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The Impact of Competing Technologies on Cable Television

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I. INTRODUCTION

Cable television systems distribute both video and nonvideo services to local subscribers through coaxial cables.[1] Like other physical distribution services, cable television is characterized by relatively high fixed capital costs and low marginal operating costs. Indeed, it is the high fixed cost of providing cable service that has led a number of observers to believe that it displays elements of a natural monopoly.[2] Empirical studies of these cost conditions tend to give some support to this belief (Owen and Greenhalgh 1982; Noam 1982a). Because of common perception that cable television is a natural monopoly, franchises are usually awarded on an exclusive basis.

Much of the recent policy debate over future regulation in the cable television industry has focused on the connection between cable's natural monopoly and market power (U.S. Congress 1983e,f). Those favoring the maintenance of a regulatory presence note that market power—generated from cable's natural monopoly—may adversely affect stated governmental goals in the communications industry (National League of Cities 1981). Others disagree with this assessment, noting the recent explosion in new video competitors to cable. They favor a more relaxed regulatory atmosphere. Although cable may be a natural monopoly for distributing video over cable, it still must compete with a number of noncable sources of video programming. Competition from noncable programming sources, it is argued, is an effective check on any market power cable operators might attempt to exert (Gordon, et al. 1981).

One of the more notable aspects of the recent debate over the regulation of cable television is the lack of empirical data. Although the recent "explosion" of new video technologies has been widely heralded and discussed (Stern, et al. 1983), little is currently known about their competitive impact on the cable television industry. Indeed, to date there have been no empirical studies documenting this impact.[3] My goal here, therefore, is to provide empirical information regarding the impact of noncable distribution sources on the market power of cable operators. I shall discuss this impact in two ways: first I shall examine how competition affects the ability of cable operators to raise prices significantly without losing a significant number of their customers; second, I shall examine how competition affects the programs cable firms decide to select.

My discussion of the impact of competition on cable television firms will be broken into six sections. Section I will document the growth in the technologies competing with cable television. Section II will discuss the methodology employed to detect market power in the cable television industry. Section III will discuss competitive responses by cable firms in their selection of programming (i.e., nonprice competition). Section IV will provide a description of variables affecting the market power of cable operators, including penetration by STV.[4] Section V will outline the empirical results of the study, while section VI will draw policy implications from the analysis.

II. GROWTH IN ALTERNATIVE VIDEO DISTRIBUTION SOURCES

Cable television is only one of a number of methods for distributing video sources which have recently become available. Indeed, an alphabet soup of new competition has recently evolved, including, for example, subscription television (STV), multipoint distribution service (MDS), direct broadcast satellites (DBS), subscription master antenna TV (SMATV), videocassette recorders (VCR) and low-power television (LPTV). Table 5.1 documents the recent growth in popularity of these different video programmers.

Although cable television remains the largest provider of pay television, other technologies continue to grow in importance. In 1977, cable television accounted for over 98 percent of all pay television subscribers, but by 1983 cable's share fell to under 90 percent. (Of course, the aggregate total increased dramatically during that period.)

Although interesting, national comparisons may be misleading. Such comparisons, for example, are too aggregated for us to infer much about the performance of video technologies in individual markets. Indeed, the interesting factor to examine is the performance of competing video technologies in the same video market. Consider penetration data in table 5.2.

When examining some of the media markets where cable and noncable firms are rivals, these markets appear to be rather competitive. Indeed, as of 1983, over 25 percent of all video subscribers purchased noncable sources of video programming in Los Angeles, Detroit, Washington–Baltimore, and Phoenix. However, the market shares presented

Table 5.1. Video Subscribers by Source[a] (in millions)

End of Year	*Transmission Source*			
	Cable	*STV*	*MDS*	*VCR*
1975	1.98	0.0	0.0	n.a.
1976	4.37	0.0	0.04	n.a.
1977	6.48	0.02	0.07	n.a.
1978	9.40	0.14	0.15	n.a.
1979	13.87	0.40	0.28	0.50
1980	18.07	0.79	0.45	0.80
1981	22.53	1.54	0.53	1.40
1982	27.20	1.82	0.57	2.00
1983	31.40	1.20	0.49	4.10

SOURCES: Paul Kagan Associates (1983c); Waterman (1984).
[a]DBS was not available until 1983, historical data on SMATV were also not available.

in table 5.2 overstate the importance of the competitors to cable. Much of the problem results from the lack of data documenting the performance of competing video technologies in individual submarkets where cable television is also available. For example, table 5.2 reveals that competitive video technologies account for over 35 percent of total subscribers in the Washington–Baltimore area. The Washington–Baltimore metropolitan area, however, like other large media markets, is composed of dozens of smaller, autonomous jurisdictions. Local and county governments within the larger metropolitan area determine both

Table 5.2. Video Subscribers by Market and Type, 1983 (in thousands)

Market[a]	*Cable*	*STV*	*MDS*	*SMATV*	*Total*	*% Cable*
New York	1666	105	55	n.a.	1826	91
Los Angeles	864	458	4	n.a.	1326	65
Chicago	365	84	14	62	525	70
Miami	346	41	12	n.a.	399	87
Dallas	305	74	11	5	395	77
Detroit	240	63	26	n.a.	329	73
Washington-Baltimore	192	72	35	n.a.	299	64
Phoenix	145	32	24	n.a.	201	72

SOURCES: Paul Kagan Associates (1983c); Television Digest (1983).
[a]Area of Dominant Influence

the existence and characteristics of cable systems. Thus, it would be fallacious to assume that these figures accurately portray the penetration by competing technologies where cable television is also available. In this market, for example, STV has probably performed well in the District of Columbia, where cable television is not available. Further, until very recently, most of the cities of Los Angeles, Detroit, and Phoenix areas did not have cable television services available. Therefore, the actual competitive impact of competing technologies, based on information presented in table 5.2, may be illusory. At best, only general statements regarding competition in the industry should be made.

III. DETECTING THE IMPACT OF COMPETITION ON CABLE OPERATORS

A number of approaches have been used to measure market power, including firm profitability, structural measures (i.e., n firm concentration ratio), Tobin's Q, and price-cost margins (Scherer 1980), but as discussed below, the first three measures will not be used in this study.

The existence of positive economic profits is not by itself a measure of market power. Positive profits may reflect a number of conditions, including scarcity rents created by government franchise agreements, a risky venture, or simply that a company is a "superior" firm (Lintner 1965; Demsetz 1969, 1973). Indeed, even competitive firms may earn economic rents simply because they are superior enterprises. Further, one would have to rely on accounting rates of return as a proxy for the variable of interest, the economic rate of return. The use of accounting data, however, to infer market power may be quite inaccurate (Fisher 1979; Fisher and McGowen 1983).

Use of structural measures, like concentration ratios or the Herfindahl index, are also problematic. These measures ignore possible entry and exit barriers and are complicated by problems involved in defining the relevant product market (Fisher 1979). Finally, highly concentrated industries characterized by significant barriers to entry still may not display elements of monopoly welfare losses. Indeed, even with a small number of firms, monopolistic outcomes could be precluded depending on the degree and type of pricing interdependence in the industry.[5]

Tobin's Q, which is the ratio of the market value of a firm to the replacement value of its physical assets, is a useful measure of long-run market power (Salinger 1984). Its use stems from the fact that a firm's market value reflects the present value of all expected profits. On the other hand, Tobin's Q ignores the important role existing tax laws have on the market value of a firm. Indeed, high market selling prices may reflect high expected future profits as well as tax benefits resulting from the sale. The importance of tax laws in bidding up selling prices in media industries appears substantial (Dertouzos and Thorpe 1982). Hence, what may appear to be long-term market power by the Q measure may, in part, reflect high market prices caused by current federal tax laws. Since in practice it may be very difficult to separate these two determinants of market value, this approach will not be employed.

A. Multiproduct Lerner Index

One indicator of market power is the ability to raise prices significantly above costs without total loss of customers. This indicator of market power is useful for two reasons. First, higher cable prices reduce the number of cable subscribers served and increase the welfare losses in the industry.[6] Second, the ability to set high subscriber prices implies an increased ability to set high access fees to potential programmers.[7] Hence, market power by this definition adversely affects two stated federal policy goals in the communications industry.

The most elementary measure employing this definition of market power is the Lerner Index.[8] According to this index, the ability of any firm to increase prices above marginal costs is constrained by the elasticity of demand for the product. That is, a monopolist with entry into the industry blocked, through some combination of entry or exit barriers, maximizes profits in the following manner.

$$\frac{P - MC}{P} = \frac{1}{\eta}$$

Where P represents the product price,
MC is the firm's marginal cost and
η is the own-price elasticity of demand facing the firm.

The greater the elasticity of demand (i.e., more elastic) for cable services, the lower the price-cost margin. Here, the monopolist cannot increase price as much above marginal cost as another firm facing a more inelastic demand for cable service. Hence, the firm facing the more elastic demand would, ceteris paribus, be constrained in its ability to set higher prices for cable services or higher access fees to potential programmers.

Given appropriate knowledge of prices and the own-price elasticity of demand, one could—through inferring marginal costs—indirectly calculate price-cost margins. This approach is often useful, especially in industries where marginal cost data are very difficult to identify (Rosse 1970; Dertouzos and Thorpe 1982). The actual calculation of price-cost margins in the cable industry, however, is somewhat more difficult, because cable operators are multiproduct firms. Therefore, the price-cost margin that the profit-maximizing cable operator would set for any product depends on a series of complex relationships between the relevant own- and cross-price elasticities of the products produced.[9]

Entry conditions in the industry will also affect the price-cost margins of cable operators. If, for example, there exists a competitive fringe of firms supplying similar video programming, pricing decisions by the cable operator would be constrained by the residual demand curve rather than the market demand curve.[10] Further, pricing behavior of the cable operator will also be a function of how the operator expects its competitors to compete along both price and product selection dimensions.[11]

To assess the impact of competition on price-cost margins, a single, summary price-cost margin for each cable operator will be constructed. This indexing approach will be used for a number of reasons. It is especially significant that cable operators have a great deal of freedom in choosing pricing strategies in response to competition. Indeed, these pricing responses for individual services (e.g., basic, expanded basic, and pay packages) will vary according to a number of factors that we may or may not be able to measure. As the first-order conditions for profit maximization for a multiproduct firm indicate, price-cost margins for any particular product depends crucially on the cross-price elasticities between the goods sold.[12] In the cable industry, for example, one would expect to see different price-cost margins, ceteris paribus, for cable operators offering HBO and the Disney Channel compared

with one offering Showtime and the Movie Channel. This difference in price-cost margin for each of these services—under the ceteris paribus assumptions—occurs since the cross-price elasticity of HBO with respect to the Disney Channel is probably lower than the cross-price elasticity of Showtime with respect to the Movie Channel. Hence, low or high price-cost margins for individual program services may reflect a number of factors, including the own- and all relevant cross-price elasticities as well as the programs contribution to total system revenues. Therefore, the examination of a single price-cost margin may be misleading unless special care is taken to control the composition of pay program packages. To facilitate comparison across cable firms, I will create a single price-cost margin. The price-cost margin will represent a weighted average (weighted by its share of total revenue) of each of the program specific price-cost margins. The dependent variable I will use appears below.[13]

$$PCM = ln\left[\sum_{i=1}^{J}\left(\frac{Pi - MCi}{Pi}\right)\cdot\left(\frac{Pi \cdot Qi}{Pz\ Qz}\right)\right].$$

Where P_zQ_z is total revenue, Pi is the price of the particular service offered by the cable operator, MCi is the marginal programming cost for the ith service, summed over all j services.

B. Determinants of Price-Cost Margins

Demand and cost conditions in the cable industry will affect the relative magnitude of their price-cost margins. Relevant demand-side factors are those affecting the own-price elasticity of demand for cable television, including the availability of substitute products such as STV and good television reception. In addition, regulatory interventions, especially rate regulation, could affect the price-cost divergence.

Cost conditions in the industry also affect the relative size of price-cost margins. The most important marginal cost incurred when a new subscriber initially purchases cable, or simply purchases more cable services, is the marginal license fee paid to programmers.[14] That is, most major programmers offering either advertiser supported or pay programming charge cable operators a certain monthly license fee per subscriber per month. Some examples of these license fees appear below (see table 5.3).

Table 5.3. License Fees for Basic Television Services, 1983

Basic service	*Fee (per subscriber per month)*
Arts	Free
Christian Broadcast Network (CBN)	Free
Cable Health Network	Free
Cable News Network (CNN)	0.20, 0.15 if take WTBS
CNN Headline News	0.05, free if with CNN
C-Span	0.03
Daytime	Free
ESPN	0.10
Music Television (MTV)	Free
Nashville Network	Free
Nickelodeon	0.10–.15
Spanish Info. Network	
USA	0.07–.13[a]
WGN	0.10
WOR	0.0–.10
WTBS	0.10 for first 18,000 subscribers zero for additional
Pay TV service	
HBO	3.20–5.00[b]
Showtime	3.08–5.00[b]
The Movie Channel	3.75–4.60[c]
Prism	5.25–6.75[d]
Cinemax	2.66–4.25[b]

SOURCE: Paul Kagan (1983e), plus conversations with relevant basic pay cable program representatives.

[a].07 if USA is on Basic Service, up to .13 if on Expanded Basic

[b]Price varies depending on the number of subscribers and the price charged to subscribers.

[c]Price varies depending on the number of subscribers.

[d]Price varies depending on the price charged to subscribers.

In general, license fees that cable operators remit to program packagers depends on the total number of subscribers served by the operator. If the cable firm is a member of a group (multiple system operator), the price would depend on the total number of subscribers purchasing program type x at the *group level.* Cable firms that are not members of groups may also receive volume discounts—based on the number of subscribers served in the franchise area—or they may receive performance discounts when available. Performance discounts depend, in general, on the total number of cable subscribers purchasing a particular

program. As table 5.3 illustrates, the prices cable operators are charged by HBO, Showtime, Prism, and Cinemax depend on the prices the cable operator charges subscribers for access to the programming. For example, suppose a cable firm is owned by a group that has 100,000 HBO subscribers. Now assume that the cable operator—who currently charges subscribers $9.00 for HBO—decides to increase the price to $10.00. The price the cable operator pays HBO would increase from $3.76 to $3.84 per subscriber. Showtime has a similar pricing strategy. The Movie Channel, however, charges cable operators only according to the number of subscribers served.

Vertical integration of cable operators with program packagers will also affect the firms' price-cost margin. Vertically integrated firms, if they are profit maximizing, would internally transfer programming inputs at their true social opportunity costs. Due to the public good nature of programming, the marginal social costs are zero. Hence, the price-cost margins of vertically integrated cable firms *may* be larger than other cable systems.[15]

Given that both demand and cost conditions in the industry affect price-cost margins, it is important for purposes of this study to isolate empirically the demand-side effects.

IV. NONPRICE COMPETITION

The competitiveness of media markets will also affect the number and variety of programs a cable firm offers. However, we cannot make an unambiguous a priori prediction of which market structure will lead to a greater number of programs or more program diversity. Cable firms that do not currently face competition from pay programmers could offer either more or a similar amount of programming than cable firms that do face competition.

Cable television firms will add an additional program source if the marginal program revenues exceed the marginal programming costs. Marginal revenues can be received from three sources: new cable subscribers, existing cable subscribers who purchase more (or fewer cable services),[16] and new subscribers switching from STV—or other competing technologies—to cable television. Of course, cable firms not currently facing competition from any other sources of pay television would only view marginal revenues coming from the first two sources.

As a result of these differences in perceived marginal revenues across different markets, both the number and diversity of programming would be greater in the monopolistically competitive market than in the isolated monopoly market. Indeed, it is these differences in perceived marginal revenues that has led some observers to note that monopolistically competitive industries will offer more product variety than isolated monopolists (Spence 1976).

Cable firms that deter entry through program-selection decisions could offer more programming than other cable firms. Under these assumptions, cable firms could proliferate programming in an attempt to preclude any advantages in product differentiation among potential competitors.[17] These entry-deterring strategies are given added credibility if the cable operator maintains excess channel capacity. Even if entry by a competitor were successful, the cable operator maintains post-entry flexibility to duplicate the program selection of competitors who generally have smaller channel capacities.

Finally, there are strong reasons to presume that the order of entry into a particular media market will also affect penetration. That is, cable penetration would be lower, ceteris paribus, when STV firms entered a media market before cable television. Lower penetration by cable firms in these situations could be due to product differentiation advantages of STV as the "pioneering" firm in a media market (Schmalensee 1982). This advantage of incumbent STV firms results from the relative uncertainty regarding the product (programming) quality of cable television firms.[18] Because of these asymmetries in product information, one would expect to see slower growth in cable penetration in areas where STV had originally entered.

V. EXPLAINING VARIATIONS IN PRICE-COST MARGINS

I shall use a number of variables to explain both the variation in price-cost margins and the program-selection decisions of cable television firms facing different competitive situations. These variables will measure factors affecting both demand and supply conditions in each cable market. The unit of observation will be the market area where cable television is available. As such, I have matched—as best as possible—penetration by competing technologies in each area where cable service is available.

The demand for cable television services results from a two-part process: the initial decision to purchase cable, followed by the decision about how many cable services to purchase. Factors affecting this decision process will include the following:

A. Characteristics of the Basic and Expanded Basic Service Package.

Cable operators offer a number of services on the so-called basic service package over and above what is available from over-the-air television. These networks—which are delivered either by satellite or microwave service—include those devoted primarily to sports (ESPN), children's programming (Nickelodeon), news (CNN), and a variety of other specialty programs (e.g., Weather Channel, Silent Network, Black Entertainment Network, and MTV). As one would expect, a number of past studies have revealed that the demand for basic cable service is very sensitive to the number and type of over-the-air broadcasts available on cable compared with those available over the air without cable. Indeed, the number of network, independent, and educational stations available on cable compared with that offered over the air has a strong impact on cable penetration (Park 1971; Noll et al. 1973; Charles River Associates 1978; Bloch and Wirth 1982).

B. Signal Quality

Historically, one of the more important reasons that viewers subscribed to cable television was to improve the visual quality of the television signals they received (Park 1971). Although the role of the cable operator has changed over time, the technical quality of the signals available over-the-air remains an important determinant of cable penetration.

C. Income

Past studies have revealed that cable television is a normal good. Hence, ceteris paribus, cable penetration appears to increase with income.

D. Rate Regulation

If rate regulation resulted in lower prices for basic cable service, one would expect to see lower basic price-cost margins. Overall, however,

price-cost margins may not be reduced. Indeed, whether rate regulation of only the basic cable price lowers the firm's overall price-cost margin depends on how the cable operator—as a multiproduct firm—responds to the imposition of the regulatory constraint. Lower basic prices may, for example, simply result in higher pay cable prices, or the development of expanded basic service offerings which are not subject to rate regulation. Indeed, given the flexibility of cable firms to change prices for services that are not regulated, one would expect to see a reduced impact on the price-cost margins of cable operators. This study allows for such a test.

E. Number of Pay Services Offered by the Cable System

Clearly, an increase in the number of pay television services offered by the cable system will increase the total price-cost margin. Hence, one needs to control for this. Unfortunately, as the previous discussion illustrates, the service offerings by cable operators are clearly not exogenous in this model. To correct for this, two-stage least squares regressions will be run to determine the impact of endogeneity on this variable as well as other variables of interest.

F. Ownership Characteristics

There are strong incentives for vertical integration in the cable television industry.[19] Vertically integrated firms may increase profits if they internally transfer inputs (i.e., programming) at the competitive marginal cost (Vernon and Graham 1971). Given the public-good element of such programming, the social marginal cost is zero. Hence, the price-cost margins of vertically integrated firms are likely to exceed those of other firms. In addition, the marginal programming costs paid by cable firms depend crucially on total number of subscribers served. In general, group-owned cable systems serve more subscribers than independently owned systems. Hence, the marginal programming costs for all cable firms within a group are lower, ceteris paribus, than they would be if independently owned. On the other hand, if marginal costs decrease one would expect that the product price would also decrease. Hence, the net effect on the price-cost margin depends on the relative magnitude of these two effects.

G. Age of the Cable System

Observed price-cost margins will also depend on the age of the cable system. The inclusion of an age variable recognizes that both penetration and prices depend on the rate that cable systems mature. Linear splines will be employed to allow for flexibility in the functional form.

VI. DATA

Any serious study attempting to document the competitive impact of the new video technologies on cable television needs very refined data. In particular, one would need to know the performance of these technologies in areas that currently have cable television available. As part of this study, I have compiled a unique data set. A number of STV operators throughout the country agreed to provide—on a confidential basis—the location of their subscribers by zip code. This information is unique in two respects. First, it will allow a direct comparison of the penetration of a major competitor to cable—STV—in cabled areas. Second, it provides an opportunity to detect empirically the economic impact of this competition on the cable industry.

In addition to the unique information regarding the location of STV subscribers, a telephone survey of nearly 175 cable firms was used to gather more detailed information on actual pricing patterns in the cable industry.[20] The survey was undertaken because there was no systematic published information available documenting either the actual pricing patterns of cable firms (e.g., bundling practices) or how programming has been packaged. Both pieces of information are crucial in determining the competitive impact of new technologies on the cable industry.[21]

A. The Sample

On average, the sample used for the study represented slightly larger cable systems than the national average (see table 5.4). The difference, although not very large, reflected in part the attempt to match the sample. Since most cable firms facing competition from STV are larger systems located in major metropolitan areas, an attempt was made to pick urban and suburban systems that do not face STV competition for comparison. The estimation of the impact of competition on the price-

Table 5.4. Comparison of 175 Firm Sample to National Averages, 1983

Variable	*Sample Average*	*National Average*
Basic subscribers	10,250	8,243
Homes passed	17,675	15,779
Price basic	8.56	8.45

SOURCE: Sample and Paul Kagan Associates (1983c).

cost margins of cable operators requires some assumptions about the functional form of the model. Specifically, the general expression of the model(s) estimated appears below. The definitions of the variables, including their sources, are displayed in table 5.5.

$$\begin{aligned} LPCM = {} & \alpha_0 + \alpha_1(\text{COMNET}) + \alpha_2(\text{COMIND}) + \alpha_3(\text{COMED}) \\ & + \alpha_4(\text{TOP100}) + \alpha_5(\text{TOP200}) + \alpha_6(\text{OUTSIDE}) \\ & + \alpha_7(\text{LYR}) + \alpha_8(\text{SPLINE1}) + \alpha_9(\text{SPLINE2}) \\ & + \alpha_{10}(\text{PION}) + \alpha_{11}(\text{PION1}) + \alpha_{12}(\text{PION2}) + \alpha_{13}(\text{SIG}) \\ & + \alpha_{14}(\text{LARGE}) + \alpha_{15}(\text{INDEP}) + \alpha_{16}(\text{MID}) \\ & + \alpha_{17}(\text{VI}) + \alpha_{18}(\text{INIT}) + \alpha_{19}(\text{LSERV}) + \alpha_{20}(\text{LAHI}) \\ & + \alpha_{21}(\text{REG}) + \alpha_{22}(\text{LSTV}) + \alpha_{23}(\text{SAT}) + \alpha_{24}(\text{XSAT}) \\ & + \alpha_{25}(\text{C1}) + \alpha_{26}(\text{C2}) + \alpha_{27}(\text{C3}) + \alpha_{28}(\text{C4}). \end{aligned}$$

Table 5.5. Variable Definition

Name	*Definition*	*Data Source*
LPCM	Log of the cable firms price-cost margin + 1 where each service offered was weighted by its share of total revenue.	Paul Kagan Associates 1983c. Phone survey to determine how program services were bundled together and how they were priced.
LSTV	Log of the number of STV subscribers in a cable area + 1.	Data received directly from STV operators throughout the U.S.
SAT	Log of number of satellite services available on the basic service package + 1.	*Television Digest* (1983) and direct phone survey to cable operators.
XSAT	Log of number of satellite services on the expanded basic service package + 1.	Same as SAT.

Table 5.5. (Continued)

Name	*Definition*	*Data Source*
COMNET	Log (number of network services on cable/number of network station in the Grade B contour area).[a]	*Television Digest* (1983).
COMIND	Log (number of independent stations on cable/number of educational stations within the Grade B contour on the cabled area).	Same as COMNET.
COMED	Log (number of educational stations on cable/number of educational stations within the Grade B contour of cable area).	Same as COMNET.
LSERV	Log (number of pay television services not available on basic or expanded basic service).	Paul Kagan Associates 1983c.
LAHI	Log of average household income in county where cable was available.	*Circulation* (1983).
TOP100	Dummy variable for existence of cable system in TV market between 51 and 100.	*Television Digest* (1983).
TOP200	Dummy variable for existence of cable system in TV market between 101 and 200.	Same as TOP100.
OUTSIDE	Dummy variable for existence of cable system outside all TV markets.	Same as TOP100.
SIG	Variable ranging from 1 to 5 to denote physical obstructions of television signals.	Department of Interior, (1970).
C1	Dummy variable for cable system in the South region.	U.S. Department of Commerce (1977).
C2	Dummy variable for cable system in the North Central region.	U.S. Department of Commerce (1977).
C3	Dummy variable for cable system in the West region.	U.S. Department of Commerce (1977).
C4	Dummy variable for cable in the Plains region.	U.S. Department of Commerce (1977).
C5	Dummy variable for cable system in the East region.	U.S. Department of Commerce (1977).
INIT	Dummy variable equal to 1 if STV operator entered market before the cable firm.	Paul Kagan Associates, *Census of Pay TV, 1983.*
LCAP	Log of total channel capacity of the cable system.	Same as INIT
LPOP	Log of population in cable franchise area.	Same as INIT

Table 5.5. (Continued)

Name	*Definition*	*Data Source*
REG	Dummy variable equal to 1 if cable firm's rates are regulated.	National Cable Television Assoc.
INDEP	Cable firms not owned by a multiple system operator.	
LYR	Log of the cable system age (in years).	Paul Kagan Associates (1983).
SPLINE1	Allows for a separate coefficient to be estimated for cable systems that are less than or equal to three years old. That is, it is min(0, log(YR) − log(3)).	
SPLINE2	Allows for a separate coefficient to be estimated for cable systems greater than or equal to ten years old. Hence, it is defined as max(0, log(YR) − log(10)).	
PION1	Is an interaction term between spline 1 and init.	
PION2	Is an interaction term between spline 2 and init.	
VI	Dummy variable equal to 1 if cable firm was commonly owned with a major pay television programmer. These included:	*Television Digest* (1983).
	Pay Programmer — *MSO* Home Box Office (HBO), Cinemax — ATC The Movie Channel (TMC) — Warner Amex Showtime — Viacom	
PION	Is an interaction term between age of system and cabled areas where STV was available before cable.	
LARGE	Identifies cable firms owned by one of the top 20 cable multiple system operators.	Paul Kagan Associates (1983f).
MID	Identifies cable firms owned by the next 30 largest multiple system operators.	
SMALL	Identifies all remaining cable firms owned by multiple systems operators.	

[a]Grade B contour area is a technical measure indicating the quality of the television picture received. Within a given Grade B contour, the quality of the reception should be satisfactory to the median observer at least 90 percent of the time, for at least 50 percent of the receiving locations.

B. Empirical Results

A number of different models were evaluated to assess the effect of existing models of video competition, primarily over-the-air television and STV, on the price-cost margins of cable firms. The results across these models were remarkably consistent.[22] A number of interesting results emerged from the study (see table 5.6). Perhaps the most notable was the impact STV had on the ability of cable firms to raise prices above costs. This impact differed appreciably depending on which technology was available first. In cable franchise areas where cable preceded STV, STV had a negative, although *very minor* impact on cable price-cost margins. In these markets, a 1 percent increase in STV penetration was associated with approximately a .004 to .007 percent decrease in the price-cost margin. The competitive impact of STV on cable operators was more pronounced, however, when STV was the first video technology available. In these video markets, the price-cost margins on cable operators were an additional 9 percent lower.[23] Hence, STV appears to have a significant impact on the price-cost margins of cable operators, but this impact occurs only in certain markets where STV was available before cable.

Price-cost margins of cable television firms outside the top 50 television markets were approximately 2 to 3 percent larger. This result seems plausible for a number of reasons. Most importantly, these variables were included to capture a number of potential competitors to cable and television viewing in general, such as other sources of entertainment, that are not easily measured. Cable firms outside the top media markets have fewer sources of competition for cable viewing, and therefore appear to have more market power.

Price-cost margins increase with the age of the cable system. This result is consistent with past studies examining the demand for cable television where the final system's penetration was time dependent (Comanor and Mitchell 1966). To allow for flexibility in estimating the functional form of the age variable, a series of linear splines was employed. When a log linear relationship between the system's age and the price-cost margin is assumed, the price-cost margins of cable operators increased approximately 3 percent each year. Subsequent models using the splines, however, indicate that this relationship is not linear. Using this more flexible functional form, the relevant elasticities range from .05 to .08 over the first ten years of operation. Hence, cable systems

Table 5.6. Factors Affecting Price-Cost Margins of Cable Operators: Ordinary Least Squares Estimates and Standard Errors

MODEL	*CONSTANT*	*COMNET*	*COMIND*	*COMED*	*TOP100*	*TOP200*	*OUTSIDE*	*1YR*	*SPLINE1*	*SPLINE2*	*PION*	*PION1*	*PION2*	*SIG*
1	.833*	-.0007	.0004	.011	.016	.0009	.013	.028*	—	—	.075*	—	—	.008
	(.280)	(.009)	(.008)	(.011)	(.013)	(.012)	(.013)	(.008)	—	—	(.017)	—	—	(.011)
2	.809*	—	—	—	.021**	.007	.001	.052*	.038	-.049*	.044*	—	—	—
	(.246)	—	—	—	(.012)	(.011)	(.011)	(.014)	(.033)	(.023)	(.019)	—	—	—
3	.871	—	—	—	.025*	.011	.019**	.038*	.079	-.031	.128*	-.097	-.203*	—
	(.244)	—	—	—	(.012)	(.011)	(.011)	(.017)	(.065)	(.025)	(.042)	(.081)	(.087)	—

MODEL	*LARGE*	*INDEP*	*MID*	*VI*	*INIT*	*LSERV*	*LAHI*	*REG*	*LSTV*	*SAT*	*XSAT*	*C1*	*C2*	*C3*	*C4*	R^2
1	.030*	.009	.013	.006	-.169*	.005	-.109*	.009	-.004*	-.005	.001	.007	.005	.024	-.021	.70
	(.009)	(.014)	(.012)	(.013)	(.034)	(.015)	(.027)	(.012)	(.002)	(.006)	(.005)	(.015)	(.015)	(.015)	(.019)	—
2	.033*	.017	.016	—	-.102*	—	-.111*	—*	-.004	—	—	—	—	.020*	—	.69
	(.008)	(.013)	(.011)	—	(.039)	—	(.023)	—	(.002)	—	—	—	—	(.010)	—	—
3	.033*	.011	.014	—	-.240*	—	-.116*	.023*	-.004*	—	—	—	—	.025*	—	.71
	(.008)	(.013)	(.011)	—	(.075)	—	(.023)	(.011)	(.002)	—	—	—	—	(.011)	—	—

*Significantly different from zero, $P \leq .05$ (two-tailed test).

**Significantly different from zero, $P \leq .10$ (two-tailed test).

appear to mature within the 10-year time period. Beyond this time, price-cost margins appeared lower. Of course, this relationship could again be partially explained by the positive correlation between the system's age, channel capacity, and number of program offerings.

The price-cost margins of cable systems facing rate regulation by either state or local governments did not differ appreciably from other systems. In fact, in one specification, rate regulation, appeared positively related. As previously noted, the fact that rate regulation did not have a discernible negative effect on price-cost margins may not be surprising given the pricing flexibility which remains on expanded basic and pay television tiers. Further, rate regulation in the cable industry is more ad hoc than other industries. Indeed, there is rarely any formal rate of return decision; instead local regulators appear to use external references such as the rate of inflation to guide their decisions (Kalba 1980).

Other competition related variables, such as the comparative service offerings of over-the-air television and signal quality, did not add to the explanatory power of the model.

One final demand-side factor that was examined, average household income, produced the only seemingly anomolous result. The results imply that the price-cost margins of cable operators were negatively associated with higher income. This result runs counter to the expectation that higher income would, through demand-side effects, lead to higher price-cost margins. One potential explanation of this result is that it is driven by supply- and not demand-side factors. In particular, the negative relationship between income and price-cost margins could be an artifact of the correlation between large cable groups, who have relatively lower programming costs and television market size (see table 5.7). Because of the programming cost advantage these groups enjoy, price-cost margins would be larger due to both demand-side (since there is less video competition) and supply-side factors resulting from lower

Table 5.7. Cross-Tabulation of Market Size by Group Ownership

MSO Size				
Market Size	*Large*	*Mid*	*Small*	*Independent*
Top 50	23	12	14	5
Top 100	8	0	12	2
Top 200	22	5	13	0
Outside	27	8	10	8

programming cost. Hence, the observed relationship may be driven by supply rather than any perverse demand-side responses.

C. Supply-Side Results

Price-cost margins of cable systems owned by the top 20 multiple system operators were 3 percent higher than other cable firms.[24] Other ownership characteristics explained little of the cross-sectional variation in price-cost margins.[25]

D. Impact of Competition on Program Selection

Two different models were used to explore the factors affecting programming decisions. The first model explained variations in the total number of cable channels programmed, while the second model examined the number of pay television programs offered (see table 5.8).

Table 5.8A. Log Number of Cable Channels Programmed: Estimated Coefficients and Standard Errors

DEP VAR: LPROGS

Variable	*Estimated Coefficient*	*Standard Error*
INTERCEPT	12.19	2.47
LCAP*	0.28	0.11
LPOP*	0.09	0.03
LSTV	−0.0055	0.01
TOP100	−0.31	0.12
TOP200	−0.20	0.12
OUTSIDE	−0.25	0.12
INIT	−0.04	0.15
LYR*	−0.42	0.15
SPLINE1	0.11	0.30
SPLINE2**	0.44	0.23
VI	0.08	0.13
LARGE	0.06	0.09
MID	0.12	0.11
INDEP	−0.02	0.14
SIG	−0.006	0.08
REG	−0.12	0.11
LAHI*	−1.10	0.24

*Statistically different from zero, $P \leq .05$ (two-tailed test).
**Statistically different from zero, $P \leq .10$ (two-tailed test).

Table 5.8B. Log Number of Pay Television Programs Offered: Estimated Coefficients and Standard Errors

Dependent Variable: LSERV

Variable	*Estimated Coefficient*	*Standard Error*
INTERCEPT	1.67	1.33
LCAP**	0.10	0.06
LPOP	0.02	0.02
LSTV	.00002	0.01
TOP100	−0.08	0.06
TOP200	−0.08	0.06
OUTSIDE	−0.08	0.06
INIT	0.004	0.08
LYR*	−0.20	0.08
SPLINE1	0.11	0.16
SPLINE2**	0.30	0.12
VI	−0.08	0.07
LARGE	0.02	0.05
MID	−0.008	0.06
INDEP	−0.08	0.07
SIG	−0.02	0.04
REG	0.06	0.06
LAHI	−0.11	0.13

*Statistically different from zero, $P \leq .05$ (two-tailed test).
**Statistically different from zero, $P \leq .10$ (two-tailed test).

Demand-side influences included the population of the cable franchise area. The estimated elasticity of the number of programs offered with respect to population was .09. Hence, a 10 percent increase in population was associated with nearly a 1 percent increase in the number of channels programmed. Not surprisingly, the channel capacity of the system also affected the number of channels programmed. The estimates suggest that a 10 percent increase in the number of channels offered is associated with approximately a 3 percent increase in the number of cable programs.

Competition from STV firms did not appear to influence the number of cable programs offered. This result was consistent across both models. Hence, at least in this particular sample, cable firms did not respond to competition by proliferating more programming. This is not to say, of course, that cable operators do not attempt to duplicate the

program offerings of STV operators. Instead, there appears no substantial evidence that cable operators have attempted to deter entry through program proliferation.

The age of the cable system was also associated with the number of programs offered. Once again, the relationship between the system's age and the number of programs was nonlinear. In particular, newer cable systems tended to offer more cable programming. The relationship between age and number of programs offered was negative up to a threshold of 10 years; beyond that time, there was no apparent relationship between age and the number of programs.

The particular television market where the cable firm was located also influenced the number of programs offered. Cable systems located outside the top 50 television markets offered anywhere from 25 to 30 percent fewer programs. This result may or may not have resulted from competition between cable operators and over-the-air television. Alternatively, the result could simply be an artifact of the larger channel capacity of cable systems in larger metropolitan markets that have resulted from local franchising proceedings. Based on the information presented, we cannot separate these competing explanations.

The average household income in the county where the cable franchise is located appears negatively related to the number of programs offered. Again, this result runs counter to the maintained hypothesis that higher income should, through demand-side effects, lead to more cable programs.[26]

Finally, there is no evidence from the data supporting the proposition that vertically integrated firms discriminate against other programmers and therefore provide fewer services.

VII. CONCLUSIONS AND POLICY IMPLICATIONS

Much of the recent debate over the structure of regulation in the cable television industry has focused on the competitiveness of video media markets. One point of contention is that cable operators are natural monopolists with monopoly pricing powers which thwart federal policy goals promoting source and program diversity, access to the media, and economic efficiency. As part of this policy debate, Congress has recently passed legislation which alters the current regulatory structure, most notably by restricting the regulatory powers of state and local

governments in the cable franchising process. Much of the rationale for the movement toward "deregulation" stems from the growth in competitive alternatives to cable television. Because of this influx of new technology, it is argued, most media markets are "workably" competitive, thus warranting a more relaxed regulatory atmosphere. Policy prescriptions that follow have usually included loosened cross-ownership restrictions between cable systems and broadcasters, eliminating rate regulation and access requirements.

Much of the policy discussion appears to lead to a simple dichotomy: if cable firms have market power then regulate; otherwise do not. This framework is too narrow, however, since it neglects the role of long term contracts as a form of regulation (Goldberg 1976; Thorpe 1984a). Given the specialized technology employed by the cable industry, some form of regulation will always be required. Long-term contracts are required to initially attract the specialized capital to build a cable television system. Because of the legal entry barriers created by local governments, as well as those resulting from the "sunk" cost nature of cable technology, cable firms are able to exercise monopoly powers (Baumol et al. 1982). Hence, the interesting policy question is not whether to regulate cable systems if they price above costs—surely they all do. Rather, the question is how to structure and administer long-term cable franchise agreements to further stated federal policy goals.

Within this broader regulatory context, there are a number of important decisions regulators must undertake. These decisions include tradeoffs that are important to highlight. Potential bidders for the cable franchise base their bids on expectations concerning the profitability of the franchise. Larger expected profits increase the likelihood that potential bidders will install cable systems of higher "quality" (i.e., larger channel capacity, two-way interactive systems, and more channels programmed). Of course, the converse is also true. Local regulators have substantial influence over a number of factors influencing the profitability of a cable system. This power stems from the regulator's influence over the regulation of competitors to cable, contract length, renewal expectations, franchise fees, and rate regulation. More profitable cable contracts, in part influenced by the terms of the contract, may provide greater cable "quality" but may also entail costs such as short-run monopoly pricing, and inhibiting consumers from adopting newer, potentially cheaper substitutes to cable. Hence, the "appropri-

ate" tradeoffs between prices and quality are difficult, *a priori,* to prescribe.

Within the broader context of long-term cable franchise agreements, a number of "short" run allocation decisions are required. That is, cable regulators must administer the contract by choosing among numerous mechanisms to allow for short-run price and quality adjustments. It is for these short-run allocation decisions that the analysis presented above is most useful. In particular, my empirical analysis provides information for policymakers regarding the impact of rate regulation, and video competition on the short-run price and quality decisions of cable firms.

Given the current method of rate regulation, which covers only the basic cable rates, there was no discernible difference between cable price-cost margins, or the number of programs offered over cable in regulated or non-rate-regulated systems. Hence, recent legislation proposing to restrict the ability of local regulators to use rate regulation as a short-run policy tool may not, on average, significantly affect consumers, cable operators, or federal policy goals. In contrast, competition from other video media did have a competitive impact on cable operators. In areas where STV firms entered a market before cable was available, cable price-cost margins were nearly 10 percent lower than in other markets. Where STV entered after cable was available, however, there was a negligible impact on the price-cost margins of cable firms. Although the finding that competition from even a single-channel competitor to cable may reduce overall price-cost margins is interesting, it may not be a useful guide for public policy. Many areas of the country already have cable available. Indeed, most of the growth in the industry has already been completed. Hence, new competitive technologies, such as multichannel MDS and DBS, will usually face competition from an entrenched cable operator. Although these technologies are multichannel, they generally have fewer channels available than cable. Hence, unless the new technologies are able to enter cabled areas through differentiating their program offerings from cable, the competitive role of these outlets may be limited.[27] Indeed, some DBS firms have already focused on areas of the country that will never have cable for their marketing efforts.

The rapid growth in videocassette recorders (VCRs), however, may have a greater impact on cable firms than other technologies. The extent

of this impact is yet to be fully realized and should be monitored carefully. It is not clear, however, whether VCRs are substitutes for or merely complementary to purchasing cable television.

Cable television firms in the top 50 television markets have lower price-cost margins than other cable firms. In fact, the analysis suggested that the price-cost margins in these markets were approximately 3 percent lower than elsewhere. This result seems reasonable given the large number of competing sources of entertainment to cable in the largest media markets.

Competition from either STV or over-the-air television did not appear to influence the number of programs offered by the cable operator. Indeed, it appears that these decisions are influenced primarily by local cable regulators through the initial franchise bidding process, the renewal process, as well as the population size of the cable franchise market.

Finally, whether the competitive impacts of STV observed in the study are "adequate" for the short-run allocation goals of local regulators cannot be easily determined. One can say, however, that existing rate regulation of basic cable rates does not have a discernible negative impact on price-cost margins. Hence, existing rate regulation is not an effective short-run allocation tool. If local cable regulators want to achieve short-run resource allocation results similar to those cable firms in the top 50 markets, or those facing competition from an entrenched STV firm, other policy instruments need to be explored.

Notes

1. Although in the near future, because of technological advances, cable services will be provided by other types of cable.

2. Strictly, for a multiproduct firm such as cable television, two conditions must be met before a firm can be considered naturally monopolistic. First, cost conditions must produce economies of scale in the production of each good, and second, the firm must exhibit economies of scope. See, Sharkey (1982).

3. One study examining the "competitiveness" of the industry simply examined penetration by subscription television in two cabled areas. See Pottle and Bortz (1982).

4. The focus of the study on over-the-air television and STV, to the apparent exclusion of other forms of video programming outlets, is quite deliberate. First, detailed data on MDS penetration were not available. However, even a cursory examination of the relevant penetration data reveals that MDS and SMATV rarely compete directly with cable. With respect to MDS, the reason is rather simple. Of the 570,000 subscribers currently taking MDS services, 66 percent receive programming from HBO. Another 11 percent of MDS subscribers receive their programming from either Showtime or the Movie Channel (Paul Kagan Associates, 1983c). Hence, less than one-quarter of all MDS subscribers receive programming other than that provided by the three largest pay programmers. Thus, in areas which could technically receive either MDS or cable, incentives for direct competition are either reduced, or contractually prohibited. Of course, there are important exceptions. Cable firms in Dallas and Milwaukee, for example, face direct competition from both STV and MDS. Here, the MDS programming provided is not available over cable television. Although SMATV alone competes against cable in other markets there was insufficient subscriber data available to analyze properly.

5. Indeed, if conjectures are made in quantity space, outcomes ranging from either monopoly or competition emerge. Further, if conjectures are made in prices, competitive outcomes could also result under Bertrand assumptions.

6. Assuming that the cable operator does not price discriminate, and using linear demand curves, the welfare loss (w) associated with monopoly pricing can be approximated by the following (assuming changes in price and output are relatively small). The Harberger welfare loss measure is as follows:

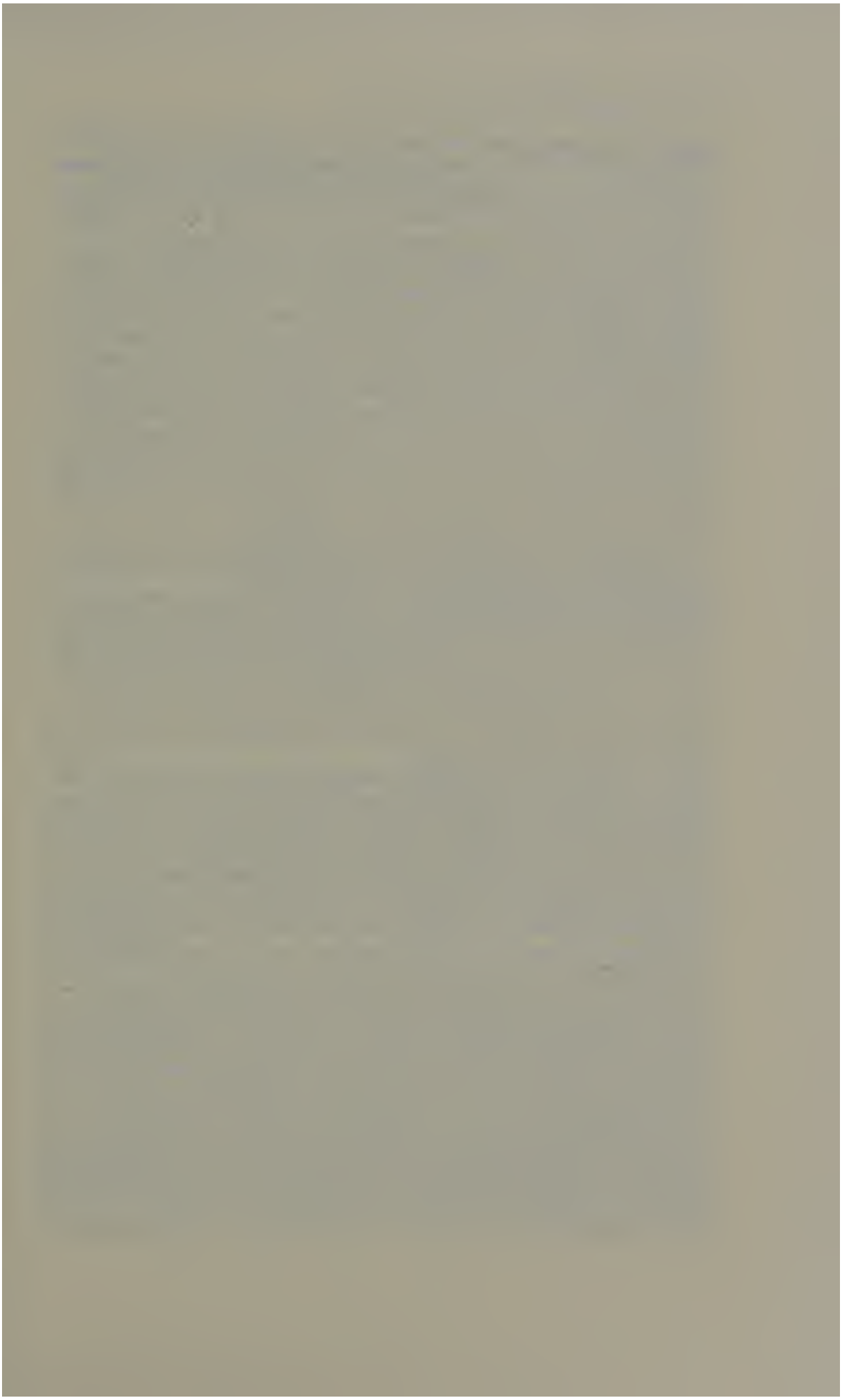
$$W = \tfrac{1}{2}\,\Delta P \Delta Q$$

This can be rearranged to yield the following

$$W = (\tfrac{1}{2}P) \cdot Qnd^2$$

where d is the price-cost margin ($(P - MC)/P$), n is the own-price elasticity of demand, Q is the product output and P is the final product price. Hence, welfare losses increase quadratically with the relative price distortion away from competitive (marginal cost) pricing, and as a linear function of the own-price demand elasticity. See Harberger (1954).

7. In general there are two problems stemming from monopoly: resource allocation and income distribution. Assuming the cable operator has some market power, and does not price discriminate, higher deviations of price from cost implies larger welfare losses, and a larger redistribution of income from consumers to the cable operator. Further, greater price-cost margins imply an increased ability to set high access fees to the cable system. On the other hand, there are a number of methods the cable operator can employ to price discriminate. Most



except for labor costs, there is little cross-sectional variation in these charges (although converter prices do vary as a function of the size of the cable group, or total subscriber base). Finally, once the initial hookup has been completed, and either the subscriber decides to upgrade his services or a new subscriber moves into the premises, marginal costs are substantially less. Given the data at hand, it would be impossible to distinguish between these latter two types of customers.

15. Both cable operators and program suppliers face downward sloping demand curves—that is, they are serial monopolies. In general, one may not easily determine whether the price-cost margins of serial monopolists are smaller than vertically integrated firms. Serial monopolists charge higher prices than vertically integrated firms. However, vertically integrated firms have lower marginal programming costs. The ultimate outcome depends whether the lower final product price resulting from integration is less than the reduction in marginal cost. Given the large pay programming markups over marginal costs (anywhere from $3 to $5), one would expect the reduction in marginal programming costs would swamp the reduction on final product price. Even a cursory examination of the relevant data provides strong support for this assumption.

16. Monopoly firms must also consider changes in revenue that could result if existing subscribers drop other services the firm offers.

17. The argument presented here is very similar to the one presented by Schmalensee and by Scherer in their discussions of the ready-to-eat breakfast cereal case. There, it was suggested that existing cereal companies had deterred entry by proliferating cereal brands, which reduced the profitability of entry. See, for example, Schmalensee (1979) and Scherer (1979). For a general discussion of the role of product selection as an entry deterrent strategy, see Eaton and Lipsey (1979), and Wildman (1980).

18. In addition to the advantages associated with being the pioneering firm, STV firms have traditionally had an advertising advantage over most cable operators. That is, STV—thanks to its larger relevant market—has made great use of television as a method to reach its audience. Cable, on the other hand, because of the franchising process, faces a much smaller market area. For the most part, the relatively small market areas have made advertising on television impractical. This trend has recently been reversed, however, because of the recent growth in chain ownership of clusters of adjacent cable systems. This clustering has allowed chains to further exploit scale economies.

19. Given that the competitive marginal cost of pay programming is zero, total revenues available to both the cable firm and the pay programmer are maximized when the cable firm uses the zero marginal cost to guide pricing decisions. Any positive price charged by the pay programmer will reduce total revenues available.

20. Cable systems used in the analysis were drawn from Paul Kagan's publication *Pay Cable TV by Households, 1983*. In this publication, relatively detailed information regarding the number of households receiving multiple pay programming was provided. Kagan reports this information for 392 of 2,562 systems in their annual survey. Of the 392 first reported in this publication, I

randomly selected 175 firms for analysis. All 175 firms provided the requisite information on pricing and bundling decisions.

21. The welfare implications of these pricing schemes are discussed in Thorpe (1984a).

22. A number of different model specifications were used. For example, the sample was stratified by group and market size where separate regressions were run to detect whether the results were robust. Coefficient estimates for the variables of interest (i.e., rate regulation, competition) were remarkably consistent across these different models. Further, there was some initial concern regarding the likely endogeneity of the variables characterizing the number of channels programmed. A number of different models were used to assess the sensitivity of the coefficient estimates, including two-stage least squares, as well as separate models estimating price-cost margins for cable firms offering two three, four, or five pay programs. Results were very similar across these widely different specifications. Finally, to test for the possible influential effect that individual observations could have on the coefficient estimates, statistics suggested by Cook (1977) and Belsley, et al. (1980) were calculated. In general, the Cook test allows one to detect the change in each parameter estimate by deleting the observation. Of the 175 observations, four were found to have an especially influential impact in the estimated coefficients. Although the deletion of these observations did change some coefficient estimates, resulting policy conclusions were not affected.

23. This effect, of course, includes all relevant interaction terms.

24. This result was not particularly sensitive to the definition of "large" group. In particular, redefining the variable to include only the largest 10 cable multiple system operators yielded similar results.

25. In order to test for the sensitivity of the results to the maintained hypothesis that vertically integrated firms internally transfer programming at its true social marginal cost, another series of regressions was run using positive marginal costs for these firms. That is, I assumed that the marginal programming costs paid by vertically integrated firms were calculated in exactly the same manner as nonintegrated firms. This assumption did little to change the underlying relationships of interest.

26. One of the problems with this line of analysis is that the initial size of the cable system is determined by the local cable regulatory body. There has been a clear trend over time for new cable systems to have much larger channel capacity and program offerings than older systems. For a quick analysis of these trends over time, see *Television Digest* (1983).

27. Again, it is important to point out that through existing licensing regulation by the FCC and local cable regulatory authorities, there is generally *not* free entry into cabled areas. These procedures give cable operators who have larger channel capacities time to "react" through changing their pricing or programming decisions.