Principles of Public Utility Rates

Second Edition

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INTRODUCTION

The standards of reasonable or optimum prices for a public utility depend in part on the special characteristics of the enterprise and in part on the objectives sought in the establishment of such prices. This chapter deals with the special characteristics and concepts of public utility enterprises, with special kleig light focus on the technological and managerial characteristics that lead to declining unit costs as the scale of operations becomes increasingly large. But our discussion will be brief, since it is designed merely to supplement the more extensive discussions in the general treatises on public utility law and economics.

The term "public utility" is one of popular usage rather than of precise definition, and writers are not uniform in extending its scope to regulated enterprises such as radio and television broadcasting and community access television. The definition is no longer appropriate, if indeed it ever was, since the production and gathering of natural gas — and more generally upstream activities in the electric and telecommunications industries — are increasingly being governed by competitive forces. For present purposes, however, precise definition of a public utility company need not concern us, since the basic principles of reasonable rates can best be developed by reference to those enterprises that are subject either to outright public ownership or else to government regulation of prices and of service. Moreover, as we shall discover later, no industries are permanent utilities but evolve through a life cycle of no regulation, then some regulation, then great regulation, and finally "ashes to ashes" back to no regulation.

Throughout this book we regard regulation as the particular institution by which the state intervenes directly (not indirectly as with the antitrust laws) in selected markets on a continuing basis (Mitchell and Kleindorfer, 1980). Thus, when people speak of "deregulation" they mean "reregulation" if the state continues to intervene directly. Prices; entry and exit; new, extended, or abandoned service offerings; service standards; financial structure; accounting methods, and a host of other elements in these industries are determined by direct regulation of quasi-judicial and quasi-legislative regulatory commissions without the usual American pattern of separation of powers. Regulation represents third-party intervention by a government agency as an arbitrator between the company and the customers it serves. Ideally, the regulators attempt to maximize the net benefits of efficiency, equity, and innovation by seeking fair profits (at a level attractive to the efficient rate of new investment into the utility) and "just and reasonable" rates. The record in the United

States speaks eloquently to the difficulties facing an indepe regulatory agency in attempting to discharge that heady respons

The form of control most important in the United States in of output, although not numerosity, is the regulated private own and the private form that will be assumed throughout most discussion of price theory and policy. It should not be in however, that an economic theory of public utility rates which i under private ownership becomes invalid under public own and vice versa. On the contrary, the essential principles, as dev in these chapters, apply with modification under both for organization.

We next turn to examining the characteristics of public u We first examine the characteristics and key concepts (i.e., mega of a public utility in general and later develop the more dimensions throughout the remainder of this and the followin chapters, but not all of them in equal detail.

CHARACTERISTICS AND CONCEPTS OF A PUBLIC UTILITY

Overview

The utility industry started about 1882 and grew steadily 1917 when holding companies became important, and in fact, b the largest 16 holding companies generated over 75 percent power in the U.S. (Hall, 1983). In 1907, there were 45 private el in the city of Chicago alone and New York and Wisconsin decid regulate utilities permanently. Today, there are four broad sect the American economy that are commonly regulated and often re to as public utilities — communications, energy, transport, and services. These industries generate about 5 percent of national in and account for about 15 percent of total investment each year, private utilities historically contributing about three-fourths o output. Utility regulation could be extended to virtually any se the legislators so rule, as in *Nebbia v. New York* (1934), tha sector is "affected with a public interest" (see also *Munn v. Il* 1877). However, there is general consensus that only portions of of these sectors need to be regulated while the rest can be left forces of competition. But there is considerable debate over parts are which, and so regulation in a specific sector of an ind or market should be regarded as an evolving or evoluti phenomenon, rather than something that is writ in stone. Neverth

Shepherd (1985, p. 330) has courageously outlined the competitive versus the monopoly portions of these sectors in Table 1-1, including both privately-owned sectors (for the most part telephone and electrics) and publicly-owned sectors (for the most part urban systems and postal service), as they are currently perceived.

TABLE 1-1
Traditional Utility Sectors and Their Current Status

Primarily Monopolies	*Primarily, Partly, or Potentially Competitive*
Local telephone service	Long-distance telephone
Local electric power distribution	Specialized postal services
Local natural gas distribution	Railroads
Basic postal services	Waterways
Cable television	Pipelines
Urban transit	Airlines
Water and sewage	Broadcasting
Ports	Hospitals
	Trucking

Source: Shepherd (1985), Table 12-1, p. 330.

A public utility is a constellation of characteristics, *no one of which is entirely unique* (Howe & Rasmussen, 1982, Ch. 1). In the end, public utilities are public only by law, with limited property rights endowed by their creator. However, the following combination of conditions and concepts are often associated with the regulation of companies that are generally classified as public utilities.

1. Public utilities are often characterized by technical conditions of production that lead to lower unit costs with ever increasing levels of output within their legally and/or economically restricted market area. These cost advantages may be due to "economies of scale" and/or "subadditivity of costs" (see infra, this chapter, for explanations of these concepts). When these conditions prevail, the market is said to be a "natural monopoly," in which case a single firm can supply the entire market at a lower cost than can two or more firms; hence, in the presence of entry barriers, competition can only increase social costs and is undesirable.
2. A public utility provides a service that is "important," "essential," "vital" — perhaps a "necessity" for which present

livelihood or future societal growth mandates the supply. an economist this roughly means that both the utility servi direct price elasticity of demand (based on a derived dem as an intermediate service) and the cross elasticity of dem (and supply) is low or inelastic. However, *see infra*, this chap for an explanation and evaluation of this notion.

3. Most regulated industries are capital intensive. For instar utilities often have $3-$4 of assets for every $1 of sales, whe for manufacturing companies the ratio is $.80 of assets for e $1 of sales. In addition, capital assets costs are rising fa than prices in general in the economy. For instance, the aver cost per kilowatt-hour (kwh) of installed, electric generat capacity was $200 in 1960 (CPI = 88.7) and $1,000 per kwh 1984 (CPI = 311.1); electricity investment cost increased five ti whereas the overall prices increased only three and a half tin Moreover, the facilities of a public utility are often classified social overhead capital. These services are not consumed dire but are a primary requirement in the direct production of goo As with other social overhead capital (such as transportati education, and public health), utility investments invo expensive, durable, lumpy, high fixed cost and high sunk cost cap outlays. Utilities are also allowed to exercise eminent dom in acquiring property, perhaps even by coercion.
4. Most regulated industries sell services, rather than goods wh ordinarily (save, e.g., natural gas) cannot be stored. This a means the services are both nonstorable and nontransferal which gives them a special place from the point of view price policy (Houthakker, 1951, p. 2). Because production a consumption are synchronous, utilities need to maintain exc capacity to meet peak demands and generally to maintain dir connections by wire, pipe, or other means, with their custome Customers have great difficulty changing suppliers. Suppli therefore can control use and can prevent reselling, whi taken together with varying elasticities, makes price discrimi tion by them feasible.
5. Costs vary by time of use and consumers have diurnal, perioc and seasonal demands. As a result of these factors, utilities concerned with the (Phillips, 1984, pp. 404-405): (1) *peak or p load factor*, i.e., the maximum load consumed (or produced) a system in a stated period of time; (2) *diversity factor*, i.e., sum of noncoincident maximum demands of a syster customers divided by the maximum demand on the wh system; (3) *utilization factor*, i.e., peak load divided by syst

capacity; and (4) *load factor*, i.e., annual sales load divided by peak demand.

6. Public utilities are normally granted partial or complete territorial integrity, being provided franchises as exclusive (or quasi-exclusive) suppliers of a particular configuration of services in a given geographical area. Regulatory approval is often required to offer a new service, or to extend, modify, curtail, or abandon a particular service. A public utility is expected to provide just and reasonable services to all who want them at the prescribed, regulated prices.

Although all of the above characteristics may be used to describe a public utility, it will be shown that only the first, under certain circumstances, is a necessary condition. Obviously, government intervention is itself a sufficient condition for regulation. In any case we shall look at some of the more important of these elements discussed above in greater detail in this chapter and throughout the book.

Definition of the Term "Public Utility"

While traditionally it has been presumed that the primary purpose of regulation was, ostensibly at least, the promotion of the public interest through the protection of consumers against exploitation, the more recent private interest theories of regulation and transaction cost literature described in Chapter 2 have challenged, but not vitiated, this presumption. For the purpose of this study, an enterprise is not regarded as a public utility, at least for the most part, unless the regulation to which it is subject includes direct control of its rates of charge for services and a limitation on its allowed rate of return. Governmental price control alone is not enough to confer public utility status upon an enterprise or an industry.

An additional requirement is that the enterprise must be limited in its opportunities to earn a rate of return in excess of what a company with similar risks might be expected to earn, over an extended period, in a competitive industry without price and entry regulation.

This definition will not govern all our discussions, for to do so would effectively foreclose discussion of franchising, major segments of the natural gas industry, and the issues involved in the transition from the regulation of profits to the regulation merely of prices. Moreover, it does not comport precisely with American judicial opinions nor the older institutionalist usage where the phrase "business affected with a public interest" was used in a broader sense, while restricting the term "public utility" to an enterprise enjoying special grants of

authority and operating under an obligation to serve all ap without undue discrimination. Statutes sometimes applied purpose definitions, as in the federal statute the Public Utility Company Act of 1935, which restricted the term "publi company" to a company engaged in some segment of the electric business.

Major Classes of Public Utilities

Historically, public utilities have been divided convenien two major classes: (1) those enterprises which supply, dire indirectly, continuous or repeated services through more permanent physical connections between the plant of the s and the premises of the consumer, and (2) the public transp agencies. The most important members of the first class a enterprises supplying electricity, gas, water, and telecommunic The transportation agencies were sometimes divided into railroads along with competing forms of transit public transpor and (2) the local transit systems.

Transportation Industries. Until the 1970s, the United transportation industry was one of the most regulated sectors economy. Railroad, common carrier trucking, bus, airline and transportation companies were subject to extensive economic regul The foci of public regulation were on entry, exit, and rate rule nation depended on common carriage, the backbone of the tra tation system, to supply freight and passenger services. Transpor was presumed to be a business "affected with the public interes few carriers had complete freedom to change prices, modify rou services or merge with, or acquire, other companies. Goverr officials actively observed management actions and routinely use laws of the land to minimize or eliminate monopolistic and comp practices. Then came the movement to substantially reregulate a deregulate the transportation industries.

On November 9, 1977, the amended Federal Aviation A 1958-Insurance Risks was signed into law, extensively deregu the domestic air cargo industry and ushering in the era of signifi increased competition in interstate, as well as intrastate transport In rapid succession, the federal government adopted legislativ deregulating entry, exit, prices and other economic aspects c interstate domestic airline passenger business (1978), trucking (railroad transportation (1980), bus transportation (1982), and most s freight forwarding (1987). Reregulation, rather than deregulation,

more appropriate term for the overhaul of the transportation
ns, since most of the acts did not end, but significantly lessened
)mic regulation. As a result, most entry, exit, and rate decisions
been returned to the jurisdictions of the private sector.
)y the previous terms defining public utilities (rates directly
)lled by regulations and/or limitations on permitted rates of return),
10 longer appropriate to include transportation within the broad
ional public utility context. Readers interested in the current and
y competitive transportation industry are referred to special treatises
en specifically on that subject, such as that by Stephenson (1987),
1 contains citations to the reregulated era as well as many historical
rations of rate-making problems in the railroad, trucking, and
transport sectors that led to the restructuring of the industries.
The systematic development of principles of public utility rates in
book will refer primarily to nontransport utilities, and especially
ie electric, natural gas and telecommunications companies, but
rical references will be made to the transportation industries insofar
ndmark decisions and issues were derived from them. The reason
his narrowed emphasis lies in the closer approach to natural
opoly enjoyed by the nontransport companies and their long
tion of rate-base and rate-of-return regulation.

Transmission and Distribution. Despite the distinction just drawn
'een the transportation agencies and the nontransport businesses,
most of the latter engage in transport if we use "transportation"
broad sense to include the functions more frequently referred to
ransmission" and (in gas and electricity parlance) "distribution."
, a company may have a production department, such as an
ric company which generates its own power or a gas company
h manufactures its own gas, but the transmission-distribution
e of the business is a vital part of most public utility systems and
constitute the major component of the total cost of service.
:over, even though the entire utility system is usually subject to
lation, it is likely to have derived its recognized utility status from
lepartment of the operations concerned with the transfer of the
or the electricity, or the telephone messages from one location to
her.
The more clearly entrenched public utility status of the transmission
ct of a regulated industry is illustrated by the controversy as to
lesirability of control by the Federal Energy Regulatory Commission
field prices and pipeline transmission rates and service. The
er has been largely settled in favor of a competitive solution,
:eas the latter remains contentious. In the field of electric power

supply, companies producing power merely for sale at the bus bar are increasingly contending that their business should be subject to regulation by neither the federal government nor the state regulatory commissions. In Great Britain, the first step toward the complete nationalization of the electric power industry was the nationalization of the main transmission system, the "grid." The economic significance of these facts will be noted in a later paragraph in this chapter.

"Private" Business Versus Business "Affected with a Public Interest"

We already in effect have defined a public utility as any enterprise subject to regulation, including price regulation, of a type designed to place limits on its opportunity to earn profits greater than an unregulated and competitive firm might be expected to earn. And in order to come still closer to traditional usage, we may amend the definition to have it apply only to those enterprises subject to regulation as a matter of long-run policy, rather than as a temporary expedient in wartime or some other emergency. But what are the special attributes of an enterprise, or of an industry of which the enterprise is a member, that give it utility status even in a country that has gone as far as has the United States in its reliance on the automatic forces of market competition for the regulation of economic activities?

The Legal Tradition. Down to the decade of the 1930s, the question just raised was often discussed as a legal problem — specifically, as a problem in constitutional law. Except in times of emergency, state and Federal legislatures were held by the Supreme Court of the United States to have no power to impose price restrictions on ordinary business enterprises. Statutes imposing such restrictions were held void as violations of constitutional guaranties of property rights, including the guaranties of the Fifth and Fourteenth Amendments. But exception was made of certain types of business said to have been "dedicated to a public use" or "affected with a public interest," and these types included the railroads and the familiar municipal utility companies.

A layperson might suppose that a list of all businesses affected with a public interest would be very long and that it would exclude only the producers of fripperies or luxury goods, which the community could very well do without. In fact, however, the early Supreme Court rulings were much more restrictive and did not go very far beyond the traditional public utility field in recognizing legislative power to fix prices or to impose upon private businesses restrictions not merely designed to protect "health, safety, and morals."

Economic Interpretation. Perhaps the most plausible way to rationalize these early legal cases, which seem to deny any public interest in the production of vitally important goods and services, is to infer that what the courts were denying was the public importance of any single producing firm or enterprise rather than the public importance of an entire industry. But the rationalization would not fit all the cases; and it would be cogent only under the assumption of competition among many producers, no one of which has a sufficiently large share of the market to make its output or price-fixing policies a matter of general concern.

Today, however, any attempt to explain the early judicial distinctions between a public and private business has little more than historical interest, since the Supreme Court has now changed its own position, as indicated by the famous *Nebbia* case of 1934 in which the Court declared that the legislative power of price regulation was not limited to a public utility. Legislative proposals to place a given industry under price regulation may now be considered on their merits from the standpoint of economic and social policy, and without serious danger of upset by reason of conflict with the older, traditional legal doctrines. But this does not solve the problem; it merely shifts the emphasis from considerations that have seemed of special importance to lawyers and judges to considerations that seem valid to people unindoctrinated in legal lore.

Essential Nature of the Service and Public Utility Status

The preceding paragraphs based on the historical conceptions of regulation defined a public utility as any enterprise actually subject to regulation as a public utility. But this definition begs a question that must now receive attention: why certain types of enterprise are, or should be, singled out for this treatment whereas others are free from direct price control and from related types of regulation except, perhaps, in a period of emergency such as war. Even those modern writers that are sympathetic toward regulation generally agree that no simple or single answer will suffice. Regardless of our paradigmatic proclivities, all may agree that the economic and social forces that have imposed regulation on the electric, natural gas, and telecommunications companies are multiple and complex.

Nevertheless, two attributes of a public utility business have received emphasis in the literature, and they will be discussed in turn. The first is the special public importance or necessity of the types of service supplied by utility enterprises; the second is the possession of specific physical and human assets like utility plants,

distribution networks, and technical expertise that lead almost ine to monopoly or at least to ineffective forms of competition. As Cl (1950, p. 25) neatly puts it: "Necessity and monopoly are prerequisites of public utility status."

Earlier writers sometimes stressed the special privileges u accorded to public utilities as justifying special regulations-pri including the power to take private property under the law of er domain and the right to use the public streets. But current w while conceding a relationship between possession of privileg subjection to special duties, no longer view this relationship as cause and effect. Indeed, even in early years, the courts did no their list of "businesses affected with a public interest" to businesses enjoying legal privileges denied to ordinary businessp See, e.g., Chief Justice Taft's opinion for the Court (in *Wolff P Co. v. Court of Industrial Relations of Kansas,* 262 U.S. 522, distinguishing three classes of business "clothed with a public int justifying some public regulation.

The Meaning of Essential. As to the character of public services considered as a group, few people would deny that the essentials of modern living in the sense of having price ine demands rather than mere luxuries or conveniences which have price elastic demands. An inelastic (elastic) demand means tha quantity change is proportionately less (greater) than any price ch Thus, the price may be raised to an inelastic demander with a rela modest curtailment of consumption. A well-functioning natura distribution system, for example, is a matter of inordinate impor to the nation. Especially in a large city, even a temporary stoppa "brownout") of electric power service is serious, and a prolc cessation (a "blackout") would be disastrous. This recognized p importance of adequate utility service, available without del reasonable rates and without unjust discrimination, certainly h to account for the public demand for regulation even in a peri American history which was notably unfriendly toward govern interference with business.

But what the recognized importance of public utility service to account for is the restriction of regulation to services which, hov essential they may be to the life of a community or the whole na are no more so than are the supplies of many commodities and se produced and distributed by unregulated business. Granted that el power and telephone service in some senses are necessitie contemporary living rather than mere luxuries, so also are clothing, and housing. Yet the prices of these essential product

The public interest theory warns that free competition may well lead to the survival of only one firm (and attendant potential dangers) in a natural monopoly setting (for as George Orwell said: "The trouble with competitions is that somebody wins them."). Smaller firms may go bankrupt or be acquired by the dominant company, and the consumer is feckless. For a somewhat skeptical evaluation of this possibility see the section entitled "Destructive, Ruinous, or Cutthroat Competition" later in this chapter.

It should be noted that if demand is elastic and/or barriers to entry are low, the natural monopolistic firm, if it exists, need not be regulated as it is without market power. Regulation may also not be needed if the auctioning of franchise privileges is feasible, but this point is debatable as can be seen in Hazlett's (1985) comprehensive survey. Some proponents of regulation in the public interest argue that the capital intensive nature of an industry, such as that found in electric generation, forms a barrier to entry. Many other economists argue, however, that even if the capital requirements are high, which is not clear if one is speaking in relative as opposed to absolute terms, if profits are high enough, the required financial capital will be forthcoming. Thus, many natural monopolies need not be regulated, and a regulated industry need not be a natural monopoly in certain segments or even in all of its operations. Similarly, neither the peaking or inelasticity of demand conditions, nor the supply conditions alone, necessarily imply natural monopoly and the need for regulation. These two together, in combination with behavioral conditions of potential entrants (pricing strategies), may be *sufficient* determinants of that *bête noire* called natural monopoly.

Problems of Identification. A natural monopoly is of particular interest to this study inasmuch as it is *sine qua non* of regulation according to the public interest theory of regulation. However, determining whether natural monopoly or competition characterizes a specific industry is a complicated task that depends on the supply (cost and technology) structure, the demand pattern, and the behavioral intentions (e.g., pricing strategies) between incumbent firms and potential entrants. (We draw on the Asch and Seneca, 1985, Chapter 13, format in developing this.)

Even with the best of intentions and of qualifications of the analyst, the econometric estimates of cost and demand may be challenged because of inaccurate or insufficient data or because of inadequacy of estimating techniques. Behavioral interactions are often assessed on the basis of historical performance which may not be a good surrogate for the future. Thus, the costs and benefits of a policy

of regulation, reregulation, or deregulation are subject to consi uncertainty. (As Goethe observed: "When ideas fail, words c very handy.") Thus, the problem of deciding when to regu industry is relatively easy if based strictly on theoretical groun assessing whether an industry is naturally monopolistic or com requires much more information, skill, and judgment. This im task is beyond the scope of our assignment.

Prevention of Undue Price Discrimination

A monopolist practicing price discrimination can cause an transfer from customers of the service to investors, and this is ge regarded as undesirable. Price discrimination involves charging for technically similar commodities that cannot be accounted the (marginal) costs of production, distribution, transportation, s risk, or uncertainty. The necessary conditions for a monop practice price discrimination among customer classes are dow sloping demand curves that differ in their elasticity for two o identifiable classes of buyers, and the segmentation of those r at a low enough cost to deter resales from the low to hig buyers. Clarkson and Miller (1982, p. 240) emphasize that the r ments posited by some economists that there must be contr other sellers and over entry appear overly restrictive.

Railroads and telephony provide the most common historic of successful price discrimination in that inelastic demander been charged higher prices than were more elastic customers ironic that railroads in the 1800s fit both the contrasting mo natural monopoly or destructive competition depending upon th circumstances). Towns without railroad competition were c grossly discriminately high rates to the point that noncompetitiv hauls were more expensive than competitive long hauls. Small sh also fared poorly. Similarly business telephone users, such as brokers, are charged higher prices for their inelastic demand can be accounted for by peaking or other differential costs. The of price discrimination advocate regulation to stop *undue* di nation.

The criterion for regulation here shifts from the norm of ec efficiency to that of equity. According to Dewey (1974, pp. probably some variant of equity has motivated most regulatio issue is what constitutes *undue* discrimination. Clearly, some differentiation — which is not necessarily price discrimination even some non-undue price discrimination is acceptable. In f we show in Chapter 20, discriminatory Ramsey pricing may,