R. D. 1979. "The Theory of Network Access Pricing." In *Issues in Public Utility Regulation*, edited by H. Trebing, East Lansing, MI: Michigan State University Press.
- Worrall, J. D. 2001. "Private Passenger Insurance in New Jersey: A Three Decade Advert for Reform." AEI-Brookings Conference on Insurance Regulation, January 18, Washington, DC.