THE ECONOMIC IMPACT OF STATE CABLE TV REGULATION

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Abstract

This study describes the results of several econometric analyses of the effects of state cable television regulation on subscriber rates charged, penetration rates and ownership patterns. Data including age of the cable system, channel capacity, per capita income of the system community, number of off-the-air signals received in the community and system ownership were collected for a sample of 653 cable systems in 1971, 1974, and 1976. Results show that subscriber rates charged by systems in regulating states tended to be higher than rates charged by systems in states without state-level regulation (although this difference had changed by 1976). Several explanations for this finding are discussed, including: the cost of regulation, geographic cost differences and management efficiency incentives. Other results show that comprehensive state regulation does not have a significant effect on: system penetration rates, growth of penetration and ownership patterns. A number of alternative definitions of penetration and ownership are described in relation to future research possibilities in this area.

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The state cable television regulation project addresses the political dynamics, legal options, regulatory issues and economic impacts of state government involvement in cable television. This 18-month project was conducted by the Harvard University Program on Information Resources Policy in conjunction with Kalba Bowen Associates, Inc., under a National Science Foundation grant.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The economic analysis of state regulation of cable television presented in this report follows two traditions in the economic literature. One is the empirical analyses of the effects of regulation, a classic example of which is the Stigler-Friedland study of the electricity industry.[1] In that study, the authors found that, contrary to then-current opinion, regulation had no effect on prices. This study will follow a similar but more detailed method of analysis to examine the effect of state-wide regulation on the fees charged by cable operators as well as on their penetration, growth and ownership patterns.

A second body of literature on which we build are studies of the economics of cable television. Although the focus of these studies has varied, several have estimated, among other parameters, the price and income elasticities of demand for cable services.[2] Among the additional areas that have been investigated are the effects on demand of various types of programming and the competition from over-the-air signals. However, none of the previous studies have examined the effects of state regulation on cable television

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[1] G. Stigler and C. Friedland, "What Can Regulators Regulate: The Case of Electricity", Journal of Law and Economics, 5:1-16 (October 1962).

[2] See: W. S. Comanor and B. M. Mitchell, "Cable Television and the Impact of Regulation," Bell Journal of Economic and Management Science, Spring 1971; R. E. Park, "Prospects for Cable in the 100 Largest Television Markets", Bell Journal of Economic and Management Science, Spring 1972; R. E. Noll, M. J. Peck, and J. J. McGowan, Economic Aspects of Television Regulation, 1973; Charles River Associates, "Analysis of the Demand for Cable Television", CRA Report 178-2, April 1973; K. Lyall, R. Duncan and E. F. DeKay, "Estimation of an Urban Cable Demand Model and Its Implications for Regulation for Major Markets", Johns Hopkins University, March 1976. For a summary of these studies and an overview of the area, see P. W. McAvoy, ed., Deregulation of Cable Television, American Enterprise Institute for Public Policy Research, 1977. See also R. W. Crandall and L. L. Fray, "A Reexamination of the Prophecy of Doom for CATV", Bell Journal of Economics, Vol. 5, Spring 1974.

systems or on their subscribers. Nonetheless, we did make considerable use of the methods and findings of this earlier research in the formulation of our model of cable television supply and demand and in our approach to the analysis which follows.

Even when the analysis is restricted to the "economic" sphere, the effects of state regulation on cable television systems and their subscribers may be quite varied. The following is a taxonomy of potential economic impacts:

(1) impacts on service availability

(2) impacts on rates and service characteristics

(3) impacts on system growth and profitability

(4) impacts on industry structure

(5) impacts on service quality

(6) impacts on channel usage

(7) impacts on the relationship between basic services and ancillary services (and on the structure of the fees)

Rather than delve into each of these in detail here, we can simply state that the first four will be analyzed in detail in the remaining sections of this chapter. This concentration on (1) to (4) is not to be interpreted as implying that (5), (6) or (7) are any less important. The decision to look primarily at penetration, rates, growth, and ownership structure was based primarily on data availability and reliability.

2.0 HYPOTHESIS TESTING AND THE STATISTICAL MODEL

As described above, the purpose of this study is to determine the impact of state regulation on (1) the prices cable system operators charge their subscribers, (2) the availability of cable TV to consumers, (3) the growth of CATV systems, and (4) ownership structure. The following sections will state the precise hypotheses that were tested and will develop the economic model that underlies these tests.

2.1 The Statistical Hypotheses

In this section we will describe the hypotheses developed for the first three types of analyses. The fourth area, pertaining to ownership structure, will be treated separately in Section 5.

2.1.1 Monthly Subscription Fees

One view of rate of return regulation is that regulation has the beneficial effects of causing lower prices to be charged and a greater quantity of service to be provided than would be the case without regulation. On the other hand, the opposite relationship has also been argued: that regulation imposes costs on the firm that are ultimately passed on to consumers in the form of higher prices. Although we do not have the detailed data that would enable sophisticated tests of these alternative theories, we do have sufficient data to analyze the effects state regulation has on the subscription fee.

Specifically, we wish to test the null hypothesis:

H_0^1: state regulation has no effect on subscription fees (or, more precisely, the fees in states with and without regulation are the same)

versus the alternative hypothesis:

H_A^1: state regulation has an effect on subscription fees (or, more precisely, the fees of systems in states with regulation are different from those of systems in states without regulation).

It should be noted that the alternative hypothesis H_A^1 is worded so as not to prejudge the possible effects of state regulation (i.e. higher or lower prices).

By using analysis of variance and covariance and/or a linear regression model, the effects of other factors can be controlled. In particular, we developed a quasi-experimental design to control for factors such as cost differences of the systems, income differences of the potential subscribers, the age of the system, the number of over-the-air TV signals received in the county in which the cable system is located, and the number of channels carried by the system. This design could be implemented by using an index of cost as a covariate and by dividing the sample into twelve cells for analysis purposes, as illustrated in Table 1.

Table 1: The Statistical Design

	Number of Channels					
	12 or fewer			13 or more		
	Age of System			Age of System		
	1 to 5 yrs. old	6 to 10 yrs. old	11 yrs. + older	1 to 5 yrs. old	6 to 10 yrs. old	11 yrs. + older
Regulated States						
Non-Regulated States						

This twelve-cell design was chosen to allow us to test for significant effects of the number of channels, the age of the system and the presence or absence of state regulation, as well as interaction effects of any two or all three variables.[3] Since the monthly subscription fee may be correlated with other factors, specifically the average per capita income of the community and the quality of off-the-air signals (and because of the continuous nature of these factors), we added income and signal quality factors as covariates. By holding the covariates constant, we could test for main and interaction effects of all the variables. Unfortunately there

[3] For the purposes of the analysis, we defined state regulation as the presence of a state-level regulatory agency (e.g. PUC or CATV commission) with broad regulatory authority over the operation of cable systems. The "regulated" states in our 1974 and 1976 samples were Alaska, Connecticut, Delaware, Hawaii, Massachusetts, Minnesota, Nevada, New York, New Jersey, Rhode Island and Vermont. However, we recognize that other definitions of state regulation are possible. For example, several states without regulatory agencies have applied special tax provisions or exemptions to cable systems; see the companion report by Larry S. Levine, Konrad K. Kalba and Philip R. Hochberg, Taxation, Regionalization and Pole Attachments: A Comparison of State Cable TV Policies, Harvard University Program on Information Resources Policy, Publication P-78-5, August 1978.

is no specific state or regional cost index that would capture the cost differences that are likely to be important. This may or may not lead to biased results; see the discussion in Section 6.1.1, below.

Based on this sample design, we examined data for regulated and non-regulated cable systems for each of three years: 1971, 1974 and 1976. The number of systems in each cell of the 1974 sample is shown in Table 2.[4]

Table 2: Sample Size (1974)

	Number of Channels							
	12 or fewer				13 or more			
	Age of System				Age of System			
	0 to 5 yrs. old	6 to 10 yrs. old	10 yrs. + older	sub-total	0 to 5 yrs. old	6 to 10 yrs. old	10 yrs. + older	sub-total
Regulated States	10	72	70	152	47	18	14	79
Non-Regulated States	46	153	151	350	44	15	13	72

2.1.2 Service Availability and Penetration

It has been argued that state regulation may have the effect of causing the system operators to avoid service "marginal" areas in the franchise area because of the higher costs and lower profits associated with operating under regulation. To test this directly, we would need to have precise "penetration" data -- the number of subscribers divided

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[4] How the sample, which includes all "regulated" systems and a random selection of "non-regulated" systems, was drawn up is explained in the Appendix.

by the number of potential subscribers in the franchising area. Unfortunately, there is no source of consistent data on the numbers of potential subscribers.[5] We therefore decided to use a different measure of penetration as a proxy. The penetration measure used was the number of subscribers divided by the number of homes passed. The obvious disadvantage of this approach is that it does not directly measure the extension or non-extension of the system. However, it is the only statistic which can be calculated from the available data.

Our formal null hypothesis is:

H_0^2: state regulation has no effect on the penetration of the system

and the alternative hypothesis is:

H_A^2: penetration of systems in states with regulation is different from that of systems in states without regulation.

2.2 An Economic Model of the Cable System[6]

The statistical hypotheses described above can be integrated into a conceptual economic model of the cable system. From this model one can

[5] Also, the number of subscribers contained in the Television Factbook is somewhat artificial. It is the sum of two numbers: a) the number of residences paying the basic residential subscription fee, and b) a proxy equal to the revenue from non-residential subscribers divided by the basic residential subscription fee. This adjusts for both the number of non-residential subscribers and the fees they are charged. For a complete discussion of the variables used in our analyses, see the Appendix.

[6] This section is more mathematical and can be omitted by the non-technical reader.

calculate "reduced form" equations. These reduced form equations enable one to determine the overall effects of the exogenous variables (including a dummy variable representing the presence or absence of state regulation) on the endogenous variables (monthly fee and penetration). This approach has two major statistical benefits: the estimated equations are free from simultaneous-equations bias; and the failure to completely specify the structural model does not affect the estimates of the individual reduced form equations.

The conceptual structural model has a demand and a supply equation. In each, the number of subscribers (S) is a function of the monthly subscription fee (P), the number of homes passed (H), and several exogenous variables. Therefore we have:

(1) $$S_i = f(P_i, H_i, NS_i, Y_i, A_i, B_i, M_i) \quad \text{(demand)}$$

(2) $$S_i = g(H_i, P_i, A_i, B_i, R_i, M'_i) \quad \text{(supply)}$$

where:
- S_i = number of subscribers of system i
- P_i = monthly subscriber fee (price)
- H_i = number of homes passed by the cable
- A_i = age of system i
- B_i = number of channels provided on the cable
- NS_i = number of TV broadcast signals that can be received over-the-air in the franchise area of system i
- Y_i = per capita income of the cable system community
- R_i = the presence of state regulation
- M_i = variables under management control influencing demand (e.g. promotional activity)
- M'_i = variables representing management and cost differences that influence the cost of operations (e.g. underground cables, cost of labor, etc.)

There are several assumptions implicit in this model. First we assume (realistically) that the franchise area is fixed and determined outside the model. Second we have not specified how cable extension decisions are made. Although H_i is clearly under management control, we will leave the exact relationship between H_i and the other variables unspecified. What we will do is to transform the equations by dividing both sides by H_i, thereby converting the left-hand sides to (S_i/H_i), the "penetration" of each system. Finally, we shall assume a linear, additive relationship between the right hand side variables and penetration; and that the variables reflecting management and cost differences (M_i and M'_i) are uncorrelated with the other independent variables and therefore will not cause biased estimates if they are omitted. (For a discussion of the effects of cost differences, see Section 6.1.1. below.)

As a result of these assumptions, the demand and supply equations become:

$$(3) \qquad Q_i = (S_i/H_i) = a_{11}P_i + a_{12}NS_i + a_{13}Y_i + a_{14}A_i + a_{15}B_i + a_{16}$$

$$(4) \qquad Q_i = (S_i/H_i) = a_{21}P_i + a_{22} + a_{23}R_i + a_{24}A_i + a_{25}B_i$$

The reduced form equations for this specification are (dropping the subscript i):

$$(5) \qquad Q = \frac{a_{21}a_{12}}{(a_{21} - a_{11})}NS + \frac{a_{21}a_{14} - a_{11}a_{24}}{(a_{21} - a_{11})}A + \frac{a_{21}a_{15} - a_{11}a_{25}}{(a_{21} - a_{11})}B$$

$$- \frac{a_{11}a_{23}}{(a_{21} - a_{11})}R + \frac{a_{21}a_{13}}{(a_{21} - a_{11})}Y + \frac{a_{21}a_{16} - a_{11}a_{22}}{(a_{21} - a_{11})}$$

(6)
$$P = \frac{a_{12}}{(a_{21} - a_{11})} NS + \frac{a_{13}}{(a_{21} - a_{11})} Y + \frac{a_{14} - a_{24}}{(a_{21} - a_{11})} A + \frac{a_{15} - a_{25}}{(a_{21} - a_{11})} B - \frac{a_{23}}{(a_{21} - a_{11})} R + \frac{a_{16} - a_{22}}{(a_{21} - a_{11})}$$ [7]

[7] The measures used for each of the variables, the data sources, and the sample construction are described in the Appendix.

3.0 FINDINGS FOR 1974

The reduced form equations were first estimated by an ordinary least squares technique using data from 1974. In addition, because of the use of a number of dummy variables, an analysis of variance and covariance was used so that interaction effects of age, number of channels, and regulation could be detected if they were present. Furthermore, the reduced form quantity equation was also estimated using a logit specification: namely, $\log\left(\frac{Q}{1 - Q}\right)$ was tried as the dependent variable.

In 1974, there were eleven states in which cable television was regulated at the state level.[8] The formulation using a dummy variable to indicate the presence of this regulation causes concern as to whether this variable could be acting as a proxy for other variables or whether there were differences between regulated and unregulated systems that pre-dated state regulatory control. This concern will be considered in Section 4.

3.1 Effects on the Monthly Subscription Fee

The average monthly subscription fees for each of the twelve cells are shown in Figure 1 (see page 22). The regression results for 1974 are presented in Table 3. Although the overall explanatory power is low, the effects of the explanatory variables can be observed in several instances. Looking at the price equations (columns 1 and 2), one finds that in 1974 the presence of state regulation (d_4) had a positive and significant effect

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[8] For purposes of this study, differences among the states which were defined as "regulating" were ignored (e.g. states which regulate via a public utility commission vs. those which regulate via a separate cable commission). Further research could be directed towards separating these different state regulatory forms. See also footnote 3, *supra*, and Section 6.5, *infra*.

Table 3: 1974 Regression Results

Column	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var	P	P	Q	Q	$\ln(\frac{Q}{1-Q})$	$\ln(\frac{Q}{1-Q})$
Const	5.470	4.985	0.535	0.826	0.256	2.049
Y (per cap)	--	0.218 (5.31)**	--	-0.022 (2.25)*	--	-0.086 (1.15)
N Sig Viewed	--	-0.086 (3.91)**	--	-0.014 (2.75)*	--	-0.128 (3.13)**
Age (d_1)	-0.0458	-0.0186	0.164	0.161	1.018	1.004
Age (d_2)	-0.0377	-0.0331	0.2975	0.281	1.878	1.768
B - #ch (d_3)	0.165 (1.46)	0.157 (1.39)	-0.210 (6.34)**	-0.193 (5.77)**	-1.300 (4.85)**	-1.188 (4.41)**
Reg'l (d_4)	0.202 (2.12)*	0.221 (2.61)*	0.0228 (1.87)	0.0405 (2.54)*	0.198 (1.55)	0.326 (2.20)*
(F d_1, d_2) (2,641)	(0.825)	(1.25)	(46.4)**	(42.9)**	(25.1)*	(23.0)**
significant interactions	--	--	AB (4.44)*	AB (4.71)**	AB (1.72)	AB (1.75)*
R^2	.023	.0838	.189	.212	.115	.097

Notes:

* $p < .05$.

** $p < .01$.

(t-statistics are shown below each coefficient in parentheses except for d_1 and d_2; an F-statistic for the test of both coefficients = 0 is reported for d_1 and d_2.)

on the monthly subscriber fees. This difference amounts to between 20 and 22 cents per month for the average subscriber. We also see that both per capita income (Y) and the number of "Significantly viewed" over-the-air signals (NS) have statistically significant coefficients. As one might expect, the effect of income on price is positive and the effect of the number of over-the-air signals is negative.

As an additional check on the robustness of these results, two other explanatory variables were tested, both by themselves and in combination with those reported above. These were the number of unused channels on each system and the number of "imported" signals (the number of TV channels on the system minus the number of significantly viewed over-the-air signals). Both variables had low explanatory power and left the effects of the other factors unchanged. In all the analyses described, H_0^1 can be rejected. Informally, we can conclude that regulation increases the monthly fees paid by cable subscribers.

3.2 Effects on Penetration

The results of the penetration equations (columns 3 to 6 in Table 3) are not so consistent. In all of the equations, the coefficient of the regulation dummy variable is positive, but this must be looked at in light of the low statistical significance. In both the linear and logit specifications, the t-statistic is just on either side of being significant (at the 95% level). More information on which one can base tentative conclusions is presented in Section 4.1.

The penetration equations do provide other interesting results. We see that the age of the system has a strong, positive effect on the penetration. This is consistent with the theoretical work on the diffusion of innovation over time. There is an inverse relationship between penetration and the number of significantly viewed over-the-air signals. There is also an inverse relationship between the number of channels and penetration. (This may be due to the positive relationship between the number of channels and the monthly fee, or due to the fact that the "larger" systems are, in general, the newer ones.) We should also note that the interaction between system age and number of channels is statistically significant in two of the cases.

One of the more intriguing findings is that the level of per capita income has a negative coefficient in the penetration equations, even though this is (in most cases) not statistically significant. In previous studies that directly estimated the demand for cable television, the income elasticity was generally found to be positive and significant. An exception is the Comanor-Mitchell study, which finds an income elasticity not significantly different from zero.[9]

[9] There is similarly a possible contradiction with the results of our price equation. From equations (5) and (6), respectively, we see that the coefficients of the per-capita income term in the penetration and price reduced form equations are:

$$\frac{a_{21}a_{13}}{(a_{21} - a_{11})} \quad \text{and} \quad \frac{a_{13}}{(a_{21} - a_{11})}$$

If the second of these is positive, for the first to be negative or zero requires a_{21} to be negative or zero. Since $a_{21}\,P/Q$ is the price elasticity of supply (for the linear specification), it is unlikely that a_{21} is negative. It may, however, be very close to zero, causing our estimate to be insignificant.

4.0 COMPARISONS WITH 1971 AND 1976

By creating the simple two-way classification of state regulation vs. no state regulation, we introduce the possibility of confounding our analysis. This can occur because of any or all of a number of factors. For instance, since the states with state regulation are predominantly in the northeast, it may be true that costs or tastes are different there from the rest of the country. Similarly, most of the "regulated" systems are in industrialized or urbanized states.[10] Still another source of confounding could be that there were pre-existing differences between the cable systems in the states that were to become regulated and those that did not adopt state-wide regulation.

To see if the last of these concerns could be reduced (if not eliminated), we developed a pre/post design. We estimated the same monthly subscription fee and penetration equations for a year before state regulation was adopted in the more populated states (i.e. Massachusetts, Minnesota, New Jersey, New York, Delaware), and examined the coefficient of the state regulation dummy variable.[11] Only now the value of its coefficient would not indicate the effects of state regulation, but would reflect any differences between the systems prior to the adoption of regulation.

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[10] Alaska, Hawaii, Vermont and (to some extent) Minnesota are the exceptions, but they do not account for a large proportion of the regulated systems or subscribers. Even Nevada is highly urbanized, if one looks at Las Vegas and Reno where the cable systems are located. But regional cost differences were not found to be related to the presence or absence of state regulation. For a discussion of this point, see Section 6.1.1, infra.

[11] In 1971, the year for which the "pre-regulation" data was drawn, six states had already started state-wide regulation, but this involved only twenty-four systems (vs. the 1974 sample of 231 "regulated" systems). Two of the six states had no operating cable systems in 1971.

4.1 Pre-Regulation (1971) Results

A subset of the 653 systems in the 1974 sample -- those of the systems who reported the necessary data for 1971 -- was developed. This new sample consisted of 428 cable systems and was analyzed using the same twelve cell design described in Section 3.1. The number of systems in each cell (for 1971) is shown in Table 4.[12]

Table 4: Sample Size (1971)

	Number of Channels							
	12 or fewer				13 or more			
	Age of System (yrs.)				Age of System (yrs.)			
	0 to 2	2 to 7	7 +	sub-total	0 to 2	2 to 7	7 +	sub-total
Regulated States	4	61	63	128	5	6	5	16
Non-Regulated States	16	126	126	268	5	7	4	16

At this point we should note that there may be problems of statistical significance from the low number of systems in several of the cells. In 1974, 77% of all systems had twelve or fewer channels, but in 1971, 92% of the systems had twelve or fewer channels. Therefore, the sample size could reduce the likelihood of finding any significant differences between the two categories. The regression results using the 1971 data are presented in Table 5 and analyzed below.

12 The age categories were revised so that the systems would remain in the same categories for 1971 that they were in for 1974. For example, the first age category is now 0 to 2 years old, rather than 0 to 5 years old.

Table 5: 1971 Regression Results

Column	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var	P	P	Q	Q	$\ln(\frac{Q}{1-Q})$	$\ln(\frac{Q}{1-Q})$
Const	5.076	5.052	0.406	0.681	-0.514	1.072
Y (per cap)	--	0.129 (2.85)**	--	-0.013 (.99)	--	-0.09 (1.03)
N Sig Viewed	--	-0.076 (3.17)**	--	-0.008 (1.113)	--	-0.018 (.389)
Age (d_1)	0.204	0.217	0.101	0.108	0.616	0.556
Age (d_2)	0.260	0.244	0.287	0.280	1.760	1.731
B - # ch (d_3)	-0.006 (0.379)	0.0049 (0.276)	-0.123 (1.64)	-0.060 (1.34)	-0.547 (1.366)	-0.569 (1.142)
Reg'l (d_4)	-0.032 (0.744)	0.0037 (1.25)	0.0525 (0.937)	0.071 (1.06)	0.280 (1.98)*	0.287 (1.992)*
($F\ d_1, d_2$) (2,416)	(1.78)	(1.59)	(17.96)**	(17.24)**	(17.38)**	(16.92)**
R^2	.019	.058	.091	.093	.108	.107

Notes:

* $p < .05$.

** $p < .01$.

(t-statistics are shown below each coefficient in parentheses except for d_1 and d_2; an F-statistic for the test of both coefficients = 0 is reported for d_1 and d_2.)

4.1.1 Monthly Subscription Fees

The results in columns 1 and 2 should be compared with those in the same columns of Table 3. The effects of per capita income and the number of significantly viewed signals remain the same both in their signs and degrees of statistical significance. The effects of age and number of channels remain statistically insignificant. However, for 1971, the coefficient of the state regulation variable is no longer statistically significant. This can be interpreted as indicating that there were no significant pre-existing differences between the systems in the states with regulation and those in states without. (This finding will be discussed more fully in Section 6.1.)

4.1.2 Penetration

As with the 1974 regressions, the results for the 1971 analysis of penetration are not as straight-forward as those for the monthly subscription fee equations. The t-statistic for the state regulation variable's coefficient is not significant for the linear specification, and is barely significant (at the 95% level) in the logit specification. (In 1971, the effective difference in penetration is at most 7 percentage points; in 1974, the effective difference drops to 4 points.) The borderline nature of the t-statistic, the similarity of the results from 1971 and 1974, and the fact that other variables generally have higher significance levels lead us to conclude that state regulation does not have any significant effects on penetration in those years <u>as we have measured it</u>.

4.2 Results for 1976

During the period of time we were conducting these analyses, data for 1976 became available. We decided to use this data to confirm, if possible, our 1974 findings and to investigate any changes that may have occurred between 1974 and 1976.[13] The same sample of 653 systems was used for the 1976 analysis as was used for 1974. However, the systems were now two years older, and twelve systems (net) had increased their channel capacities, moving them from the "12 or fewer" category to the "13 or more" category. The division of the 1976 sample into the twelve cells is shown in Table 6.

Table 6: Sample Size (1976)

	Number of Channels							
	12 or fewer				13 or more			
	Age of System (yrs.)				Age of System (yrs.)			
	2 to 5	6 to 10	10 +	sub-total	2 to 5	6 to 10	10 +	sub-total
Regulated States	6	38	103	147	36	24	24	84
Non-Regulated States	14	117	212	343	29	28	22	79

13 For example, we were especially sensitive to the possibility that the impact of regulation on subscriber fees in 1974 could reflect a temporary effect (e.g. due to regulatory inexperience or other factors).

The regression results for 1976 are shown in Table 7. The results are very similar to those of 1974, with one exception. In 1974, the presence of state regulation caused a significant increase in the monthly subscription fee. However, in 1976, regulation alone did not lead to a significant difference. What is apparent is a statistically significant interaction between regulation and the number of channels in 1976. This is illustrated in Figure 1. The heavier lines (marked "u") are the average monthly subscription fees for each of the twelve cells. The dotted lines are for systems in states with state-wide regulation; the solid lines are for systems in non-regulating states. The lighter lines (marked "c") are the same data after correcting for per capita income differences and the effects of the number of significantly viewed over-the-air signals. One can see that for both 1974 and 1976, the major differences are in the systems with thirteen or more channels. Again, these findings will be discussed more fully in Section 6.1.

Table 7: 1976 Regression Results

Column	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var	P	P	Q	Q	$\ln(\frac{Q}{1-Q})$	$\ln(\frac{Q}{1-Q})$
Const	6.582	5.415 (29.16)**	0.521	0.828 (18.88)**	0.168	2.136 (6.84)*
Y (per cap)	--	0.228 (7.13)**	--	-0.019 (2.13)*	--	-0.116 (1.71)
N Sig Viewed	--	-0.062 (2.82)**	--	-0.017 (3.19)**	--	-0.128 (3.42)**
Age (d_1)	-0.259	-0.244	0.133	0.130	0.746	0.720
Age (d_2)	-0.301	-0.264	0.290	0.198	1.733	1.622
B - # ch (d_3)	0.302 (2.68)**	0.257 (2.41)*	-0.220 (6.74)**	-0.146 (6.16)**	-1.278 (4.89)**	-1.156 (4.38)**
Reg'l (d_4)	0.053 (0.814)	0.0255 (0.833)	0.0144 (1.11)	0.099 (1.76)	0.156 (1.18)	0.292 (1.82)
(F d_1, d_2) (2,641)	(1.151)	(1.132)	(30.06)**	(28.54)**	(18.77)**	(17.93)**
significant interactions (F)	BR (2.21)*	BR (2.63)*	--	--	--	--
R^2	.029	.107	.152	.159	.089	.109

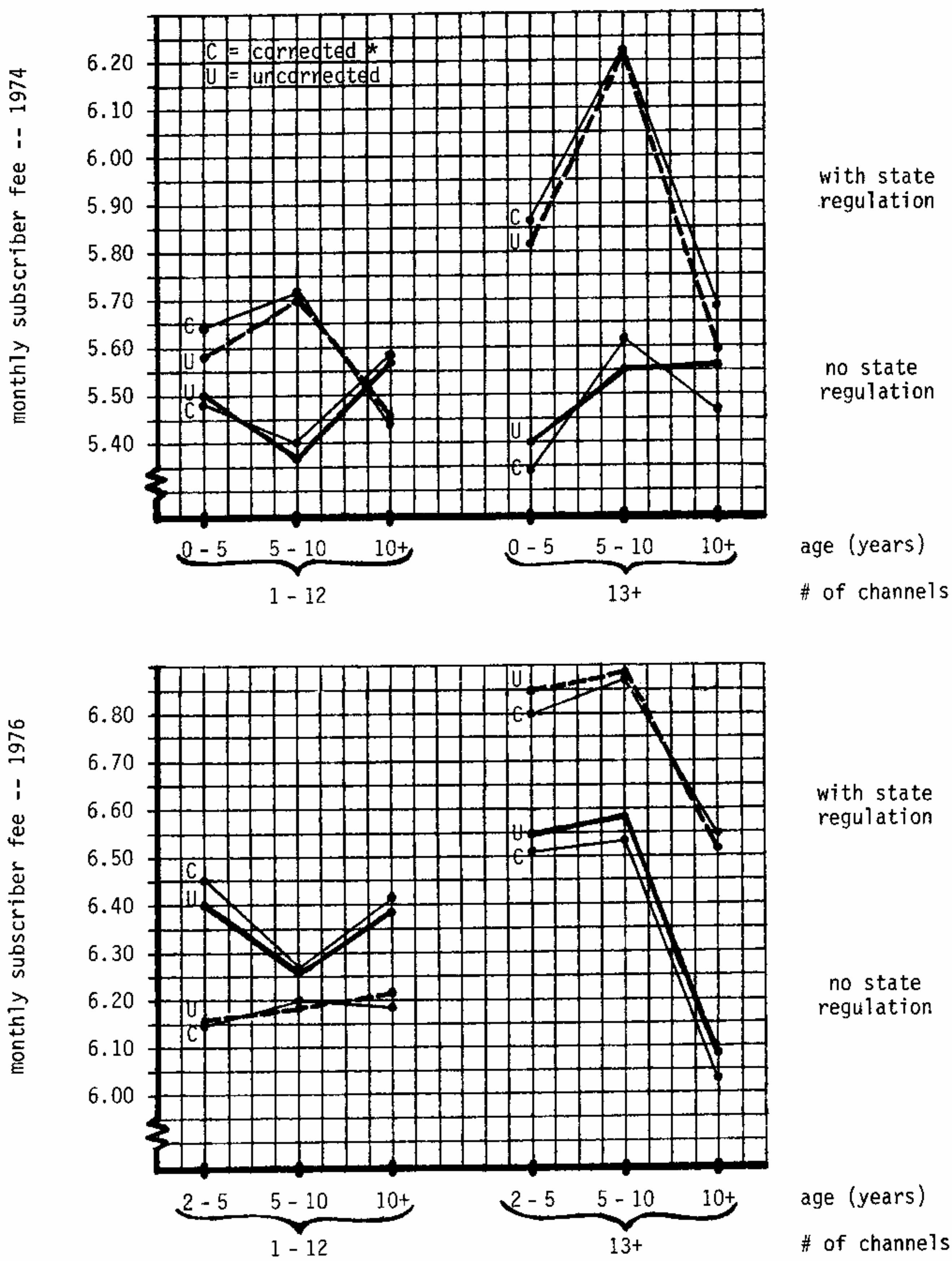
Notes:

* $p < .05$.

** $p < .01$.

(t-statistics are shown below each coefficient in parentheses except for d_1 and d_2; an F-statistic for the test of both coefficients = 0 is reported for d_1 and d_2.)

Figure 1: Monthly Subscriber Fees (1974 and 1976)



* Corrected values are residuals of regression on per capita income and number of significantly viewed over-the-air TV signals (plus the overall mean).

4.3 Reanalysis of 1974 Data

In the preceding sections, we found a statistically significant differential in the monthly subscription fees in 1974 that did not exist in 1971, a year that was (for most of the systems in our sample) prior to the institution of state regulation. One remaining doubt about our statistical design is that there were 225 systems in the 1974 sample that were not in the 1971 sample. (The remaining 428 systems were common to both samples.) This was due to either of two factors: the system came into existence after 1971 or failed to report data for 1971. As a result, we need to examine whether our findings resulted from the increase in sample size from 1971 to 1974.

The mean monthly fee in 1974 for these 428 systems was $5.56; the mean of the larger sample was $5.55. Some of the 428 systems in the 1971 sample increased the number of channels they carried, and therefore are in different categories for 1974 than for 1971. The new breakdown is shown in Table 8.

Table 8: Number of Systems in Each Cell for 1974 (Using 1971 Sample)

	Number of Channels					
	12 or fewer			13 or more		
	Age of System (yrs.)			Age of System (yrs.)		
	0 to 5	5 to 10	10 +	0 to 5	5 to 10	10 +
Regulated States	4	56	59	5	11	9
Non-Regulated States	14	125	120	7	8	10

The results of the regression analysis for this sample are shown in Table 9. Although there are a few differences, these results closely parallel those for the larger sample which were presented in Table 3. Both per capita income and the number of significantly viewed signals remain statistically significant and have the same signs (positive and negative, respectively). The age of the system is still not significant, although its sign is now positive. There are, however, some differences in the significance levels of the variables reflecting the number of channels, and the presence of state regulation, as well as the interaction term. With the larger sample, we found positive coefficients for each of the variables and the regulation coefficient was significant. Now, with the smaller sample, we have the regulation coefficient being borderline in significance. Also, the number-of-channels coefficient is statistically significant and the interaction between regulation and number of channels is also of borderline significance.

In summary, the 1974 results using the 1971 sample show again that state regulation leads to higher monthly fees. However, the average amount of the difference is less than the earlier finding (9¢ to 12¢ per month, as compared to 20¢ to 22¢ per month). Also, there is a difference in the effect of regulation between systems with 13 or more channels and those with fewer. These results, in fact, look quite like those for 1976 reported above. This seems reasonable, as in both this case and the 1976 results the samples are based on a random sample of non-regulated systems and a complete sample of systems in regulated states, both from an <u>earlier</u> year.

Table 9: 1974 Regression Results (Using 1971 Sample)

Dep Var	P	P
Const	5.476	5.191
Y (per cap)	--	0.158 (3.42)**
N Sig Viewed	--	-0.071 (2.90)**
Age (d_1)	0.029	0.044
Age (d_2)	0.017	.0094
B - # ch (d_3)	0.318 (2.27)*	0.306 (2.09)*
Reg'l (d_4)	0.089 (1.46)	0.116 (1.86)
(F d_1, d_2)	(0.064)	(0.923)
interactions	B - Reg'l (1.71)	B - Reg'l (1.85)
$\bar{R}^2$	.030	.073

Notes:

* $p < .05$.

** $p < .01$.

(t-statistics are shown below each coefficient in parentheses except for d_1 and d_2; an F-statistic for the test of both coefficients = 0 is reported for d_1 and d_2.)

4.4 System Growth

The preceding results are of the comparative statics and cross-sectional variety. Although state regulation has only been in existence for a few years, we also examined the growth of the penetration of the systems to see if we could detect any effects of state regulation on this growth.

Specifically, we examined changes between 1971 and 1974, and therefore used the smaller sample of 428 systems. System age and number of channels were defined as of 1974; this resulted in cell sizes different from those used in the 1971 analysis (see Table 10). Two measures of growth were used: change in penetration between 1971 and 1974 (G_1), and the logarithm of the 1974 penetration divided by the 1971 penetration (G_2). Thus the two dependent variables are:

$$G_1 = Q_{74} - Q_{71}$$

$$G_2 = \ln\left(\frac{Q_{74}}{Q_{71}}\right) = \ln Q_{74} - \ln Q_{71}$$

These formulations pose an additional problem. Since we have no data on the number of homes in the franchise area, our measures of change in penetration reflects a mixture of changing penetration for a fixed plant and changes in the cable plant. For example, if a cable system extends the plant into a previously unserved area, the penetration will go down, as long as the penetration in the new area is less than the average overall penetration. Our variable will show a drop in penetration even though the system is, by some measure, growing.

Table 10: Sample Size (1971 to 1974 Growth)

	Number of Channels							
	12 or fewer				13 or more			
	Age of System (yrs.)				Age of System (yrs.)			
	0 to 5	6 to 10	10 +	sub-total	0 to 5	6 to 10	10 +	sub-total
Regulated States	4	56	59	119	5	11	9	25
Non-Regulated States	14	125	120	259	7	8	10	25

The regression results are shown in Table 11. We see that the presence of state regulation has no significant effect on the growth measures and that the overall explanatory power of the equations is very low. The independent variables that do have significant effects are the number of channels (in two cases) and the age of the system. The signs indicate that (in general) the "smaller", younger systems tend to grow faster than those with more channels or those that are older.

Table 11: Growth Equations Regression Results (1971 to 1974 Growth)

Dep Var	$(Q_{74} - Q_{71})$	$(Q_{74} - Q_{71})$	$\ln(\frac{Q_{74}}{Q_{71}})$	$\ln(\frac{Q_{74}}{Q_{71}})$
Const	0.165	0.153	0.578	0.273
Y (per cap)	--	-0.001 (0.089)	--	0.001 (0.032)
N Sig Viewed	--	-0.006 (1.08)	--	-0.005 (0.352)
Age (d_1)	0.0044	0.0016	-0.264	-0.262
Age (d_2)	-0.057	-0.0596	-0.415	-0.418
B - # ch (d_3)	-0.089 (3.43)**	-0.083 (3.34)**	0.0392 (0.00)	0.042 (0.03)
Reg'l (d_4)	-0.012 (0.212)	-0.011 (0.367)	-0.034 (0.122)	-0.031 (0.071)
(F d_1, d_2) (2,416)	(3.428)*	(3.658)*	(13.52)**	(13.63)**
significant interactions (F)	--	--	--	--
R^2	.060	.063	.078	.079
N	428	428	428	428

Notes:

* $p < .05$.

** $p < .01$.

(t-statistics are shown below each coefficient in parentheses except for d_1 and d_2; an F-statistic for the test of both coefficients = 0 is reported for d_1 and d_2.)

5.0 REGULATION AND OWNERSHIP PATTERNS

We suspected that the presence or absence of state regulation might have an effect upon the ownership structure of the cable industry within a particular state. We had several reasons to believe that state regulation might either encourage or discourage multiple system operators (MSO's) to commit capital in a state.[14] Therefore, we could not predict in which direction the effect of state regulation on ownership patterns might appear.

For the analysis of ownership patterns we looked at the percentage of systems whose principal owner is an MSO or other group owner. The twelve cell means for 1974 are shown in Table 12. Although there is no obvious effect of regulation, we proceeded with the analysis of variance.[15] In this case the null hypothesis is:

> H_0^3: state regulation has no effect on the percentage of systems owned by group owners

and the alternative hypothesis is:

> H_A^3: the percentage of systems owned by group owners in states with regulation is different from that in states without regulation.

The analysis shown in Table 13 shows that we can not reject the null hypothesis or, more informally, we can conclude that regulation did not affect ownership patterns in 1974.

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[14] For a full explanation of the various rationales for predicting that state regulation could either increase or decrease MSO ownership, see Section 6.4, below.

[15] Since type of ownership is difficult to quantify, we used the percentage of systems with group ownership as the single element in each cell of the analysis of variance. This prevents us from measuring any interaction effects.

Table 12: Percentages of Systems with MSO's as Principal Owners -- 1974

	Number of Channels					
	12 or fewer			13 or more		
	Age of System (yrs.)			Age of System (yrs.)		
	0 - 5	5 - 10	10+	0 - 5	5 - 10	10+
Regulated States	90.0	79.2	77.1	80.9	66.7	92.9
Non-Regulated States	82.6	84.3	80.8	84.1	86.7	76.9

Table 13: MSO Ownership Analysis of Variance (1974)

Source	Degrees of Freedom	Mean Square	F-statistic
A - age	2	0.068	0.425
B - # of channels	1	0.007	0.044
C - regulation	1	0.016	0.100
error	7	0.160	--

It should be noted that the definition of group ownership used here is quite broad; approximately 80% of the systems overall have group ownership. We believed that it was possible that a further refining of ownership status into additional categories could lead to significant results. Therefore we developed three categories for the analysis of the 1971 (pre-regulation) and 1976 data. These categories were:

A: The owner (or largest percentage owner) of the system was one of the "top twenty" MSO's (see Table 14).

B: The owner (or largest percentage owner) of the system was a group owner, but not one of the "top twenty" MSO's.

C: The owner (or largest percentage owner) was not a group owner or an MSO.

The percentages in categories A and B and the results of the analyses of variance for 1971 and 1976 are presented in Tables 15 through 17. (Because of the three-way classification, it was necessary to do three separate analyses of variance for each year.)

Table 14: Twenty Largest Cable Television Companies in the United States*

1) TELEPROMPTER CORP.
2) WARNER CABLE CORP.
3) TELE-COMMUNICATIONS, INC.
4) AMERICAN TV & COMMUNICATIONS CORP.
5) COX CABLE COMMUNICATIONS, INC.
6) VIACOM INTERNATIONAL, INC.
7) SAMMONS COMMUNICATIONS, INC.
8) COMMUNICATIONS PROPERTIES, INC.
9) UA-COLUMBIA CABLEVISION, INC.
10) UNITED CABLE TV CORP.
11) CABLECOM-GENERAL, INC.
12) SERVICE ELECTRIC CABLE TV, INC.
13) STORER CABLE TV, INC.
14) CONTINENTAL CABLEVISION, INC.
15) TELECABLE CORP.
16) MIDWEST VIDEO CORP.
17) GENERAL ELECTRIC CABLEVISION CORP.
18) ATHENA COMMUNICATIONS CORP.
19) LIBERTY COMMUNICATIONS, INC.
20) VIKOA, INC.

Source: TV Digest, April 17-20, 1977, pp. 1-3.

* As measured by the number of subscribers served by each company.

Table 15: Percentages of Systems with "Top 20" MSO or Group Owners as Principle Owners (1971 and 1976)

1971

		Number of Channels					
		12 or fewer			13 or more		
		Age of System (yrs.)			Age of System (yrs.)		
		0 - 2	2 - 7	7 +	0 - 2	2 - 7	7 +
Regulated States	A	0.0	8.2	33.3	0.0	0.0	20.0
	B	75.0	73.8	44.4	40.0	66.7	80.0
Non-Regulated States	A	6.3	22.2	29.4	20.0	28.6	25.0
	B	75.0	54.0	49.2	80.0	57.1	25.0

1976

		Number of Channels					
		12 or fewer			13 or more		
		Age of System (yrs.)			Age of System (yrs.)		
		0 - 5	5 - 10	10+	0 - 5	5 - 10	10+
Regulated States	A	16.7	23.7	44.7	33.3	16.7	50.0
	B	50.0	71.1	36.9	44.4	58.3	29.2
Non-Regulated States	A	28.6	38.5	44.8	44.8	35.7	36.4
	B	42.9	43.6	41.0	44.8	46.4	54.5

Note: A = principal owner is a "Top 20" MSO.
B = principal owner is a group owner, but not a "Top 20" MSO.

Table 16: Analyses of Variance of Ownership Percentages (1971)

A: Principal owner is "Top 20" MSO.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.042	6.347*
Number of Channels	1	0.000	0.042
Regulation	1	0.041	6.150*
Error	7	0.007	--

(* significant at the 95% level)

B: Principal owner is "other" group owner.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.034	0.905
Number of Channels	1	0.004	0.112
Regulation	1	0.013	0.344
Error	7	0.038	--

C: Principal owner is not a group owner.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.001	0.029
Number of Channels	1	0.007	0.146
Regulation	1	0.008	0.167
Error	7	0.046	--

Table 17: Analyses of Variance of Ownership Percentages (1976)

A: Principal owner is "Top 20" MSO.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.027	3.075
Number of Channels	1	0.003	0.375
Regulation	1	0.016	1.786
Error	7	0.009	--

B: Principal owner is "other" group owner.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.021	1.848
Number of Channels	1	0.000	0.042
Regulation	1	0.002	0.198
Error	7	0.012	--

C: Principal owner is not a group owner.

Source	Degrees of Freedom	Mean Square	F-statistic
Age of System	2	0.007	1.178
Number of Channels	1	0.001	0.239
Regulation	1	0.005	0.940
Error	7	0.006	--

Examining the analysis of variance results and the percentage for 1971, we notice that there are two barely statistically significant findings:

(i) the "Top 20" MSO's own a higher percentage of older systems than younger systems; and

(ii) the "Top 20" MSO's own a lower percentage of systems in states that were to adopt state-wide regulation than in states that did not adopt state-wide regulation.

This second finding was true for all six age/number of channel classifications except for systems that were seven or more years old and had twelve or fewer channels.

Looking at the 1976 findings, we see that the "Top 20" MSO's still own a smaller percentage of systems in the states with state-wide regulation. (Again, there is a single exception to this overall trend.) However, in 1976, this difference is no longer statistically significant.

One could explain these findings by arguing that the largest MSO's were successful in preventing state regulation in the states in which they were most active, or that after seeing that state regulation was not harmful to cable operators' interests (i.e. after 1974), the largest MSO's moved into the regulated states. However, it is important here to repeat that these findings are just barely statistically significant, and without further evidence such conclusions are probably unwarranted.

6.0 ASSESSING THE RESULTS

In previous sections of this paper we have outlined the analytical tradition within which we have worked, our sampling procedures, the basic econometric models we employed, and the results of individual model estimations. In this section our function will be different. The results we have reported in Sections 3.0 through 5.0 could have important policy implications for the existence and continuation of state cable television regulation. These implications will be very different depending upon how the results are interpreted. Therefore, in Sections 6.1 through 6.4, we will step back and sketch some alternative explanations of our results, as well as the implications of the various explanations. In Section 6.5 we will indicate some areas for future research.

6.1 Alternative Explanation of the Fee Differential

In the way of a summary, we have generated the following results in this area: using 1971 data, monthly subscriber fees in regulated states were not significantly different from monthly subscriber fees in unregulated states; using 1974 data (the total sample), monthly subscriber fees were higher for systems in regulated states than for systems in unregulated states; and finally, using 1976 data, for systems with twelve or fewer channels, there was no difference between the subcriber fees of systems in regulated states and systems in unregulated states, but for systems with thirteen or more channels, systems in regulated states had higher monthly subscriber fees than systems in unregulated states.[16]

[16] Findings similar to those of 1976 resulted from using 1974 data with the 1971 sample. See Section 4.3, above.

Some additional information will help put these results into perspective. Since 1971, all subscriber rates have been increasing from an average of \$5.26 in 1971 to \$5.55 in 1974, and to \$6.37 in 1976. In the three-year period from 1971 to 1974, average rates increased only \$.29, but from 1974 to 1976, a two-year period, average rates increased \$.82. Therefore we can conclude that even without taking the existence of state regulation into account, subscriber monthly fees are increasing more rapidly now than they had been in the past.

When we take state regulation into account, we see the following results: systems with regulation had an average monthly subscriber fee of \$5.25 in 1971, \$5.68 in 1974 (using the total sample), and \$6.41 in 1976. Systems operating in states without state level regulation had rates of \$5.29 in 1971, \$5.47 in 1974, and \$6.36 in 1976. We pointed out the differences between regulated and unregulated systems above, but what is of equal importance is to determine whether rates are rising more rapidly in states with or without regulation. From 1971 to 1974, rates in regulated states jumped \$.43, while rates in unregulated states only increased \$.18, so that rates in regulated and unregulated states were quite different. But from 1974 to 1976, rates in unregulated states increased \$.89, while rates in regulated states only grew \$.73. Therefore, disregarding the number of channels or the age of the system, rates in regulated states were not significantly different from rates in unregulated states. And if the trends found in the 1974 to 1976 data continue in the future, rates in unregulated states may become higher than rates in regulated states.

Ultimately, the following trends need to be explained: why were rates found to be higher in regulated states than in unregulated states using the 1974 data, and concurrently why were rates found to be higher