To the Graduate Council:

I am submitting herewith a dissertation written by Yasuji Otsuka entitled "The Effectiveness of Regulation: Evidence from the CATV Industry." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

John W Mayo

John W. Mayo, Major Professor

We have read this dissertation
and recommend its acceptance:

William F. Fox

Thomas P. Boehm

Hui-shyong Chang

Accepted for the Council:

CW Minkel

Vice Provost
and Dean of The Graduate School

THE EFFECTIVENESS OF REGULATION:
EVIDENCE FROM THE CATV INDUSTRY

A Dissertation

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Degree

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ABSTRACT

Prior to the implementation of federally mandated rate-deregulation (Dec. 29, 1986) the cable television industry was under various types of regulation. State governments got involved with the industry along with local governments, and several different techniques were employed to regulate the industry, including: (1) local franchise regulation; (2) state public utility type regulation (rate base / rate-of-return regulation); (3) local regulation assisted by a state cable commission; (4) state common tariff regulation; and (5) state deregulation. The purpose of this work is to examine the effectiveness of these alternative types of regulation. Assuming that a regulatory commission seeks its own well-being by balancing possibly conflicting regulatory objectives, we may expect that the regulatory commission behaves differently under the alternative regulatory frameworks. Based on this, a series of implications for a typical regulatory commission's conduct can be obtained and compared with the observed behavior of regulated cable systems.

The results indicate that states that used rate base / rate-of-return regulation, preempting local governments' power to regulate the industry, were most effective in lowering rates for basic cable service, while cable systems in the states that chose the dual approach to regulate the industry (local regulation assisted by a state cable commission) were found to charge higher basic rates than cable systems under any other type of regulation. In terms of free public service and the quality of services, however, the latter was found to be most successful and cable systems under rate-of-return regulation were

least effective in these areas. Overall, the series of implications for the behavior of regulatory commissions and regulated cable systems was proved. This implies that there is a link between the regulatory framework and the regulator's conduct, and consequently the regulated firm's behavior.

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CHAPTER I

INTRODUCTION

Prior to the 1960s, it was generally believed among economists and public policy analysts that regulation of firms was instituted in response to the demands of the public and administered to promote the public interest.[1,2] This belief, which has been dubbed the Public Interest Theory, began to receive serious scrutiny in 1962.[3] In a cross sectional study of the early years of the electric utility industry, Stigler and Friedland (1962) found that state regulation was ineffective in lowering prices and constraining price discrimination. With this evidence, they successfully cast doubts on the necessity of regulation

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[1]For a brief discussion of the debate over the effectiveness of economic regulation from Munn v. Illinois (1877) to the present, see Trebing (1984a).

[2]There are two kinds of public control over businesses: economic regulation, which primarily controls prices, earnings, and expenses, and restricts the entry and exit of firms; and social regulation, which deals primarily with the activities and output of the firm. In this thesis, we limit our discussion to economic regulation.

[3]It should be noted that there is a distinct difference in the constitution of "public interests" (social objectives such as economic efficiency, ethics, development of the industry, ...etc.) among economists. While institutionalists view regulation as an arrangement for balancing conflicting social objectives and preventing the abuses associated with the unrestricted excercise of monopoly power, neoclassicalists seem to put more emphasis on the promotion of economic efficiency as the public interest.

Goldberg (1976) provided another view of regulation as a long term contract administrator protecting the producer's right to serve and the consumer's right to be served. His view may well fit the institutionalists' perspective.

by questioning the ability of government to change industry behavior and pointing out the possible effects of interindustry competition.[4,5]

This empirical evidence, along with evidence taken from the railroad and airline industries, prompted Jordan (1972) to look for an alternative explanation of these findings.[6,7] In an attempt to establish a single "producer protection" hypothesis regarding the different economic effects of regulation, Jordan divided the regulated industries into two groups on the basis of the prior market structure. One group consists of industries whose prior market structure was a natural monopoly. The other group includes those whose prior market structure

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[4]Stigler and Friedland pointed out two circumstances which may explain their findings as follow:

> The ineffectiveness of regulation lies two circumstances. The first circumstance is that the individual utility system is not possessed of any large amount of long run monopoly power. It faces the competition of other energy sources in a large proportion of its product uses, and it faces the competition of other utility systems, to which in the long run its industrial (and hence many of its domestic) users may move...
>
> ....
>
> The second circumstance is that the regulatory body is incapable of forcing the utility to operate at a specified combination of output, price, and cost. (p.11)

[5]Another significantly influential work in 1962 was done by Averch and Johnson (1962). They found that the method of regulation itself, i.e., rate base / rate-of-return, was conducive to economic inefficiency by encouraging the regulated firms to overinvest in capital.

[6]Jordan's paper was originally presented at the Fourty-fifth Annual Conference of the Western Economic Association on August 28, 1970.

[7]For the empirical evidence from the other regulated industries in which economic regulation was found to have increased prices and price discrimination, see Kolko (1965) and Jordan(1970).

was oligopolistic or competitive. In so doing, he claimed that the producer protection hypothesis implies that "following the implementation of regulation over the natural monopolies, the prices will be essentially unchanged and will be above marginal costs, price discrimination will continue to be widely practiced, and rates of return will remain above those which exist under competition." (p.155). On the other hand, when the prior market structure was oligopolistic or competitive, the producer protection hypothesis implies that following the implementation of regulation, prices should increase, price discrimination should grow, realized rates of return improve, and entry is likely to be more restricted. Although the producer protection hypothesis could not fully explain the observed pattern of regulation (e.g., why are certain industries regulated, while some are not ?), it did extend doubts regarding the ability of regulation to promote stated social goals.[8,9]

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[8]The inconsistent findings and actions (taken by regulatory commissions) with the implications of the public interest theory led some of those who accepted the theory to revisions, such as that: (1) regulatory agencies were created for public purposes, but were mismanaged; (2) despite the public purposes, the regulated industries have managed to "capture" their regulators so that the commissions become the protector of the regulated firms. Jordan's producer protection hypothesis, however, showed a clear distinction from these revisions. It suggested that regulation was designed to protect the regulated industries from the outset.

[9]For the public interest theory to be effective, it also requires a confidence in government's ability to promote social objectives, a distrust of the effectiveness of market forces in promoting efficiency (and / or balancing conflicting objectives), and no (or minimal) cost of regulation. In the 1960s, in addition to increasing doubts of the government's ability and intent, there was an effort to regain the

(Footnote Continued)

Finally, a fundamental change in the way regulation was analyzed was provided by Stigler (1971). In his economic theory of regulation, Stigler viewed the regulator as one who seeks both votes and dollars. Moreover, he argued that regulation is supplied in response to the demand of interest groups, not of the public. As a result, the observed pattern of regulation was likely to be a product of the interaction of the supply of regulation (by regulators and legislators) and the demand for regulation (by interest groups). Even though Stigler did not discuss any empirical results specifically in the public utility industry in the 1971 paper, it was generally perceived as the theory which covers the full range of regulatory activities.[10,11] While there have been serious disagreements among economists as to the acceptability of Stigler's theory as the general one, no one would deny the significant role of the theory.

The intention of this thesis is not, however, to refute the economic theory of regulation, but a considerably more modest one. Specifically, two aspects of the discussion of the effectiveness of

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(Footnote Continued)
confidence in market forces promoting efficiency relying on potential competition. See Demsetz (1968).

[10]For example, Peltzman (1976) stated as the following.

> What Stigler accomplished in his theory of economic regulation was to crystallize a revisionism in the economic analysis of regulation that he had helped launch in his and Claire Friedland's work on electric utility. (p.211)

[11]Note that Stigler's economic theory of regulation can allow capture by effective political groups, as well as capture by effective interest groups.

economic regulation are lacking. First, considering the crucial role of empirical analysis in formulating and refining the theory and its implications for public policy, one must be surprised at the very limited number of empirical studies in this area and their inconclusive results. As far as we are aware, following Stigler and Friedland's seminal paper, Moore (1970), Cowing (1978), and Meyer and Leland (1980) are the only empirical inquiries into the effectiveness of regulation. However, they were all in a single industry, i.e., the electric utility industry, and the results were not consistent.[12] While these results have, to this point, been inconclusive, it is interesting to note that, particularly in policy settings, the effectiveness of regulation in the

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[12]For example, Moore (1970) estimated the benefit of regulation using a 1962 cross sectional data focusing on residential electric customers, and found that regulation conferred a benefit of only 3 percent reduction in price. On the other hand, Meyer and Leland (1980) measured a possible gain of price reductions in the electric utility industry on a state base, employing basically the same technique used by Moore. They found that significant differences in the effectiveness of regulation across states existed, and price discrimination between residential and commercial-industrial customers varied over time. Treating all states as a sample, the null hypothesis that observed prices are the same as would be charged by a profit maximizing monopolist was rejected. Based on the so-called Averch-Johnson model, Cowing (1978) attempted to estimate the effectiveness of regulation in constraining profits. He, too, found that regulation was generally effective and varied across firms and over time. It should be noted, however, that all these studies compared the firm behavior observed under regulation with a hypothetical firm behavior which is likely to take place without regulation (which is pure monopolistic behavior), while Stigler and Friedland (1962) examined the actual differences of regulated and non-regulated firm behavior.

public utility industry has been discussed with serious doubts, if not in a totally negative sense.[13]

Secondly, the existing literature focused exclusively on rate base / rate-of-return regulation. As such, little or no insights into the effectiveness of alternative forms of regulation exist. Moreover, the theory of regulation to this point has been silent on any subtle differences that might exist. As Peltzman (1976) and Evans and Garber (1988) made it explicit, however, a regulator, whose behavior is assumed to be that of a vote getter (in the Peltzman case) or a personal utility maximizer (in the Evans and Garber case), can be a protector of producers or consumers, or simply a mediator of conflicting interests by seeking his own interest. In essence, "public" protection or "producer" protection is an end result, and the regulator's conduct and performance of regulation is likely to vary in different institutional settings (e.g., alternative forms of regulation) with a given behavioral assumption. Granted that a regulator seeks his own well-being, not that of the public nor the producers, it is still possible in theory that the regulator ends up by promoting the well-being of society within a given institutional framework.

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[13] In the deregulation of the cable television industry, a typical doubt on the effectiveness of regulation was expressed by Baldwin and McVoy (1983) as follow:

> ...the success of rate regulation of monopolies in the United States--in energy, transportation, and communication--in terms of price and performance efficiency has very limited. If the state and federal commissions, with professional staffs, are unable to regulate rates, can a cable commissions of volunteer citizens and limited or nonexistent staff do so ? (p.232)

The purpose of this thesis, then, is to provide evidence that will contribute to a better understanding of the effectiveness of regulation. To accomplish this, we take cross sectional data from the cable television industry in 1982, and conduct an empirical analysis of the effectiveness of regulation. In the process, we attempt to examine the possibly different effects of various types of regulation on prices because the cable television industry's basic rate was regulated at that time by several forms of regulation (i.e., local franchise regulation, state public utility type regulation, local regulation assisted by state independent cable commissions, state common tariff regulation, and state deregulation). The different levels of government control and forms of regulation may confer different objectives on each regulatory commission, and may, accordingly, lead the regulatory bodies to different types of conduct. For example, a local regulatory commission might place more value on free public services, possibly obtainable from the franchised cable system as a concession to a price increase, than a state regulatory commission does. Or, a state public utility commission (in which the state legislature vested the authority to regulate the cable television industry) might place more value on constraining the rate of return to the cable system because of its traditional function than an independent state cable commission (which was established for the purpose of regulating the cable television industry). In Chapter III, a simple utility maximizing model of the behavior of the regulator implies that regulators in the different institutional settings are likely to set different price levels.

There are several areas in which we hope this study will be able to contribute in the debate over the effectiveness of regulation. First, as mentioned before, the study should help to generalize the results of studies of the effectiveness of regulation in the public utility industry by providing additional information from a non-electric utility industry. Secondly, since the deregulation of the cable television industry (Dec 29, 1986), price hikes have been seen and discussed in many places. For example, the average basic rate was raised by 31 percent from 1986 to 1988 while the rate of inflation was very low during that time period.[14] On the other hand, from 1976 to 1980, when the rate for basic service was regulated, the total price increase was 15 percent while the rate of inflation was 38.4 percent.[15] Amid such price hikes, some Congressmen have cautioned the industry by implying a reconsideration of regulation. Hence, the information provided here, to the extent that it reveals which forms of regulation were most conducive to economic efficiency, is important in its own right. Thirdly, the study enables us to test the hypothesis regarding the behavior of the regulator as a utility maximizer. We derive some expected behavior patterns of regulators in different institutional settings, and compare them with observed performances. Fourthly, it may be possible to observe the effects of price regulation on prices of non-regulated goods and

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[14]See U.S.A. Today, Dec 22, 1988.

[15]This statistic was provided by the cable television industry to the U.S. Congress in the effort of deregulation. See U.S. Congress (1981)

services. Cable firms provide two separate services, basic and pay TV services, and only basic service was regulated during the sample period. Since the demands of basic and pay TV are interdependent, the effects of regulation on basic service may be reflected in the prices of pay TV services.

In the next chapter, we will provide a background of the cable television industry. Brief sketches of the services and technology of a typical cable system will be presented, and the evolution of the federal, state, and local government involvement along with the development of the industry will be discussed. The previous studies which are relevant to our study and data source are also supplied in Chapter II. In Chapter III, we will build a theoretical model to achieve our stated goals. The expected effects of demand and cost conditions, and various forms of regulation on prices are discussed in detail in that chapter. Then, a set of empirical models will be provided on the basis of the theoretical model. The econometric results of demand and cost estimations, and a reduced form price equation will be presented in Chapter IV, and the findings will be discussed along with policy implications in Chapter V.

CHAPTER II

BACKGROUND ON THE CABLE TELEVISION INDUSTRY

The cable television industry has been one of the fastest growing industries in the United States. This rapid growth of the industry has been largely due to technological developments in and around the industry. For example, channel capacity has expanded rapidly over time (see Table II-1). The development of the communications satellite made it possible for cable firms to utilize the expansion of channel capacity by providing super-stations (e.g., WTBS, Atlanta, WGN, Chicago, and WOR, New York), satellite distributed services (e.g., ESPN, USA Cable Network, and MTV), and pay TV programs (e.g., HBO, the Movie Channel, and Showtime). These enhanced services enabled cable firms to enter large urban markets. Today (1987), about 55 million houses are passed by cable in the United States, and 40 million households subscribe to basic cable service. Nearly 30 million units of pay TV cable services are purchased monthly, and some of the cable systems provide interactive services such as home security, home shopping, and games, by way of the two way system.

The first federal regulation of the cable industry was imposed in 1962, and extended fully over the industry in 1972. As the industry grew, and as the technological environment around the industry changed, however, the restrictive rules imposed on the industry were gradually lifted. Finally, rate regulation on basic service, which was required of all local governments in the 1972 rules, was preempted in the Cable Communications Policy Act of 1984. In this chapter, we will present

Table II-1. Channel Capacity of Cable TV Systems, 1972 and 1987.

number of channel capacity	1972	1987
54 and Over	0	565
30 - 53	0	3,272
13 - 29	361	1,610
6 - 12	2,026	1,557
Below 6	387	38
Not Available	65	10
Total	2,839	7,836

Source: Television Factbook 1972 and 1987.

sketches of the services and technology of the cable television industry, and discuss the evolution of government involvement along with the development of the industry. A summary of the previous studies on the cable television industry that are relevant to our study and data sources are also provided in this chapter.

1. Services.

The cable television industry began as a mere distribution system of local broadcasters, but it grew into a multi-service industry by the 1980s. The services can be categorized into four groups: (1) traditional broadcast; (2) entertainment services; (3) print information service; and (4) telecommunication service. Although a cable system is considered to be a natural monopoly in a given franchise area, and is currently the only technology which can provide such a wide range of services, the cable system faces (potential) competitors in each service. For example, over-the-air TV programs are available to almost all the U.S. citizens and are a very significant substitute for basic service, though the quality and quantity of services vary widely according to the locations. For pay TV services, in addition to multiple distribution systems (MDS) and subscription television (STV), indoor theaters, major sports franchises, and other entertainment services compete for the consumers' income. Videocassette recorders (VCR) may be a substitute for pay TV services as well.[1] In the print information and telecommunication

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[1]A recent study conducted by Levy and Pitsch (1985), using a
(Footnote Continued)

services, which have only recently been introduced and are still marginal services, the cable television industry faces competitors such as AT&T, independent telecommunication companies, Xerox, newspapers, and others.

2. Technology.

Cable television is in essence a method of distributing television, radio, and data signals from an originating location to households and business through a coaxial cable. The main components are the headend, including antennas and satellite earth stations, the distribution network, which consists of the trunk and feeder cable, and the subscriber drop. This operation of cable television (especially in its distribution system) is very similar to the one of public utilities, and once the feeder cable is placed in front of homes, the additional cost of providing cable service to one extra home by extending a drop line is small.

Signals are carried through over-the-air, microwave systems, or communications satellites, and received by antennas and earth stations. The received signals are strengthened, cleared, and assembled in the headend, and proceed to the distribution system. The distribution system can be constructed underground or aerial, and the cost of construction

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(Footnote Continued)
cross sectional state data, confirmed that VCR and cable services were substitutes.

varies significantly between them.[2] Most of the cable systems in operation were built with coaxial cable. Since electric signals travelling through coaxial cable attenuate rapidly, amplification is required at a certain distance. The acceptable interval between amplifiers decreases as the channel capacity increases. An amplifier was required every 2,000 feet for a 20 channel system and every 1,200 feet for a 40 channel system with the technology of the early 1980s.[3] In addition, the maximum number of amplifiers in a system is limited because signal quality deteriorates with repeated amplification. Through drop lines the signal is sent to the final destination, homes. When the TV set does not have the capacity of receiving midband and superband channels, a converter is required.

3. Government Involvement and Industry.

In this section, we discuss the federal, state, and local government involvement in the cable television industry. Since our main concern is with state regulation and its diversity in forms and functions, we will discuss it separately after a discussion of federal and local government involvement.

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[2]The cost of underground cable construction is estimated to be 1.5 to 5 times higher than the cost of an aerial system, depending upon whether the cable is buried in a suburban neighborhood or in urban areas.

[3]See Webb (1983), p.48.

3.A. Federal and Local Regulation.

The cable television industry was one of supplementary technologies to improve signal quality of over-the-air TV programs when it started.[4] An elementary cable system was constructed by placing a receiving antenna on top of nearby mountain and sending the received signals through the distribution system to the subscribers' homes. The cable television industry, which was called at that time "Community Antenna Television (CATV)", had some advantages over the other supplementary technologies in its abilities to exclude those who did not want to pay the cost and carry more channels. As a result, despite its relatively higher construction cost, the cable television industry grew rapidly in rural areas and the areas surrounded by mountains where people could not receive a clear picture from over-the-air TV programs or a large enough number of channels. Because a cable system's distribution system uses local streets and public properties, local government involvement was inevitable from the beginning. The local government involvement was, however, generally limited to authorizing the use of local streets and public properties, and adopting some rules to protect the safety of life and property. In exchange, local governments traditionally levied a cost, usually in the form of a franchise fee. The relationship with broadcasters at that time was

[4]The other supplementary technologies are boosters, terrestrial antennas that retransmit signals, and translators which receive weak signals and rebroadcast them with greater power.

basically complementary, with cable firms providing better pictures of the local television stations to the subscribers.

After 1960, however, the situation changed drastically. Cable firms found that importation of distant signals through microwave relay system could increase the demand for their services. The importation of distant signals, however, met with significant resistance from broadcasters. Broadcasters argued that the importation of distant signals would fragment the local TV stations' audience, and it would cause economic injuries especially to local UHF stations, which the FCC was actively supporting in an effort of increasing the number of channels available to local citizens. Broadcasters employed two strategies in their efforts to bring pressure on the cable television industry. First, they demanded copyright fees of imported television programs. Secondly, they asked the FCC to regulate the cable television industry, arguing that cable was a threat because it would diminish broadcasters' profits and the public interest in "free" over-the-air TV programs.

Until 1962, there was no federal regulation of the industry. On one occasion when a group of broadcasters demanded regulation over the cable television industry in 1956 under the common carrier provision of the Communications Act of 1934, the FCC declined to assert jurisdiction over the industry. The importation of distant signals and the subsequent change in the relationship between the cable television industry and the broadcasters, however, had brought about a significant change in the federal government's policy toward the industry. In a very significant decision, Carter Mountain Transmission Corp (1962), the FCC prohibited a cable system from using microwave systems to import distant signals unless the local station signals were carried as well.[5] In 1966, then, the FCC decided to assert full jurisdiction over the industry, stating that the industry service was "ancillary" to broadcasting, and prohibited cable systems in the top 100 TV markets from importing distant signals.[6]

Despite that, the industry continued growing and gained more political power. The tremendous potential services cable could provide in the future through a two way system were noted by some writers, and helped the public interest argument shift from the protection of local TV stations to the development of the cable television industry.[7,8] Intense negotiations were conducted among the trading groups under the FCC chairman, Dean Birch, and the Office of Telecommunications Policy

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[5]See FCC (1962).

[6]See FCC (1966).

[7]For example, Smith (1972) stated that:

> Cable can bring into homes and into business places audio, video, and facsimile transmissions that can provide newspapers, mail service, banking, and shopping facilities, data from libraries and other storage centers, school curricula, complete course offerings leading to college degrees, cultural programs, community-originated TV fare, and other forms of information too numerous to specify. In short, every home and office can contain a communications center of a breadth and flexibility to influence every aspect of private and community life. (p.1)

[8]It should be also noted that such futuristic services gave the cable television industry a look of infrastructural technology for modern urban life. Then, along with the development of the industry, regulation of the industry as a common carrier by separating its services and distribution system was also debated.

Director, Clay T. Whitehead, and resulted in the 1972 rules.[9] Among other things, these rules relaxed the freeze on the importation of distant signals to some extent, and set some technological requirements to meet the cable's potential "blue sky" services. For example, all new cable systems were required to have 20 channels and two way capability. There were also local origination requirements and some rules regarding pay TV, signal carriages, and ownership.[10] And most importantly, the FCC set franchise standards according to which local authorities were required to regulate rates for basic service.[11]

These rules, however, went through significant changes. The local origination requirement was, for example, challenged in the federal court on the grounds that it went beyond the FCC's authority. The Supreme Court supported the FCC, but the FCC decided to abandon the rule

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[9]See FCC (1972) or Owen and Gottlieb (1986) for a summary of the 1972 rules.

[10]A cable system was required to create its own programming and make free channels available for public uses when the cable system had over 3,500 subscribers under the origination requirement rule. Cable systems were also required to carry all the local signals and "significantly viewed" signals in the market. Restrictions on cable firms carrying pay TV services included prohibitions of advertising and the broadcasting of movies made between the past 4 to 10 years. Under the ownership rule, cable firms were not to be owned by TV stations or telephone companies in the same market.

[11]The FCC required local authorities to regulate rates for services regularly furnished to all subscribers (basic service). These are charges for installation, disconnection and reconnection as well as charges for broadcast signal carriage and all required access channels, including original programming. It does not include rates for specialized programming for which a per-program or per-channel charge is made.

before the decision.[12] The FCC modified or eliminated its rules governing technological standards, access channel rules, and signal carriages as well, and the restriction on the carriage of distant signals was completely deleted in 1980. The rate regulation requirement was no exception from this trend, either. Citing unintended problems associated with rate regulation, the FCC proposed in 1975 modification or deletion of the rate regulation requirement to local authorities, and made it discretionary in 1976.[13]

In addition to a relaxed regulatory environment around the industry, technological development in the communications and electronic industries contributed largely to the growth of the industry. Channel capacity was expanded from 12 to over 100, and the expansion of channel capacity was utilized by an addition of services which were carried through communications satellites (see Table II-2). As cable television became more popular with the enhanced services, cable firms desiring to obtain a franchise in the same community began to compete by offering higher franchise fees or additional free public services. This situation led local governments to a more active role in franchising.

The combination of several factors such as: (1) the growing deregulation climate in Washington; (2) more political power gained through the growth of the industry; (3) the industry's potential "blue sky" services; and (4) the increasing competitive environment for cable

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[12] FCC v. Midwest Video Corp. (1979), 440 U.S. 689 (1979).

[13] See FCC (1975) and FCC (1976).

Table II-2. Major Satellite Distributed Services, 1982.

Service	Start-Up Date	Type
HBO (Home Box Office)	12/75	Pay service
WTBS, Atlanta	12/76	Cable Network
CBN (Christian Broadcasting Network)	4/77	Cable Network
Showtime	3/78	Pay Service
HTN (Home Theatre Network)	9/78	Pay Service
WGN, Chicago	11/78	Cable Network
C-SPAN	1/79	Cable Network
Nickelodeon	4/79	Cable Network
PTL	4/79	Cable Network
WOR, New York	4/79	Cable Network
The Movie Channel	4/79	Pay Service
ESPN	9/79	Cable Network
Gala Vision	10/79	Pay Service
CNN	6/80	Cable Network
Cinemax	8/80	Pay Service
USA Cable Network	9/80	Cable Network
Bravo	12/80	Pay Service
Escapade	12/80	Pay Service
Dow Jones Cable News	4/81	Cable Network
Spotlight	5/81	Pay Service
Christian Media Network	6/81	Cable Network
MTV	8/81	Cable Network
Financial News Network	11/81	Cable Network
HTN Plus	3/82	Pay Service
The Weather Channel	5/82	Cable Network
Black Music Network	7/82	Cable Network
The Disney Channel	1/83	Pay Service

Sources: Webb (1983) and Knowledge Industry Publications (1983) firms, the cable television industry actively sought federal deregulation beginning in the late 1970s.[14] While Congress attempted to amend the Communications Act of 1934, there were intense talks between cities, represented by the National League of Cities (NLC), and the industry, represented by the National Cable Television Association (NCTA).[15] In the debate over rate regulation, the industry argued that the services provided by cable are not essential, and numerous substitute goods are available. Also, the industry complained that cities frequently used a rate increase request as an opportunity to demand excessive non-profitable public services. In contrast, the cities viewed the franchised cable system as the only technology which can provide such a wide variety of services. Although those services can be substitutable, there is no single substitute which has the capability of providing such a large bundle of services. The cities also argued that deregulation would deprive them of the means for keeping the cable firms honest.[16]

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[14] With the development of multipoint distribution services, subscription television stations, videodiscs and cassettes, master antenna television and satellite master antenna television systems, low power television stations, and direct satellite-to-home broadcast systems, the role of cable in our national telecommunication system has changed. As a result, the need to regulate cable as was originally proposed by the Commision in 1972 is seriously in doubt. (U.S. Senate committee (1983))

[15] For the federal legislative history, see U.S. Senate Committee (1983).

[16] See U.S. Congress (1981).

Reflecting the debates and negotiations between the NLC and the NCTA, Congress finally passed, and the President signed a bill. In this Act, the Cable Communications Policy Act of 1984, the state and local governments' power to regulate rates charged by cable firms was preempted where effective competition is available, and the franchise provision was changed to be more advantageous to the incumbent firms at a renewal period by making a renewal denial of local governments more costly. Rate deregulation was implemented on December 29, 1986.

3.B. State Involvement.

In the years prior to the Federally mandated deregulation, state government got involved with the cable television industry in many different forms. Some states regulated the industry directly through public utility commissions or separate commissions that were newly established for the purpose of regulating cable, simultaneously preempting or restricting local governments' regulatory power. The other states left the authority of regulation to localities while passing some laws regarding some specific issues such as franchising, rates, pole attachment, theft of service, taxation and fees, programming, regionalization, and the provision of good service.

Since certain common characteristics among state regulation were observed corresponding to the time period in which the state regulation was instituted, we will discuss state regulation in a chronological order.[17] Through this discussion, we intend to identify regulatory objectives, and discuss which objectives tended to arise from the different forms of regulation. By doing so, we will be able to arrive at a series of predictions of a regulatory commission's performance based on the behavioral assumptions regarding regulatory commissions. These behavioral assumptions will be tested in later chapters.

Before 1971: public utility type regulation. Six states got involved with the cable television industry before 1971. They were Connecticut (1963), Nevada (1970), Rhode Island (1970), Vermont (1970), Alaska (1970), and Hawaii (1970).[18] All these states defined cable service as a public utility, and vested the regulatory authority to the existing public utility (or service) commissions, preempting local governments' power to regulate the industry. Rates were regulated by the traditional rate base / rate-of-return (RB / ROR) method.

In Connecticut, the compelling forces behind the state regulation were a pole attachment problem and the legislature's intent to wire the entire state. In Nevada, it was stated that the rates, services, and operations of cable firms "are affected with a public interest", and

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[17]See a series of studies conducted by Harvard University Program on Information Resources Policy for these findings. The series consists of: Braunstein, Kalba, and Levine (1978); Kalba, Levine, and Birinyi (1978); Kalba, Levine, Braunstein, and Hochberg (1978); Kalba (1978); Levine (1978); and Levine, Kalba, and Hochberg (1978).

[18]Since we did not take sample from Alaska, Hawaii, and Rhode Islands, we will focus our discussion on Connecticut, Nevada, and Vermont. Alaska and Hawaii were excluded because of some expected significant differnces in the demand conditions from the mainland. No sample which meet our data criteria were available from Rhode Islands.

declared the following intent: (1) fair regulation of cable systems and promotion of economical and efficient service; (2) provision of just, reasonable, and non-discriminatory rates; (3) promotions of harmony between cable systems and subscribers; (4) cooperation with other states and the federal government in regulating cable systems; and (5) authorization of the Public Commission to regulate cable systems. In Vermont, cable television was a "monopoly" by the statute's definition, and the Public Service Board was granted statutory authority to regulate cable service as a public utility in 1970. Most of the Board's cable time was spent on rate regulation.

In general, it can be said that state regulation during this period was a mere extension of public utility regulation, viewing cable television as a natural monopoly and considering cable service as a public utility, or attacking some intrastate and intercommunity problems such as pole attachment and cable regionalization. There is no clear and significant evidence that state regulation in this period was prompted by the industry.

<u>1971-1974: broad application of regulation through separate cable commission (or office)</u>. From 1971 through 1974, 5 states began regulating cable systems. Massachusetts (1971), New York (1973), and Minnesota (1973) created independent cable commissions for this purpose. Though New Jersey (1972) and Delaware (1974) used the existing utility commissions (New Jersey established a separate office in the utility commission for the purpose of regulating cable firms), cable service was defined not as a public utility in contrast to the previous states' regulation.

Massachusetts established the Community Antenna Television Commission in 1971, after having learned of corrupt franchising practices and franchise trafficking. The Commission worked as an appellate function leaving local governments the authority to grant licenses. Any objections to a local government's selection of franchisee was open to appeal. The Commission also assumed its jurisdiction over rates and reviewed all rates agreed to by the local authority or required hearings upon petition of a cable system.

The New York Commission on Cable Television was established in 1973 as an outcome of a report by Robert F. Kelly, chairman at the time of the Standing Committee on Corporations, Authorities and Commissions. The role of the state in the regulation of the cable television industry was, according to the report, not to impose utility regulation, but to regulate from an "arm's length". The Commission worked, in essence, as a review process, and was assigned more to regulate than any other state commission. Rate regulation was primarily a local matter and the Commission played only a review and assistance role.

The Minnesota Cable Communications Board which consists of seven members was established in May, 1973. The statute that established the Board required it to develop a state cable communications policy and to promote the growth and development of cable communications, eliminating disparities between rural and urban areas of the state. The Board did not regulate rates. The rates were set and adjusted by local authorities. According to a Board source, however, the industry approached the Board informally for rate regulation.

New Jersey established an Office of Cable Television within the Public Utility Commission in 1974 primarily in response to a report which described the failure of local government performance. The state's main concerns were with franchising, rate regulation, pole attachment, standards of service, and regionalization. Local governments' power to set rates was replaced totally by the Commission which used a modified RB / ROR regulation.

In Delaware, the legislature defined cable service not as a public utility and granted the Public Service Commission the authority to franchise and regulate system operations only in unincorporated areas. The statute did not impose rate regulation except to require that cable firms obtain approval from the Commission for increases exceeding 5 percent in any one year.

In general, the state regulation instituted in this period was more comprehensive than state regulation established during the previous period. States seemed to recognize the uniqueness of the cable television industry, establishing independent cable commissions, defining cable service not as a public utility in case they used the existing public utility commissions, and expressing more interest and concerns about line extension and the quality of services than under the typical public utility type regulation. Most of the states which began regulating the industry during this period worked as a review process in terms of rate regulation. There are several possible reasons for the emergence of state level regulation. First, state authorities may have distrusted local governments' ability to conduct fair regulation.[19] Secondly, cable firms may have desired to find someway to avoid arbitrary, capricious, or onerous regulation by local governments.

1975-1982: revision. The cable television industry was no exception to the general deregulation movement in the last decade, and that was featured in this industry by two important trends in state involvement with the industry after 1975. First, many states passed laws regarding the cable firm's activities such as pole attachment, theft of service, and the quality of service, instead of adopting state comprehensive regulation. In fact, no state started regulating the industry after 1975, though there were attempts in some states. Secondly, the extant state regulation, especially public utility type regulation, was revised and relaxed significantly. For example, New Jersey decided to adopt a "common tariff" regulation, and gave a choice of either a common tariff or modified RB / ROR regulation to cable systems in 1977. Under the common tariff regulation, cable firms were assigned to one of six categories depending upon the level of competition (availability of over-the-air TV signals and penetration rates), density of subscribers per mile, and the number of channels (12 or more than 12). A maximum rate level was set for each category, and cable systems were permitted to raise prices up to the maximum in incremental steps once per year.

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[19] Note that it was this distrust of local (municipal) franchises in the electricity industry that, in part, led to the demise of the municipal electricity company and the emergence of state regulation. See Schap (1986).

The Massachusetts legislature attempted to pass a bill which was similar to New Jersey's, but failed. Beginning in 1978, the state proceeded on a deregulatory course, and ultimately deregulated rates where adequate over-the-air TV signals were available.[20] The legislature in California also adopted a rate deregulation scheme in 1979 which allowed cable systems meeting certain conditions, at their option, to operate without rate regulation. Eligible systems must have more than 20 channel capacity, an earth station, and be located in a county that has three significantly viewed stations, and they must participate in a community channel service program.

Over time, those states that utilized existing public utility commissions to regulate the industry began to recognize the growing level of interindustry competititon. As a result, they too began to liberalize regulation of the industry.

3.C. State of Rate Regulation in 1982.

Based on the discussion above, we can categorize federal pre-deregulation rate regulation in the industry into five groups:

(1) local franchise regulation (LR);

(2) local regulation assisted by state independent cable commission (LR / SR);

(3) state public utility type regulation (RB / ROR);

(4) state "common tariff" regulation (CTR); and

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[20] See U.S. Congress (1981) for the statement of Jeff Horbes, former commissioner of the Massachusetts Cable Commission.

(5) state deregulation (SD).

We expect that the major participants in the regulatory process are: (1) managers and stockholders; (2) subscribers; and (3) sub-groups of the subscribers or special interest groups. Also, we assume the following four factors which a regulatory commission must take into consideration in order to maximize its own goals:

(1) profits (π);

(2) prices (P);

(3) non-profitable public services (K); and

(4) improvement in the quality of services (line extension) (D).

Managers and stockholders are expected to press regulatory authorities for higher profits, subscribers for lower prices, and sub-groups of subscribers or interest groups demand free public services, line extension, and better quality of services. Thus, regulatory commissions that attempt to satisfy these constituencies will, in general, see value in allowing higher profit margins, lower prices, and assuring more public services and better quality of services from cable systems.

While these factors enter the utility functions of all regulatory bodies, their weighting is not likely to be uniform across the alternative types of regulation. First, the regulatory commission's relation with each participant may be different between local regulation and state regulation. Different degrees of pressures caused by the various relations with the regulatory participants will potentially lead to a different relative significance of each argument in the utility functions. Secondly, the priority of the regulatory objectives assigned by legislatures varied, as discussed. Since the regulatory commissions' performance will be measured basically according to the assigned goals, they cannot be ignored. Thirdly, regulatory commissions need experts, enough funds, and quality information to perform their assigned functions. The availability of quality information, adequate funds, and experts, however, varied to a great degree across the alternative types of regulation. Therefore, we will consider the regulatory objectives and how they may vary across regulatory types more closely, based on the regulatory commission's relation to each participant, assigned goals, and its abilities.

Relation to the participants. In general, a local regulatory commission faced each participant on a one-on-one basis while a state regulatory commission experienced a one-to-many relation. Since the relative significance of arguments in the utility functions depends partially upon differences in the relative degrees of pressures applied by the participants and perceived by the regulatory commissions, we must examine if the degrees of pressures applied by each participant vary across the regulatory types, and if any particular type of regulation is more vulnerable to pressures.

Comparing local regulation and state regulation, the pressures applied to state regulation would be greater only if the members in each group could unite in the state. In the past, however, there was no such concerted effort observed among subscribers, interest groups, and cable systems for each case, though the industry did have state trade associations. Therefore, we cannot find any particular reasons that pressures on state regulators are greater than on local regulators.

Instead, state regulators may experience lower pressures for some reasons. First, state regulators might be able to take advantage of possible diversity in cable firms' interest (or rivalry among MSOs). Secondly, there might be a lack of interest of the local subscribers in other cable franchise' rate, and it may prevent a formation of concerted effort for lower prices. Thirdly, state regulators are able to keep a certain distance from each participant. Especially, interest groups, which demand free public services and were frequently led by influential local politicians, are more likely to lose their strengths under state regulation. Thus, while it is difficult to find any clear differences in the relative degrees of pressures over the alternative types of regulation, with the exception of interest groups, local regulation in general seems to be more sensitive to any changes in the relative degrees of pressures because of its closer and more direct relation to each participant.

Assigned goals. We observed through the discussion of state involvement that local regulation assisted by a state regulatory commission (LR / SR) emerged as recognizing the uniqueness of the cable television industry, and expressed more interest and concerns about cable system's other activities, such as the quality of services and line extension. On the other hand, state public utility type regulation (RB / ROR), from its traditional functions, seems to have aimed to regulate profit margins to a normal rate and to lower prices. In the comparison with state independent cable commissions, public utility type regulation seems to have placed less value in line extension and free public services.

Local governments began their involvement with the industry by granting the right-of-way to cable systems and in exchange levied a cost in the form of a franchise fee. Rate regulation was prompted mainly because of the 1972 FCC rules. Local authorities' main concerns seem to have been with keeping prices at a certain level, line extension, and free public services especially in big cities. In comparison with local regulation and local regulation assisted by state regulation, we expect that the existence of independent cable commissions may have allowed higher prices to cable systems because the systems which were not satisfied with the decisions made by local authorities could appeal to the state cable commissions.

Ability. For a good performance, better financial information, experts to analyze it, and adequate funds are necessary. In this regard, state regulation has distinct advantages over local regulation. Local regulation without enough experience, funds, and quality information might have attempted to keep the prices charged by the franchised cable system in line with those charged by cable systems which were in similar conditions.

Summary of the discussion of the relative significance of regulatory objectives. Local regulation seems to be more vulnerable to local interest groups, and in general more sensitive to changes in the relative degrees in pressures than state regulation. Its main concerns seem to have been with lower prices, line extension, and free public services (especially in big cities). Its concern with lower prices, however, might have been hindered by inadequate information and funds or lack of expertise. Alternatively, that might have directed local authorities to attempt to keep prices in line with those of cable systems which were operating under similar conditions.

A state cable commission which assisted local regulation regulated a wider range of cable system's activities and worked as an appeals process in rate disputes. Therefore, it might have allowed higher prices to cable systems than local regulation would have allowed. The use of the RB / ROR method and its traditional functions indicate that state public utility type regulation seems to have been more concerned with keeping profits at a certain level and lowering prices than with the other regulatory objectives.

Table II-3 reports the expected relative significance of regulatory objectives among local regulation, local regulation assisted by state regulation, and state public utility type regulation. Since regulatory commissions' power to affect these factors were limited under common tariff regulation and state deregulation, no implications are available.

4. Previous Studies in the Cable Television Industry.

In this section, we will present an overview of previous studies that are relevant to this research, regarding demand estimations, cost estimations, and effects of regulation on prices.

4.A. Demand Estimation.

In a study of the impact of proposed regulation by the FCC on the development of the cable television industry, Commonar and Mitchell

Table II-3. Expected Relative Significance of Regulatory Objectives.

	Higher π	lower P	More K	More D
LR	important	very important	important	important
LR/SR	important	important	important	important
RB/ROR	not important	very important	not important	not important

LR: Local Regulation
LR/SR: Local Regulation assisted by State Regulation
RB/ROR: State Public Utility Type Regulation

(1971) estimated demand for cable service. The penetration rate (i.e., ratio of the number of subscribers to the number of homes passed by cable) was taken as the dependent variable and regressed on several explanatory variables. Since people subscribe to cable primarily for additional TV channels and the value of the additional channel would vary depending upon the types of station, TV channels were categorized into four groups, such as: primary network stations; independent stations; duplicated network stations; and educational stations. Then, they took the ratio of the number of channels carried by cable to the number of channels through over-the-air in each group as "comparative cable services". The age of the system was included on the belief that maturity is reached only after a certain period of time. In addition, monthly rates for cable service, family income, and local origination were also taken as the explanatory variables. The results were primarily as expected. Additional networks and the age of the system had positive effects on penetration and were statistically significant. Additional independent stations, family income, and monthly charge had the expected signs respectively, but were not statistically significant.

Park (1972) improved Commonar and Mitchell's model by adding a distance factor to the comparative cable service in each group, in an attempt to account for another important reason for cable subscription, i.e., improvement in the quality of TV signals. The estimation model was specified as a logistic function, in order to control the dependent variable from 100 percent to 0 percent, and regressed on the explanatory variables which were basically the same as Commonar and Mitchell's. The result was similar to Commonar and Mitchell's with some statistical improvements. The notable difference was, however, the speed of cable firms reaching maturity. In contrast to Commonar and Mitchell's who found that it would take 4 to 6 years for a cable system to reach 90 percent of the ultimate penetration rate, Park found that the ultimate penetration rate was reached within 18 months. The different findings in the growth rate may be attributed to the fact that systems with the highest penetration were built first. Since the improvement in the TV signal quality was not introduced explicitly in Commonar and Mitchell's model, the age variable might have measured the effect of the differing reception condition, and consequently may have estimated the growth rate to be slower than it actually was.

Webb (1983) estimated the demand for basic and pay TV services separately, using the data reported in 1980 by urban cable systems.[21] Dependent variables were the market penetration rate for basic service (i.e., the same as the penetration rate), and the system penetration rate for pay TV services (i.e., ratio of the number of pay TV subscription to the number of basic subscribers), and were regressed on similar explanatory variables as in the earlier studies plus the geographic character of the city. The comparative cable services in all the categories except education had the positive sign as expected and were statistically significant. The prices for basic and for pay TV as well had the expected sign, i.e., negative, and were statistically

[21] Webb discussed the interdependence of the demands for basic service and pay TV services, and the price structures under the interdependent demands in his book, but did not take these into consideration in the empirical models.

significant. The most interesting result was, however, the negative effect of income on the penetration rate.[22]

Levy and Pitch (1985) estimated demands for VCR and cable in order to obtain some statistical evidence on the substitutability among video media. Though the statistical results were not as strong as the previous studies, they confirmed the substitutable relationship of VCR and cable. One of the important features in their study is the use of price structures in the demand estimation, i.e., basic rates, pay TV rates, and composite rates.[23]

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[22]He explained the negative effect of income on the demand for basic service from the characteristics of data, which were collected from urban cable systems, where more low-income families live, and they may have found that basic service provided an inexpensive substitute for the other kinds of entertainment the city offered. Webb suggests that the negative income elasticity implies that the basic cable service might be an essential good for low-income families.

[23]Levy and Pitch (1985) explained the relationship of basic cable service and pay TV demand as follows:

> A viewer will subscribe to basic cable if he values it above the basic rate, or if he values it below the basic rate but his valuation of pay cable is sufficiently greater than the pay cable rate that the value of basic plus pay service is greater than the composite rate. In this event, he will find a basic subscription worthwhile just to gain access to pay cable.
>
> In order to choose pay service, it is necessary for the value placed on basic plus pay service to be greater than the composite rate. However, this is not sufficient. The value placed on pay service alone must also be above the pay rate. If the first condition were true gecause basic service was very highly valued but pay service was not, then only basic service would be purchased. (pp.63-64)

4.B. Cost Estimation.

Owen and Greenhalgh (1982) estimated a cost condition of a cable system using a multiproduct cost function, collecting data from proposals submitted in municipal franchise bidding. Outputs they considered were number of subscribers, number of channels in use, channel-miles of institutional network, and number of miles of wire in the system. Input prices were the cost of labor, i.e., the average salary of cable system employees, and the cost of capital.[24] Translog and truncated translog functions were tried, and the latter was used for the estimation of economies of scale in homes passed (size), in number of subscribers, and in number of channels in use. They found economies of scale in homes passed to be moderate, but economies of scale in number of subscribers and in number of channels in use to be substantial respectively.

Noam (1985) also used a multiproduct translog cost function for the estimation of the cost condition. However, the major difference between his and Owen and Greenhalgh's study is in the selection of data. While Owen and Greenhalgh obtained the sample from the proposals, rather than the the actually operating systems, Noam's data was from all 4,800 U.S. cable systems in operation in 1981. Thus, the Owen and Greenhalgh's data might be biased, as they mentioned, because of potential

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[24]Dummy variables for the last three years covered by the sample, which were '80, '81, and '82, were used as proxies for changes in input price levels and capital equipment costs.

"gamemanship" in the franchise bidding process. Nevertheless, there are some advantages in their sample. First, it reflects modern and large systems with greater channel capacity, in contrast to Noam's in which most of the systems were relatively small, old, and 12 channel capacities. Secondly, it includes non-profitable public services, i.e., institutional network. Outputs in Noam's model were number of homes passed, number of basic subscribers, and number of pay TV service subscriptions. Input prices were wages and the cost of capital. The age of the cable system, density of population, and the number of channels in use were also included as the conditional variables which might affect the cost. The result Noam obtained was similar to Owen and Greenhalgh's finding. Specifically, Noam found moderate economies of scale in homes passed, and economies of scale in basic subscribers and in pay subscription to be greater than the ones in homes passed.

Using 1979 New Jersey cross sectional firm data, Webb (1983) estimated the annual operating and depreciation expenses functions separately. He also found economies of scale in homes passed, in number of channels, and in number of subscribers. The economies of scale in homes passed was found, likewise, to be smaller than the ones in number of subscribers and in number of channels.

From these studies, the following tentative conclusions may be drawn. First, there are economies of scale in homes passed, but they are very small. The relatively small economies of scale in homes passed implies that a large system does not necessary have cost advantages over a small system. Secondly, substantial economies of scale in number of subscribers (basic or pay TV) and in number of channels in use in a given size of distribution system exist. This suggests that competition between two cable firms with differentiated services or "head-to-head" competition between two cable firms down the same street are not likely to take place.

4.C. Effects of Regulation.

There are two studies which attempted to examine the effects of regulation on prices. One was done by Braunstein, Kalba, and Levine (1978) and the other by Thorpe (1985). Braunstein et al. collected sample of operating systems in 1974, and found that state regulation raised the rates for basic service.[25] There are, however, several questions which should be addressed regarding the validity of their result. Most crucial among them, they treated state regulation as an identical form, disregarding the fact that states regulated the cable television industry in various forms, from no state rate regulation to RB / ROR regulation. As they suggested for further research, more effective and useful information may be obtained by taking the differences in forms of state regulation into consideration.

Thorpe (1985) examined the effects of price regulation on price-cost margins in the course of the study of the impact of interindustry competition on cable. He found that price regulation did not have any significant effects on the price-cost margins. Again, however, his treatment of price regulation ignored the differences in

[25]Braunstein et al., like Stigler and Friedland (1962), used the reduced form price equation derived from demand and supply equations.

the form of price regulation. Besides, the result, i.e., no effects of rate regulation on the price-cost margins, does not necessarily mean that rate regulation was ineffective in lowering prices. Based on the fact that a cable firm is a multi-service firm, a lower basic price may "simply result in higher pay cable prices, or the development of expanded basic service offerings which are not subject to rate regulation" (p.150). Given such price flexibility, it might be erroneous to take the result as the indication of ineffectiveness of rate regulation.

5. Data.

The data for this study were taken from cable systems in operation in 1982 which were listed in Television Factbook 1982-1983. Because we would like to examine the effects of price regulation on non-regulated service, i.e., pay TV service, and eliminate the possibility of inclusion of no local price regulation, those systems which did not have pay TV service or had a population franchise of less than 5,000 were dropped, leaving an ultimate sample of about 1,750 firms.[26]

Table II.4 presents the description of variables, which are used in our study, and the data source. Table II.5 reports the means and standard deviation of each variable.

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[26]According to the Cable Television Information Center (CTIC), some municipalities which did not have enough funds or expertise deregulated the rates.

Table II-4. Description of Variables and Source.
(data are from 1982
and the unit of observation is a cable system)

VARIABLE	DESCRIPTION	SOURCE
H82	The number of homes passed by cable	TELEVISION FACTBOOK
LH82	LOG (H82)	
QB82	The number of basic subscribers	TELEVISION FACTBOOK
QP82	The number of pay TV service subscriptions	TELEVISION FACTBOOK
PR82	Penetration rate for basic service. PR82 = QB82 / H82	
HP82	Penetration rate for pay TV service. HP82 = QP82 / H82.	
PPR82	Penetration rate for pay TV serivce. PPR82 = QP82 / QB82.	
LPR82	LOG (PR82)	
LPPR82	LOG(PPR82)	
PB82	Monthly charge for basic service.	TELEVISION FACTBOOK
PP82	Monthly charge for pay TV service.	TELEVISION FACTBOOK
IPF	Income per family.	COUNTY AND CITY DATA BOOK / 1983
AGE	The age of the system the functional form is: AGE = EXP(1/AGE)	TELEVISION FACTBOOK and CABLEFILE 84
NP	The number of pay TV programs provided by a cable system.	TELEVISION FACTBOOK
LNP	LOG (NP)	
NC	The number of TV channels provided by a cable system.	TELEVISION FACTBOOK
LNC	LOG (NC)	

Table II-4 (continued)

VARIABLE	DESCRIPTION	SOURCE
PD	The inverse of population density. The length of cable needed to pass one home in a franchise. (the ratio of the length of cable to the number of homes passed by cable.	
LPD	LOG (PD)	
LO	Hours of local origination programming per week.	TELEVISION FACTBOOK
FFEE	Franchise fee charged to a cable system by state or (and) city governments (% of gross revenues)	TELEVISION FACTBOOK
PCP	Programming cost of pay TV service to a cable system. (per subscription per month) HBO $4-$5 Showtime $4-$5 Movie Channel $3.50-$4.50 CINEMAX $3-$4 HTN Plus $2.95	CABLE AGE, Dec. 14, '81 and SAT GUIDE, Dec.,'81
LCSj	Comparative cable service. LCSj = LOG [(1 + Sj)/(1 + Sj')] Sj: number of signals of the type j carried by the cable firm i. Sj': total value of over-the-air TV programs to viewers in which the cable firm i locates. $Sj' = a_0 S_{0j} + a_1 S_{1j} + a_2 S_{2j}$ If the cable firm i locates in A contour of the TV station, the type j, the value of a_0 is assigned. If it locates in B contour of the TV station, a_1 is assigned as the value of that signal. If it is outside B contour, a_2 is assigned. a_0 (= 1) > a_1 > a_2 > 0, and Sj > Sj'. j = N, D, I, or E. N: network station D: duplicated network station I: independent station E; educational station	TELEVISION FACTBOOK and CABLE ATLAS 87

Table II-4 (continued)

VARIABLE	DESCRIPTION	SOURCE
MRk	k = 1,..., 6 MRk = 1 or 0 MR1 = 1 if the cable system locates in the city areas of the top 50 ADI market. MR2 = 1 if the cable system locates in the non-city areas of top 50 ADI market. MR3 = 1 if the cable system locates in the city areas of the second 50 ADI market. MR4 = 1 if the cable system locates in the non-city areas of the second 50 ADI market. MR5 = 1 if the cable system locates in the third 50 ADI market. MR6 = 1 if the cable system locates in the outside of the top 50 ADI market. No dummy is assigned if the cable system locates in the outside of the second and third 50 ADI market.	TELEVISION FACTBOOK, CABLEFILE 84, and CABLE ATLAS 87
Rl	l = 1,..., 8 No dummy is assigned if the cable system locates in the New England areas, which includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont. Rl = 1 or 0 R1 = 1 if the cable system locates in the Middle Atlantic area, which includes New Jersey, New York, Pennsylvania. R2 = 1 if the cable system locates in the East North Central area, which includes Illinois, Indiana, Ohio, Michigan, Wisconsin. R3 = 1 if the cable system locates in the West North Central area, which includes Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota. R4 = 1 if the cable system locates in the South Atlantic area, which includes Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia. R5 = 1 if the cable system locates in the East South Central area, which includes Alabama, Kentucky, Mississippi, Tennessee. R6 = 1 if the cable system locates in the West South Central area, which includes Arkansas, Louisiana, Oklahoma, Texas. R7 = 1 if the cable system locates in the Mountain area, which includes Arizona, Colorado, Montana, Nevada, New Mexico, Utah, Wyoming. R8 = 1 if the cable system locates in the Pacific area, which includes California, Oregon, Washington.	DEPARTMENT OF LABOR

Table II-4 (continued)

VARIABLE	DESCRIPTION	SOURCE
MSOh	h = 1,..., 2 MSOh = 1 or 0 MSO1 = 1 if the cable system's ownership belong to the top 25 Multi System Operation. MSO2 = 1 if the cable system's ownership belong to the Multi System Operation which is ranked between 26th and 100th. No dummy variables were assigned for the cable system which are independent or belong to Multi System Operations which were ranked below Top 100.	TELEVISION FACTBOOK and CABLEFILE 84
DRg	g = 1,..., 4 (41 or 42) DRg = 1 or 0 DR1 = 1 if the price was primarily regulated local authorities with the assist of state regulatory authority. (NY. MI. RI.) DR2 = 1 if the price was regulated by public utility type of regulation. (CON. NV. VT.) DR3 = 1 if the price was regulated by " Common tariff " regulation. (NJ.) DR4 = 1 if the price was deregulated by state regulatory authorities. (some cable systems in CA. and Mass.) DR41 = 1 if the cable system is in Mass. DR42 = 1 if the cable system is in CA. No dummy was assigned if the price was regulated by local authorities without state regulatory authorities.	Briley (1978 and 1980), CTIC, and NCTA
DV	Expansion of cable firm's distribution system from 1982 to 1984. Percentage increase in the number of homes passed by the cable system i.	TELEVISION FACTBOOK and CABLEFILE 84

Table II-4 (continued)

VARIABLE	DESCRIPTION
DCONB	Index to account for the differences in basic demand conditions. The values were generated with the exogenous variables in short-run equilibrium.
	DCONB = 93.31 + 29.36*LCSN + 13.36*LCSD + 1.327*LCSI + 0.0002*IPF - 13.32*AGE - 15.38*MR1 - 8.58*MR2 - 10.81*MR3 - 6.84*MR4 - 4.18*MR5 - 5.87*MR6 + 0.47*R1 - 4.74*R2 - 0.29*R3 - 4.68*R4 + 0.02*R5 - 2.12*R6 - 8.73*R7 - 5.91*R8
DCONP	Index to account for the differences in pay TV demand conditions. The values were generated with the exogenous variables in short-run equilibrium.
	DCONP = -32.827 - 11.84*LPR82 + 18.39*NP + 0.001*IPF + 5.77*MR1 + 2.54*MR2 + 3.58*MR3 - 3.43*MR4 - 0.99*MR5 - 2.73*MR6 + 2.12*R1 + 6.65*R2 + 5.21*R3 + 3.22*R4 + 3.64*R5 + 12.49*R6 + 5.29*R7 - 0.50*R8
CCONB	Index to account for the differences in basic cost conditions. The values were generated with the exogenous variables in short-run equilibrium.
	CCONB = 57.826 - 1.364*LH82 + 5.018*LPD + 11.001*LNC
MCB1	Marginal cost of basic subscriber. the values were generated by using the Owen and Greenhalgh's cost estimation.
MCB2	Marginal cost of basic subscriber. the values were generated by using the Noam's cost estimation.
MCP2	Marginal cost of pay TV subscription. the values were generated by using the Noam's cost estimation.

Table II-5. Means and Standard Deviations of Variables.

Variable	Number	Mean	S.D
H82	1759	17680.466	30837.122
QB82	1759	9879.502	15320.446
QP82	1759	6579.118	13981.091
PR82	1759	64.684	19.972
HP82	1682	31.383	17.200
PPR82	1682	57.410	45.563
PB82	1759	8.2233	1.4128
PP82	1759	9.4616	1.4419
IPF	1759	15575.153	4347.229
AGE	1759	13.188	8.2230
NP	1747	1.8975	1.1021
NC	1746	15.740	5.5889
CC	1759	25.487	12.775
PD	1759	0.0138	0.0063
LCSN	1759	0.0935	0.1032
LCSD	1759	0.1880	0.1466
LCSI	1759	0.1832	0.1470
DV	1759	0.1040	0.7605
FFEE	1575	3.1225	1.4311
LO	1682	279.962	268.597
PCP	1614	4.4744	0.1424

CHAPTER III

MODELING THE EFFECTIVENESS OF REGULATION

The goal of this thesis is to examine the possibly different effects of various forms of regulation on firm pricing. For this purpose, a theoretical model is built and a set of empirical models is designed in this chapter. In the next section, the theoretical model is discussed in an attempt to identify the factors that determine the actual prices charged by regulated firms. Demand and cost conditions, and various forms of regulation, which supposedly affect firm pricing, are discussed in Section 2. The set of econometric models is presented in section 3 with the intent of shedding light on the extent to which regulation has affected firm prices and its price structure.

1. Theoretical Model of Reduced Form Price Equation.

We specify a general inverse demand function and a general cost function as follows:

$$P = P(Q, A_m) \qquad (1)$$

$$C = C(Q, B_n) \qquad (2)$$

where P, C, and Q are prices, production costs, and output levels respectively, and A_m and B_n are economic factors which determine the demand and cost conditions for its services ($m = 1, \ldots, M$ and $n = 1, \ldots, N$). Also, let P_i^m denote the price of a firm i able to charge the pure monopoly price and P_i^c be the price that would occur if the price charged is at the competitive level.[1] Because in reality most firms have some, but not complete, market power, the actual price charged by the firm i for its services will lie above the purely competitive level, but below the purely monopolistic price. In this case, the monopoly price serves as an upper bound on observed price levels while the competitive price serves as a lower bound.[2] Then, observed price levels can be approximated by a linear combination of the competitive price, P^c, and the monopolistic price, P^m. That is,

$$P_i = \lambda_i P_i^{\,c} + (1 - \lambda_i) P_i^{\,m} \qquad (3)$$

where $0 \leq \lambda_i \leq 1$. If $\lambda_i = 0$, $P_i = P_i^{\,m}$, and for $\lambda_i = 1$, $P_i = P_i^{\,c}$. Thus the higher is λ_i, the closer actual prices are to competitive prices, and the lower is λ_i, the closer are prices to monopolistic levels.

For a firm subject to regulation, we can interpret λ_i to be a measure of the extent to which regulation is binding. Assuming that one of the goals of regulation is to limit monopolistic price levels, regulation can be thought to be perfectly effective when $\lambda_i = 1$. Conversely, when $\lambda_i = 0$, regulation is completely ineffective.

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[1] We limit our analysis here to the use of uniform pricing. The thrust of the analysis would not change if we were to consider nonlinear price mechanisms.

[2] There are some exceptions for this expression. For example, when a firm excercises predatory pricing, P^c may not be the lower bound of P_i while P^m may not be the upper bound for a non-integrated successive monopoly case. For a discussion of successive monopoly case, see Blair and Kaserman (1985), pp 295-304.

We know also that in competitive equilibrium, P_i^c is equal to C_i', the firm's marginal cost, and that the standard first order condition for profit maximization by a pure monopolist yields,

$$P_i^m = [E_i/(1+E_i)]C_i'' \qquad (4)$$

where C_i'' is the firm's marginal cost and E_i the firm's price elasticity of demand at the profit maximizing output level.[3] Substituting C' for P^c in the equation (3) and equation (4) into (3) yields,

$$P_i = \lambda_i C_i' + (1 - \lambda_i)[E_i/(1+E_i)]C_i'' \qquad (5)$$

Thus, actual prices charged by a regulated firm will generally depend upon the firm's marginal costs, its price elasticity of demand, and the extent to which regulation is effective.

In practice, knowledge of these factors is limited. The extent to which regulation is binding, i.e., λ, is clearly unknown. Similarly, neither the monopoly price nor the competitive price is directly observable. Knowledge of marginal costs or price elasticity of demand is not readily available, either. We do know, however, that P_i^c, P_i^m, C_i', C_i'', and E_i are all dependent upon the demand and cost factors, i.e., A_{im} and B_{in}, and equations (3) and (5) are expressed more generally,

$$P_i = P\{\lambda_i,\ P^c[Q^c(A_{im},\ B_{in})],\ P^m[Q^m(A_{im},\ B_{in})]\} \qquad (3)'$$

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[3] Since the firm's marginal cost may vary depending upon its output levels, we use C_i'' for the firm's marginal cost at the profit maximizing output level. In general, C_i' may be equal to, greater than, or less than C_i''.

$$P_i = P\{\lambda_i, C'[Q^c(A_{im}, B_{in})], C''[Q^m(A_{im}, B_{in})], E[Q^m(A_{im}, B_{in})]\} \qquad (5)'$$

where Q^c is corresponding to P^c, and Q^m to P^m. Then, it is possible, through the econometric techniques of demand and cost estimation to glean information about economic factors that determine monopoly prices, competitive prices, marginal costs, and price elasticities of demand. The effects of these economic factors on actual prices can be seen by taking derivatives of them from equation (3)' or (5)'.

$$\partial P/\partial B_n = (\partial P^c/\partial Q^c)(\partial Q^c/\partial B_n) + (1-\lambda)(\partial P^m/\partial Q^m)(\partial Q^m/\partial B_n) \qquad (6)$$

$$\partial P/\partial A_m = (\partial C'/\partial Q^c)(\partial Q^c/\partial A_m) + (1-\lambda)(\partial C''/\partial Q^m)(\partial Q^m/\partial A_m) + (1-\lambda)C''[1/(1+E)^2] \qquad (7)$$

$$\partial P/\partial \lambda = C' - [E/(1+E)]C'' = P^c - P^m \qquad (8)$$

where λ_i, $1 - \lambda_i$, C_i', and C_i'' are all non-negative, and $E_i/(1+E_i) > 1$ because a firm with market power must produce in the elastic portion of demand in order to maximize profits. Then,

$\partial P/\partial B_n > 0$ if $\partial Q^c/\partial B_n$ and $\partial Q^m/\partial B_n < 0$,
and if $\partial P^c/\partial Q^c$ and $\partial P^m/\partial Q^m < 0$.

$\partial P/\partial A_m \gtrsim 0$ if $\partial Q^c/\partial A_m$ and $\partial Q^m/\partial A_m > 0$,
and if $\partial C'/\partial Q^c$ and $\partial C''/\partial Q^m \gtrsim 0$.[4]

$\partial P/\partial \lambda < 0$.

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[4]Non decreasing marginal cost with a given set of cost factors is the sufficient condition for the positive effect of increases in demand factors on actual prices. If margimal cost is continuously declining, however, the effect of changes in the demand factors on the actual prices might be reversed.

Thus, in general, the factors which increase the firm's marginal cost in the relevant range should raise the actual price.[5] The factors which increase the demand in the relevant range must lift the actual price if the marginal cost is non-decreasing. The more effective the price regulation is, the lower is the actual price. We now turn to a more in-depth discussion of these determinants as they exist in the cable television industry.

2. Factors That Would Affect Prices.

2.A. Demand for cable.

Services provided by the cable television industry were classified in the previous chapter into four groups, which were traditional broadcasting, entertainment services, print information, and telecommunications service. Since print information and telecommunications services were still the insignificant parts of cable demand when the data were taken (1982), we limit the extent of the product market to traditional broadcasting (basic cable service) and entertainment services (pay TV cable service). In this section, we discuss the theoretical aspect of interdependent cable demands (basic and pay TV cable services), and identify factors that are expected to affect the cable demands.

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[5] We make here the standard assumption concerning demand, i.e., quantities demanded for its services are inversely related to its own price levels, *ceteris paribus*.

Theoretical aspects of the cable demands. Suppose that a household j faces a consumption decision for cable services. Assuming that it attempts to maximize its own utility within a given budget, the household j will choose to obtain basic service (or pay TV service) only when its valuation of basic (pay TV service) exceeds the price.

$$VALb_j > Pb_j \qquad (9)$$

$$VALp_j > Pp_j \qquad (10)$$

where $VALb_j$ and $VALp_j$ are the household j's valuation of basic and pay TV service, and Pb_j and Pp_j the prices charged on these services. In other words, the household j will choose to subscribe to basic or pay TV service only when:

$$Cb(Xb_j) = VALb_j - Pb_j > 0 \qquad (11)$$

$$Cp(Xp_j) = VALp_j - Pp_j > 0 \qquad (12)$$

where Cb and Cp are consumer's surplus for basic and pay TV service respectively, and Xb and Xp are vectors of demand factors that are expected to affect the household j's consumer's surplus for the respective services.

Since the probability that the household j chooses to purchase each service could be assumed to be proportional to the size of consumer's surplus, the probability can be expressed as follows.

$$Pr(\theta b_j = 1) = Pr(Cb_j > 0) = Cb(Xb_j) \qquad (13)$$

$$Pr(\theta p_j = 1) = Pr(Cp_j > 0) = Cp(Xp_j) \qquad (14)$$

where θb and θp are binary variables, and $\theta b_j = 1$ (or $\theta p_j = 1$) if the household j decides to subscribe to basic service (pay TV service), while $\theta b_j = 0$ ($\theta p_j = 0$), if not.

Also, let's Yb_j and Yp_j denote unobservable variables which measure the houdehold j's intensity of desire to purchase the basic and pay TV services respectively. In equation (13) and (14), then, $Yb_j = Cb_j$, and $Yp_j = Cp_j$, and these equations may be written in regression forms as,

$$Yb_j = Xb_j\beta b + Ub_j \qquad (15)$$

$$Yp_j = Xp_j\beta p + Up_j \qquad (16)$$

Assuming that Ub and Up are normally and independently distributed around the mean of 0 with constant variables and there is no correlation between Ub and Up, the relatioship between the observable binary variables, θb_j and θp_j, and the unobservable continuous variables, Yb_j and Yp_j, can be expressed in the following way.

$$\theta b_j \ (\theta p_j) = 1 \text{ if } Yb_j \ (Yp_j) > 0$$

$$\theta b_j \ (\theta p_j) = 0 \text{ if } Yb_j \ (Yp_j) < 0$$

and

$$E(Yb_j) = Pr(\theta b_j = 1)$$

$$E(Yp_j) = Pr(\theta p_j = 1)$$

where

$$E(Yb_j | Xb_j) = Xb_j\beta b \qquad (17)$$

$$E(Yp_j | Xp_j) = Xp_j\beta p \qquad (18)$$

In practice, however, these two services (basic and pay TV services) are not offered separately by cable firms. Those who want to subscribe to pay TV service must obtain basic service first. Given this technical requirement forced on households by cable systems, Table III-1 describes five types of households whose homes are passed by cable and their consumption decisions.

Type I household values the basic service and pay TV service above their prices and obtain both of the services. Type II household values the basic service above its price, but the pay TV service below its price. Its decision is, then, to obtain only the basic service. Type III and IV household's consumer's surplus is negative for the basic service, but positive for the pay TV service. Only when the composite consumer's surplus, Cb + Cp, is positive, the household decides to obtain both of them (which is the case for Type III household), and it chooses not to purchase either of them when the composite surplus is negative (which is the case for Type IV household). Type V household values the basic or pay TV service below the prices, and chooses to obtain neither of them.

Therefore, the correct expression of the probability that the household j decides to obtain basic and pay TV service are as follows.

$$\Pr(\theta b_j = 1) = \Pr(Cb_j > 0) + \Pr(Cb_j < 0 \text{ but } Cb_j + Cp_j > 0) \qquad (19)$$

$$\Pr(\theta p_j = 1) = \Pr(Cp_j > 0 | \theta b_j = 1) \qquad (20)$$

Two things must be noted in the above equations. First, the probability of pay TV service subscription, equation (20), is conditional on the probability of basic cable service subscription, equation (19).

Table III-1. Types of Households and Their Purchasing Decisions.

Type	Basic Service	Pay Service	Decisions Θb	Θp
I	Cb > 0	Cp > 0	1	1
II	Cb > 0	Cp < 0	1	0
III	Cb < 0	Cp > 0		
		and Cp + Cb > 0	1	1
IV	Cb < 0	Cp > 0		
		and Cp + Cb < 0	0	0
V	Cb < 0	Cp < 0	0	0

Cb: consumer's surplus for basic cable service.
Cp: consumer's surplus for pay TV service.

Secondly, the probability of basic cable service subscription depends upon the consumer's surplus for pay TV service as well. Omission or misspecification of these conditions may cause some serious problems to estimators.

Suppose that one applied least squares method on equation (15) and (16), though their correct relationship were presented by equation (19) and (20). As a result, instead of equation (17) and (18), the sample regression may be written as

$$E(Yb_j|Xb_j,\ Xp_j) = Xb_j\beta b + E(Ub_j|Xp_j) \tag{21}$$

$$\begin{aligned} E(Yp_j|Xp_j,\ Yb_j) &= Xp_j\beta p + E(Up_j|Yb_j) \\ &= Xp_j\beta p + E(Up_j|Xb_j\beta b + Ubj) \end{aligned} \tag{22}$$

The second terms of the right-hand side in equation (21) and (22) are the conditional means of the disturbances, Ub and Up. If they are non-zero, the least squares estimators obtained from equation (15) and (16) are biased as a result of misspecification (omission of relevant variables).

Considering the above discussion , we will rewrite equation (15) and (16) as follows.

$$Yb_j = Xb_j\beta b + Xp_j\beta p' + Vb_j \tag{23}$$

$$Yp_j = Xp_j\beta p + Yb_j\beta y + Vp_j \qquad (24)^6$$

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[6] We do not restrict the parameters of Xp_j across these two equations ($\beta p'$ and βp) to be equal.

Assuming that the conditionality of pay TV service subscription on the basic service subscription in equation (24) is correctly specified, equation (23) and (24) form a recursive system.

For a cable system i, the basic penetration rate (PR_i, the ratio of the number of basic subscribers to the number of households passed by cable), and pay TV penetration rate (HP_i, the ratio of the number of pay TV subscriptions to the number of households passed by cable),may be written as,

$$PR_i = (1/Ni)\Sigma\theta b_j \qquad (25)$$

$$HP_i = (1/Ni)\Sigma\theta p_j \qquad (26)^{7}$$

where j = 1, ..., Ni, and Ni is the number of homes passed by cable in the cable system i. In fact, the respective penetration rate can be interpreted as the probability that a typical household in the cable system i chooses to obtain the basic and pay TV services.

$$PR_i = (1/Ni)\Sigma Yb_j \qquad (27)$$

$$HP_i = (1/Ni)\Sigma Yb_j \qquad (28)$$

Then, replacing the unobservable variables in equation (23) and (24), Yb_j and Yp_j, by the observable variables, PR_i and HP_i, and taking the

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[7] There are two ways to compute the pay TV penetration rate. One is to take the ratio of number of pay TV subscriptions to number of homes passed by cable (which we denote HP), and the other is the ratio of pay TV subscriptions to number of basic subscribers (which we denote PPR). We choose to use the former definition, HP, as the pay TV penetration rate.

mean values of explanatory variables, Xb and Xp, for the cable system i, we will obtain

$$PR_i = Xb_i\beta b + Xp_i\beta p' + Vb_i \qquad (29)$$

$$HP_i = Xp_i\beta p + PR_i\beta pr + Vp_i \qquad (30)$$

This set of demand equations is a recursive system and least squares method can be applied, provided that the disturbances from each equation, Vb and Vp, are independent.[8] In the following section, we will discuss the demand factors, Xb and Xp.

Demand factors. People subscribe to cable for several reasons. They subscribe to cable to improve the quality of over-the-air TV signals or to have more TV programs. Some subscribe to cable for satellite distributed programs (e.g., MTV, ESPN, and CNN), or for pay TV programs (e.g., HBO, the Movie Channel, and Showtime). From these reasons, several determinants of demand for cable can be identified. First, the distance of the cable system from the nearest local TV stations which were dominantly viewed within the franchise area will be a significant determinant.[9] Secondly, the differences in the numbers of, and types of, TV programs available through over-the-air and those available through cable (which have been referred to in the literature as "Comparative

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[8]This assumption also excludes the possibility of biased estimators resulting from a specification error in equation (24). This assumption will be tested later.

[9]Besides distance, the extent to which local terrain interferes with broadcast signal reception is also an important factor. The difficulty of measurement, however, prevented us from using this.

Cable Services"), will be another important factor. Types of TV programs are categorized into network, duplicated network, independent, and educational programs. Thirdly, availability of substitute goods, other than traditional broadcasting, such as Subscription TV (STV), Multipoint Distribution System (MDS), movie and indoor theaters, and sports franchises, may be important demand factors, especially for those who subscribe to cable for pay TV programs or satellite distributed programs. Fourthly, the relative prices of these alternative goods may affect the demand for cable. In addition, family income and geographical region of the country (which may reflect cultural differences) are expected to determine the demand for cable. Although age of the system is not a demand factor, it is included in order to account for a certain period of time required for households to learn about cable services.[10]

As the factors which determine the demand for pay TV service, we consider its own price, family income, availability of substitute goods, and regional differences. In addition, the number and types of pay TV programs offered by cable system may be significant factors because different types of pay TV programs can accomodate various tastes of households.

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[10] In the previous studies, the age of the system was included in the demand estimation in order to account for a certain period of time required for a cable system to reach its ultimate penetration rate. The estimated time periods for maturity, however, are quite different in the prior research. For example, Park (1972) concluded that the ultimate penetration rate is reached within 18 months while Commanor and Mitchell (1971) estimated that it would take 4 to 6 years for a system to reach 90 % of the ultimate penetration rate.

The determinants of the demands for basic and pay TV services we consider are, then, considered to be the following.

Demand factors for basic service, Xb.

Comparative cable services;[11]

Availability of alternative goods;

Price of basic service;

Family Income;

Age of the system; and

Geographical region.

Demand factors for pay TV service, Xp.

Number of pay TV programs provided by the cable firm;

Price of pay TV;

Family income;

Availability of alternative goods; and

Geographical region.

2.B. Cost Conditions.

Costs of a firm are generally categorized into capital expenditures and operating expenses. Major capital expenditures in a cable system are on headend equipment, distribution system, subscription drops, and cablecasting and other equipments. Operating expenses are

[11]The ratio of the number of programs provided by the cable system to the number of programs available through over-the-air with distance consideration in the four categories, which are network, duplicated network, independent, and educational programs. See Table II-4 for a detailed description of comparative cable services.

service costs, origination expenses, and general, selling, and administrative (GSA) expenses.[12] In the following, we discuss possible determinants of each cost component with the intent of identifying the determinants of costs.

Headend equipment. Every cable system needs towers, buildings, and antennas, including earth stations to receive signals. The signals received must be processed for distribution and for that purpose each system requires electronic equipment, whose cost is proportional to the number of signals received. As a result, headend costs are largely fixed regardless of the number of homes passed or the number of subscribers, but they are affected by the number of signals imported. That is,

headend costs = fixed + f(number of channels).

Distribution system. The distribution system is the main capital expenditure of cable firms and consists of cables such as trunk and feeder lines, and electronic equipment which is necessary to distribute the signals throughout the system. The cost of the distribution system depends on the channel capacity, the length of the cable, and the types of construction required for installation, which is underground or aerial. A rather general specification of the distribution system costs is then given by:

costs of distribution system = f(length of cable, channel capacity, type of construction).

[12] See Commanor and Mitchell (1971), Cable Television Information Center (1972), and Webb (1983) for discussion of the cost components of a cable system.

Or, alternatively, (and equivalently)

costs of distribution system = f(number of homes passed by cable, population density, channel capacity, type of construction),

because the length of the cable is equal to the length of cable required to pass one home multiplied by the number of homes passed.

Subscription drops. From feeder trunk cables, a drop line must be drawn and a converter is required as the final set component needed to introduce the cable system signals into a subscriber's television set. The cost of constructing drop lines depends largely upon the number of subscribers and upon whether it is aerial or underground. That is,

subscriber drop equipment costs = f(number of subscribers, type of construction).

Cablecasting, tele-equipment, tools, and spare parts. Except for the cost of cablecasting equipment, the cost of other equipment and spare parts is likely to be proportional to the costs of headend, the distribution system, and subscription drops.

Service costs. These are the costs to hook up new subscribers and disconnect old ones, pay for the rental of poles, or maintain some specific service level. About 50 to 70 percent of these costs are for wages and salaries of employees and the rest is for repairs, maintenance, and operation of the cable system. As the system size increases, the service costs increase. Thus,

service costs = f(wages and salaries, system size).

Origination expenses. The cost of producing locally originated cable programs depends upon the number of hours of programming produced annually. The major components of this cost are wages and salaries of employees and operating supplies. That is,

origination expenses = f(hours of locally originated programs).

GSA expenses. The costs would be proportional to the system size.

Summarizing all these cost determinants, the total cost for a cable system will be expressed by the following.

Input Prices:

Cost of capital;

Wages and salaries;

Outputs:

Number of homes passed by cable;

Number of basic service subscribers;

Number of pay-TV subscriptions;

Number of channels;

Hours of locally originated programs.

Conditional factors:

Type of construction;

Population density.

2.C. Regulation.

As discussed in Chapter II, we assume a regulatory commission to be a utility maximizer which seeks its own benefits by balancing conflicting interests. In the spirit of Evans and Garber (1988), we define an objective function for the commission to be,

$$U = U(\pi, P, K, D) \qquad (31)$$

which is subject to

$$\pi = f(P, C, K, D) \geq 0$$

where

π: economic profits received by the regulated system.

P: price of the regulated service.

C: the production cost of the regulated service, where $C = C(Q)$.

K: unremunerative services demanded by the franchiser and supplied by the franchisee, such as institutional networks to universities and hospitals.

D: system upgrading or line extension in the franchise.

The objective function is assumed to be twice differentiable, and

$$U_\pi > 0,\ U_p < 0,\ U_K > 0, \text{ and } U_D > 0,$$ [13]

where

U_π: marginal utility of a dollar profit increase.

U_p: marginal disutility of a dollar price increase.

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[13]For the discussion of marginal utility of each argument, see Chapter II, Section 2.C.

U_K: marginal utility of a dollar's worth of unremunerative services.

U_D: marginal utility of a dollar's worth of system upgrading (or line extension).

Also, we assume some degrees of interdependencies between P and K, and P and D, but not between π and P, K, or D in the objective function.

$$U_{pK} > 0,\ U_{pD} > 0,$$
$$U_{\pi p} = 0,\ U_{\pi K} = 0,\ U_{\pi D} = 0, \text{ and } U_{KD} = 0.$$

where $U_{pK} > 0$ and $U_{pD} > 0$ means that the marginal disutility of a dollar price increase declines with an increase in the unremunerative services and with an improvement in the service quality respectively. It is a reasonable assumption because those who seek free public services, system upgrading, and line extension may overlap the subscriber group, or represent the general public. Moreover, it is assumed that the regulatory commission would have a relatively easier time justifying price increases to the subscribers if K or D are simultaneously increased.

The formal problem for the regulator is, then, to maximize the Lagrangian

$$L = U(\pi, P, K, D) + \mu(\pi - f(P,C,K,D)) \qquad (32)$$

with respect to π, P, K, D, and μ, which yields,

$$-\mu = U_\pi = -(U_p/f_p) = -[(U_{pK}+U_K)/f_K] = -[(U_{pD}+U_D)/f_D] \qquad (33)$$

which requires f_p, f_K, and f_D are non-zero. We are interested in the range over which $f_p > 0$ and $f_{pp} < 0$, and, of course, $f_K < 0$. However, f_D may be positive or negative because while system upgrading is costly to a cable system, it improves the demand conditions for the system. Especially if the system upgrading was initiated by a cable system, rather than a regulatory commission, we should expect f_D to be positive in the long-run.

Suppose initially that there is no K or D in the objective function, i.e., the regulatory commission does not see any benefits by imposing K or D on the regulated cable system. Then, the solution is where $f_p = -(U_p/U_\pi)$. Or graphically it is the tangent point of the indifference curve, u_1, and the profit function, π_1, which is the point A in Figure III-1A. The price levels vary according to the shape of the indifference curve which reflects the relative significance of lower prices and higher profits as the regulatory objectives. For example, if the regulatory commission does not see any benefits in restricting the price, the indifference curve will be horizontal, and the solution would be the same as the monopolistic price.

As discussed in Chapter II, Section 3.C., and reported in Table II-3, we expect that state public utility type regulation places more significance on lower prices relative to higher profits than the other types of regulation, and local regulation assisted by state regulatory commissions places less significance on lower prices relative to higher profits than local regulation. Then, the indifference curve will be steeper in descending order of public utility type regulation, local regulation, and local regulation combined with state regulation, and the optimal price levels would be higher in the reverse order. Figure III-1B depicts the solutions for the alternative types of regulation.

Now suppose that the regulatory commission would like to obtain a certain dollar value of unremunerative services, K^0, for a special interest group or for its own political record. The imposition of K^0 reduces the regulated firm's profitability, shifting the profit function, π_1, inward to, π_2 in Figure III-2.[14]. Given the same shape of the indifference curve (i.e., $K = K^0$, $U_{pK} = 0$, and $U_{pD} = 0$), the solution is at the point A', which implies a higher price than without the unremunerative services. Moreover, if $U_{pK} > 0$ and $U_{pD} > 0$, which is more plausible, the indifference curve becomes more horizontal (i.e., from U_2 to U_3 in Figure III-2), and raises its equilibrium price further. In any case, it seems certain that an imposition of unremunerative services, K, or forced (or involuntary) system upgrading and line extension, D, raises the regulatory price.

For an ideal measurement of the effectiveness of regulation, not only prices, but also the other regulatory objectives in equation (31) must be considered. However, detailed empirical examination regarding the effects of alternative regulation on free public services and system upgrading is beyond the scope of this study. Accordingly, we will present only statictics with the intention of providing some sketches about them.

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[14]The shift of the indifference curve from U_1 to U_2 should not be taken as a reduction of the regulator's utility. $U_1 = U(\ P,\ \pi,\ K = 0\ )$ and $U_2 = U(\ P,\ \pi,\ K = K^0\ )$.

Figure III-1

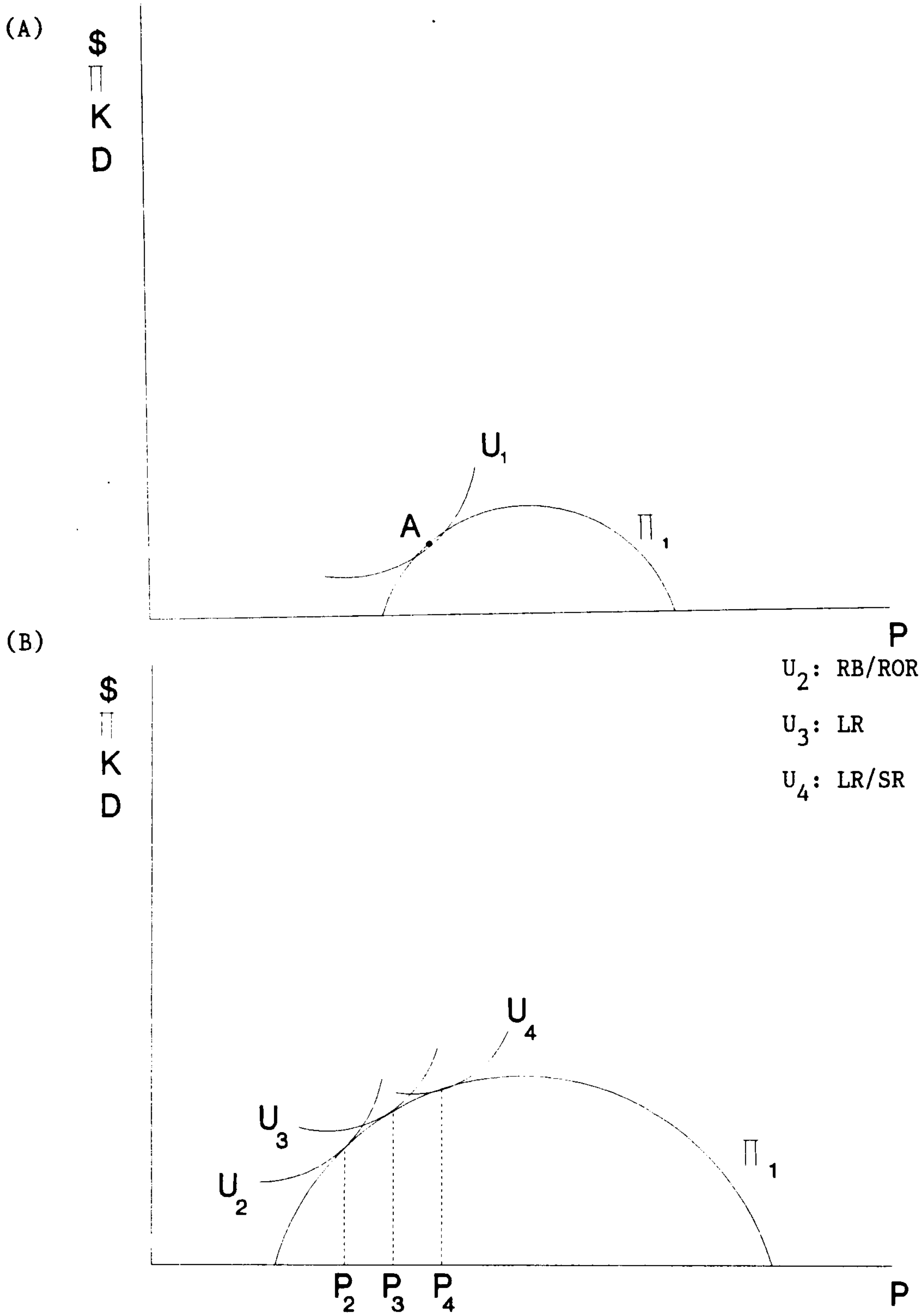

Figure III-2

U_1: $U(\pi,P;K=0)$

U_2: $U(\pi,P;K=K^0,U_{PK}=0,\ U_{PD}=0)$

U_3: $U(\pi,P;K=K^0,U_{PK}>0,\ U_{PD}>0)$

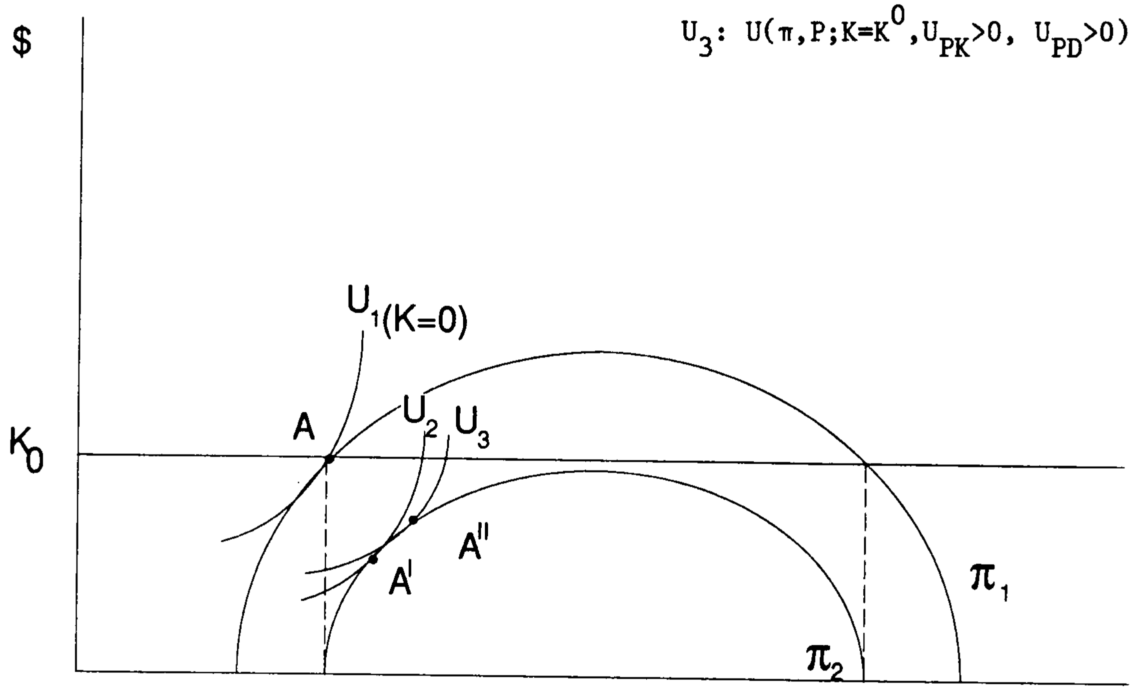

Table III-2 reports the results of a simple regression model for free public services. The dependent variable is the hours of local origination programming per week, and was regressed on channel capacity (availability of channels for local origination), number of homes passed by cable (the proxy for the cost of local origination per home passed), TV market rankings (the proxy for possible bargainning powers possessed by local governments), and regional differences.[15] The results show clearly that more hours of local origination programming were obtained by local regulation assisted by state cable commissions, DR1. No significant difference between local regulation and state public utility type regulation was found, though it was expected. Table III-3 reports the system upgrading according to types of regulation.[16] The tables (A and B) reveal again that more systems were upgraded under a system of local regulation assisted by state regulation, LR / SR (DR1), and less systems were upgraded under a regime of state public utility type regulation, RB / ROR (DR2).[17] Tables III-2 and Table III-3 confirm the importance of assigned goals to regulatory commissions. State independent cable commissions which assumed a wider range of the cable system's activities seem to have been successful in obtaining more free

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[15] Channel-miles of institutional networks may be more significant part of free public services, but data were not available.

[16] Only those cable systems which started before 1970 were taken as the sample, assuming that all those systems had a channel capacity of less than 16 at that time.

[17] Note that some system upgrading may have been initiated by cable systems, especially in Top 100 TV markets.

Table III-2. Local Origination Programming Equation.

dependent variable = LO

Variable	Estimate	S.D.	t-stat
CONSTANT	-2.0849	41.736	-0.05
CC	7.1118	0.556	12.79**
H82	0.0019	0.0002	9.67**
MR1	114.826	21.418	5.36**
MR2	43.5865	25.812	1.69
MR3	92.6731	24.575	3.77**
MR4	44.4417	26.947	1.65
MR5	14.3037	18.564	0.77
MR6	10.1231	21.746	0.47
R1	-76.7063	42.738	-1.79
R2	123.6354	41.879	2.95**
R3	61.0902	40.380	1.51
R4	7.5608	39.886	0.19
R5	32.9297	42.861	0.77
R6	55.5393	40.954	1.36
R7	32.2416	41.881	0.77
R8	-43.7323	40.593	-1.08
DR1	75.1348	27.894	2.69**
DR2	30.9750	51.635	0.60
DR3	197.8573	44.256	4.47**
DR4	9.4008	48.659	0.19

R-square = 0.30
n = 1712

** indicates that the estimated value is statistically significant at 99 percent level of confidence.

* indicates that the estimated value is statistically significant at 95 percent level of confidence. This expression will be used throughout this thesis.

Table III-3. System Upgrading According to Types of Regulation.

	no. of cable systems (started before 1970)	no. of cable systems (CC < 15 in 1984)	percentage
	A. Top 100 TV Market.		
LR	237	45	19%
LR/SR	16	1	6%
RB/ROR	1	1	100%
CTR	0	0	–
	B. Below 100 TV Markets.		
LR	579	173	30%
LR/SR	43	7	16%
RB/ROR	15	8	53%
CTR	8	1	13%

public services and system upgrading, and state uitlity commissions seem to have been less active in those areas.

Based on the above discussions and statistics, we draw the following tentative conclusions on the effects of various forms of regulation on prices.

(1). State public utility type regulation, which seems to place more value on restricting prices and profits through RB / ROR regulation, may set a relatively lower price than local franchise regulation or local regulation assisted by state regulation for a couple of reasons. First, traditionally, lowering prices as one of the regulatory goals is more significant relative to higher profits than for the other types of regulation. Secondly, public utility type regulation seems to see less value in obtaining free public services, local line extension, and better quality of services than local regulation or local regulation assisted by state regulation.

(2). Local commissions assisted by a state independent cable commission may allow cable systems to set a relatively higher price than when it is regulated only by local authority or by state public utility type regulation for several reasons. First, the state cable commission seems to have been established because of the combination of distrust in local authorities' ability to conduct fair regulation and the industry's desire to avoid somehow arbitrary, capricious, or onerous regulation by local governments, and has functioned as an appeals process in rate cases for those cable systems which were not satisfied with the decisions made by local authorities. Secondly, state cable commissions which assisted local governments covered a wider range of the cable system's activities and were more concerned with the quality of services, line extension, and public services than state public utility type regulation.

(3). For common tariff regulation and state deregulation, our analysis of the regulator as utility maximizer does not provide any implication. The effects probably depend upon several factors, such as the possible reduction in the cost of regulation to regulated firms, the degree of market power, and public opinion.

3. Empirical Models.

In the previous sections, we presented the theoretical model of a price equation which is expressed by demand and cost conditions and the extent to which regulation is effective. Also, we identified the economic factors that possibly determine the demand and cost conditions for a cable system. Regulation was differentiated according to the methods and techniques used by the regulatory authority and its judicial level, and the extent to which regulatory prices would be affected by the different types of regulation was discussed as well. Based on this information, we posit a set of empirical models in this section in an attempt to examine the economic impacts of various forms of regulation on firm's regulated prices and its price structure. In section 3.A and 3.B, demand and marginal cost equations for basic and pay services are designed. The empirical models of reduced form price equations for basic and pay services are provided in section 3.C.

3.A. Demand Equations for Basic and Pay TV Services.

Based on the discussions of the determinants of demand for basic and pay services and the set of demand equations, (29) and (30), the equations we estimate for basic and pay TV services are the following:

$$\begin{aligned} PR82_i = {} & a_0 + a_1 LCSN_i + a_2 LCSD_i + a_3 LCSI_i + a_4 LCSE_i \\ & + a_5 PB82_i + a_6 PP82_i + a_7 IPF_i + a_8 AGE_i + a_9 MR1_i \\ & + a_{10} MR2_i + a_{11} MR3_i + a_{12} MR4_i + a_{13} MR5_i + a_{14} MR6_i \\ & + a_{15} R1_i + a_{16} R2_i + a_{17} R3_i + a_{18} R4_i + a_{19} R5_i + a_{20} R6_i \\ & + a_{21} R7_i + a_{22} R8_i + u_i \qquad (34)\text{,}^{18} \end{aligned}$$

$$\begin{aligned} HP82_i = {} & b_0 + b_1 PR82_i + b_2 PP82_i + b_3 LNP_i + b_4 IPF_i \\ & + b_5 MR1_i + b_6 MR2_i + b_7 MR3_i + b_8 MR4_i + b_9 MR5_i + b_{10} MR6_i \\ & + b_{11} R1_i + b_{12} R2_i + b_{13} R3_i + b_{14} R4_i + b_{15} R5_i + b_{16} R6_i \\ & + b_{17} R7_i + b_{18} R8_i + v_i \qquad (35) \end{aligned}$$

(See Table II-4 for the description of variables)

where i stands for a cable system i, and u_i and v_i are the disturbance terms which are assumed to possess the basic statistical assumptions.[19] The log form was taken for comparative cable service, LCSN, LCSD, LCSI, and LCSE, in order to account for the expected diminishing marginal utility of an additional TV channel. An exponential of the inverse of

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[18] Several combinations of the installation fee and monthly charge for basic may be used as alternatives for PB82.

[19] These assumptions are: (1) the disturbance has zero mean; (2) its variance is constant; (3) there is no cross sectional correlation; (4) independent variables are nonstochastic.

age of the system, AGE, was used expecting that a cable system grows faster at the beginning.

Equation (34) and (35) will be treated as a recursive system, and in this system prices of basic and pay TV services, PB82 and PP82, and family income, IPF, affect both the basic and pay TV penetration rates, PR82 and HP82. Given the standard assumptions regarding the disturbance terms and providing that u_i and v_i are independent, ordinary least squares estimation (OLS) applied to each equation brings unbiased estimators. The condition that u_i and v_i are independent, which will be tested later, also eliminates the possibility of specification error of equation (30).

Several functional forms will be tried such as linear, logarithmic, and logit functional forms. Logit functional form constrains the predicted value of dependent variable from 0 to 1, and has been used frequently in previous studies.

3.B. Cost Equations for Basic and Pay Services.

The ealier theoretical analysis clearly points toward the importance of marginal costs in the determination of the regulatory price. Unfortunately, this key information is not observable directly. In fact, even total costs of cable systems are not available, though output and conditional variables are available to us. We do not, however, need to know the exact marginal cost or total cost. What we need to know is what the cost determinants for cable systems are and how they are related to the cable system's marginal cost condition, and the information obtained through this plays a crucial role in the price equations.

For that purpose, we take advantage of the previous cable system cost studies.[20] Using their estimated values for the parameters, we generate values of marginal cost for cable systems and use them to examine how cost determinants are related to the marginal cost.[21]

$$MCB_i = c_0 + c_1LH82_i + c_2LQB82_i + c_3LPD_i + c_4LNC_i + w_i \quad (36)$$

$$MCP_i = d_0 + d_1LH82_i + d_2LQB82_i + d_3LQP82_i + d_4LPD_i + d_5LNC_i + x_i \quad (37)$$ [22]

where w_i and x_i are the disturbance terms, and they are assumed to possess the classical statistical properties. Log forms for the number of homes passed, LH82, the number of subscribers, LQB82, the number of pay subscriptions, LQP82, and the number of channels, LNC, were used to account for possible product specific economies of scale in each of them.

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[20] They are Owen and Greenhalgh (1982) and Noam (1985). They both used translog multiproduct cost functions, so that marginal cost is the function of all the cost determinants.

[21] In the process of generating the values of marginal cost, a mean value was used when an independent variable was not available. In the Noam's equation, the mean value was 1 because all the variables were standardized around the mean equal to 1. In the Owen and Greenhalgh's study, the mean values were presented in their paper.

[22] A set of alternative forms are,

$$MCB_i = c_0 + c_1LH82_i + c_2LPR82_i + c_3LPD_i + c_4LNC_i + w_i \quad (36)'$$

$$MCP_i = d_0 + d_1LH82_i + d_2LPR82_i + d_3LPPR82_i + d_4LPD_i + d_5LNC_i + x_i \quad (37)'$$

Equivalently, equation (37) can be expressed as the combination of the marginal cost of basic service, MCB_i, and the number of pay TV subscriptions, LQP82. Furthermore, since the cable system usually paid flat fees per subscription per month to pay TV program providers (which vary according to the types of pay TV program), or typically 50:50 split of the cable system charged to the subscriber to pay TV program providers, the additional cost of pay TV subscription seems to depend on the types of pay TV program offered by the cable system, rather than the number of pay TV subscriptions. Then, equation (37) can be expressed alternatively as,

$$MCP_i = d_6 + d_7 MCB_i + d_8 PCP_i + x_i' \qquad (38)$$[23]

Simple regressions of each equation can be applied using the OLS method. Or, if the disturbance terms, w_i and x_i (x_i'), are highly correlated (which is more likely to occur in the cost equations because of the difficulty in attributing the total cost to the different products), we might be able to improve the efficiency of the estimators by the use of GLS methods applied on the set of equations (36) and (37) (or (38)).

3.C. Reduced Form Price Equation.

Our theoretical model of the reduced form price equation shows that observed price depends upon cost determining factors and demand

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[23]Since greater volume discounts were available to larger MSOs, equation (38) underestimates the marginal costs of pay TV programs for a cable system which belongs to a larger MSO.

determining factors through the changes in marginal cost and price elasticity of demand (or the changes in monopolistic price and competitive price), and the extent to which regulation is binding. Also, we hypothesized that the extent to which price regulation is effective would vary according to the types of regulation. Then, the general forms of the price equations are the combination of demand equations, cost equations, and the alternative forms of regulation. Thus,

$$\begin{aligned} PB82_i = {} & a_0' + a_1'LCSN_i + a_2'LCSD_i + a_3'LCSI_i + a_4'LCSE_i \\ & + a_7'IPF_i + a_8'AGE_i + a_9'MR1_i + a_{10}'MR2_i + a_{11}'MR3_i \\ & + a_{12}'MR4_i + a_{13}'MR5_i + a_{14}'MR6_i + a_{15}'R1_i + a_{16}'R2_i \\ & + a_{17}'R3_i + a_{18}'R4_i + a_{19}'R5_i + a_{20}'R6_i + a_{21}'R7_i \\ & + a_{22}'R8_i + c_1'LH82_i + c_3'LPD_i + c_4'LNC_i \\ & + e_1DR1_i + e_2DR2_i + e_3DR3_i + e_4DR4_i + e_5MSO1_i \\ & + e_6MSO2_i + e_7DV_i + e_8FFEE + e_9LO + y_i \end{aligned} \qquad (39)^{24}$$

$$\begin{aligned} PP82_i = {} & b_0' + b_1'PR82_i + b_3'LNP_i + b_4'IPF_i + b_5'MR1_i \\ & + b_6'MR2_i + b_7'MR3_i + b_8'MR4_i + b_9'MR5_i + b_{10}'MR6_i \\ & + b_{11}'R1_i + b_{12}'R2_i + b_{13}'R3_i + b_{14}'R4_i + b_{15}'R5_i \\ & + b_{16}'R6_i + b_{17}'R7_i + b_{18}'R8_i + d_1'H82_i + d_2'LQB82_i \\ & + d_4'LPD_i + d_5'LNC_i + f_1DR1_i + f_2DR2_i + f_3DR3_i + f_4DR4_i \end{aligned}$$

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[24] We include local origination, LO, as one of the regulatory factors that would constitute a cost to cable systems. Possible effects of local origination on basic cable demand will be tested by inserting LO into the basic demand equation (34). The previous studies found that local origination did not contribute to increases in demand.

$$+ f_5 MSO1_i + f_6 MSO2_i + f_7 DV_i + f_8 FFEE + z_i \qquad (40)^{25}$$

where y_i and z_i are the disturbance terms and they are assumed to possess the basic statistical assumptions. Also, the coefficients a' and b' are corresponding to the coefficients a and b in the demand equations (34) and (35) respectively. The coefficients c' and d' similarly correspond to the coefficients c and d in the cost equations (36) and (37) respectively.

As the theoretical model implies, the coefficients of the cost factors, c' and d' in the equations (39) and (40), are expected to have the same sign as the coefficients of the cost factors, c and d in the equations (36) and (37). The corresponding coefficients of demand factors, a' and a, and b' and b, must also have the same sign in the equations (39) and (34), and (40) and (35), if the marginal costs are non-decreasing. However, the cost studies of Noam (1985) and Owen and Greenhalgh (1982) showed that marginal costs of basic subscriber and pay TV subscription were non-increasing. Thus, the sign from the demand factors in the price equation (39) and (40), i.e. a' and b', might not

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[25]Alternatively,

$$\begin{aligned} PP82_i = {} & b_0' + b_1' PR82_i + b_3' LNP_i + b_4' IPF_i + b_5' MR1_i + b_6' MR2_i \\ & + b_7' MR3_i + b_8' MR4_i + b_9' MR5_i + b_{10}' MR6_i + b_{11}' R1_i + b_{12}' R2_i \\ & + b_{13}' R3_i + b_{14}' R4_i + b_{15}' R5_i + b_{16}' R6_i + b_{17}' R7_i + b_{18}' R8_i \\ & + d_7' MCB_i + d_8' PCP_i + f_1 DR1_i + f_2 DR2_i + f_3 DR3_i + f_4 DR4_i \\ & + f_5 MSO1_i + f_6 MSO2_i + f_7 DV_i + f_8 FFEE + z_i' \qquad (40)' \end{aligned}$$

be as clear as expected. Regarding the effects of various forms of regulation, the negative sign is expected for the public utility type regulation, DR2, and the positive sign for the local regulation assisted by state regulation, DR1. No implications were available for state common tariff, DR3, and state deregulation, DR4. Franchise fees, FFEE, which were charged to cable systems usually in the form of percentage of gross revenue, were included in the basic price equations. Since they were a direct cost of regulation to cable systems, higher prices are expected when higher franchise fees are charged. Local origination programming, LO, is also expected to raise the basic prices

To examine the effects of regulation on a firm's price structure, the dummy variables for the different types of regulation and franchise fees were also included in the pay TV price equation. The complementary condition of basic and pay TV services indicates that the higher is the basic price, the lower the pay price is, resulting in the profit maximizing price structure.[26] Thus, the corresponding coefficients of dummy variables for regulation between the basic price equation, i.e., (39), and the pay price equation, i.e., (40), are expected to have the opposite signs if they are statistically significant.

In addition, we insert two other variables into the price equations to account for possibly different pricing depending upon the cable system's characteristics. One is the cable system's ownership. A system which is owned by a large multiple system operation (MSO) may use

[26]See Phillips (1980) and Webb(1983), Chapter 5.

a different pricing strategy because it had greater bargaining power over pay TV program providers than a small MSO or an independent cable system.[27] Considering this along with the complementary relation of basic and pay TV services, a cable system whose ownership belongs to a large MSO may set a relatively lower price on the basic service with an intention of increasing potential pay TV subscribers, and set a relatively higher price on the pay TV service.

The other variable we consider in the price equations is the cable system's stage of growth. The cable system's main target might be on the penetration rate rather than on the price at the beginning or when it is expanding its coverage area. As it matures, i.e., as it reaches the ultimate penetration rate, then, it might shift its target from the penetration to the price. If that is the case, DV, which measures the cable system's plan on expansion of its distribution system, must have a negative sign.

Before proceeding to the next chapter, we should comment on some econometrics problems we may encounter in these empirical models. First, as discussed in the empirical models of cost equations, the disturbance

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[27] Pay services may give volume discounts for subscribers, for example, percentage reductions at various increments in absolute numbers of subscribers to the service: 10,000 or over, 2 percent; 25,000 or over, 3.5 percent; 40,000 or over, 5 percent; 75,000 or over, 15 percent; 100,000 or over, 20 percent. Additional discounts may be offered for high levels of pay-to-basic penetration for a particular pay network, for example, for HBO service charges of $ 5.00 or more per subscriber, at 40 percent penetration of affiliates subscribers, 2 percent discount; at 60 percent, 4 percent; at 80 percent, 6 percent. (Baldwin and McVoy (1983), p.299)

terms, y_i and z_i, may be highly correlated. In this case, the GLS method applied to the set of equation (39) and (40) may produce more efficient estimators than the OLS method applied to each equation separately. Secondly, collinearity may be severe. The use of a large number of variables makes one suspicious about serious multicollinearity problems.[28] Thirdly, dummy variables, which were intended to reflect the regional demand differences and the availability of substitute goods in the demand equations, MR and R, might gather unintended effects in the price equations. To screen out this problem, a careful examination of these variables is necessary.

[28] One way to avoid this problem is the use of the demand and cost estimations. Utilizing the estimated values for the parameter obtained through the demand and cost estimations, we can create some indices for the demand and cost conditions for a cable system i. The variables for the demand conditions can be substituted for LCSN, LCSD, LCSI, LCSE, IPF, AGE, MR, and R in equation (39), and NP, IPF, PR82, MR, and R in equation (40). The variables for the cost conditions can be substituted for LH82, LPD, and LNC in equation (39), and LH82, LQB82, LPD, and LNC in equation (40).

CHAPTER IV

RESULTS

In this chapter, the results of demand, cost, and price estimations will be provided along with a discussion of the econometric methods and model specifications used in this study.

1. Demand Estimation.

As we discussed in Chapter III, 2-A, basic and pay TV demands are interdependent, and we treat them (i.e., equation (34) and (35) in Chapter III) as a recursive system. In recursive system, application of Ordinary Least Squares (OLS) method on each equation yields consistent estimates, provided that the disturbance terms from these equations are uncorrelated. Several functional forms of basic and pay TV cable demand estimation were tried. Among them (i.e., linear, logarithmic, and logistic functional forms), the linear form performed the best. Accordingly, we will discuss the empirical results on the basis of the OLS estimation of the linear demand equations, presented in equations (34) and (35) in Chapter III. The results of logistic functional form of basic and pay TV demand estimations are provided in Appendix, Table AP-1.

Table IV-1 and Table IV-2 report the results of the basic and pay TV demand estimations. Model DB1 and DP1 in Table IV-1 were estimated on the assumption that alternative goods affect the size of demand, while the alternative goods were assumed, in Model DB2 and DP2 in Table IV-2, to change the sensitivity to price changes. From a theoretical

Table IV-1. Estimation of Basic and Pay TV Demand, DB1 and DP1.

dependent variable = PR82 for Basic (DB1)
and HP82 for Pay TV (DP1)

	Model DB1		Model DP1	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	91.235	18.25**	4.358	1.06
LCSN	30.784	7.01**		
LCSD	13.926	5.36**		
LCSI	1.185	1.81		
PB82	-1.179	-3.70**		
PR82			0.209	8.64**
PP82	-0.112	-0.42	-1.576	-5.67**
IPF	0.0003	2.62**	0.001	9.71**
LNP			19.633	20.64**
AGE	-12.130	-9.83**		
MR1	-15.204	-8.19**	7.247	4.55**
MR2	-8.564	-4.27**	2.543	1.36
MR3	-11.069	-5.53**	4.683	2.69**
MR4	-6.930	-3.39**	-2.435	-1.28
MR5	-4.269	-3.00**	-0.780	-0.60
MR6	-5.943	-3.68**	-2.454	-1.60
R1	0.694	0.31	1.209	0.56
R2	-4.036	-1.67	6.676	2.94**
R3	-0.973	-0.43	4.929	2.32*
R4	-4.154	-1.95*	2.579	1.26
R5	0.700	0.28	4.303	1.87
R6	-1.672	-0.72	12.983	5.95**
R7	-8.282	-3.24**	4.929	2.10*
R8	-5.645	-2.40*	-1.488	-0.67

R-square = 0.40
n = 1374

R-square = 0.42
n = 1374

Table IV-2. Estimation of Basic and Pay TV Demand, DB2 and DP2.

dependent variable = PR82 for Basic (DB2)
and HP82 for Pay TV (DP2)

	Model DB2		Model DP2	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	82.173	18.22**	7.243	1.85
LCSN	30.705	7.22**		
LCSD	14.705	5.76**		
LCSI	1.120	1.81		
PB82	-0.452	-1.45		
PR82			0.203	8.35**
PP82	-0.126	-0.41	-1.853	-6.19**
IPF	0.0003	3.08**	0.001	9.79**
LNP			19.857	20.85**
AGE	-12.420	-10.79**		
MR1*PB82	-1.704	-8.08**		
MR2*PB82	-1.000	-4.39**		
MR3*PB82	-1.143	-5.05**		
MR4*PB82	-0.629	-2.65**		
MR5*PB82	-0.433	-2.72**		
MR6*PB82	-0.590	-3.26**		
MR1*PP82			0.687	4.12**
MR2*PP82			0.333	1.71
MR3*PP82			0.432	2.34*
MR4*PP82			-0.245	-1.22
MR5*PP82			-0.079	-0.58
MR6*PP82			-0.230	-1.46
R1	0.861	0.39	1.477	0.68
R2	-4.015	-1.73	6.890	3.01**
R3	-0.825	-0.38	5.064	2.37*
R4	-3.723	-1.79	2.790	1.36
R5	0.819	0.34	4.454	1.96*
R6	-1.563	-0.70	13.113	5.97**
R7	-8.381	-3.39**	4.986	2.11*
R8	-4.774	-2.10*	-1.472	-0.66

R-square = 0.39 n = 1374 (Model DB2)

R-square = 0.42 n = 1374 (Model DP2)

perspective, the availability of substitute goods can act to influence the demand in both ways, however, separate estimations were chosen here to avoid a possibly serious collinearity problem. Since both of the estimations provided very similar results, we base our subsequent discussion on Table IV-1, Model DB1 and Model DP1.

In the basic cable service demand estimation, Model DB1, all the comparative cable service variables (i.e., LCSN, LCSD, and LCSI) had the expected sign and were statistically significant at a 99 percent level of confidence, with the exception of the comparative cable service in independent stations, which was significant at a 90 percent level of confidence. This confirms our prior expectation that a cable system which carries additional primary network, duplicated network, and independent stations including cable networks such as MTV, ESPN, and CNN-News would have a higher penetration rate, and subscribers would value primary networks more than duplicated networks, and duplicated networks more than independent stations.

The comparative cable service in educational stations was initially included in the empirical models; however, in accord with the results of previous cable demand studies, it had the unexpected sign and was statistically significant.[1] The adverse effect of an increase in educational stations on the basic penetration rate, however, cannot be explained by the expected consumer behavior. Educational stations in a bundle of basic cable service are free disposable services, and they

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[1]See, for example, Pacey (1985).

should not have the negative effect on the basic penetration in that sense. Besides, in practice, cable systems provided educational stations when educational stations were available without significant additional costs and when they had some unused channels. This case was often seen in big cities where penetration rates were lower. Then, the comparative cable service in educational stations was dropped from our empirical models to prevent it from gathering some unintended effects.

The coefficients for monthly basic price, PB82, pay TV price, PP82, and income per family, IPF, were of the expected signs, though the coefficient for PP82 was statistically insignificant.[2]

The age parameter, AGE, had a statistically significant coefficient of -12.132. Table IV-3 reports the projected penetration rate and the percent of the final penetration rate at each year. By the second year, cable systems reach about 90 percent of the ultimate penetration rate. This confirms the Park's finding that a cable system approaches its maturity very quickly.

The dummy variables for the availability of substitute goods all proved to be statistically significant and of the expected sign. Penetration rates were the highest where cable systems were located outside TV markets, MR6 and MR7 (no dummy variable for MR7), and higher in order of Below 100 TV markets, MR5, Second 50, MR3 and MR4, and Top

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[2]When the basic cable demand was estimated only in those cable systems which were located in Top 50 ADI TV market rankings, the coefficient of PP82 was of the expected sign, and became significant. This implies that more people subscribe to basic cable service in order to gain access to pay TV services in these areas.

Table IV-3. Estimated Growth Path
Toward Final Penetration Rates.

Year	Estimated Penetration	% of the Final Penetration Rate
1	49.8	70.5 %
2	62.7	88.8 %
3	65.8	93.2 %
4	67.1	95.1 %
5	67.9	96.2 %
6	68.4	96.9 %
7	68.8	97.4 %
8	69.0	97.7 %
9	69.2	98.0 %
10	69.3	98.2 %

The figures were computed on the basis that a cable firm is located in the suburb of a Top 50 ADI TV market in New England region.

50 TV markets, MR1 and MR2. Also, it was observed that penetration rates were higher in suburbs than in urban areas (e.g., MR1 v. MR2, MR3 v. MR4), and lower when cable systems' nearest TV market was not Second 50 but Top 50 TV markets (e.g., MR2 v. MR4, MR6 v. MR7 (no dummy)).

The other dummy variables recognizing cultural differences in regions showed that penetration rates were about 8 percent lower in Mountain areas, R7, about 6 percent lower in Pacific areas, R8, and about 4 percent lower in South Atlantic areas, R4, than in New England areas for which no dummy variable was assigned.

Local origination programming, LO, was also included initially to test whether it had any effects on the basic cable demand. Similarly to previous studies, however, the coefficient was insignificant. Then, it was dropped from the models.

Model DP1 in Table IV-1 reports the results of the pay TV demand estimation. The effects of pay TV price, income per family, and number of pay TV programs were as expected, and were statistically significant. Also, it was observed that the pay TV penetration rate was the highest in the city areas of Top 50 TV Markets, MR1, and in East North Central, R2, West North Central, R3, West South Central, R6, and West North Central, R7, than in New England areas.

The estimated coefficient of basic penetration rate, PR82, is of the correct sign and statistically significant. This variable, PR82, was inserted in the pay TV demand equation (along with the pay TV price, PP82, in the basic demand equation) in order to account for the interdependency of pay TV and basic demands. While the coefficient of PP82 turned out to be insignificant in the basic demand equation, the significant estimate of PR82 indicates that changes in basic demand condition (e.g., a change in basic cable service price, PB82) affect the pay TV penetration rate. Moreover, the residuals of the two equations, (34) and (35), were found not to be significantly correlated when PR82 was included in the pay TV demand equation, though they were found to be highly correlated without PR82 in the equation.[3] This justifies the application of OLS method on each equation, eliminating the possibility of specification error which could be caused by the conditional probability of pay TV demand to basic cable service demand.[4]

For a more detailed examination of the effects of prices and incomes on basic and pay TV demand, price and income elasticities of basic and pay TV demand according to different TV market rankings were

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[3]To look into this problem, simple regressions on the residuals were conducted. It was found that R-square was 0.005 and the estimated coefficient was not statistically significant at a 99 percent level of confidence when PR82 was included in the pay TV demand equation. When PR82 was not included in the equation, however, R-square was 0.09 and the estimated coefficient turned out to be stasistically significant.

[4]In order to test hetroskedasticity problem the Breush-Pagan test was conducted. It was found that the hetroskedasticity problem was significant in the basic and pay TV demand equations, and TV market rankings (MR) in the basic demand and TV market rankings and number of pay TV programs offered by a cable system (MR and LNP) in the pay TV demand were found to be the source of the hetroskedasticity. Then, the variances of the sample means of the dependent variables (PR82 and HP82) according to the TV markrt rankings and the number of pay TV programs were computed. The original regression equation (34) and (35) were then divided by the variances of the sample means since they are consistent estimator of the population variances (see Kmenta (1986), p.291) and reestimated. The least squares estimators obtained from the transformed regression equations (i.e., the weighted least squares estimators) are efficient. Having compared the respective coefficients and variances, it was found thet the hetroskedasticity problem was not of serious one. The estimation results are reported in Appendix, AP-2.

computed and reported in Table IV-4 and Table IV-5. The elasticities under DB1 and DB2 in Table IV-4 were calculated on the basis of the estimated values of Model DB1 in Table IV-1 and Model DB2 in Table IV-2, respectively. DP1 and DP2 in Table IV-5 were calculated based on the estimated values of Model DP1 in Table IV-1 and Model DP2 in Table IV-2, respectively.

Several features of Table IV-4 and IV-5 are noteworthy. First, it can be seen that subscribers are in general more sensitive to price and income changes for pay TV services than for basic cable services. Furthermore, as expected, price elasticities and income elasticities for basic cable service were lower in rural and suburb areas. For pay TV demand, however, in contrast to our prior expectation, it was observed that subscribers were more sensitive to price and income changes in rural and suburb areas. One possible explanation may be that people in cities subscribe to cable services mainly for pay TV programs, while the main reason for cable subscription in rural and suburb areas is for traditional broadcasting services. As far as pay TV demand is concerned, then, the effects of alternative goods could not be found.

Table IV-6 reports the effects of basic price and the total effects of income changes to pay TV demand. Cross price elasticities were found to be around -0.06.

2. Cost Estimation.

As mentioned previously, cable systems' financial data were not available, and that prevented a direct cost estimation. There are, however, two recent cable system cost studies available, and both the

Table IV-4. Price and Income Elasticities of Basic Demand.

TV Market	Price Elasticities		Income Elasticities
	DB1	DB2	DB1
MR1	-0.184	-0.336	0.107
MR2	-0.148	-0.182	0.074
MR3	-0.172	-0.234	0.084
MR4	-0.143	-0.131	0.065
MR5	-0.138	-0.100	0.060
MR6	-0.136	-0.119	0.061
MR7	-0.130	-0.050	0.054

Elasticities were estimated at the mean values of each TV market, using the estimated values reported in Table IV-1, Model DB1 and Model DB2, and Table IV-2, Model DB3, respectively.

Table IV-5. Price and Income Elasticities of Pay TV Demand.

TV Market	Price Elasticities		Income Elasticities
	DP1	DP2	DP1
MR1	-0.353	-0.261	0.441
MR2	-0.454	-0.437	0.492
MR3	-0.411	-0.369	0.445
MR4	-0.559	-0.743	0.545
MR5	-0.530	-0.651	0.497
MR6	-0.579	-0.762	0.548
MR7	-0.520	-0.626	0.476

Elasticities were estimated at the mean values of each ADI TV Market Rankings, using the estimated values reported in Table IV-4, Model DP1 and Model DP2, respectively.

Table IV-6. Cross Price Elasticity and Combined Income Elasticity for Pay TV Demand.

TV Market	Cross Price Elasticity	Combined Income Elasticity
MR1	-0.048	0.497
MR2	-0.062	0.532
MR3	-0.058	0.493
MR4	-0.076	0.596
MR5	-0.072	0.532
MR6	-0.078	0.583
MR7	-0.074	0.503

Elasticities were estimated at the mean values of each ADI TV Market Rankings, using the estimated values reported in Table IV-1, Model DB1 and DP1, respectively.

articles revealed similar characteristics of the cost conditions for cable systems. They are:

(1) economies of scale in basic subscribers (and pay TV subscriptions) exist;

(2) economies of scale in homes passed exist, but they are very small;

(3) population density and the number of channels offered by a cable system significantly affect the cable system's costs; and

(4) input prices, such as wages, and costs of capital and programming, significantly affect costs.

We utilize the two studies in two ways. First, values of marginal cost of basic subscribers and pay TV subscriptions will be generated using their estimated coefficients. Second, the relationship between the marginal cost of basic subscribers (or pay TV subscription) and the cost factors identified earlier will be established. In the final reduced form price equation, both the generated marginal cost values and the cost factors will be used. The established relationship between marginal cost and the cost factors must be transferred to the final reduced form price equation as the relationship between prices and the cost factors.

The estimation results of Noam (1985), and Owen and Greenhalgh (1982) that we used to create the values of marginal costs of basic subscribers and pay TV subscriptions are provided in Appendix, Table AP-3 and AP-4. In the process of creating the values, the mean values were used for unavailable variables. Once the values of marginal cost were generated, they were again regressed on the cost variables in order to identify the relationship between the marginal cost and the cost variables, and to confirm that the generated marginal costs have the same characteristics which were found and discussed in the previous literature.

Table IV-7, Table IV-8, and Table IV-9 report the estimation results, and Table IV-10 shows the correlations among them. MCB2 and MCP2 are the generated values of marginal costs for basic subscribers and pay TV subscriptions respectively by the use of Noam's results. MCB1 is the marginal cost value utilizing the Owen and Greenhalgh's estimation, and PCP is the cost of pay TV program per subscription per month to cable systems.

Given the same population density, LPD, and number of channels in use, LNC, the marginal cost of basic subscribers declines with an increase in the number of homes passed, LH82, holding the penetration rate constant, LPR82. The marginal cost declines more significantly with an increase in the number of subscribers, which means an increase in the penetration rate for basic, LPR82, holding the other variables constant. Inverse of the population density, i.e., the length of miles of cable required to pass one extra home, and the number of channels in use also increase the marginal cost of basic subscribers.

Table IV-10 exhibits that MCB1 and MCB2 are highly correlated as expected. For the marginal cost of pay TV subscriptions, however, the values generated by the use of Noam's empirical results, MCP2, are questionable, especially on the estimated coefficient for pay TV penetration rates, LPR82, which was expected to be constant. Probably

Table IV-7. Marginal Cost of Basic Subscriber, MCB1

dependent variable = MCB1

Variable	Estimate	S.E.	t-stat
CONSTANT	57.8253	0.3497	165.37**
LH82	-1.3636	0.0173	-78.80**
LPR82	-6.7669	0.0487	-138.97**
LPD	5.0178	0.0427	117.48**
LNC	11.0005	0.0599	183.72**

R-square = 0.98
n = 1482

Table IV-8. Marginal Cost of Basic Subscriber, MCB2.

dependent variable = MCB2

Variable	Estimate	S.E.	t-stat
CONSTANT	0.6243	0.0252	24.77**
LH82	-0.0297	0.0012	-23.78**
LPR82	-0.1278	0.0035	-36.41**
LPPR82	0.0799	0.0019	42.98**
LPD	0.0741	0.0031	24.07**
LNC	0.2183	0.0043	50.58**

R-square = 0.89
n = 1482

Table IV-9. Marginal Cost of Pay TV Subscription, MCP2.

dependent variable = MCP2

Variable	Estimate	S.E.	t-stat
CONSTANT	1.7777	0.0780	22.77**
LH82	-0.0078	0.0039	-2.03*
LPR82	-0.1525	0.0109	-14.02**
LPPR82	-0.2692	0.0058	-46.72**
LPD	0.0581	0.0095	6.08**
LNC	0.1623	0.0134	12.14**

R-square = 0.61
n = 1482

Table IV-10. Pearson Correlation Coefficients.

	MCB1	MCB2	PCP	MCP2
MCB1	1.000	0.881	-0.058	0.003
MCB2	0.881	1.000	-0.310	0.004
PCP	-0.058	-0.310	1.000	0.012
MCP2	0.003	0.004	0.012	1.000

the problem comes from the difficulty in separating the costs for basic and pay TV services.

3. Price Estimation.

The basic equations used for the reduced form price estimation are equations (39) and (40) in Chapter III, which are the combination of demand conditions, cost conditions, firm characteristics, and regulatory environments. The use of the dummy variables, such as for availability of alternative goods and regional differences in the demand for cable services, raised some concerns that they might gather additional and unintended effects in the price equations. To look into this possibility, we regressed prices of basic and pay TV services only on these demand and cost factors. The results were examined on the basis of the implications derived from our theoretical model, which are that: (1) factors that increase the firm's marginal cost should raise the actual prices; and (2) factors that increase the demand in the relevant range might lower the actual prices if the marginal cost is declining, which is the case in the cable television industry.

Table IV-11 reveals that quantitative variables (LCSN, LCSD, LCSI, and IPF) imply that favorable demand conditions do not necessarily lead to higher prices, but rather to lower prices. The dummy variables for the availability of alternative goods, MR_k, however, demonstrated that favorable demand conditions lead to higher prices. Furthermore, there was no consistent link found between the demand equation and the price equation in terms of the dummy variables recognizing regional differences in the demand, R_1. Basic penetration rates were found lower

Table IV-11. Comparison of Basic Demand, Cost, and Price Equation

dependent variable = PR82 for Model DB3
MCB1 for Model MCB1
PB1 for Model PB1

	Model DB3		Model MCB1		Model PB1	
Variable	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
CONSTANT	90.1572	21.94**			8.6845	17.08**
LCSN	30.6596	6.98**			-0.0427	-0.12
LCSD	13.9111	5.36**			-0.6408	-3.15**
LCSI	1.2006	1.83			-0.2596	-5.28**
PB82	-1.2006	-3.82**				
IPF	0.00029	2.63**			0.000006	0.78
AGE	-12.0161	-9.85**			-0.4091	-4.40**
MR1	-15.2946	-8.22**			-0.5532	-3.67**
MR2	-8.5960	-4.23**			-0.3230	-2.06*
MR3	-11.1154	-5.55**			-0.2071	-1.28
MR4	-6.9805	-3.42**			-0.2228	-1.40
MR5	-4.3180	-3.03**			-0.1779	-1.58
MR6	-5.9888	-3.71**			-0.2692	-2.12*
R1	-0.7034	-0.31			-0.5974	-3.46**
R2	-4.2258	-1.93			-0.2111	-1.15
R3	-0.9986	-0.44			-0.1906	-1.11
R4	-4.1669	-1.93			-0.0628	-0.38
R5	0.6950	0.28			-0.0179	-0.09
R6	-1.8039	-0.77			0.0360	0.20
R7	-8.4014	-3.28**			0.7811	3.95**
R8	-5.7713	-2.48*			0.5905	3.28**
LH82			-1.3636	-78.80**	0.0527	1.37
LPR82			-6.7669	-138.97**		
LPD			5.0178	117.48**	0.4764	5.11**
LNC			11.0005	183.72**	0.7154	5.76**
	R-square = 0.40		R-square = 0.98		R-square = 0.15	
	n = 1399		n = 1583		n = 1399	

in West North Central, R2, Mountain, R7, and Pacific areas, R8, while basic prices were found higher in Mountain and Pacific areas, and lower in West North Central. Also, basic prices were found lower in Middle Atlantic areas, R1, though there was no significant differences in penetration rates.

The cost factors held the same relationship in the price equations, except the number of homes passed by cable, LH82. An increase in the length of cable required to pass one home (i.e., a decrease in the population density), LPD, and an increase in the number of channels offered by the cable system, LNC, will raise the basic prices through an increase in the marginal cost.

Table IV-12 was also intended to examine whether the relationships which were found between pay TV penetration rates and the demand and cost factors were maintained in the pay TV price equation. Similarly to the basic cable services, favorable (or unfavorable) demand conditions did not yield any conclusive results (see LNP, MR1, R2, R6, R7, and R8), while the cost factors in the price equation had the expected relations.

These results suggest that the dummy variables, which were intended in the demand equations to account for the availability of substitute goods and regional differences in the demands, may have gathered additional effects in the price equations. It may be the case that a cable system makes pricing decisions according to its TV market ranking and region, among other factors. The cable system which was under regulation and public scrutiny is vulnerable to the comparison to

Table IV-12. Comparison of Pay TV Demand, Cost, Price Estimation.

dependent variable = HP82 for Model DP3
PP82 for Model PP1

	Model DP3		Model PP1	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	4.2345	1.03	-0.2941	-0.27
PR82	0.2074	8.58**	0.0027	1.05
PP82	-1.5512	-5.58**		
LNP	19.5547	20.57**	0.1570	1.60
IPF	0.0010	9.75**	-0.00001	-1.18
MR1	7.1269	4.47**	-0.2706	-1.79
MR2	2.5247	1.35	-0.0613	-0.35
MR3	4.6745	2.69**	-0.1209	-0.73
MR4	-2.4437	-1.29	0.0805	0.44
MR5	-0.7434	-0.57	0.0946	0.76
MR6	-2.4215	-1.58	0.2226	1.54
R1	1.2251	0.57	-0.1643	-0.78
R2	6.6637	2.93**	-0.3135	-1.45
R3	4.9066	2.32*	-0.0321	-0.16
R4	2.5677	1.26	-0.0630	-0.32
R5	4.2714	1.86	-0.1091	-0.50
R6	12.7510	5.84**	0.0803	0.39
R7	5.0096	2.13**	0.3614	1.61
R8	-1.5230	-0.69	1.0407	5.00**
PCP			2.0991	9.25**
MC1			0.0117	1.04

R-square = 0.42, n = 1399 (Model DP3)

R-square = 0.14, n = 1399 (Model PP1)

other cable systems which are in similar environments, and may not be able to set a significantly different price.[5]

Therefore, to separate the demand effects and possible additional effects in the price equations, and to lessen collinearity problems, a couple of proxy variables were created. To account for the basic demand effects, DCONB was generated with the short-run exogeneous variables, and DCONP for pay TV demand effects. Another variable, CCONB, was also created to prevent LH82 from picking up unintended effects.[6]

Table IV-13 and Table IV-14 report the results of the OLS basic price estimation with various proxy variables.[7] Model PB2 is the estimation of equation (39), Model PB3 with the proxy variable for demand conditions, DCONB, Model PB4 with the proxy variable for cost conditions, CCONB, and Model PB5 with the proxy variables for both the demand and cost conditions, DCONB and CCONB.

Comparing Model PB2 and Model PB3 in Table IV-13, it can be observed that the use of the index, DCONB, did not change the effects of the cost factors (LH82, LPD, and LNC), the firm characteristics

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[5] It shoud be noted that some of the major competitors for cable firms are the mass-media services such as broadcasting and newspapers, which have considerable effects on public opinion.

[6] See Table II-4 for detailed description of DCONB, DCONP, and CCONB.

[7] Age variable was dropped from the price equation by eliminating cable systems which started after 1980. This was done on the basis that: (1) age was included in the demand estimation to account for a speed of reaching maturity, not as a demand factor; and (2) our system maturity projection revealed that a cable system reaches more than 90 percent of its final penetration rate within 3 years.

TableIV-13. Basic price estimation, PB2 and PB3, OLS.

dependent variable = PB82

	MODEL PB2		MODEL PB3	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	8.5717	15.32**	9.8231	11.73**
DCONB			-0.0110	-1.62
PR81				
LCSN	0.0049	0.01		
LCSD	-0.3505	-1.67		
LCSI	-0.2454	-4.88**		
IPF	0.00001	1.24		
MR1	-0.5481	-3.53**	-0.6963	-3.18**
MR2	-0.2493	-1.55	-0.3710	-2.06*
MR3	-0.2594	-1.57	-0.3961	-1.96*
MR4	-0.2733	-1.66	-0.3680	-2.03*
MR5	-0.1878	-1.64	-0.2929	-2.42*
MR6	-0.2921	-2.26*	-0.4004	-2.95**
R1	-1.1286	-4.38**	-1.1155	-4.29**
R2	-0.5999	-2.35*	-0.5561	-2.16*
R3	-0.6193	-2.53*	-0.4923	-2.01*
R4	-0.4468	-1.86	-0.4177	-1.70
R5	-0.4770	-1.83	-0.3261	-1.26
R6	-0.3487	-1.41	-0.2297	-0.92
R7	0.4539	1.76	0.5711	2.19*
R8	0.2898	1.19	0.3273	1.33
CCONB				
LH82	0.0360	0.85	0.0326	0.77
LPD	0.5006	5.23**	0.5351	5.56**
LNC	0.6875	5.39**	0.6673	5.30**
DV	-0.1612	-2.20*	-0.1661	-2.23*
MSO1	-0.0182	-0.23	-0.0133	-0.17
MSO2	0.1378	1.45	0.1392	1.46
DR1	0.4562	2.67**	0.4633	2.69**
DR2	-0.7523	-2.43*	-0.7909	-2.53*
DR3	-0.2557	-0.98	-0.1915	-0.73
DR4	-0.6381	-2.12*	-0.6438	-2.12*
FFEE	0.0368	1.44	0.0365	1.41
LO	0.0004	2.74**	0.0005	3.31**

R-square = 0.17
n = 1560

R-square = 0.15
n = 1560

Table IV-14. Basic Price Estimation, PB4 and PB5, OLS.

dependent variable = PB82

	MODEL PB4		MODEL PB5	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	4.8745	8.70**	5.7737	6.84**
DCONB			-0.0103	-1.50
LCSN	-0.0416	-0.12		
LCSD	-0.3483	-1.67		
LCSI	-0.2413	-4.80**		
IPF	0.00001	1.32		
MR1	-0.4936	-3.24**	-0.6255	-2.91**
MR2	-0.2112	-1.32	-0.3225	-1.80
MR3	-0.1855	-1.13	-0.3044	-1.51
MR4	-0.2476	-1.50	-0.3326	-1.83
MR5	-0.1433	-1.26	-0.2415	-2.02*
MR6	-0.2723	-2.11*	-0.3756	-2.76**
R1	-1.1143	-4.31**	-1.1040	-4.24**
R2	-0.6324	-2.48*	-0.5818	-2.26*
R3	-0.6549	-2.68**	-0.5268	-2.15*
R4	-0.4189	-1.74	-0.3806	-1.56
R5	-0.4776	-1.84	-0.3199	-1.24
R6	-0.3507	-1.41	-0.2247	-0.90
R7	0.4403	1.71	0.5644	2.16*
R8	0.3009	1.23	0.3389	1.37
CCONB	0.0668	7.09**	0.0679	7.26**
LH82				
LPD				
LNC				
DV	-0.1814	-2.48*	-0.1829	-2.46*
MSO1	0.0318	0.41	0.0272	0.35
MSO2	0.1520	1.60	0.1496	1.57
DR1	0.4409	2.58**	0.4505	2.61**
DR2	-0.7737	-2.49*	-0.8072	-2.59**
DR3	-0.2330	-0.90	-0.1712	-0.66
DR4	-0.5951	-1.98*	-0.6023	-1.98*
FFEE	0.0494	1.96*	0.0493	1.96*
LO	0.0005	3.72**	0.0006	4.21**

R-square = 0.16 n = 1561 (Model PB4)

R-square = 0.15 n = 1561 (Model PB5)

variables (DV, MSO1, and MSO2), and the regulatory variables (DR_g, FFEE, and LO) on basic prices. The differences between the estimated coefficients for MR_k and R_1 in Model PB2 and PB3 are the demand effects, which were accounted for by DCONB in Model PB3. The negative sign for DCONB (though it was insignificant) indicates that favorable demand conditions lead to lower prices. This result is not so surprising when we remind ourselves that a favorable change in the demand factors might lower prices when the marginal cost is declining. The comparison of Model PB2 in Table IV-13 and Model PB4 in Table IV-14 also shows that the use of the index for the cost factors, CCONB, did not create any problems. The coefficient for CCONB was of the expected sign and significant.

DV, which indicates the stage of development of the cable system had the expected sign, which is negative, in all models. This implies that a cable system which is expanding its distribution system may set a relatively lower price focusing more on increases in penetration rates.

Regulatory variables revealed the expected results as well. Regardless of the use of proxy variables, our results consistently showed that rate base / rate-of-return (RB / ROR) regulation, DR2, was most effective in lowering prices. Against local regulation for which no dummy was assigned, basic prices were about \$ 0.75 lower under RB / ROR. Under local regulation assisted by a state regulatory commission (LR / SR), DR1, prices were higher about \$ 0.45 than under local regulation. When the results are considered along with the average franchise fees (which were reported in Table IV-15) and the average hours of local origination programming per week (which significantly raised basic

Table IV-15. Franchise Fees (% of gross revenues).

State	Types of Regulation	Mean	N
ALL		3.12	1716
NY	DR1	4.94	77
MN	DR1	2.95	22
RI	DR1	1.50	2
CT	DR2	9.00	14
NV	DR2	1.50	6
VT	DR2	0.05	12
NJ	DR3	4.00	35
MA	DR4 (DR41)	1.00	23
CA	DR4 (DR42)	3.25	8

NY; City Fee plus State Fee (2% Of gross revenues)
MN; only City Fee. By 1980 State Fee (1% of gross revenues)
CT; only State Fee (9% of gross revenues)
NV; only City Fee
VT; only State Fee (0.05% of gross revenues)
NJ; City Fee plus State Fee (2% of gross revenues)
MA; City Fee ($.50 per subscriber annually)
State Fee ($.80 per subscriber annally)
CA; only City Fee

prices), the differences in the effects of state regulation on prices were found to be greater. Table IV-16 reports these combined effects of state regulation.

A surprising result is state deregulation, DR4, which showed lower basic prices for deregulated cable systems. Since our information on state deregulation in California was more credible with the date of deregulation in each franchise, we segregated the state deregulation into Massachusetts, DR41, and California, DR42. The results were reported in Table IV-17, Model PB6. The deregulated cable systems in California exhibited about $ 1.00 lower basic price than the locally regulated systems. Model PB7 in Table IV-17 shows that state regulation did not make any differences in terms of lowering basic prices when the differences in the types of regulation were ignored.

The coefficient for the franchise fees is of the correct sign and significant at a 95 percent confidence level in Model PB4 and Model PB5. Also, local origination, LO, which was found to have no effects on basic demand, was found to raise basic prices.

Table IV-18 reports the results of pay TV price estimation. Model PP3 is the estimation with the proxy variable, DCONP. Similarly to the basic price estimation, the use of the index, DCONP, improved the coefficient estimations slightly.

The most dominant variable in the pay TV price estimation was pay TV programming cost per subscription per month to cable system, PCP. Pay TV prices were almost two times the cost to cable firms of pay TV program per subscription. Marginal cost of basic subscribers had the expected effect, and was significant. This implies that some portion of

Table IV-16. Combined Effects of State Regulation.

State	Effects of State Regulation	Effects of Franchise Fees	Effects of Local Origination	Combined Effects
NY	.45 (DR1)	.12	.04	.61
MN	.45 (DR1)	-.001	-.02	.43
CT	-.70 (DR2)	.39	.09	-.22
NV	-.70 (DR2)	-.11	-.12	-.93
VT	-.70 (DR2)	-.20	-.12	-1.02
NJ	-.17 (DR3)	.06	.13	-.02
MA	-.30 (DR41)	-.14	.02	-.42
CA	-1.04 (DR42)	0	-.07	-1.11

The coefficients for state regulation were taken from Table IV-15, Model PB6.

The effects of franchise fees were obtained by multiplying the estimated coefficients for FFEE (.0509) to deviations of franchise fees from the national average.

The effects of local origination were obtained by multiplying the estimated coefficients for LO (.0006) to deviations of local origination from the national average.

Table IV-17. Basic Price Estimation, PB5, PB6 and PB7, OLS.

dependent variable = PB82

	MODEL PB5		MODEL PB6		MODEL PB7	
Variable	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
CONSTANT	5.7737	6.84**	5.6602	6.66**	5.4368	6.46**
DCONB	-0.0103	-1.50	-0.0104	-1.52	-0.0104	-1.51
MR1	-0.6255	-2.91**	-0.6399	-2.97**	-0.6511	-3.02**
MR2	-0.3225	-1.80	-0.3270	-1.82	-0.3653	-2.03*
MR3	-0.3044	-1.51	-0.3109	-1.55	-0.3223	-1.60
MR4	-0.3326	-1.83	-0.3319	-1.83	-0.3484	-1.91
MR5	-0.2415	-2.02*	-0.2432	-2.04*	-0.2493	-2.08*
MR6	-0.3756	-2.76**	-0.3784	-2.78**	-0.3627	-2.66**
R1	-1.1040	-4.23**	-0.9774	-3.47**	-0.6110	-2.99**
R2	-0.5818	-2.26*	-0.4562	-1.64	-0.1818	-0.80
R3	-0.5268	-2.15*	-0.4018	-1.51	-0.0956	-0.44
R4	-0.3806	-1.56	-0.2558	-0.96	0.0205	0.10
R5	-0.3199	-1.24	-0.1949	-0.70	0.0759	0.33
R6	-0.2247	-0.90	-0.0996	-0.37	0.1698	0.77
R7	0.5644	2.16*	0.6846	2.45*	0.9147	3.84**
R8	0.3389	1.38	0.4853	1.76	0.7240	3.33**
CCONB	0.0679	7.26**	0.0679	7.25**	0.0670	7.13**
DV	-0.1829	-2.46**	-0.1775	-2.39*	-0.1766	-2.37*
MSO1	0.0273	0.35	0.0268	0.34	0.0301	0.39
MSO2	0.1496	1.57	0.1448	1.52	0.1619	1.69
DALL					0.0873	0.59
DR1	0.4505	2.61**	0.4497	2.61**		
DR2	-0.8072	-2.59**	-0.7056	-2.18*		
DR3	-0.1711	-0.66	-0.1695	-0.65		
DR4	-0.6023	-1.98*			-0.3009	-1.03
DR41			-0.2997	-0.76		
DR42			-1.0361	-2.19*		
FFEE	0.0493	1.96*	0.0509	1.99*	0.0498	1.99*
LO	0.0006	4.21**	0.0006	4.16**	0.0006	4.18**

R-square = 0.15, n = 1561 (Model PB5)
R-square = 0.15, n = 1561 (Model PB6)
R-square = 0.14, n = 1561 (Model PB7)

Table IV-18. Pay TV Price Estimation, PP2 and PP3, OLS.

dependent variable = PP82

	Model PP2		Model PP3	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	-1.0393	-0.93	-0.9306	-0.86
DCONP			0.0073	1.63
PR82	0.0034	1.41		
LNP	0.1249	1.29		
IPF	-0.00001	-0.79		
MR1	-0.2386	-1.62	-0.3695	-2.76**
MR2	-0.0685	-0.40	-0.1320	-0.80
MR3	-0.1158	-0.73	-0.2057	-1.36
MR4	0.0633	0.37	0.0522	0.31
MR5	0.0444	0.38	0.0295	0.26
MR6	0.1672	1.22	0.1726	1.26
R1	0.0399	0.14	0.0551	0.20
R2	0.0578	0.21	-0.0001	-0.00
R3	0.1803	0.68	0.1485	0.56
R4	0.1302	0.50	0.1236	0.48
R5	0.1623	0.58	0.1583	0.57
R6	0.2650	0.99	0.1748	0.63
R7	0.4912	1.79	0.4352	1.58
R8	1.2347	4.67**	1.2367	4.70**
PCP	2.0200	8.57**	2.0206	8.58**
MCB1	0.0324	2.87**	0.0277	2.83**
DV	-0.0416	-0.53	-0.0394	-0.51
MSO1	0.4938	5.82**	0.4903	5.80**
MSO2	0.1597	1.55	0.1608	1.57
DR1	-0.1171	-0.64	-0.1210	-0.66
DR2	0.7248	2.15*	0.7529	2.25*
DR3	0.1094	0.36	0.0710	0.23
DR4	-0.3060	-0.97	-0.2981	-0.95
FFEE	0.0158	0.59	0.0129	0.48

R-sqare = 0.17
n = 1399

R-square = 0.17
n = 1399

the basic marginal cost were passed on to pay TV prices. Also, pay TV prices were lower in city areas of Top 50 TV markets by about $ 0.37, and higher in Pacific areas, R8, by about $ 1.24. Large MSOs, MSO1, set $ 0.50 higher price than the others. Since large MSOs can obtain significant volume discounts on pay TV programs, which indicates lower marginal costs for MSO1, their price-cost margin will be greater than observed in our results.

Again, the regulatory variables produced very interesting results. In the states where RB / ROR regulation was used, DR2, pay TV prices were much higher than local regulation, by about $ 0.75. Considering the results of basic prices under RB / ROR regulation in which the basic prices were found to be $ 0.70 to 0.80 lower, this reveals the spillover of price regulation to non-regulated prices, which were pay TV prices in our study.

Pay TV prices were found to be lower under state deregulation, but insignificant. When the state deregulation was divided into Massachusetts and California (see Table IV-19), however, lower pay TV prices for the deregulated cable systems in California were again observed, (approximately $ 1.40).

The observed lower prices for basic and pay TV services under state deregulation do not coincide with what we have seen in the cable television industry after the federal deregulation, and consequently raise some questions. Some possible explanations include: (1) insufficient time to raise prices since they were deregulated in 1980 or 1981; (2) lower initial prices when they were deregulated; (3) fear of re-regulation or public scrutiny; and (4) concern that rapid price

Table IV-19. Pay TV Price Estimation, PP3, PP4 and PP5, OLS.

dependent variable = PP82

	Model PP3		Model PP4		Model PP5	
Variable	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
CONSTANT	-0.9306	-0.86	-1.3442	-1.24	-0.6963	-0.65
DCONP	0.0073	1.64	0.0072	1.61	0.0077	1.72
MR1	-0.3695	-2.76**	-0.4019	-3.00**	-0.3582	-2.67**
MR2	-0.1320	-0.80	-0.1392	-0.84	-0.1074	-0.65
MR3	-0.2057	-1.36	-0.2188	-1.45	-0.1955	-1.29
MR4	0.0522	0.31	0.0588	0.35	0.0620	0.36
MR5	0.0295	0.26	0.0260	0.23	0.0356	0.31
MR6	0.1726	1.27	0.1678	1.23	0.1658	1.21
R1	0.0551	0.20	0.4232	1.39	-0.3393	-1.57
R2	-0.0001	-0.00	0.3660	1.21	-0.3135	-1.30
R3	0.1485	0.56	0.5127	1.77	-0.1826	-0.82
R4	0.1236	0.48	0.4908	1.72	-0.1821	-0.86
R5	0.1583	0.57	0.5236	1.74	-0.1511	-0.63
R6	0.1748	0.63	0.5428	1.81	-0.1373	-0.58
R7	0.4352	1.58	0.7912	2.65**	0.1537	0.62
R8	1.2367	4.70**	1.6627	5.59**	0.9366	4.12**
PCP	2.0206	8.58**	2.0324	8.65**	2.0380	8.64**
MCB1	0.0277	2.83**	0.0272	2.79**	0.0270	2.76**
DV	-0.0394	-0.51	-0.0291	-0.37	-0.0375	-0.48
MSO1	0.4903	5.80**	0.4873	5.78**	0.4900	5.79**
MSO2	0.1608	1.57	0.1457	1.42	0.1531	1.49
DALL					0.0852	0.54
DR1	-0.1210	-0.66	-0.1232	-0.67		
DR2	0.7529	2.25*	1.0563	3.03**		
DR3	0.0710	0.23	0.0738	0.24		
DR4	-0.2981	-0.95			-0.5266	-1.77
DR41			0.5192	1.26		
DR42			-1.3978	-2.93**		
FFEE	0.0129	0.48	0.0205	0.77	0.0137	0.51
	R-square = 0.17		R-square = 0.17		R-square = 0.16	
	n = 1399		n = 1399		n = 1399	

increases might jeopardize the federal deregulation movement since most of these cable systems belonged to MSOs. Alternatively, deregulation may have simply allowed cable systems to respond to competition by reducing costs and prices. Regardless of the origin of the price reductions associated with state deregulation, however, consumers unequivocally benefited at least in the period immediately following the deregulation of the cable industry.

Table IV-20 reports the average price increases between 1981-1983 for regulated and deregurated cable systems. Since it was expected (and discussed in Chapter III, 2-C) that a price hike would be greater when a cable system has been upgraded during that period, the average price increases were reported accordingly. Though it was found that the price increase for upgraded systems was significantly different from the one of the systems without upgrading, there was no significant difference between the regulated and dereglated systems in the respective group. This seems to imply that lower prices for deregulated systems were not the result of deregulation.

Finally, Table IV-21 and Table IV-22 report the results of joint estimation and recursive system estimation of basic and pay TV prices. The results did not show any significant differences from the OLS estimation of basic and pay TV prices.

Table IV-20. Comparison of Basic Price Increases (%) Between 1981-1983.

	N.	Means	Variance
A. Cable Systems with No System Upgrading.			
All the others	1059	12.35	286.80
DR4	20	13.18	399.95
B. Cable Systems with System Upgrading.			
All the others	510	15.43	346.84
DR4	12	16.42	250.72

Table IV-21. Joint Estimation of Basic and Pay TV prices, GLS.

dependent variable = PB82 and PP82

	Basic Price (PB82)		Pay TV Price (PP82)	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	6.3516	7.19**	-0.5497	-0.52
DCONB	-0.0185	-2.59**		
DCONP			0.0048	1.09
MR1	-0.9257	-4.10**	-0.3456	-2.59**
MR2	-0.4698	-2.47*	-0.1287	-0.78
MR3	-0.5998	-2.85**	-0.1921	-1.27
MR4	-0.5364	-2.81**	0.0431	0.25
MR5	-0.3179	-2.53**	0.0278	0.24
MR6	-0.4231	-2.97**	0.1635	1.19
R1	-1.0939	-3.93**	0.0682	0.24
R2	-0.6716	-2.44*	0.0277	0.10
R3	-0.6034	-2.31*	0.1715	0.65
R4	-0.4879	-1.87	0.1421	0.55
R5	-0.4172	-1.52	0.1767	0.64
R6	-0.3746	-1.40	0.2217	0.81
R7	0.4619	1.67	0.4561	1.66
R8	0.2707	1.03	1.2426	4.72**
CCONB	0.0742	7.49**		
PCP			1.9499	8.47**
MCB1			0.02712	2.79**
DV	-0.2132	-2.73**	-0.0361	-0.47
MSO1	-0.0193	-0.23	0.4995	5.93**
MSO2	0.1073	1.06	0.1687	1.65
DR1	0.3068	1.67	-0.1198	-0.65
DR2	-0.8807	-2.65**	0.7639	2.28*
DR3	-0.1298	-0.43	0.0716	0.24
DR4	-0.6238	-2.00*	-0.2981	-0.95
FFEE	0.0524	1.98*	0.0135	0.51
LO	0.0006	4.30**		

System Weighted R-square = 0.15.
n = 1402

Cross model correlation between PB82 and PP82 is 0.2101.

Table IV-22. Recursive System of Basic and Pay TV Prices.

dependent variable = PB82 and PP82

	Basic Price (PB82)		Pay TV Price (PP82)	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	6.0408	6.73**	-1.9648	-1.84
DCONB	-0.0154	-2.10**		
DCONP			0.0033	0.74
PB82			0.2020	7.57**
MR1	-0.8287	-3.62**	-0.2343	-1.77
MR2	-0.4213	-2.21*	-0.0718	-0.44
MR3	-0.5223	-2.46*	-0.1371	-0.92
MR4	-0.4895	-2.55*	0.1038	0.62
MR5	-0.2931	-2.33*	0.0714	0.63
MR6	-0.4025	-2.83**	0.2259	1.68
R1	-1.1081	-3.98**	0.2970	1.07
R2	-0.6533	-2.38*	0.1416	0.52
R3	-0.5953	-2.28*	0.2828	1.09
R4	-0.4721	-1.81	0.2190	0.86
R5	-0.4170	-1.52	0.2527	0.93
R6	-0.3586	-1.34	0.2895	1.09
R7	0.4873	1.75	0 3467	1.28
R8	0.2764	1.05	1.1756	4.55**
CCONB	0.0746	7.49**		
PCP			1.9495	8.44**
MCB1			0.0150	1.54
DV	-0.2101	-2.69**	0.0045	0.06
MSO1	-0.0233	-0.28	0.5130	6.19**
MSO2	0.1059	1.05	0.1539	1.53
DR1	0.3122	1.70	-0.1925	-1.06
DR2	-0.8848	-2.66**	0.9278	2.82**
DR3	-0.1093	-0.36	0.0687	0.23
DR4	-0.6267	-2.01*	-0.1774	-0.58
FFEE	0.0522	1.96*	-0.0016	-0.06
LO	0.0006	3.75**		

R-square = 0.16 n = 1399

R-square = 0.20 n = 1399

CHAPTER V

CONCLUSIONS

This study was initiated with purpose of hopefully providing a contribution to the debate over the effectiveness of regulation in two areas. First, we intended to provide empirical evidence regarding the effectiveness of regulation from a non-electric utility industry. Since all previous studies have concentrated on a single industry (i.e., the electric utility industry), additional evidence from another industry should help to generalize the results. Secondly, we attempted to measure the possibly different effects of alternative forms of regulation. Although several different forms of regulation have existed, the existing literature to this point exclusively focussed on rate base / rate-of-return regulation, and provided little or no insights into the alternative forms of regulation.

Data were taken from operating cable systems in 1982 which were under various forms of regulation (i.e., local franchise regulation, state public utility type regulation, local regulation assisted by a state cable commission, state common tariff regulation, and state deregulation). We have examined how these different types of regulation affected the regulated prices. A regulatory commission was assumed to be a utility maximizer in this study, in contrast to the previous empirical studies, in which a regulatory commission was treated as a constrainer on a regulated firm's profits and pricing practices. In the simple theoretical model which was developed in Chapter III, constraining firm's pricing practices is one of the regulatory objectives the regulatory commission must consider in order to maximize its utility, and the extent to which regulation is binding in terms of lowering prices depends partially on the relative significance of the regulatory goals. This suggests that the different forms of regulation in the industry would lead to different pricing patterns.

We found that state public utility type regulation was more effective in lowering the prices of basic cable than any other types of regulation, as we predicted. However, a very distinct case of the effect of price regulation on non-regulated service was found. Specifically, in the states which were successful in lowering the basic cable prices through rate base / rate-of-return regulation, pay TV prices were found to be higher than in any other state. Also, local regulation assisted by a state cable commission was found to have raised the basic prices, though no effects were found on pay TV prices. Lower prices were observed in those areas where states had deregulated cable systems. It should be noted, however, that this result must be considered tentative because our method compared prices at a certain point (1982), not changes of prices over time. Indeed, this result on deregulation may have been driven by a number of factors: (1) insufficient time to raise prices since they were deregulated in 1980 or 1981; (2) lower initial prices when they were deregulated; (3) fear of re-regulation or public scrutiny; (4) concern that rapid price increases might jeopardize the federal deregulation movement since most of these cable systems belonged to MSOs; and (5) deregulation simply allowed the cable systems to respond to competition by reducing costs and prices. Comparison of basic price increases between 1981-1983, which was reported in Table IV-20, however, seems to imply that lower prices for deregulated prices were not the result of deregulation.

Overall, the results proved our predictions regarding the pricing patterns of various types of regulation. Moreover, a better picture of a regulatory commission's activities can be obtained when the results of pricing patterns are combined with the results of free public services and system upgrading, which were presented in Chapter III. Table V-1 reveals that local regulatory commissions assisted by a state cable commission allowed cable systems to set relatively higher prices and were successful in obtaining free public services and system upgrading. State public utility type regulation was effective in lowering prices, but many systems remained at less than 15 channel capacity. New Jersey's common tariff regulation (which started in 1977) did not make any differences in terms of lowering prices, but more free public services and system upgrading were obtained. In fact, these findings confirm the importance of assigned goals to regulatory commissions as well as the institutional framework within which regulation is carried out, and imply that there are some trade-offs among these objectives.

We suggest, then, as the conclusion of this thesis that for a more prolific discussion of the effectiveness of regulation, more attention must be directed to institutional structures surrounding regulatory commissions and the regulatory objectives assigned to them. A regulatory commission which seeks only to further its own well-being is a mediator of conflicting interests, and it may end up being a protector of either the public interest or the producer interest. The outcome seems to hinge on several factors: (1) the relative significance of

Table V-1. Comprehensive Comparison of Various Forms of Regulation.

	Basic Prices	Pay TV Prices	Local Origination	System Upgrading
LR/SR (DR1)	+	0	+	+
RB/ROR (DR2)	-	+	0	-
CTR (DR3)	0	0	+	+
SD (DR4)	-	0	*	*

Each type of regulation was compared with local regulation (LR).
* indicates that statistics are unavailable.

regulatory objectives assigned to and perceived by the commission; (2) availability of information, experts to analyze it, and adequate funds to carry out its stated objectives; (3) whether the commissioners and staff members are paid in accordance with their performance. Or, the regulatory commission may just appear to be a protector of either the public interest or the producer interest, depending upon what the public interest is considered to be. In this study, for example, if the effectiveness of regulation had been measured in terms of system upgrading, local regulation assisted by a state cable commission would have appeared to be more effective than any other type of regulation. Therefore, special care must be taken in the discussion of the effectiveness of regulation when there is more than one regulatory objective.

Before ending this thesis we should also comment on some limitations of the study for further research. First, we measured the effectiveness of regulation mainly in terms of lowering prices. Other regulatory objectives surely exist; statistical sketches of some of which were provided in Chapter III. For a more accurate and complete measurement of regulation, these other regulatory objectives should be examined more carefully. Secondly, we had a problem in gathering the data, especially cost data. Better data should improve the quality of future research.

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APPENDIX

Table AP-1. Basic and Pay TV Demand Estimations, Logistic Form[1]

dependent variable = LOGITB for basic and LOGITP for pay TV[2].

	BASIC SERVICE		PAY TV SERVICE	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	-1.0477	-0.99	-11.7681	-11.52**
LCSN	1.7574	6.58**		
LCSD	0.4026	2.48*		
LCSI	0.0510	1.29		
LPB82	-0.5733	-3.85**		
LPR82			0.8196	10.25**
LPP82	-0.0027	-0.03	-0.3338	-3.19**
LIPF	0.2554	2.50*	0.7824	7.97**
LNP			1.0872	18.71**
AGE[3]	-0.4204	-11.82**		
MR1	-0.6887	-6.14**	0.4980	5.21**
MR2	-0.3972	-3.27**	0.1702	1.49
MR3	-0.3972	-4.45**	0.2684	2.54*
MR4	-0.4331	-3.49**	-0.1421	-1.22
MR5	-0.2871	-3.34**	-0.0410	-0.51
MR6	-0.2717	-2.78**	-0.1256	-1.34
R1	-0.0349	-0.25	0.0377	0.28
R2	-0.1899	-1.30	0.4710	3.38**
R3	-0.0202	-0.15	0.3028	2.33*
R4	-0.1988	-1.52	0.1672	1.33
R5	0.0764	0.51	0.3101	2.19*
R6	-0.0838	-0.59	0.7204	5.38**
R7	-0.5881	-3.81**	0.3165	2.20*
R8	-0.4719	-3.34**	-0.0613	-0.46

	BASIC SERVICE	PAY TV SERVICE
R-square	0.38	0.37
n	1374	1374

1. A simple regression was conducted on the residuals in order to look into correlation of the equations. R-square was 0.005, and the coefficient was found to be significant at a 95 percent level of confidence, but not at a 99 percent level.

2. LOGITB = LOG[PR82/(100-PR82)]
LOGITP = LOG[HP82/(100-HP82)].

3. AGE = LOG(1/AGE).

Table AP-2. Basic and Pay TV Demand Estimation,
Hetroskedasticity Corrected.

dependent variable = PR82 for basic
= HP82 for pay TV

	BASIC SERVICE		PAY TV SERVICE	
Variable	Estimate	t-stat	Estimate	t-stat
CONSTANT	89.223	18.55**	1.999	0.55
LCSN	30.996	6.95**		
LCSD	12.878	5.04**		
LCSI	1.331	2.09**		
PB82	-1.143	-3.63**		
PR82			0.193	9.26**
PP82	-0.061	-0.24	-1.023	3.96**
IPF	0.0003	3.14	0.0008	8.59**
LNP			16.607	18.16**
AGE	-11.399	-9.51**		
MR1	-15.724	-8.66**	5.841	3.94**
MR2	-8.740	-3.99**	1.102	0.66
MR3	-11.341	-6.22**	4.878	2.81**
MR4	-7.033	-3.40**	-3.813	-2.55*
MR5	-4.292	-3.14**	-0.754	-0.73
MR6	-6.074	-3.55**	-2.280	-1.92
R1	0.316	0.14	1.673	0.87
R2	-4.011	-1.67	4.338	2.16*
R3	-1.232	-0.54	4.049	2.20*
R4	-4.485	-2.06*	2.277	1.26
R5	0.801	0.32	2.314	1.17
R6	-1.785	-0.76	10.443	5.44**
R7	-7.916	-3.09**	4.854	2.40*
R8	-5.919	-2.50*	0.020	0.01

n = 1374 n = 1374

Table AP-3. Cost Function Parameters, Noam (homogeneity).

dependent variable = total costs

Variable	Estimate	t-stat
CONSTANT	-0.2669	14.11
P1	0.2150	8.29
P2	0.1584	6.35
P3	0.6265	27.29
QB	0.5476	12.75
QP	0.1972	3.72
H	0.1970	11.56
PD	-0.2019	2.89
NC	0.5284	7.21
AGE	-0.0296	0.62
P1*P1	0.0653	5.06
P1*P2	-0.0996	4.48
P1*P3	-0.0309	3.41
P1*PD	0.1114	1.76
P1*NC	-0.0369	0.46
P1*AGE	0.0493	1.30
P2*P2	0.0750	6.64
P2*P3	-0.0504	5.40
P2*PD	-0.0077	0.13
P2*NC	0.0485	0.65
P2*AGE	-0.0280	0.81
P3*P3	0.0406	14.81
P3*PD	-0.1037	3.54
P3*NC	-0.0115	0.39
P3*AGE	-0.0213	1.18
PD*PD	0.0972	2.08
PD*NC	0.4015	2.72
PD*AGE	0.1653	1.51
NC*NC	0.1148	0.68
NC*AGE	0.4372	2.86
AGE*AGE	0.1309	2.99

R-Square = 0.97

The "hybrid" mutiproduct translog cost function was used with homogeneity assumtion. All variables were standardised around the sample mean.

P1: Prices of labor inputs
P2: Prices of capital inputs
P3: Prices of programming inputs
QB: Number of basic subscribers
QP: Number of pay TV subscriptions
H: Number of homes passed
PD: The length of cable per household passed.
NC: Number of video channels offered by a cable firm.
AGE: Number of years of actual operation.

Table AP-4. Cost Estimation, Owen and Greenhalgh.

dependent variable = TC

Variable	Estimate	S.D	t-stat
CONSTANT	0.7521	0.6701	1.12
QB	0.7556	0.0752	10.04
NC	0.4233	0.0928	4.56
WIRE	0.1941	0.0750	2.59
INST	0.0312	0.0081	3.84
WAGE	0.5387	0.0858	6.28
YR80	0.1223	0.1001	1.22
YR81	0.1870	0.0980	1.91
YR82	0.4105	0.1286	3.19

R-sqare = 0.97
n = 160

Tbe costs were estimated in a truncated translog specification.

TC: Total costs
QB: Number of basic subscribers
NC: Number of channels in use
WIRE: Number of miles of wire in the system as a whole
INST: Channel-miles of institutional network
WAGE: The average salary of cable firm employees
YR80, YR81, YR82: Dummy variables intended to be proxies for changes in input price levels and capital equipment costs

VITA

Yasuji Otsuka was born in Fukuoka, Japan on February 9, 1953. He graduated from Soka High School in Tokyo in March 1971. The following April he entered The Soka University in Tokyo, and in March 1975 received a Bachelor of Arts in Economics. He worked for Fuyo Publishing Company from April 1975 to March 1981.

In October 1981, Yasuji Otsuka came to the United States and resumed his studies at The University of Louisville. He received a Bachelor of Science in May 1983. In the fall of 1983 he accepted an assistantship with the Department of Economics at The University of Tennessee, Knoxville and began work toward the degree of Doctor of Philosophy. This degree was awarded in August 1989.