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## THE IMPACT OF CABLE TELEVISION ON OVER THE AIR BROADCASTERS

### 1. INTRODUCTION

The laws concerning copyright have been undergoing change in recent years. This is due partly to changing technology and new products derived from this technology. Early copyright law could not make provisions for the innovation of television and cable. In this paper we shall focus on the impact of cable television on this copyright protection through the effect of cable on broadcasting revenues.

This particular issue has been scrutinized by both the Canadian and American governments. The American government, in 1976, made changes through the General Revision of the Copyright Act. In Canada at present, and in the U.S. prior to 1976, cable television companies (also known as CATV) were not required to make any payment for the right to retransmit television broadcasts. The new U.S. law provides for a compulsory license which allows cable companies to retransmit broadcasts upon payment of a specified percentage of revenues. This revenue is then disbursed among the owners of the copyrighted material retransmitted on cable. Various proposals have been made in Canada regarding the appropriate form of copyright payments to be made by cable television operators to copyright owners of retransmitted materials. The Canadian government has not yet promulgated new copyright legislation.

Prior to the introduction of the new American legislation several studies were undertaken to determine the influence of CATV on broadcasters.

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<sup>1</sup>See Besen, Manning and Mitchell, "Copyright Liability for Cable Television: Compulsory Licensing and the Coase Theorem," JLE, April 1978, for an analysis of this revision.

Park's work is most notable in this area.<sup>2</sup> These studies were mostly concerned with estimating an ex ante impact of CATV on broadcasting revenues. Simulations were run to determine the possible effects of CATV on revenues for both VHF and UHF broadcasters. These simulations were based on estimates of the audience division brought about through the addition of new network and independent stations due to the introduction of cable. The actual impact of cable was never measured, ex post.

Our study eschews this ex ante estimation technique in favour of a more direct method of measuring the impact of cable on actual television broadcasters. We also examine the possible beneficial impact of cable more closely than do previous studies.

The common assumption held by those favouring the imposition of copyright payments on CATV is that CATV reduces copyright payments made by broadcasters. Imposing copyright payments on Cable companies is thought to be an appropriate method of restoring these copyright payments to the levels that would exist in a world without CATV. It is this assumption regarding the impact of CATV on copyright payments which will be the focus of this paper. We will find this assumption to be unfounded.

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<sup>2</sup>See R. Park, "Potential Impact of Cable Growth on Television Broadcasting," Rand Report R-587-FF, October 1979; and "Prospects for Cable in the 100 Largest Television Markets," Rand Report R-875-MF, October 1971. Also see F. Fisher, "Community Antenna Television Systems and the Regulation of Television Broadcasting," American Economic Review, May 1966, pp. 320-327; and F. Fisher, et al., "Community Antenna Television Systems and Local Television Station Audience," Quarterly Journal of Economics, 1966, pp. 227-251.

## 2. INSTITUTIONAL FACTORS

Our study will examine the impact of Cable television in Canada. This is an attractive market to study since Canadian Cable companies are considerably more mature than their American counterparts. In 1978 50% of Canadian households were using CATV services.

Cable companies usually own a large antenna (headend) or sometimes microwave relay systems with which they receive television broadcasts and they retransmit these broadcasts through trunk lines (cables) which carry signals to individual households. They charge a monthly fee for this service and usually an initial installation fee as well. Cable companies are also known as Community Antenna Television (CATV). CATV should not be confused with pay TV which is a system active in generating its own broadcasts.

Households pay for this service because they are able to receive more and higher quality broadcasting signals than was previously the case while at the same time obviating the need for a conventional antenna system. Cable companies usually carry some of their own programming which might be weather and news headlines, stock market tickers or local broadcasting.

Cable companies in Canada are not free to import any broadcast they desire. The Canadian Radio and Television Commission (CRTC) has imposed rules specifying a priority system of stations which the cable companies are required to carry. Cable companies must carry all local stations (with preference given to the Canadian Broadcasting Corporation (CBC) and educational stations) before importing any distant stations. There are also rules regulating the order in which distant signals can be imported with the CBC and educational stations again receiving preferential treatment.

Canadian cable systems usually carry American stations as well as Canadian stations.

Canadian broadcasters (including the government-run CBC) generate revenues by selling advertising time. These revenues in turn allow broadcasters to buy programs from copyright holders. Thus CATV will influence copyright payments to the extent that advertising revenues are altered. The efficacy of this linkage between audience valuation of programs and copyright payment is not a concern of this paper.

Our analysis occurs within this institutional framework.<sup>3</sup>

### 3. POSSIBLE EFFECTS OF CATV ON BROADCASTING REVENUES

A) CATV is known to cause 'market fragmentation'. In other words viewers in a given locality who might have access to one station, say station X, prior to the introduction of CATV will have, after the introduction of CATV, many more stations which they may watch. Station X's share of the local audience will drop because people on Cable will watch some of the distant stations brought in by Cable. The loss of viewers to station X is the gain to distant stations. On the other hand viewers in distant localities will be able to watch station X on their Cable and this will tend to increase station X's audience. Even if station X's total audience remains the same

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<sup>3</sup> See Canada, Consumer and Corporate Affairs, Copyright in Canada-- Proposals for a Revision of the Law, by A. Keyes and C. Brunet. Minister of Supply and Services, 1977; Canada, Economic Council of Canada, Report on Intellectual and Industrial Property, Information Canada, 1971; Canada, Minister of Supply and Services, Television Broadcasting Regulation, Minister of Supply and Services, 1977; and Canada, Minister of Supply and Services, Cable Television Regulations, Minister of Supply and Services, 1977.

the average distance from transmitter to viewer has increased. This is market fragmentation.

This fragmentation is thought to reduce advertising revenues because advertisers in a given locality might not value viewers in a distant locality as much as they value local viewers. This is due to the fact that distant viewers are less likely to patronize local establishments since these viewers would have to travel a long way to reach them. However, the existence of national or regional advertisers with outlets in many localities mitigates the impact of market fragmentation since these advertisers are likely to place similar values on viewers in all localities.

B) It has been suggested that a second influence of CATV on the audience size-revenue relationship is that CATV tends to strengthen large stations and weaken small stations.<sup>4</sup> This is supposedly brought about because the signals of large audience TV stations are usually put on CATV and the higher quality programming of the large stations is thought to pull away viewers from smaller stations with lower quality programming. It has been suggested in the literature that advertisers might not value additional viewers as highly when the advertisement is already reaching a large audience.<sup>5</sup> In other words the audience-revenue relationship is non-linear with slope decreasing as audience size increases. This hypothesis has been tested and confirmed by Park. The rationale for this type of behavior seems extremely weak, however.

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<sup>4</sup>Park, among others, has made this assertion.

<sup>5</sup>See R. Park, "Potential Impact of Cable Growth on Television Broadcasting," Rand Report R-587-FF, October 1970, p. 38. However, Fisher et al. do not come to this conclusion.



Why should advertisers value marginal viewers at a diminishing rate?

The literature is mute on this point. We might assume that any additional viewer will have the same likelihood of being influenced by the advertisement and should therefore be equally regarded by the advertiser with prior viewers. If, on the other hand, advertisements are more effective when a smaller percentage of the population is aware of them, say because the information can easily be spread by word of mouth, the results obtained by Park would make more sense. This particular form of advertising effectiveness seems rather contrived and not a form of reasoning in which to place much faith. It is also interesting to note that under this hypothesis, CATV should increase advertising revenues because it tends to fragment the audience so as to increase the effectiveness of any word of mouth advertising.

There are other potential explanations of the diminishing marginal viewer revenue (DMVR) effect which are less difficult to believe. Television stations with large audiences are usually found in large metropolitan areas where there are also more competing stations than in less populated localities. The paucity of competition in these small localities may lead to the exercise of monopoly power by the local television stations. This would result in above normal advertising rates and revenues in low population centers.

A second explanation of the DMVR effect has to do with locational factors. Large markets may have a large percentage of the population living far away from the location of the broadcast and/or the location of particular advertisers. If the percentage of people living far away is higher in high population areas then the DMVR effect may in fact merely be the local-distant distinction in disguise.

A third possible explanation concerns the cost of providing advertising. It may be that the average broadcasting cost per viewer reached is lower for stations with large audiences than for stations with small audiences. If large stations tended to compete primarily with each other<sup>6</sup> we would find that they would have lower advertising rates per viewer. A shift in audience to large stations from small stations might decrease advertising revenues but it would also decrease total broadcasting costs. There is no reason to expect a decrease in broadcaster profits or a decrease in broadcaster demand for programs. Since program creators would not have a decrease in their revenues, no copyright compensation plan would be necessary.

In later sections of this paper we will test the linearity of the revenue-audience size relationship. From the arguments presented above we would not expect the shape of this relationship to influence copyright payments received by program suppliers in a negative way.

C) The effects mentioned above will tend to diminish advertising revenues. On the other hand, CATV may increase advertising revenues by directly changing the size or viewing habits of the total audience. Larger or more attentive audiences will lead to greater advertising revenues, ceteris paribus. We might expect larger or more attentive audiences for two reasons. Firstly, CATV improves the reception of television signals by eliminating many forms of interference due to antenna directionality, etc. Secondly, CATV increases

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<sup>6</sup>If all stations competed against each other, regardless of size, price per viewer would be the same for all stations. Large stations with lower costs would merely earn larger profits. Shifts to large stations by viewers would not decrease advertising revenues.

the choice of programs available to viewers. Both effects work in such a way as to make television viewing a more attractive activity than would be the case without CATV.

It is the examination of this last effect which most radically differentiates this work from that done in past studies. This effect is clearly one which gives CATV a positive impact on advertising revenues and copyright payments for programs. Neglect of this effect has biased past studies such that the negative effect of CATV on broadcasters and program suppliers has been greatly exaggerated.

#### 4. VARIABLES INFLUENCING ADVERTISING RATES

The major empirical goal of our study is to determine the impact of CATV on the advertising revenues of over the air broadcasters. This can be broken up into two major effects: (1) the negative impact due to market fragmentation; (2) the positive impact due to the influence of CATV on the viewing habits of the population. The latter effect will be investigated in the next section and we shall now turn our attention to the former.

Each broadcaster whose programs are carried on CATV finds his audience spread out over all geographical areas which are served by CATV's which carry his station. The average distance between broadcaster and viewer is increased by CATV. The further away these viewers the less valuable we would expect them to be to a local advertiser.

We would not expect national advertisers to be affected as strongly. Viewers far away from transmissions are as likely to be valuable as viewers close to transmissions. To the extent that fragmentation helps or hinders

the transactions involved in coordinating advertising purchases we might expect advertising revenues to increase or decrease respectively.

In order to test these hypotheses we have constructed a data set in which the audience for each station is broken down into various categories based on location from the transmitter. For each station we have determined the number of man-viewing hours per week inside the B contour and outside the B contour where B contour is defined as that area where satisfactory over-the-air reception occurs 90% of the time for 50% of televisions.<sup>7</sup>

With the audience partitioned in this manner it is possible for us to determine the value of both of these groups to advertisers. We wish to explain advertising rates (both national and local) as a function of the audience size in each category. These categories reflect the likelihood of using CATV as well as distance from the transmitter (relative to its strength and height). This is because viewers outside B contour are not likely to receive a signal of sufficient strength over-the-air to provide reasonable reception. It is likely that they will only view the station using CATV.<sup>8</sup>

In addition to audience size, we shall expect audience income to influence advertising rates. This is for one of two possible reasons. If most viewers are wealthy they probably spend more money on products and are more valuable to advertisers. In addition, some areas have higher costs of living than others. To the extent that income differences are

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<sup>7</sup>This distinction is made by the industry. See appendix for the detailed construction of these variables.

<sup>8</sup>But see the caveat in the appendix.

illusionary (due to cost of living differences) we would expect different costs of living to be reflected in different advertising rates.

We have also included several other variables in the data set. The Herfindahl index, defined as the sum of squared market shares, measures the ease of collusion in a market. A market dominated by a small number of firms will register a high value (close to one) for the Herfindahl index whereas markets with many small firms will have a low value for the Herfindahl index (mean zero). Collusive markets should have high advertising rates and high Herfindahl indices.

Dummy variables for those stations which either broadcast in French or are owned by the CBC have also been calculated. The CBC dummy was included to pick up any difference between government run stations and private stations. The French dummy was included to pick up any structural differences in French programming (predominant in Quebec).

The average population of the areas into which a station broadcasts have also been calculated. If advertisers value viewers in heavily populated areas differently than they value viewers in sparsely populated areas this variable should pick up the difference.

A consideration prompted by previous studies concerned the linearity of the relationship between audience size and advertising rates. Fisher found the relationship to be linear whereas Park found it to be non-linear. In order to examine the linearity of our relationship we sometimes ran a quadratic form of the audience variable and we sometimes ran it in logged form. Further examination of this point will appear in our discussion of the empirical estimates.

## 5. ADVERTISING REGRESSION RESULTS

A) We ran a regression of the form

$$R = \beta_0 + \beta_1 A + \beta_2 C + \beta_3 I + \beta_4 H + \beta_5 P + \beta_6 \text{CBC} + \beta_7 F + \mu$$

where R is 30-second advertising rates during prime time,  $\beta_0$  is a constant term, A and C refer to man-hours of viewing per week inside contour B and outside contour B respectively, I refers to average viewer income, H refers to the Herfindahl index, P stands for population, CBC and F are dummy variables for CBC affiliation and French programming respectively and  $\mu$  is an error term. The value of the coefficients  $\beta_1$  and  $\beta_2$  indicate the average worth per 30-second commercial to an advertiser (or station) of a viewing-hour in either of our two categories.

These regressions were run with both national and local advertising rates. Past studies on U.S. data have not distinguished between these advertising rates in this manner. These studies also have not had as much market fragmentation to measure for two reasons: (1) There is a much larger percentage of homes on CATV in Canada than in the U.S. because U.S. regulations have been very restrictive about letting CATV into the 100 largest markets; (2) our study uses more recent data and CATV penetration has increased rapidly since the late 1960s, the period upon which past studies were based.

There are several predictions we can make regarding these coefficients:

- (1)  $\beta_1$  will be larger than  $\beta_2$ ; both will be positive
- (2)  $\beta_3$  will be positive
- (3)  $\beta_4$  will be positive
- (4)  $\beta_5$ ,  $\beta_6$  and  $\beta_7$  can be of any sign.

Also, we would expect the difference between  $\beta_1$  and  $\beta_2$  to be more pronounced for local advertising rates than for national advertising rates since local advertisers should value distant viewers to a lesser degree than national advertisers.

Various combinations of our independent variables were used in regressions which attempted to explain advertising rates. The results can be found in Table 1. Some general comments can be made before we discuss the particulars.

- (1) The audience size is always positive and significant at the 5% level.
- (2) Income is always positive and generally significant.
- (3) The Herfindahl index is always negative and usually quite significant.
- (4) The CBC dummy variable is always negative and quite significant.
- (5) Our French dummy variable and population variables are not significantly different from zero.

(6) Our specifications seem capable of explaining about 90% of the variance of the dependent variable, a result in line with those of past studies and one which should give us confidence in our work.

B) The first matter we wish to investigate concerns the relative value of local and distant viewers. Looking at regression one we can see that the value of the A coefficient (.035) is two-and-a-half times that of the C coefficient (.014). Using regressions 1 and 4 we are able to determine the significance of this difference. The difference is significant at the 95% level but not at the 99% level. We can make similar calculations for regression 6 which has a slightly different specification of these variables.

TABLE 1

## Regressions with Advertising Rate as Dependent Variable

	A	C	AC	log A	log C	log AC	AC <sup>2</sup>	INC	CBC	HERF	POP	FR	R <sup>2</sup>
(1)	.035* (93.5)	.014** (4.3)						.026** (5.4)	-52* (8.0)	-253* (9.9)	-.86 E-5 (.3)	-32 (2.2)	.900 .887
(2)***	.013** (4.1)	.036* (10.6)						.022 (.9)	-42 (1.7)	-183 (1.2)	.3 E-4 (1.5)	52 (1.5)	.865 .825
(3)	.025* (23.6)	.029* (10.8)						.013 (.4)	-58** (4.8)	-245 (3.2)	.4 E-5 (.1)	-2 (0)	.925 .903
(4)			.028* (216)					.024** (4.3)	-55* (8.3)	-264* (10.3)	.5 E-5 (.1)	-26 (1.3)	.891 .880
(5)			.035* (109)				-.3 E-6 (6.0)	.026** (5.4)	-56.6* (9.5)	-214* (6.9)	.2 E-4 (1.2)	-20.1 (.9)	.902 .889
(6)	.040* (91)	.021* (8.7)					-.3 E-6 (5.1)	.028** (6.5)	-54* (9.1)	-209* (6.9)	.5 E-5 (.1)	-27 (1.6)	.908 .895
(7)***	.010 (1.9)	.032* (6.7)					.13 E-6 (.5)	.014 (.4)	-35 (1.4)	-212 (1.6)	.2 E-4 (.4)	43 (1.1)	.865 .823
(8)								.029 (3.1)	-83* (9.7)	-138 (1.4)	.8 E-4* (16.2)	23 (.6)	.784 .762
(9)				118* (51.2)	1.52 ( $\phi$ )			.031 (3.3)	-82.9* (9.0)	-138 (1.3)	.7 E-4* (12.3)	19.9 (.4)	.774 .746

\* significant at 99% level

\*\* significant at 95% level

F statistics in Parentheses

bottom R<sup>2</sup> is the corrected R<sup>2</sup>

Advertising rates and viewing man-hours are for September, 1978

\*\*\* Advertising rates are national except for rows 2 and 7.

67 national rates, 32 local rates.



In this instance the difference in coefficients is not significant at the 95% level although it is 'close'. As we will see below, it can be argued that equation 6 is a superior specification of the relationship than equation 1.

If we were to end our examination at this point we would conclude that local viewers are worth more than distant viewers but that the relationship was rather weak. However, further examination will lead us to question the robustness of these results even more. In particular, we wish to see how viewers are regarded by local advertisers.

Equations 2 and 7 will help us in this endeavour. The independent variables are identical to those of equations 1 and 6 but our dependent variable is the local advertising rate for those stations which supplied us with local data. We expected the difference between  $\beta_1$  and  $\beta_2$  to be greater in equations 2 and 7 but to our surprise and consternation we find this not to be the case at all. Instead we find that distant viewers are worth more than local viewers.<sup>9</sup> (The difference in coefficients is not even close to being statistically significant, however.) This is surely a suspicious result. To determine the extent to which it was determined by sample selection (since there are fewer stations which have local data, 32 vs. 67 for national rates) we regressed the same variables on national rates for those stations which had local rates and regression 3 of Table 1 gives these results.

In this case we find that the distant audience is still worth more although to a lesser degree than in the previous instance. Thus sample

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<sup>9</sup>These regressions show strong evidence of multicollinearity due to the smaller sample size.

selection plays a large part in causing these results. In addition, all CBC-owned stations have local rates and thus they have a disproportionate impact on the results of this sample. As we shall see later there is reason to believe that CBC stations fail to price their advertising rates in a competitive manner, thus distorting natural market effects. When we tried running these regressions for the non-CBC sample, however, there was no appreciable difference, indicating that the CBC stations were not responsible for the greater value of distant viewers.

The overall results from our regressions are ambiguous. It seems fair to say that local audiences are probably worth somewhat more than distant audiences but that the available evidence for this assertion is quite weak.

In the U.S. study by Park similar results were obtained. He found local audiences to be worth 50% more than distant audiences but only border-line statistical significance was found. For his subsample of non-network stations no significant result was found and he did not report these results.

The conclusion that local viewers are worth more than distant viewers, though theoretically appealing, is quite tenuous. Even if we accept these results we would need to quantify the impact of Cable on local/distant relationships before we could determine the reduction in rates caused by CATV.

C) Our next concern involves the linearity of the advertising-audience relationship. If the relationship were curved so that increasing audience size increased advertising revenues at a decreasing rate, we would find that a shift in audience from small audience stations to large audience stations

would decrease the total revenue of all broadcasters grouped together. This was exactly the effect reported by Park. He ran his regression in a quadratic form (i.e., he included audience and audience squared as independent explanatory variables) and found the quadratic term to be significantly negative.

Regressions 5 and 6 in Table 1 are an attempt to investigate this result with our data. Our quadratic term is negative and significant in both regressions indicating that a non-linearity does in fact exist in our data.

There are some theoretical problems with a quadratic specification of the audience-revenue relationship. A negative quadratic term implies that at some point advertising rates will fall when audience size increases and this seems to be an unlikely result. We calculated the point at which this would occur based on our coefficients and found that our audience size was nowhere in the range of this downturn of the relationship.

In an attempt to circumvent the theoretical difficulties of a quadratic form we attempted to fit the data to several other non-linear relationships. Regressions 8 and 9 were run with the audience measured in natural logs. As can easily be seen, the fit of the regression (as shown by R-squared) is much lower for this specification. Similar results were obtained in estimating a hyperbolic function (not shown). These specifications are theoretically superior in that, unlike the quadratic, they do not turn down at some audience size.

We ran several other tests on the linearity of this relationship. An inspection of the residuals (predicted value of the dependent variable minus the measured value) ranked by advertising rates did not show any

clearcut curvature. A test of curvature was performed whereby the stations were ranked by advertising rates and broken up into 7 (and 4) groups. The increased explanatory power of the regression when the slope of the coefficient of audience size was allowed to vary between groups was measured and found to be insignificant. Fisher conducted a similar test on his data with similar results.

We conclude that the evidence favouring a curved relationship is weak. There is no denying the fact that a quadratic form gives a better fit but general tests of curvature give negative results.

D) The impact of the Herfindahl index is the next important matter to be taken up. We included this variable to pick up any monopoly power that might exist on the part of broadcasters in some localities. Any such power would be reflected in a positive coefficient for this variable. The significant negative sign is very surprising and difficult to explain. This result is quite robust and holds up under almost all specifications.<sup>10</sup> This is true for Herfindahl indices based on all television broadcasters received in an area as well as an index based on only Canadian stations.

There is obviously some effect other than market power which is being picked up. Our examination of the influence of CATV on viewing habits will reveal just what this effect is. It will be a result central to the conclusions of this study.

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<sup>10</sup> Except in equations 7, 8 and 9. In 7 the lack of significance is probably due to multicollinearity. The following results, based on local advertising rates, will demonstrate this fact

$$\text{LRT} = .018A + .035C - 272\text{Herf} + K$$

(19.8)	(12.2)	(5.09)	$R^2 = .842$
			$R^2 = .827$

In equations 8 and 9 the misspecification of the audience variable is most likely responsible.

E) The final result of interest in these regressions concerns the coefficients on the CBC dummy variables. The consistently significant negative sign on this variable indicates that when the impact of the other variables is taken into account, CBC stations consistently charge advertising rates below the level that would be charged by non-CBC stations with the same audience size and characteristics. This can be interpreted to mean that CBC stations are not charging profit maximizing advertising rates since the private stations are certainly trying to maximize advertising revenues.

This result is not without precedence in the literature. In 1963

O. J. Firestone wrote:

...the CBC could about double its commercial revenues without significantly increasing the time devoted to commercial messages provided the Corporation wished to pursue appropriate policies concerning the pricing and the marketing of commercial time it has at its disposal.

The data show...that the CBC's cost per thousand in prime-time was on the whole about one-third below those charged by private broadcasters in comparable time periods.<sup>11</sup>

His estimation techniques were considerably less precise than our own but our conclusions are similar to his. We find that CBC stations tend to charge about \$55 less than the competitive advertising rate for a 30-second spot. With an average advertising (national) rate of \$228 this works out to a reduction of 25%.

It should be remembered that not all advertising rates are sold and that total revenue depends on the percentage of spots sold as well as

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<sup>11</sup> See O. Firestone, Broadcast Advertising in Canada (University of Ottawa Press, 1966), p. 294.

the price. We cannot directly measure the percentage of spots sold for each broadcaster but we can gain some institutional insights. The CRTC allows broadcasters up to 12 minutes per hour for advertisements. The CBC only allows its stations 10 minutes of advertising per hour. Thus we might expect that CBC stations would sell a higher percentage of their ads and also that their rates would be higher since they supply fewer commercial messages. Fewer commercial messages make the programming more attractive to viewers and reduce the opportunities for advertisers to reach the audience of this station. The smaller the supply of advertising time the higher the rates should be since many stations will not be in perfectly competitive markets and will in fact have downward sloping demand for their advertisements. Thus the 25% reduction in revenues caused by behavior other than profit maximization is probably an understatement.

This result is really not surprising. The CBC is not a profit-maximizing corporation and it would be unusual for it to maximize profits since it exists in a different environment than private stations. The managers of private businesses are usually motivated by different objectives than those of public enterprises. Our results imply that the CBC is subsidizing advertisers at the expense of the taxpayers.<sup>12</sup>

F) This brings us to the foremost question of this section--to what extent does Cable, by fragmenting the audience, reduce advertising revenues?

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<sup>12</sup> There is an alternative explanation of this effect. The CBC tries to reach as large an audience as possible and thus many people without Cable will have access only to CBC programming. This will tend to lead to low viewer satisfaction for those viewers with little choice as we explain in the next section. Such viewers would be worth less to advertisers than satisfied viewers. It is difficult to gauge the magnitude of this effect.

We can estimate the largest possible loss by making several assumptions. First, we assume that all viewers outside the B contour are on Cable and would not be receiving the station without Cable (we exclude the possibility of over-the-air retransmission or consumer purchases of large antennas). Next we assume that local viewers are worth two and a half times as much as distant viewers. This is the most extreme assumption we can make given our regression results.

Twenty-six percent of the viewing audience (measured in viewing hours) is located outside the B contour. Since these viewers are assumed to be worth less than half of what they would be worth if they were local viewers the total impact would be to reduce advertising revenues by 16%. This is probably an overstatement of the true impact of fragmentation since our assumptions were rather severe.

## 6. THE EFFECT OF CATV ON VIEWING HABITS

CATV television increases the choice of programming available to viewers. Since CATV allows a viewer to watch all stations which he is likely to receive without CATV we can predict that CATV will unambiguously increase the viewer's pleasure derived from watching television. This increase in pleasure is likely to lead to an increase in the amount of time spent watching television under most circumstances.

There are certain conditions under which an increase in viewer pleasure will not lead to an increase in television viewing. One constraint placed on television viewing is that of time. There are a maximum number of hours that one can watch television during any given period of time. If viewers already are watching television for the maximum number of hours possible, an increase in programming attractiveness could not lead to an increase in viewing by the viewer although it may lead to an increase in the intensity with which a viewer concentrates on a show.

It is also possible that the demand for television services is inelastic. If this were the case, an increase in television services per hour caused by the additional programs available on CATV would reduce the amount of time people spend watching television. The cost of viewing television is the time cost.<sup>13</sup>

We attempted to measure the impact of CATV on viewing habits. One primary test consisted of comparing the change in viewing habits with the change in CATV usage in localities for which it was possible to get appropriate data. We would expect a positive relationship between these variables.

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<sup>13</sup>This is analogous to increasing the size of chocolate bars without changing the price. Satisfaction or quality per bar (hour) increases. If the demand for chocolate were inelastic with respect to price fewer chocolate bars would be bought.



Using first differences was thought to be appropriate because our specification of the function influencing television viewing habits was quite incomplete. Since cable usage was rapidly changing in the time period under consideration it was thought that the primary variable influencing changes in viewing habits would be changes in cable penetration.

Two data sources were used. The first was created by looking up all CATV systems operating in Canada in 1969 and 1978, apportioning the subscribers of these systems into the appropriate B.B.M. region and using B.B.M. data to calculate viewing habits for each of these regions. The results are found in Table 2, row 1. The dependent variable is the change in viewing hours per week. The coefficient of change in CATV penetration is insignificant and of the wrong sign. A dummy variable for each province was included to take account of geographic differences but was found to have little impact on CATV penetration change.

Row 2 shows the results for a different sample of data. These data consist of a sample of major metropolitan areas which have CATV penetration rates compiled by the Bureau of Broadcast Measurement (B.B.M.). It was thought that their data collection methods might be superior to ours. Once again, however, we find that the coefficient of CATV change is not significant and is of the wrong sign. Thus the results of our first difference regressions indicate that our hypothesis that cable increases viewing time of individuals is incorrect.

In row 3 we ran a regression which is no longer in the form of first differences. In this case we regressed the level of CATV penetration in 1975 on the average viewing hours for 1975. Our sample consists of the same 24 major metropolitan areas as in row 2. As in our other regressions, CATV penetration does not significantly affect the dependent variable. In

TABLE 2

Regression of Change in Viewing Hours on  
CATV Penetration Change

	Constant	CABLECH	Ontario	Quebec	Alberta	R <sup>2</sup>	N
(1)	-.012	-.029	2.8	1.6	1.2	.27	44
		(.8)	(8.9)	(2.7)	(1.0)	.19	4
(2)	3.73	-4.9				.16	24
		(3.9)				.12	

Regression of Viewing Hours on CATV Penetration

	Constant	CATV	R <sup>2</sup>	N
(3)	23.9	.0014	0	24
		(.003)	-.04	

Change in viewing hours taken from 1969 and 1978 Reach book by B.B.M.  
Cable penetration change in row 1 comes from Television Factbook  
Services, for 1969 and 1978  
Cable information in regressions 2 and 3 come from B.B.M. Household  
enumeration, 1971 and 1975.

fact, according to our results, an increase in CATV use from 0 to 100% of the population would increase T.V. viewing by only 8 1/2 minutes.

From these results we are forced to conclude that CATV does not significantly affect the number of hours that people spend watching television. This result, although puzzling at first blush, is consistent with other results of investigations of this kind.<sup>14</sup>

Additional verification of our results come from a special B.B.M. analysis. Viewing habits of those with CATV were contrasted with those without CATV. For men it was found that CATV viewers watched an average of 21 hours and 41 minutes of television per week while those without CATV watched for 21 hours and 1 minute. For women it was a different story. With CATV they watched for a total of 24 hours and 27 minutes. Without CATV they watched for 25 hours and 25 minutes--almost an hour more. We thus conclude that CATV does not increase the amount of time people spend watching television.

It is important to emphasize that we cannot conclude from these results that CATV does not increase the value of an audience to an advertiser by changing viewing habits. What we have found is that CATV doesn't increase the amount of time that people spend watching television. Time spent in watching television can also be spent in other activities such as talking or reading. If CATV increases the intensity of television viewing, advertisers will find that television will be a more effective medium per viewer reached than it was prior to CATV. This should lead to an increase in advertising rates even though the total volume of viewing hours remains the same. This

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<sup>14</sup>See Park [1970], pp. 21-23. CATV viewers in the U.S. watch more television than non-CATV viewers but there is a self selection process at work so that people who watch more television are those most likely to value and subscribe to CATV.

proposition, however, is somewhat more difficult to test.

We now come back to the results of the previous sections. In particular we are ready to explain the negative signs of the Herfindahl indices in our regressions on advertising rates. At that time we mentioned that market power would be reflected in higher advertising rates and that the negative sign was contrary to that hypothesis. The reason that our Herfindahl index was so strongly negative is because it was picking up the influence of another variable--the CATV penetration rate!

To understand this one merely needs to realize that CATV reduces the market share of each local station and that the Herfindahl index will be reduced accordingly.<sup>15</sup> Since CATV viewers value the additional programming (they demonstrate this fact by their willingness to pay for the service) we would expect higher advertising revenues. We have demonstrated that CATV does not increase the amount of time that people keep the television turned on. Thus the higher rates due to CATV will not be picked up by the audience variable. Instead it will be picked up by the Herfindahl index which is in essence a proxy for CATV penetration.<sup>16</sup>

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<sup>15</sup>Unless CATV brings in a station which becomes so popular that it dominates the market to a greater extent than any of the local stations did before the introduction of CATV.

<sup>16</sup>The observant reader may wonder why CATV penetration rates were not directly included in the regression on advertising rates (Table 1) instead of using the Herfindahl index as a proxy. The answer has to do with the fact that CATV penetration rates exist for areas and advertising rates exist for stations. Penetration rates could only be calculated for about 40 areas whereas Herfindahl indices were calculated for over 300. Many stations which broadcast into areas with no penetration rate data would have to be excluded from the regressions and we would have had a very small sample with which to work.

To demonstrate this last point we ran a regression with the Herfindahl (Herf) index as the dependent variable. Our explanatory variables were CATV penetration (CAB), population (POP), and the number of local stations (STA). Our sample consisted of 18 localities with published CATV penetration rates. The results are given in the following equation.

$$\text{Herf} = \quad \quad \quad -.004 \text{ CAB} - .00005 \text{ POP} + .01 \text{ STA} \quad R^2 = .496$$

$$\quad \quad \quad (12.97) \quad \quad (1.2) \quad \quad (.2) \quad N = 18$$

F Statistics are in parenthesis.

The only variable which is statistically significant is the CATV penetration rate. The coefficient tells us that for every 10 point increase in penetration rate a locality has a decrease in its Herfindahl index of .04.

This result, in conjunction with some results found in previous sections allows us to make some estimates of the beneficial impact of CATV on advertising rates. The coefficient of the Herfindahl index in our regressions on advertising rates were clustered around -.225. The CATV penetration rate in Canada is now at 50%. From the above regression we would expect that a CATV level of 50% would decrease the Herfindahl indices by .20. A decrease in the Herfindahl index of this magnitude should lead to an increase in advertising rates of \$45 per 30 second commercial. With a mean advertising rate of \$230 we can estimate that CATV has lead to an increase in advertising revenues of 19.6%. Any market power (which would give the Herfindahl index a positive sign) would tend to bias this estimate downward.

Another technological change in the television industry in recent years is the increase of color televisions. This increase has paralleled the increased use of CATV. We attempted to determine if the confluence of these two changes might cause an overstatement of the impact of CATV.

A simple Pearson correlation coefficient between color and cable use was calculated for 55 metropolitan areas in 1975. A value of .019 was found to be the very insignificant result. We thus conclude that CATV and color penetration rates are not related and that our results concerning CATV rates should be unaffected by the change in color usage.

From Table 1 we can see that the local-distant distinction does not have much of an impact on the coefficient of the Herfindahl index. From the table of correlation coefficients we find that the Herfindahl index has a correlation ratio of  $-.03$  with the ratio of local to distant viewers. These results imply either that the local-distant values are not particularly indicative of CATV use or that the positive influence of CATV greatly outweighs any negative influence. Thus the 20% increase in revenues which we have estimated to be the effect of cable on broadcasters includes the negative impact of fragmentation. It is a net effect.

There are other facts to be presented which support this proposition. The first is the real growth of television advertising in the face of CATV growth. In 1972 television accounted for 44% of total national advertising expenditures. In 1977 the percentage had increased to 52%. At the same time CATV households increased from 30% to 50%.<sup>17</sup> The only reason television would increase relative to other national mediums is if television became a more effective medium relative to the others in this period. If CATV had a detrimental impact on advertising effectiveness we would not expect to find this result.

This implies that television is either increasing its viewership or advertising effectiveness. The percentage of homes with television has not

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<sup>17</sup> This information comes from TVB of Canada, Inc., TV Basics, Facts, 1978/79 (Toronto, Ontario: TVB of Canada).

changed appreciably over the period since virtually all households owned a television in this period. The amount of time spent watching television has increased somewhat over the period 1969-78 but this is not true in recent years. From March 1976 to March 1978 average daily viewing time decreased from five hours and fifty-nine minutes to five hours and thirty-three minutes. Television continued to increase its share of the market in this period, however. From 1969 to 1978, for a random sample of metropolitan areas the average viewing time increased by fifteen minutes a day. Thus it appears we cannot attribute the increase in advertising revenues to an increase in viewership. This implies that advertising effectiveness has increased over this period which is in line with our hypothesis that CATV increases advertising effectiveness.

In addition we present Table 3 which relates advertising rate per viewing hour to CATV penetration rate by province. Visual inspection reveals that provinces with high penetration rates also have high advertising rates per viewing hour. The correlation coefficient is .77 which is significant at the 95% level. The results are only suggestive since we have only seven observations and many other factors which influence advertising rates are not taken into account.

#### CONCLUSIONS

Our basic conclusion is rather simple: CATV does not decrease and appears instead to increase broadcasting revenues. This result is based on several diverse pieces of information. It is contrary to the expectations held by most researchers in the field. It invalidates the arguments for most copyright proposals put forth in this area. New justifications are needed if logic is going to imply a need for copyright payments by CATV.

TABLE 3

	NRT/U.H.	CATV Pen.	Observations
British Columbia	.0558	75	6
Alberta	.0582	59	9
Ontario	.0422	58	15
Manitoba	.0426	45	5
Quebec	.0309	40	15
Atlantic	.0240	22	8
Saskatchewan	.0397	12	7

$$r_{XY} = .766$$

$$Z \text{ transform} = 1.01$$

$$Z \text{ statistic} = 2.02$$

Column 1 is the average advertising rate per viewing hour for each province. Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island are combined into Atlantic.



It is understandable why copyright payment by CATV has recently become an issue in North America. Canadian Broadcasting revenues in 1977 amounted to nearly \$350 million. For CATV the figure was \$232 million. CATV revenue growth was outpacing that of broadcasters. Thus CATV became an obvious target for copyright payment. In addition, CATV appears to earn a high rate of return on investment.

CATV should not be a target for copyright payment just because it is a growing business. Rational economic arguments should be the center of a discussion regarding copyright payments. If it is thought that CATV is overly profitable there are other remedies (especially since CATV rates are regulated by the government). We are not saying that no economic justification for CATV copyright payments exists. We are saying that no arguments extolling the virtues of CATV copyright payments have been made which have not relied on the assumption that CATV reduces broadcasting revenues. Our work suggests that these proposals be discarded.

## APPENDIX

## CONSTRUCTING THE DATA

In order to estimate the important relationships it was necessary to construct a data set which would give us information on the audience size of television stations, income of viewers, the number of viewers outside of non-CATV viewing area, possibilities of collusion among television broadcasters in a given area and advertising rates for various broadcasters. The purpose of each variable is described in the previous sections. The construction of proxies for these variables and a discussion of their strengths and weaknesses follows.

(a) Audience Size: This information was taken from the Reach book published by the Bureau of Broadcast Measurement (BBM). This book gives the number of people reached and the number of hours watched in a week for each television station. It also gives these same variables for each BBM area (similar to Census Districts). The audience values for the station are broken down into each BBM area in which it has a non-negligible audience. For each BBM area the audience is broken down into the stations which people in that area watch.

There are two audience figures available in these data. One is known as the audience reach, the other is total viewing man-hours per week. Audience reach is a measure of the number of individuals who tune to a given station for the majority of any fifteen minute period during the week. This measure is insensitive to the variations in viewing intensity, beyond the first fifteen minute period. Someone who watches a station for thirty hours a week is given equal weight to someone who watches for a mere fifteen minutes. For this reason it is to be expected that reach is not very indicative of the true audience size of a station.

The second measure of audience is total viewing man-hours. This variable is constructed by adding up the number of hours each viewer watches of a given station. This measure is also imperfect since the show which is seen the longest in a fifteen minute period has all fifteen minutes assigned to it. This variable appears to be considerably more accurate than reach since people who watch stations for longer than fifteen minute intervals will have their total hours weighted in favor of those shows which they in fact watch the most.

Both of these variables are constructed by the BBM which sends blank diaries to individuals who then fill them out. The diaries break the viewing week into fifteen minute periods and viewers put down the program which was watched the most during that period. When a diary is sent to a child the parents are supposed to fill it in for the child. The results of the survey are tabulated by BBM and each category of individual (adult, man, women, etc.) has its observations weighted by its percentage of the population in a given area to arrive at the final figures which are estimates for the entire population.

It is not clear that our variable need be overly accurate. Since we wish to explain advertising rates we merely need to determine which variables advertisers look for when they decide to purchase advertising time. If they are content with audience reach or total hours as a measure of audience size then further refinement of these variables on our part may prove counter productive.

(b) Income of Viewers: This information comes from Taxation Statistics for 1975. This publication gives income figures for census districts. These census districts were matched up with BBM areas and the average per capita income calculated over all viewers of a station, was determined. This required weighting the income figures for every census district in which

there resided viewers of a particular station by the total hours variable for that station in the particular locality.

This weighting scheme is somewhat imperfect to the extent that total hours is an imperfect variable. Also, these income figures are not deflated by geographic price indices which may lead to some further distortions of the results.

(c) Distance of Viewers from Broadcast: This variable was taken from the BBM figures for stations. Since total viewing hours were broken down by area, it was possible to assign the viewers of each area to the categories of local or distant. In fact the areas were assigned as A contour, B contour and C contour. A contour is defined as that area around the broadcast station which has satisfactory reception 90% of the time for 70% of televisions. B contour is defined as the area where reception occurs 90% of the time for 50% of televisions. C contour is defined as anything worse than B contour. The contours for each station come from Television Factbook-Stations.

In cases where a BBM area was in more than one contour an attempt was made to look at the major population centers within each area and determine which contour seemed most appropriate.

In some instances problems were encountered because the areas used by BBM overlapped and certain populations were included in both (e.g., core cities and the district containing them were often given as separate BBM areas). In these instances attempts were made to disentangle those various populations. An additional problem was that several stations have over-the-air retransmission of their signals at other localities. We have always included just the contours of the major signal in constructing our data set.

In our empirical work the A and B contours were added together. This allowed us to distinguish those viewers who probably require CATV for reception of a station (C contour) from those viewers who don't (A and B contour).

(d) Herfindahl Index: The Herfindahl index is defined as the sum of squared market shares, where market share for a firm is the percentage of the market output which that firm supplies. In the present instance the Herfindahl index for each BBM area was calculated by taking the percentage of the total viewing hours for the market (BBM area) generated by an individual station, squaring this value and then summing over all stations seen in that BBM area. This was done for all stations as well as for only Canadian stations. The Herfindahl index is a measure of market concentration.

With the Herfindahl index calculated for each market we were able to construct a summary measure of market collusion for each television station. This was done by constructing a weighted average of the Herfindahl indices based upon all the areas into which a television station's signals (whether over air or CATV) reach. The weights are the total viewing hours for that station in each BBM area. We thus have an 'average' Herfindahl index for each television station. This value is not based on any specific market but is indicative of whether the station operates in markets which are concentrated.

(c) Advertising Rates: This information comes in two forms and from several sources. Advertising rates can be either national or retail with the retail rates being somewhat less than national rates. Retail rates are given only to local advertisers and are sold by individual stations. National rates are sold to any advertiser by either the individual station or the network it is affiliated with. Retail rates don't guarantee that the commercial message will actually be shown. If the station manages to

sell an additional commercial at a national rate the local (retail) commercial may be bumped.

In addition, advertising rates vary depending on what time of day or day of week the particular message will be shown. Prime time (weekday nights) usually commands the most expensive advertising rates. The CRTC allows a maximum of 12 minutes of advertising per hour.

Television stations display their rates on circulated 'rate cards'. National rates are listed in publications such as Canadian Advertising Rates and Data. Local rates must be taken directly off station rate cards. These rate cards were obtained by solicitation through the mail.

Comparing rates was not always easy because various stations use different time classifications. One station might have its highest rates from 7-10 p.m. while another might have them from 8:30-10:00 p.m. This made comparison of rates somewhat difficult. It was decided to take the average rate for the hours of 7-11 p.m. weighted by the frequency of each rate in that time period.

One difficulty with the rate data is that not all time slots are sold. It is not clear what it means if station A has higher rates than station B if station A does not sell as many of its slots as station B. Also, various quantity discounts are given by stations to qualified advertisers. These discounts vary from station to station and are difficult to incorporate in the data.

It is possible to make an estimate of the extent to which these practices reduce advertising rates from the list prices. We have taken three stations and calculated their potential advertising revenues if all their time slots in a week were sold at the list 30 second advertising rate. Two of the stations were large (CBLT in Toronto and CFTM in Montreal)

and the third station was small (CBCT in Charlottetown). We then divided this largest potential revenue by the number of viewing man-hours per week for the station. This gave us the value of a viewing man-hour. The results were 3.5 cents, 4.7 cents and 4.5 cents for CBLT, CBCT and CFTM respectively. We then divided the total television advertising for 1978 (approximately \$400 million) by the total Canadian viewing man-hours per year and got a result of .87 cents per hour. It is quite obvious that revenues are much lower than their maximum potential. Other factors reducing the calculated station revenues are the selling of local advertising time and the fact that 30 second slots are often more expensive than 60 second slots.

We will continue to assume that the list rates are indicative of the supply-demand conditions for the individual stations. Advertising rates give us somewhat more flexibility than revenues and are more easily available. Our regression results will indicate that this assumption is reasonable.

(f) Population: This variable comes from the 1976 Census, Population: Geographic Distributions. The variable was calculated in a manner similar to the Herfindahl indices and income figures. The population for each market which had viewers of a particular station was found and these values were weight-averaged for all markets receiving the stations signal where the weights were the total viewing hours in the market.

This variable is supposed to measure the number of people in each market. To the extent that census areas are not markets this variable will fail in its purpose.

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Sources: MacLean-Hunter Ltd. and Standard Rate and Data Inc. Canadian Advertising Rates and Data (Toronto, Ontario: MacLean-Hunter and Standard Rate and Data, September 1978).

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