The Impact of Competing Technologies on Cable Television

by Kenneth Thorpe

Columbia Institute for Tele-Information
Graduate School of Business
Columbia University
809 Uris Hall
New York, NY 10027
(212)854-4222

THE IMPACT OF COMPETING TECHNOLOGIES ON CABLE TELEVISION

by

Kenneth Thorpe

The Graduate Program in Public Policy
and Public Health
Columbia University

Presented at the conference on "Rivalry Among Video Transmission Media: Assessment and Implications"; held by Columbia University's Research Program in Telecommunications and Information Policy on April 13 - 15, 1984, at Arden House, Harriman, New York.

(Revised May, 1984)

#33

THE IMPACT OF COMPETING TECHNOLOGIES ON CABLE TELEVISION

by

Kenneth Thorpe

The Graduate Program in Public Policy
and Public Health
Columbia University

Presented at the conference on "Rivalry Among Video Transmission Media: Assessment and Implications"; held by Columbia University's Research Program in Telecommunications and Information Policy on April 13 - 15, 1984, at Arden House, Harriman, New York.

(Revised May, 1984)

#33

IMPACT OF COMPETING TECHNOLOGIES ON CABLE TELEVISION

Introduction

Cable television distributes both video and nonvideo services to local subscribers through the use of coaxial cable.[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 nature 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 support this belief.[3] Due to this common perception that cable television is a natural monopoly, cable franchises are usually given 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.[4] Those favoring the maintenance of a regulatory presence note that market power--generated from cable's natural monopoly--may adversely impact stated governmental goals in the communications industry.[5] Others disagree with this assessment, however. Indeed, those favoring a more relaxed regulatory atmosphere note the recent explosion in new video competitors to cable. Although cable is a natural monopoly when providing cable television, it still must compete with a number of noncable sources of video programming. Competition from non-cable programming sources, it is argued, effectively checks any market power cable operators attempt to exert.[6]

One of the more notable aspects of the recent debate over the regulation of cable television is the lack of empirical information.

Although the recent "explosion" of new video technologies has been widely heralded and discussed,[7] little is presently known about their competitive impact on the cable television industry. Indeed, to date, there have been no empirical studies documenting this impact.[8] The goal of this paper, then, is to provide empirical information regarding the impact of noncable distribution sources on the market power of cable operators. This impact will be examined in two ways: first I shall examine how competition affects the ability of cable operators to significantly raise prices without loss of all their customers and second, I shall examine how competition affects the program selection decisions of cable firms.

Plan of the Paper

The discussion about the impact of competition on cable television firms will broken into six sections. The first section will document the growth in the competing technologies to cable television. Section two will discuss the methodology employed to detect market power in the cable television industry. The third section will discuss competitive responses by cable firms in their selection of programming (i.e. non-price competition). Section four will provide a description of variables affecting the market power of cable operators, including penetration by STV.[9] Section five will outline the empirical results of the study, while section six will draw policy implications from the analysis.

1.Growth in Alternative Video Distribution Sources

Cable television provides one method of distributing video programming. A plethora of other distribution sources have recently become available. Indeed, an alphabet soup of new competition has

recently evolved, including subscription television (STV), multipoint distribution service (MDS), direct broadcast satellites (DBS), subscription master antenna (SMATV), and low power television to name a few. Table 1 documents the recent growth in popularity of these different video programmers.

Table 1. Video Subscribers by Source*
(in millions)

	Transmission Source		
end of Year	Cable	STV	MDS
1975	1.98	0	0
1976	4.37	0	.04
1977	6.48	.02	.07
1978	9.40	.14	.15
1979	13.87	.40	.28
1980	18.07	.79	.45
1981	22.53	1.54	.53
1982	27.20	1.82	.57

Source: Kagan Census of Cable and Pay TV, Dec. 31, 1983

* DBS was not available until 1983, past data on SMATV was also not available.

Although cable television remains the largest provider of pay television, other technologies continue to grow in importance. Indeed, in 1977, cable television accounted for over 98 percent of all pay television subscribers. By 1983, however, cable's share of total pay subscribers fell to under 90 percent.

Although interesting, national comparisons may be misleading. Such comparisons, for example, are too aggregated 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 the following penetration data revealed in Table 2.

Table 2. Video Subscribers by Market and Type, 1983
(in thousands)

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

* Area of Dominant Influence
** Not Available

Sources: Kagan Census of Cable and Pay TV, 1983 Television and Cable Factbook, Cable and Services Volume

When examining some of the media markets where cable and non-cable firms compete, these markets appear to be rather competitive. Indeed, as of 1983, over 25 percent of all video subscribers purchased non-cable sources of video programming in Los Angeles, Detroit, Washington/Baltimore, and Phoenix. Appearances may be misleading, however. Although subscriber totals of the competing technologies in media markets where cable is available are interesting, they still remain incomplete. That is, the market shares presented in Table 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 sub-markets where cable television is also available. For example, Table 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 cities. Each city within the larger metropolitan area determines both 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 quite likely performed admirably 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 did not have cable television services available. Therefore, the actual competitive impact of competing technologies, based on information presented in table 2, may be illusory. At best, only very general statements regarding competition in the industry should be made.

2. Detecting the Impact of Competition on Cable Operators

A number of approaches have been used in the past to assess market power.[10] They include examination of the profits of firms, structural measures (i.e. n firm concentration ratio) and price-cost margins. As discussed below, the first two measures will not be used in this study.

The existence of positive economic profits is not, by itself, an indication of market power. Indeed, even competitive firms can earn

economic rents. Further, it would be impossible to separate market power (a demand side phenomena) from scarcity rents. That is, the firm may make economic rents, and have no market power in any traditional sense, purely because it is a superior firm.[11] Finally, one would rarely be able to collect the relevant cost data. Instead, 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 rates of return, however, to infer market power may be quite inaccurate.[12] Use of structural measures--like concentration ratios--are also problematic. Beside the fact that they ignore both entry and exit barriers, structural measures only provide very tenuous insights regarding the probability of market power. Even with high concentration measures, and even if entry barriers are present, highly concentrated industries may not display elements of monopoly power or inefficiencies. Indeed, depending on the degree and type of pricing interdependence in the industry, (i.e. conjectural variations) monopolistic outcomes could be precluded.[13] Further, even a small number of firms in the industry could be sufficient to prevent market power.[14]

Multiproduct Lerner Index

One indicator of market power is the ability to significantly raise prices above costs without substantial loss of customers. This indicator of market power is useful for two reasons. First, higher cable prices reduces the number of cable subscribers served and increases the welfare losses in the industry.[15] Second, the ability to set high subscriber prices implies an increased ability to set high access fees to potential programmers.[16] 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.[17] According to this index, the ability of any firm to increase prices above marginal costs is constrained by 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.

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

Where P represents the product price,
MC is the firms marginal cost and
n is the own-price elasticity of demand.

Quite simply, 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 his 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 infering marginal costs--indirectly calculate price-cost margins. This approach is often useful, especially in industries where marginal cost data are very difficult to identify.[18]

The actual calculation of price-cost margins in the cable industry, however, are somewhat more difficult. This difficulty stems from the fact that 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.[19] 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 its residual demand curve rather than the market demand curve.[20] Further, pricing behavior of the cable operator in the case of entry will also be a function of the cable operators conjecture of how the competitor will compete along both price and product selection dimensions.[21] 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. Of special importance is the fact that cable operators have a large number of degrees 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 indicates, price-cost margins for any particular product depends crucially on the cross price elasticities between the goods sold.[22] For example, in the cable industry, one would expect to see different price-cost margins, ceteris paribus, for cable operators offering HBO and the Disney Channel compared to one offering Showtime and the Movie Channel. This difference in price-cost margin for each of these services--under the ceteris paribus assumptions--is due solely to the fact that the cross-

price elasticities of HBO with respect to the Disney Channel are probably lower than the cross-price elasticity of Showtime with respect to the Movie Channel. Hence, the examination of a single price-cost margin could be misleading unless special care was taken to control the composition of the pay packages.

As footnote 19 reveals, the price-cost margin for any service offered by the cable operator will depend, in part, on its budget share. Yet the share of total revenue earned from each of the programs is endogenous. To avoid the endogeneity problems, I will weight each of the individual price-cost margins by its share of total revenues and sum them. The dependent variable of interest appears below,

$$PCM = \ln\left[\sum_{i=1}^{J}\left(\frac{P_i - MC_i}{P_i}\right)\cdot\left(\frac{P_i \cdot Q_i}{P_K Q_K}\right)\right] \quad \text{where } P_K Q_K \text{ is total revenue}$$

where Pi is the price of the particular service offered by the cable operator, MC is the marginal programming cost, for the ith service, summed over all j services.

Marginal Costs

In the cable television industry, the most important marginal cost incurred when a new subscriber either initially purchases cable, or simply purchases more cable services, is the marginal license fee paid to programmers.[23] 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 3)

TABLE 3

LICENSE FEES FOR BASIC TELEVISION SERVICES, 1983

BASIC SERVICE	FEE (Per Subscriber Per Month)
Arts	Free
Christian Broadcast Network	Free
Cable Health Network	Free
Cable News Network (CNN)	.20, .15 if take WTBS
CNN Headline News	.05, free if with CNN
C-Span	.03
Daytime	Free
ESPN	.10
Music Television	Free
Nashville Network	Free
Nickelodeon	.10 - .15
Spanish Info. Network	
USA	.07 - .13[xx]
WGN	.10
WOR	0 - .10
WTBS	.10 for first 18,000 subscribers zero for additional.

xx .07 if USA is on Basic Service, up to .13 if on Expanded Basic

SOURCE: Paul Kagan, The Cable TV Program Databook, May, 1983
plus conversations with relevant basic program representatives.

LICENSE FEES FOR PAY TELEVISION SERVICES, 1983

(PER SUBSCRIBER PER MONTH)

(1) HOME BOX OFFICE

NUMBER OF SUBSCRIBERS (in thousands)	HBO SUBSCRIBER CHARGE*					
	$7	$8	$9	$10	$11	$12
0 - 10	4.00	4.50	4.70	4.80	4.90	5.00
10 - 25	3.92	4.41	4.61	4.70	4.80	4.90
25 - 40	3.86	4.34	4.54	4.63	4.73	4.83
40 - 75	3.80	4.28	4.47	4.56	4.65	4.75
75 - 100	3.40	3.83	4.00	4.08	4.16	4.25
100 +	3.20	3.60	3.76	3.84	3.92	4.00

Source: Discussions with HBO affiliation representatives plus HBO affiliation kit.

* The price HBO uses to calculate license fees to cable operators depends only on the so-called stand-alone price, (i.e., Price Subscriber pays just to receive HBO).

(2) SHOWTIME

NUMBER OF SUBSCRIBERS	6.95	7.95	8.95	9.95	10.95	11.95	12.95
0 - 499	3.90	4.30	4.60	4.70	4.80	4.90	5.00
500 - 2499	3.78	4.17	4.46	4.56	4.66	4.75	4.85
2500 - 4999	3.71	4.09	4.37	4.47	4.56	4.66	4.75
5000 - 9999	3.59	3.96	4.23	4.32	4.42	4.51	4.60
10000 - 19999	3.43	3.78	4.05	4.14	4.22	4.31	4.40
20000 - 39999	3.32	3.66	3.91	4.00	4.08	4.17	4.25
40000 - 99999	3.20	3.53	3.77	3.85	3.94	4.02	4.10
100,000 +	3.08	3.40	3.63	3.71	3.79	3.87	3.95

Source: Showtime affiliation kit, discussions with affiliation representatives.

* The price Showtime uses to calculate Showtime license fees depends on both the stand-alone price of Showtime, plus the price of Showtime if offered in a discounted package. Here, Showtime will allow discents up to 12.5 percent of the stand-alone price. The final subscriber charge used to calculate the license fee is a weighted average of the two prices by the number of subscribers taking Showtime on either a stand-alone, or "Bundled" basis. For example, if the stand-alone price of Showtime is $9.95, and is offered with another pay service -- for $17.00, and one-third of the total Showtime subscriber in cable system x only purchased Showtime, whereas the remaining two-thirds purchased it along with another pay package, the license fee at the 100,000 subscriber rate:

1/3 (3.63) + 2/3 (3.57) = 3.59

Here, the marginal programming cost facing this cable operator would be 3.59.

(3) MOVIE CHANNEL

Number of Subscribers	License Fee*
1 - 499	4.60
500 - 4997	4.50
5000 - 9999	4.40
10000 - 19999	4.30
20000 +	4.20
30000 +	4.10
40000 +	4.00
50000 +	3.95
75000 +	3.90
100000 +	3.85
150000 +	3.80
200000 +	3.75

Source: Movie Channel Affiliation Kit

* Note that the Movie Channel, as of 1983, did not make license fees depend on prices charged by the cable operator.

(4) PRISM

PRISM SUBSCRIBER CHARGE

UP TO $10	$11	$ 12	$ 13
5.25	5.75	6.25	6.75

Source: Discussions with Prism Affiliation Representatives.

(5) Cinemax

NUMBER OF SUBSCRIBERS	CINEMAX SUBSCRIBER CHARGE			
	$7	$ 8	$ 9	$10
0 - 5000	3.20	3.55	3.90	4.25
5000 +	3.14	3.48	3.82	4.17
10000 +	3.04	3.37	3.71	4.04
20000 +	2.94	3.27	3.59	3.91
30000 +	2.88	3.20	3.51	3.83
40000 +	2.82	3.12	3.43	3.74
60000 +	2.75	3.05	3.35	3.66
80000 +	2.66	2.95	3.24	3.53

Source: Cinemax Affiliation Kit.

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 3 illustrates, the price that cable operators are charged by HBO, Showtime, Prism and Cinemax, depend on the price 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, the cable operator--who presently charges subscribers $9.00 for HBO--decides to increase the price to $10.00. In the near future, the price the cable operator could have to return to HBO would increase from 3.76 to 3.84 per subscriber. As noted in Table 3, Showtime has a similar pricing strategy. The Movie Channel, as of January 1984, only charged cable operators according to the number of subscribers served.

Determinants of Price-Cost Margins

Two factors can make the price-cost margins of cable operators larger. First, on the demand side, the ability to significantly raise prices above costs is constrained if substitute products are available. Certainly, no one would deny that STV and other video technologies are to some degree substitutes to cable television. The empirical question of interest, however, is to determine both how good

a substitute consumers feel it is and to detect the economic impact this has on the behavior of cable firms.

In addition to substitute products,the ownership characteristics of cable firms also affect the price-cost margins. Firms owned by multiple system operators generally receive cable programming at lower cost than independently owned systems. Holding demand side factors constant, then, this supply side consideration increases overall price-cost margins of cable operators.[24] Further, vertically integrated firms, if they are profit maximizing, would internally transfer programming inputs at their true social opportunity costs.[25] Due to the public good nature of programming, the marginal social costs are zero. Hence, the price-cost margins of vertically integrated firms would also be larger than other cable firms.

Given these two factors affecting price-cost margins, we need to find a way to isolate empirically the demand side effects. One way to focus on the demand side factors affecting price-cost margins is to stratify the sample by group size. Once stratified, one can examine the variables of interest across the different samples to determine the impact of competition on the pricing decisions of cable firms. In addition, we can compare the stratified samples with the full sample to determine the importance of supply versus demand side factors on the summed price-cost margin measure.

Nonprice Competition

The competitiveness of media markets will also affect the number of and variety in programs offered by a cable firm. However, we cannot--a priori--make an unambiguous prediction of which market structure will lead to a greater number of programs or more program

diversity. Cable firms that do not presently face competition from pay programmers could offer either more or a similar amount of programming as a cable firm that does 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)[26] and new subscribers switching from STV--or other competing technologies--to cable television. Of course, cable firms not presently facing competition from another source 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 of and diversity in 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.[27]

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 product differentiation advantages of potential competitors.[28] 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 flexilbility 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.[29] This advantage that incumbent STV firms have results from the relative uncertainty regarding the product (programming) quality of cable television firms.[30] Due to these asymmetries in product information, one would expect to see slower growth in cable penetration in areas where STV had originally entered.

Explaining Variations in Price-Cost Margins

A number of variables will be used to explain both the variation in price-cost margins and 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 may be thought of as a two part process: first, there is the initial decision to purchase cable, and then a decision of how many cable services to purchase. Of course, these decisions may be simultaneously determined. Factors affecting this decision process will include:

1. 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 programs--which are delivered either by satellite or microwave service--include all sports stations (ESPN), childrens programming (Nickelodeon) all news programs (CNN), and a variety of other specialty programs (e.g. Weather Channel, Silent Network, Black Entertainment Network, Music Television). Other factors held constant, one would expect that a larger number of programs offered on basic would increase cable penetration.

Another very important competitor to cable is over the air television. Certainly, as a number of past studies have revealed, the demand for basic cable service is very sensitive to the number and type of over the air broadcasts available on cable compared to those available over the air without cable. Indeed, more network, independent and educational stations available on cable compared to that offered over the air has a strong impact on cable penetration.[31]

2. Signal Quality. The ability to clearly receive over the air signals is historically one of the more important determinants of the penetration of cable television.[32] Indeed, the existence of poor signal reception was the primary factor spurring the early development of the cable industry. Although the role of the cable operator has changed over time, signal quality remains an important determinant of cable penetration.

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

4. 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.

5. 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.

6. Ownership Characteristics. There are strong incentives for vertical integration in the cable television industry.[33]

Vertically integrated firms may increase profits if they internally transfer inputs (i.e. programming) at the competitive marginal cost.[34] 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. As such, I would expect that the price-cost margins of group owned systems would be larger than independently owned ones.

7. System Age. Observed price-cost margins will also depend on the age of the cable system. The inclusion of an age variable recognizes that penetration depends on rate at which cable systems reach maturity. The functional form for system age explicitly recognizes that growth in the number of subscribers increases sharply during the early years of the system then, over time, asymptotically reaches full maturity. To model this growth curve, the age variable will be entered as the inverse of the cable systems age (in years) squared.

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 presently have

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.	Kagan Census of Pay TV, 1983 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/Cable Factbook, 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
COMNET	log (number of network services on cable/number of network station in the Grade B contour area)*	Television/Cable Factbook, 1983
OMIND	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
SERV	log(number of pay television services not available on basic or expanded basic service).	Kagan Census of Pay TV, 1983
LAHI	log of average household income in county where cable was available.	Circulation, 1983
TOP50	dummy variable for existence of cable system in TV market between 51 and 100	Television/Cable Factbook, 1983

NAME	DEFINITION	DATA SOURCE
VI	dummy variable equal to 1 if cable firm was commonly owned with a major pay television programmer. These included:	Television/Cable Factbook, 1983
	Pay Programmer / MSO	
	Home Box Office, Cinemax / ATC	
	Movie Channel / Warner Amex	
	Showtime / Viacom	
AGE	age of the cable system in years. The age variable is defined as $1/(AGE)^2$	Kagan Census of Pay TV, 1983
PION	is an interaction term between system age and cabled areas where STV was available before cable.	
LAGE	log of the age of the cable system (in years)	
LARGE	Identifies cable firms owned by one of the top 20 cable multiple system operators	Paul Kagan, Cable TV Dat Book, 1983
MID	identifies cable firms owned by the next 30 largest multiple system operators	
SMALL	identifies all remaining cable firms owned by multiple systems operators	

* 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.

NAME	DEFINITION	DATA SOURCE
INDEP	Cable firms not owned by a multiple system operator.	
HC	Dummy variable for cable systems offering Home Box Office and Cinemax	Kagan, Census of Pay TV, 1983
HM	Dummy variable for systems carrying Home Box Office and the Movie Channel	same as HC
HS	Dummy variable for systems carrying Home Box Office and Showtime	same as HC
HSC	Dummy variable for systems carrying HBO, Showtime and Cinemax	same as HC
HMC	Dummy variable for systems carrying HBO, Movie Channel and Cinemax	same as HC
FOUR	Dummy variable for systems offering four pay channels There was only one combination	same as HC
FIVE	Dummy variable for systems offering five pay channels There was only one combination	same as HC

NAME	DEFINITION	DATA SOURCE
TOP100	dummy variable for existence of cable system in TV market between 51 and 100	Same as TOP50
TOP200	dummy variable for existence of cable system in TV market between 101 and 200	Same as TOP50
OUTSIDE	dummy variable for existence of cable system outside all TV markets	Same as TOP50
SIG	variable ranging from 1 to 5 to denote physical obstructions of television signals.	Department of Interior, National Atlas, Geologic Survey
C1	dummy variable for cable system in the South region	U.S. Census
C2	dummy variable for cable system in the North Central region	U.S. Census
C3	dummy variable for cable system in the West region	U.S. Census
C4	dummy variable for cable in the Plains region	U.S. Census
C5	dummy variable for cable system in the East region	U.S. Census
INIT	dummy variable equal to 1 if STV operator entered market before the cable firm	Kagan Census of Pay TV, 1983
MSO	dummy variable equal to 1 if cable firm belonged to a multiple system operator (i.e. group)	Television/Cable Factbook, 1983

cable television available. As part of this study, then, a rather unique data set has been compiled. A number of STV operators throughout the country have 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 empirically detect 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 200 cable firms was undertaken to gather more detailed information on actual pricing patterns in the cable industry. 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.[35]

The Sample

On average, the sample used for the study represented slightly larger cable systems than the national average. (see Table 4) The difference, although not very large, in part reflected 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.

Table 4 Comparison of 175 Firm Sample to National Averages, 1983

Variable	Sample Average	National Average
Basic Subscribers	10250	8243
Homes Passed	17675	15779
Price Basic	8.56	8.45

Source: Sample and Kagan Census of Pay TV, 1983

Empirical Results

A number of different specifications and sample stratifications were employed to explain the variation in price-cost margins across cable firms. The data were stratified by group size--to roughly control for differences in marginal costs--and market size--to compare cable systems facing similar levels of competition. These stratifications were used in order to test for any possible specification biases that could arise in the analysis. (see Appendix 1) Further, within each of these stratifications, two general models were examined. The first model reported in Table 5 simply sums the number of pay program services offered by the cable firm. Given the endogeneity of programming decisions, this approach will allow us to use an instrumental variable technique.[36]

The second set of regressions revealed in Table 5 explicitely identifies the pay programming combinations offered by each cable firm (e.g. HBO plus Showtime, HBO plus the Movie Channel).[36]

Demand Side Variables

A number of interesting results emerged from the study. Perhaps the most notable was the very small, although negative impact STV

TABLE 5

FACTORS AFFECTING PRICE-COST
MARGINS OF CABLE OPERATORS

	OLS		TWO - STAGE LEAST SQUARES [1]	
	R -SQUARE =.59		R-SQUARE =.58	
VARIABLE	ESTIMATE	STANDARD ERROR	ESTIMATE	STANDARD ERROR
CONSTANT	1.00	.299*	1.10	.304*
TOP 100	.008	.016	.008	.016
TOP 200	.009	.014	.010	.015
OUTSIDE	.018	.015	.022	.015
AGE	-.377	.092	-.384	.094
LARGE	.028	.011*	.028	.011*
INDEP	.025	.017	.023	.017
MID	.015	.014	.011	.015
VI	.065	.016	.061	.016*
INIT	-.041	.019*	-.039	.019
SERV	.027	.008*	.044	.021*
LAHI	-.123	.029*	-.136	.031
LSTV	-.005	.003*	-.005	.002*
XSAT	.009	.005**	.009	.005**
PION	.195	.100*	.209	.103*

* Significantly different from zero at 5 percent confidence level.

** Significantly different from zero at 10 percent confidence level.

1 Combining both the number of pay television and satellite programs together as the endogenous variable did not appreciably alter the results shown here. The variable SERV was the endogenous variable in the two-stage least squares regression. Instrumental variables used in the regression included the log of population, comparative service variables, regional dummies, log of channel capacity and signal quality.

TABLE 5
(Cont')

FACTORS AFFECTING PRICE-COST MARGINS
OF CABLE OPERATORS

VARIABLE	ESTIMATE	R-Square = .63 STANDARD ERROR
CONSTANT	.386	.300*
TOP 100	.010	.016
TOP 200	.007	.014
OUTSIDE	.014	.014
AGE	-.348	.091*
LARGE	.029	.011*
INDEP	.025	.017
MID	.011	.014
VI	.057	.018*
INIT	-.048	.019*
HC[1]	-.036	.012*
HM	-.021	.014
HS	-.031	.016**
HSC	-.005	.018
HMC	.055	.027*
FOUR	.057	.027*
FIVE	.028	.057
LAHI	-.104	.018*
LSTV	-.008	.027*
PION	.192	.099*
XSAT	.011	.005*

* Significantly different from zero at 5 percent confidence level.

** Significantly different from zero at 10 percent confidence level.

1 The excluded pay service dummy is the Movie Channel, Showtime combination.

penetration had on the ability of cable operators to raise prices above marginal costs. The results for the STV impact are consistent across all models tested.

As noted in Table 5, increased penetration by STV firms in areas offering cable service had a statistically significant impact on price-cost margins. Specifically, for every 10 percent increased in STV penetration, price-cost margins of cable operators fell by approximately .05 percent. Although this impact--relative to other factors affecting price-cost margins--is very small, it is nevertheless negative.

STV firms however, had a greater impact on cable firms, when they were the first product available in the market. As the coefficient on the variable init reveals, price-cost margins of cable operators were an additional 4 to 5 percent lower in areas where STV was the first pay programming service available. STV, as the pioneering firm, affected cable penetration by slowing the initial rate of maturation compared to other cable televison firms--including those firms that were established before STV entered the market. This effect can be seen through examining the interaction term--pion--between system age and the dummy variable indicating areas where STV was the pioneering programmer.[38] According to the coefficient on age, cable systems that do not face STV competition will reach nearly 38 percent of their final price-cost margin in the first year. In contrast cable firms that presently face STV competition have slower rates of maturation. Specifically, these firms achieve only 18 percent of their final price-cost margins in the first year. This difference is due to the fact that ultimate penetration rates by these

cable firms are slower than those firms that do not face STV competition. On the other hand, the results imply that price-cost margins will roughly converge over time. Hence, although STV firms who have entered the market before cable firms appear to have some impact on the price-cost margins, the impact appears to be only transitory.

Other demand side factors appear to explain little of the cross-sectional variation in cable price-cost margins. Comparative service and signal quality variables, while important determinants of both basic penetration and the basic service price-cost margins, did not add to the explanatory power of the model.[39]

Both the number and type of pay television services affected the price-cost margins of cable operators. As Shown in Table 5, the addition of another pay television service increased price-cost margins by approximately three hundredths of a percent. Further, the specific combinations of pay television packages offered by the cable operator also affected price-cost margins. Compared to cable systems offering only the Movie Channel and Showtime, those offering HBO and Showtime had price-cost margins over three percent less. In addition, those systems offering HBO and Cinemax had price-cost margins three and one-half percent less than systems providing the Movie Channel and Showtime. These results occur for two reasons. First, it is clear from both published rate cards and informal conversations with programming officals that HBO is the most expensive pay programming service. Second, the more expensive pay programs do not appear to sufficiently shift pay programming demand to compensate for the higher program costs. Hence, price-cost margins for these services are lower than less expensive programming.

Naturally, those cable systems using three programming services with the exception of HBO, Showtime, Cinemax combination, have higher price-cost margins. On average, their price-cost margins are over five percent higher than systems offering the Movie Channel, Showtime combination.[40]

Not surprisingly, the number of satellite program services offered on the expanded basic tier also increased the price-cost margins of cable operators. This impact, however, was very small.[41]

The existence of rate regulation did not constrain the overall price-cost margins of cable operators. This result contrasts sharply with some previous results indicating that rate regulation actually led to higher cable prices.[42] There are two possible explanations of this result. First, the rate regulation on basic services was not binding. Given the method by which most rate regulation is administered, this is entirely plausible.[43]
Second, price-cost margins were not affected due to the flexibility cable operators have to create unregulated expanded basic tiers where they provide satellite services previously offered on the basic cable package.

Although the coefficients are in the expected direction, summed price-cost margins do not appear to vary significantly across the top 200 television markets. There is some evidence, however, that price-cost margins in cable firms outside all television markets are higher than those systems located within the largest 200 markets.

One final demand side factor that was examined--average household income--produced the only seemingly anomolous result. According to Table 5, the price-cost margins of cable operators were negatively

associated with higher income levels. Upon closer examination, however, one discovers that this seemingly anomolous association is driven by supply--and not demand--side factors. In particular, when examining variations in price-cost margins for cable firms located in the top 100 televison markets, changes in average household income do not add to the explantory power of the model. (see Appendix 1). On the other hand, when stratifying the sample by group size, changes in average household income again appear to be negatively associated with price-cost margins. One way to reconcile these differences is to recognize the systematic relationship between programming cost, ownership structure and televison markets. For example, in this sample most of the large multiple system operators owned cable firms outside the largest media markets. (see Table 6) Due to the programming cost advantage these groups enjoy, price-cost margins would be larger due to both demand--since there are fewer competitors--and supply side factors due to cheaper programming costs. Given the positive correlation between market size and income, the apparent negative relationship between price-cost margins and average household income is driven by supply side factors rather than to any perverse demand side responses.

Supply Side Results

As noted in Table 5, the price-cost margins of vertically integrated firms are approximately 6 percent higher than other cable firms.[44] Further, cable systems owned by the top 20 multiple system operators are some 3 percent higher than cable firms owned by smaller cable groups. Price-cost margins of mid sized groups do not, on average, appear to differ appreciably from small cable groups.

TABLE 6

CROSSTABULATION 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

Finally, there is some evidence that independently owned systems have price-cost margins over 3 percent higher than the smaller cable groups.[45]

Impact of Competition on Program Selection

Both ordinary least squares and logistic models were used to identify the factors affecting the number of pay television programs offered by cable television firms.[46] Two major factors had a consistent impact on the number of programs offered; (1) the age of the cable system and (2) the population of the cable franchise area. (see Table 7) The age of the cable system is important for a number of reasons. For most cable television firms, the initial decision regarding the size of the system (i.e. channel capacity) is determined by the cable franchising authorities.[47] Hence, at least initially, channel capacity is exogenously determined. Older cable systems are, ceteris paribus, most likely to be smaller cable systems. By the same token, newer systems have larger channel capacities. This correlation is the result of two factors: first, newer systems generally serve larger, metropolitan areas, and second, systems are now larger due to technological advances in cable wiring.

The second variable affecting program selection decision is the population of the franchise area. This is a simple demand side phenomenon. That is, due to the fixed costs associated with program acquisition, total revenues for an additional pay television service are likely to be greater in larger market areas. For ease of interpretation, the probability that cable firms serving different market sizes is displayed below. (see Table 8).

As Table 8 indicates, cable systems serving populations of

TABLE 7

FACTORS AFFECTING THE NUMBER OF PAY TELEVISION SERVICE OFFERINGS+

	OLS		LOGIT	
	R-SQUARE = .24		MODEL CHI-SQUARE = 58.82	
	ESTIMATE	STANDARD ERROR	ESTIMATE	STANDARD ERROR
LSTV	.0005	.022	.119	.096
LPOP	.141	.044 *	.578	.224 *
LAGE	-.249	.067 *	-1.22	.040 *
TOP 100	-.086	.153	-.821	.695
TOP 200	-.116	.145	-.911	.781
OUTSIDE	-.020	.145	-.245	.678
INIT	.041	.183	.000	.816
V1	-.173	.169	-1.524	-1.162
LARGE	.164	.115	.954	.592**
MID	-.053	.141	-.113	.710
INDEP	- .033	.177	.277	.932
CONSTANT	1.42	.465	-4.61	2.27

* Significantly different from zero at 95 percent confidence level.

** Significantly different from zero at 90 percent confidence level.

\+ These services are those not found on either basic or expanded basic packages (i.e. they indlude HBO, Showtime, etc.)

TABLE 8

PROBABILITY THAT A CABLE SYSTEM WILL OFFER THREE OR MORE PAY PROGRAMMING SERVICES, BY MARKET SIZE, 1983

Population in Franchise Area	Probability of three or more services*
5,000	.28
15,000	.34
25,000	.38
50,000	.44
75,000	.50
100,000	.55

100,000 or more are nearly twice as likely to provide 3 or more programming services than cable firms serving 5,000. Of course, this result is not very surprising given that most major multiple system operators employ sophisticated models in the franchise bidding process to determine the demand for their services. Population is a critical factor in these models. Neither the existence of STV, nor the order of entry into a media market, explained variations in program selection decisions by cable operators. There are two possible interpretations of this result. First, many of the cable systems facing competition from STV in larger media markets are relatively new. Thus, collinearity is introduced into the model due to the relationship between the probability that a cable firm faces STV competition and system age. Hence, even if STV did impact program selection decisions, this reaction could have been captured through the age variable. The omission of age from the regression tends to support this proposition.[38] Secondly, it is possible that there was no relationship between program selection decisions, STV and the order of entry into a market. Based on the results presented, one cannot reject either possibility.

Finally, there is some weak evidence that cable firms owned by large multiple system operators provided more programming services than other cable firms. These results were not very robust, however. More notable, is the lack of evidence that vertically integrated firms discriminate against other programmers, and therefore provide fewer pay programming services.[49]

Conclusions and Policy Implications

The goal of this study has been to provide much needed empirical information regarding the competitive structure of the cable television industry. In so doing, a number of interesting results have emerged. Perhaps the most notable result is the finding that STV appears to have a very small impact on the price-cost margins of cable operators. This is noteworthy because it reveals that a distribution source using only one channel of programming--provided it is suitably differentiated from cable--can have a competitive impact. Yet, one should be careful not to overstate its impact. Compared to other factors affecting price-cost margins, the average competitive impact was relatively minor. On average, it was found that every ten percent increase in penetration by STV reduced the price-cost margins of cable operators by .05 percent.

Furthermore, the order of entry into a media market appears to be very important. Indeed, at least for STV, the primary impact competition had on the market power of cable operators occurred in situations where STV was available in an area before cable television. In these cases, price-cost margins of cable operators were an additional 4 to 5 percent lower. This result has important implications for multichannel MDS, DBS and SMATV. As the experience with STV has revealed, the ability to initially enter a market before cable may have implications for long term viability. Certainly, a number of cable operators already realize the strategic importance of this finding. Cable operators in some localities are presently providing SMATV services until homes in the area have access to cable. This strategy will clearly enhance the long run market power of these cable firms.

Another important finding was that existing rate regulation did not appear to have any impact on the price cost margins of cable operators. Even if rate regulation did significantly lower basic cable rates, cable operators could simply alter the composition of how cable is packaged (i.e. create expanded basic tiers) or change the prices of services not regulated. In light of the flexibility cable operators retain on pricing other services, the lack of a significant finding, is not really surprising.

Who owns the cable firm does not appreciably affect the number of pay television services offered. This result constrasts with some earlier fears that vertically intergrated firms may have an incentive to act anticompetitively by discriminating against other program suppliers.

The regulatory implications of these results are somewhat more problematic. Conceivably, cable television firms could face competition from two generic sources of pay programming: other cable firms, and non-cable programmers. Specialized investments in sunk capital assets make large scale entry by another cable firm into a particular market very unlikely, however.[50] The role that these specialized capital investments assume in deterring entry are reinforced by long term contracts guaranteeing exclusivity. Yet, as this analysis reveals, non-cable competitors can enter a market and directly compete with cable. The primary reason that these non-cable programmers can compete with cable is due to the lack of specialized, sunk resources. Entry on a small scale by these firms could reduce the price-cost margins of cable operators along the lines revealed in this analysis. The results imply, however, that the ability of STV to provide any credible threat, or affect program selection behavior of

cable operators is transitory. Indeed, whether STV can remain a viable competitive threat to cable is critically dependent upon its ability to continue to compete along product differentiation dimensions. This is clearly difficult to achieve with only one channel of programming, however. Nevetheless, some STV firms are likely to remain viable if they can retain exclusive local sport contracts, and other programming that is differentiated from that carried by cable operators. [51]

When assessing the regulatory implications, however, two factors should be considered. The first factor to consider is that most cable operators do not face competition from another distributor of pay programming. Moreover, even when competition is technically feasible, it often does not occur. The best examples of this are situations where individual homes could receive MDS programming in cabled areas but do not. Other examples, as previously mentioned, include cable operators who own and operate "competitive" programming sources such as SMATV in an areas before cable is available. Once the area is wired, the cable operator can make arrangements for consumers to switch from SMATV to cable. As such, there is no competition since the cable operator has merely attempted to preclude entry by another firm providing SMATV service. In light of these caveats, recent proposals by the FCC to construct media concentration indexes are likely to dramatically overstate the competitive structure of the local market. [52] The point here is that the growth in competitive options to cable is not nearly as great as some would imply <u>in cabled areas</u>. This is not to say, however, that some cable firms do not face competition from a number of alternative program sources such as

SMATV, STV and MDS. Rather, these situations, compared to the number of cable systems in operation, are limited.

Finally, any regulatory alternative--whether it includes rate regulation, or common carrier legislation--must be compared to the existing base case where cable operators bundle their services together. Certainly, compared to situations where cable operators do not bundle (package) services together, bundling results in more channels programmed and more subscribers served.[53] On top of these effects, competition from STV firms--especially in areas where they entered before cable--reduces price-cost margins. Whether regulation can improve on this existing situation deserves more attention and analysis.

FOOTNOTES

(1) Although in the near future, due to technological advance, 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) Owen and Greenhalgh, (1982), Noam (1982) .

(4) See, for example, the recent Senate and House hearings on cable television regulation U.S. Senate (1983), U.S. House of Representatives (1983)

(5) See, especially, National League of Cities (1981)

(6) See, for example, Gordon, Levy and Preece (1981)

(7) See, for example, Stern, Krasnow and Senkowski (1984)

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

(9) 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 was 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

presently taking MDS services, 66 percent receive programming from Home Box Office. Another 11 percent of MDS subscribers receive their programming from either Showtime or the Movie Channel (Kagan, 1983). 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 does compete in other markets with cable sufficient subscriber data was not available.

(10) See, for example, discussion in Scherer (1980).

(11) Demsetz (1969).

(12) Fisher and McGowen (1983), Fisher (1979).

(13) 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.

(14) Baumol, Panzar, and Willig (1981), Kwoka (1979).

(15) 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

$$W = (1/2P) \cdot Q\eta d^2$$

where d is 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).

(16) 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 cable operators, for example, provide volume discounts when purchasing more channels of programming. In some cases, when these discounts are used, the welfare losses associated with monopoly may be reduced, but the distributional implications of monopoly remain. For a discussion of the regulatory implications of cable pricing practices, see Thorpe (1984).

(17) The Lerner Index has been used on a number of occasions to measure market power. For a general discussion, see Scherer (1980).

(18) For recent attempts see Rosse (1966), or Dertouzos and Thorpe (1982).

(19) Specifically, it can be shown that price-cost margins for a multiproduct firm are determined in the following manner.

$$\frac{P_i - MC_i}{P_i} = \frac{1}{N} + \sum_{i=1}^{M} \frac{1}{S_i/S_j} \cdot CE_{ij}$$

Where P is the specific product price, MC is the marginal cost associated with the individual product, N is the own-price elasticity of demand, CE is the cross-price elasticity of demand and S indicates the share of total revenue (j) received from product (program) i. See Needham (1978).

(20) That is, the elasticity of demand facing a single seller is...

$$\eta_i = \left(\frac{Q_D}{q_i}\right)\eta + \left(\frac{Q_S}{q_i}\right)E$$

where n is the market demand elasticity, E represents the elasticity of supply of potential competitors with respect to the market price, QD is the total quanitity demanded QS is the total quantity supplied by all firms, and qi is the amount supplied by firm i. For its derivation, see McCloskey (1982).

(21) Cowling and Waterson (1976), Dickson (1979), and Applebaum (1982) In general, these indexes note that firms will equate marginal costs with <u>perceived</u> marginal revenues. Hence, the degree of monopoly, or oligopoly power will be a function of both the relevant own-price demand elasticities and the firm's conjectural elasticity of total industry output with respect to the output of the firm.

(22) Phillips (1980), also see footnote 8.

(23) Other factors to consider could include drop lines--which include installation charges, splitters, traps, and amplifiers--and converters. These were not considered for a variety of reasons. First, all of the marginal costs cited here are one

time charges. Once amortized over the expected length of time a subscriber is expected to have cable service, they are not very important. Second, 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 hook-up has been completed, and the subscriber decides to either 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.

(24) Given the construction of the dependent variables, ownership characteristics may not be very important. Remember that we are weighting each individual price-cost margin by its contribution to total revenue. For the most part, the most important margin will be the basic price-cost margin since it accounts for the largest component of total revenue.

(25) Vernon and Graham (1971).

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

(27) Spence (1976)

(28) The argument presented here is very similar to the one presented by Schmalensee and Scherer in their discussion 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).

(29) Schmalensee (1982).

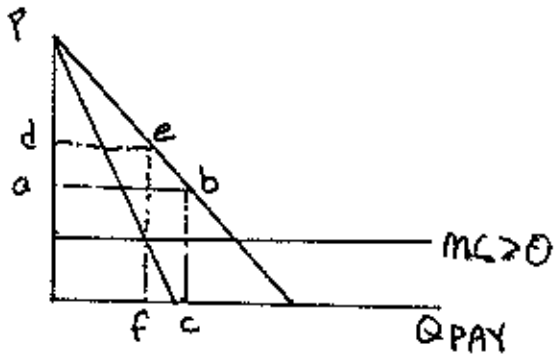
(30) In addition to the advantages associated with being the pioneering firm, STV firms have traditionally had an advertising advantage over most cable operators. That is, STV-- due to its larger relevant market-- has made great use of television as a method to reach its audience. Cable on the other hand, due to 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, due to the recent growth in chains owning adjacent cable systems. This clustering has allowed chains to further exploit scale economies.

(31) Comanor and Mitchell, (1966)
Park (1971), Noll, Peck and McGowan (1973), Charles River Associates (1978), Bloch and Wirth (1982)

(32) See especially Park (1971).

(33) Given that the competitive marginal cost of pay programming is zero, total revenues availableto both the cable firm and the pay programmer are maximized when the cable firm uses the zero marginal cost to guide pricing decisions. Any postive price charged by the pay programmer will reduce total revenues available. That is, area abc --which exists under vertical integration--exceeds area def in the non-integrated case

For further discussion, see Thorpe (1984).



(34) Vernon and Graham (1971).

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

(36) In light of the fact that programming choices are endogenous, the estimated coefficient on the programming variables will likely be both inconsistent and biased (here most likely downward). Although these variables are not of particular policy interest the bias may spread to other regressors (unless they are orthogonal to these programming variables) in the model. The direction of this bias however could be calculated with knowledge of the relevant variance-covariance matrix, Although both the number of satellite services on the expanded basic tier and the number of pay television services are likely endogenous, there is no way to estimate the model using separate instruments for each variable. As such, two different approaches were employed. First, since there are no instruments to provide separate estimates for both the number of pay television services and the number of satellite services, a two stage least squares estimate only designating the number of pay television services as the endogenous variable was performed. Second, an index was created which summed the total number of satellite and pay television services offered by the cable system. An instrumental variable approach was then used to predict variations in the index created. Instruments for the number of program service offerings

included the log of the population in the franchise area, log of channel capacity, comparative television service variables, and regional dummies. Although neither approach is entirely satisfactory, the estimated coefficients of interest did not change appreciably in any of the estimated forms.

(37) To test for the possible influential effect that individual observations could have on the coefficient estimates, statistics suggested by Cook (1977) and Belsley, Kuh and Welsch (1980) were calculated. In general, the Cook test allows one to detect the change in each paramater estimate by deleting the observation. Of the 175 observations, four were found to have an especially influential impact on the estimated coefficients. Although the deletion of these observations did change some coefficient estimates, resulting policy conclusions were not affected.

(38) Although not significantly different from zero at standard levels of confidence, the interaction term was significantly different from zero at the 10 percent level. Part of this is due to the relatively few number of observations.

(39) Results reported in appendix to Thorpe (1984).

(40) The HBO, Showtime, Cinemax combination was likely insignificant due to the lack of observations. Further, this does not imply that all cable systems should adopt the HBO, Movie Channel, Cinemax combination. Price-cost margins are higher here due to the ability of these cable systems--through local demand conditions--to support more pay programming services.

(41) Of course, the same caveat applies here as it did in footnote 40

(42) This past result is suspicious, however. The price of basic cable service will vary according to difference in both marginal

costs and the number of additional services provided by the pay programmer. Hence, the price-cost margin, and not simply basic prices should be the variable of interest. See, for example, Braunstein (1978).

(43) Most cable rate regulation does not follow traditional rate of return standards. See Kalba (1978).

(44) 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 were 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 non-integrated firms. This assumption did little to change the underlying relationships of interest.

(45) Independently owned systems could conceivably have higher price-cost margins due to performance discounts they receive (i.e. these are independent of the total number of consumers served), plus the fact that many independently owned firms are located outside all television markets (a demand side factor).

(46) Cable firms sampled provided between 2 and 6 pay television services. For purposes of the logistic model, a number of different formulations were tested. The results shown below reveal the probability that a cable system for a given set of exogenous variables provides three or more pay services. Other divisions did not appreciably alter the results.

(47) For many franchise areas, a minimum acceptable number of channels is specified. Hence, cable firms may then bid on systems given

this constraint.

(48) Indeed, once age was omitted, the init variable--indicating that STV was the first to enter a media market--was positive and significantly different from zero. That is, if age is omitted (incorrectly) the large positive coefficient on this variable would indicate that cable firms entering after STV provide more programming than other firms--even those facing STV competition but who had entered the market before STV.

(49) For a discussion of these incentives, See Ordover and Willig

(50) Baumol, Panzar and Willig (1982) Although some cable firms compete on fringe areas of a franchise due to overbuild, direct competition throughout the franchise is limited. Even more unlikely is large scale entry by another cable firm after an incumbent firm has already sunk its capital.

(51) One good example of the continued product differentiating advantage of STV is ON-TV in Los Angeles. Although ON carries many of the same movies as local cable systems, ON has exclusive rights to broadcast the home games of the local Los Angeles sports teams (e.g. Angels, Dodgers, Lakers, Kings). STV is not able to differentiate its programming along these dimensions in some other cities, however. In New York, for example, local cable systems carry the Sportschannel, which provides coverage of many local pro sports events. In this case, the cable systems have preempted a potential source of product differentiation by the local STV firm (WHT-TV).

(52) Levy, et al. (1982), discuss what is essentially a market concentration ratio to assess the competitiveness of media markets. In addition to the problems noted with such indexes

elsewhere--especially Baumol, Panzar and Willig (1982)-- failure to account for ownership and whether technologies are actually available in a particular market exacerbate these problems.

(53) For a discussion of the implications of these packaging schemes see Thorpe (1984).

BIBLIOGRAPHY

Applebaum, E. "The Estimation of the Degree of Oligopoly Power" Journal of Econometrics 19 (1982).

Baumol, W., J. Panzar, R. Willig, Contestable Markets and the Theory of Industry Structure.. Harcourt, Brace, Jovanovich. 1982.

Baer, W.S., H. Geller, J. Grundfest, Newspaper -Television Station Cross Ownership: Options for Federal Action R-1585-MF Rand Corporation, September 1974.

Baer, W.S., H. Geller, J. Grundfest, K. Possner, Concentration of Mass Media Ownership: Assessing the State of Current Knowledge R-1584-NSF, Rand Corporation, September 1974.

Besen, S.M., L. Johnson, An Economic Analysis of Mandatory Leased Channel Access for Cable Television R-2989-MF, Rand Corporation, December 1982.

Belsley, D.A., E. Kuh, R.E. Welsch, Regression Diagnostics. NY: John Wiley and sons. 1980.

Bloch, H., M. Wirth, Demand for Pay TV and Its Impact on The Expansion of Cable Availability. Center for Mass Communications Research and Policy, University of Denver, June 1982.

Braunstein, Y., et al. Economic Impact of State Cable TV Regulation. Program on Information Resources Policy, Harvard University, July 1978.

Charles River Associates. "Analysis of Demand for Cable TV". CRA Report No. 178-2. Boston. 1978.

Cook, R.D., "Detection of Influential Observation in Linear Regression", Technometrics 19. 1977.

Cowling, K. and Waterson, M., "Price-Cost Margins and Market Structure", Economica 43. 1976.

Comanor, W. and B. Mitchell, "CATV Systems and Local TV Station Audience", Quarterly Journal of Economics 80. 1966.

Demsetz, H., "Why Regulate Utilities?," Journal of Law and Economics 11. October, 1968.

Demsetz, H., "Information and Efficiency: Another Viewpoint," 12 Journal of Law and Economics, April, 1969.

Dertouzos, J. and Thorpe, K. Newspaper Groups: Economies of Scale, Tax Laws and Merger Incentives. Rand Corporation, R-2878-SBA, June, 1982.

Dickson, V.A., "Conjectural Variation Elasticities and Concentration", Economics Letters 7. 1981.

Eaton, C.B. and Lipsey, R.G. "The Theory of Market Pre-emption: The Persistence of Excess Capacity and Monopoly in Growing Spatial Markets", Economica. May, 1979.

Fisher, F., "Diagnosing Monopoly", Quarterly Review of Economics and Business. Summer 1979.

Fisher, F., McGowan, J., "On the Misuse of Accounting Rates to Infer Monopoly Profits," American Economic Review, March 1983.

Goldberg, V.P., "Regulation and Administered Contracts", The Bell Journal of Economics, Autumn 1976.

Gordon, K, Levy, J. and Preece, R., FCC Policy on Cable Ownership, Office of Plans and Policy, FCC, Nov 1981.

Harberger, A., "Monopoly and Resource Allocation", American Economic Review 44, May 1954

Hotelling, H., "Stability in Competition, The Economic Journal, V. 29, March 1929.

Kagan, P., Census of Pay Television, Paul Kagan Associates 1983.

Kalba, K., Executive Summary of Findings of State Regulation, Program on Information Resources Policy, Harvard University 1980.

Keynes, J., The General Theory of Employment, Interest and Money, 1936.

Klein, B., Crawford, R. and Alchian, A., "Vertical Integration, Appropriable Rents and the Competitive Contracting Process," The Journal of Law and Economics, October, 1978.

Kwoka, J., "The Effect of Market Share Distribution on Industry Performance", Review of Economics and Statistics 61, February 1979.

Levy, J., and Setzer, F., Concentration in Home Video Markets, Office of Plans and Policy, Federal Communications Commission, 1982

Mc Closkey, D., The Applied Theory of Price, MacMillian, 1982.

National League of Cities, Regulating Cable Television, November 1981.

Needham, D., The Economics of Industrial Structure, Conduct and Performance, Eastborne: Holt, Rinehart and Winston, 1978.

Noam, E., Economies of Scale in Cable Television, Working Paper, Columbia University, August 1982.

Noll, R., Peck, M. and Mc Gowan, J., Economic Aspects of Television Regulation. Washington, D.C., Brookings Institution.

Ordover, J.A., Willig, R., "Notes on Non-Price Anticompetitive Practices by Dominant Firms," Telecommunications Policy Research Conference, Annapolis, Md. 1981.

Owen, B., Beebe, J., Manning, W., Television Economics Lexington, D.C. Health, 1974.

Owen, B, Economics and Freedom of Expression Media Structure and the First Amendment, Cambridge, Ballinger, 1975.

Owen, B, P. Greenhalgh, Competitive Policy Consideration in Cable Television Franchising, Economists, Inc., Washington, D.C., October, 1982.

Park, R.E., Audience Diversion Due to Cable TV: Ar Analysis of New Data, Santa Monica, Rand Corporation 1971.

Peltzman, S., "Toward a More General Theory of Regulation," Journal of Law and Economics, Vol. 23, 1980.

Phillips, O., "Product Bundles, Price Discrimination and a Two-Product Firm," Working Paper, Department of Economics, Texas A & M, 1980.

Pottle, J., and Bortz, P. The Impact of Competitive Distribution Technologies on Cable Television, Browne, Bortz and Coddington, March 1982.

Rosse, J., "Estimating Cost Function Parameters Without Using Cost Data: Illustrated Methodology" Econometrica March 1970.

Scherer, F.M., The Weapons Acquisition Process: Economic Incentives, Boston, Harvard Business School, 1964.

Scherer, F.M., "The Welfare Economics of Product Variety: An Application to the RTE Cereals Industry," Journal of Industrial Economics, 1979.

Scherer, F.M., Industrial Market Structure and Economic Performance, Chicago: Rand McNally, 1980.

Schmalensee, R., "Entry Deterrence in the RTE Breakfast Cereal Industry," Bell Journal of Economics, Autumn, 1978.

Schmalensee, R., "Product Differentiation Advantages of Pioneering Brands," American Economic Review, June, 1982.

Sharkey, W., The Theory of Natural Monopoly, Cambridge: Cambridge Press, 1982.

Spence, M., "Product Selection, Fixed Costs and Monopolistic Competition," Review of Economic Studies, 43, June 1976.

Steiner, P.O., "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting," Quarterly Journal of Economics, V.66 May 1952.

Stern, J., Krasnow, E. and Senkowski, R. "The New Video Marketplace and the Search for a Coherent Regulatory Philosphy," Catholic University Law Review, 32, Spring 1983.

Stigler, G., "United States v. Loes's Inc.: A Note on Block Booking" in P. Kurland, The Supreme Court Review: 1963, Chicago: University of Chicago Press, 1963.

Stigler G., "The Theory of Economic Regulation," Bell Journal of Economics and Management Science, Vol 2 1971.

Thorpe, K., "Cable Television, Market Power and Regulation" unpublished Ph.D dissertation. Rand Graduate Institute, 1984.

U.S. House of Representatives, 97th Congress, Hearing Before the Committee on Energy and Commerce Regarding H.R. 4103.

U.S. Senate, 97th Congress, Hearings Before the Subcommittee on Communications of the Committee on Commerce, Science and Transportation, on Cable Television Regulation.

Vernon, J. and Graham, D., "Profitability of Monopolization by Vertical Integration," Journal of Political Economy 79, July/August 1971.

Wildman, S., "A Spatial Model of Entry Deterrence," Working Paper, Department of Economics, UCLA December 1980.

Williamson, O.E., "Franchise Bidding For Natural Monopolies--In General and With Respect to CATV," Bell Journal of Economics, Spring 1976.

Willig, R., "Pareto-Superior Nonlinear Outlay Schedules", Bell Journal of Economics, Spring 1978.

APPENDIX 1

FACTORS AFFECTING PRICE-COST MARGINS

MODEL 1: STRATIFIED BY GROUP SIZE: LARGE, MID SIZE MSO RESULTS

R-SQUARE = .73

VARIABLE	ESTIMATE	STANDARD ERROR
CONSTANT	1.00	.368*
TOP 100	.035	.023
TOP 200	.024	.018
OUTSIDE	.027	.019
AGE	-.135	.041*
VI	.048	.019*
INIT	-.043	.021*
HC	-.019	.015
HM	-.002	.016
HS	-.005	.023
SHC	-.011	.020
HMC	.046	.038
FOUR	.063	.041
FIVE	.031	.055
LANI	-.115	.036*
LSTV	-.007	.003 *
XSAT	.011	.007

* Significantly different from zero at 5 percent confidence level.

* Significantly different from zero at 10 percent confidence level.

MODEL 1: STRATIFIED BY GROUP SIZE: LARGE, MID SIZE
MSO RESULTS

R-SQUARE =.71

VARIABLE	ESTIMATE	STANDARD ERROR
CONSTANT	1.089	.356*
TOP 100	.031	.021
TOP 200	.021	.018
OUTSIDE	.024	.018
AGE	-.159	.036*
VI	.058	.014*
INIT	-.037	.021**
SERV	.006	.009
LAHI	-.125	.034
LSTV	-.006	.003*
XSAT	.007	.006

APPENDIX 2

FACTORS AFFECTING PRICE-COST MARGINS

MODEL 2: STRATIFIED BY MARKET SIZE: TOP 100 TELEVISION MARKETS

R-SQUARE = .60

VARIABLE	ESTIMATE	STANDARD ERROR
CONSTANT	-.176	.728
LARGE	.033	.024
INDEP	.043	.034
MID	-.020	.031
AGE	-.059	.044
VI	.051	.046
INIT	-.072	.027*
HC	-.044	.027**
HM	-.032	.036
HSC	-.069	.030*
HMC	.052	.040
FOUR	.109	.039*
FIVE	.002	.080
LAHI	.003	.073
LSTV	-.011	.004*
XSAT	.006	.011
HS	-.046	.036

* Significantly different from zero at 5 percent confidence level.

** Significantly different from zero at 10 percent confidence level.

MODEL 2 : STRATIFIED BY MARKET SIZE: TOP 100 Television MARKETS

R-SQUARE = .45

VARIABLE	ESTIMATE	STANDARD ERROR
CONSTANT	.076	.809
AGE	-.104	.046*
LARGE	.019	.026
INDEP	.044	.036
MID	-.021	.035
VI	.074	.039**
INIT	-.067	.029*
SERV	.027	.014*
LAHI	-.029	.081
XSAT	.001	.011
LSTV	-.008	.004*