Pricing in the Cable Television Industry

Colin Hoskins

Stuart McFadyen

FACULTY OF BUSINESS ADMINISTRATION
AND COMMERCE

THE UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA
CANADA
T6G 2G1

Pricing in the Cable Television Industry

Colin Hoskins

Stuart McFadyen

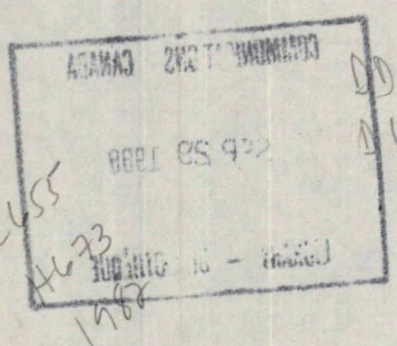


Table of Contents

List of Tables

List of Figures

ACKNOWLEDGEMENTS

We wish to note the fine support provided by Ian Ironside and Denis Guay of the Broadcasting and Social Policy Branch of the Department of Communications. Michel Tremblay gave us useful guidance. Diane Quesnel-Racine responded enthusiastically and efficiently to our many requests.

Mr. Everett King, and his staff (notably Janet Hutton and Hsieh Wong) in the Statistical Information Service, Department of Communications, again demonstrated their willingness to creatively assist our data collection efforts. Michel Granger in the library went out of his way to help our research assistant.

At the CRTC Nigel Weir and Jean Sylvestre provided useful counsel.

We would like to thank our research assistants, Darrolyn Daniel, Pat Willison, Steven Zolf, Ken Coull, and especially Joe Stott for their valued contributions.

Judith Abbott typed the entire manuscript with speed, precision, and enthusiasm.

Perhaps the greatest single contribution was made by Andy Hsu, senior programmer/analyst in the Faculty of Business, in providing extensive top priority statistical and computational assistance.

We would also like to thank members of the cable industry who responded to our requests for information; namely C. D. Watson, President of Rogers Cablesystems Inc.; Dr. H. Hinds, Vice President of Operations for Maclean Hunter Cable TV; I. McCallum, Executive Director of Cablecom Corporation; D. F. Marlett, Executive Director of the Cable Television Association of Alberta.

Pricing in the Cable Television Industry

Executive Summary

This study was undertaken prior to the initiation of pay-television in Canada in order to provide information on demand for such a service and analysis of the various factors relevant to pricing the service - both in light of their relevance to the formulation of public policy governing the industry.

First the various pay-television applications were examined in order to identify the principal economic issues. The method of signal delivery, the method of payment (pay per channel, pay per program, or universal flat charge) and the level of payment specified in the various applications were reviewed. The implications of control of retail pricing by the pay-television organizations as opposed to the usual wholesaler/retailer arrangement were also raised. The CRTC's pay-television discussion was then analyzed along these dimensions.

Next, an extensive analysis of the theory of price determination for cable services was developed. It was established that where a non-subscriber to basic cable becomes a subscriber in order to obtain access to a pay channel or a non-programming services (such as teletext or burglar alarms) that there is an element of cross-subsidization in the sense that it is only the net benefit received from the pay or non-programming service that induces the basic cable

subscription. For pay programming services the extent of this cross-subsidization can be expected to be a function of the distinctiveness (from broadcast programming) of the pay service.

A consumer should not have to pay for a basic cable service in order to be able to subscribe to a new pay or non-programming service offered on cable. All the consumer, who does not subscribe to the basic cable service, should have to pay for the new service, in addition to the monthly price of access (and any user charge), is the installation price to cover the cost of hook-up and any other incremental costs.

Since the marginal cost of supplying basic cable service is very small, its price basically depends on demand considerations. Basic cable prices can be expected to be higher the fewer the number of channels available over-the-air, the more additional channels provided by basic cable, the lesser the other entertainment opportunities, and, assuming it is a "normal" good, the greater the per capita income. When the marginal cost of providing access becomes non-negligible, as in the cost of non-programming services, demand determined prices will increase (by one-half of the magnitude of the marginal costs in the case of a linear demand function).

Theoretical analysis reveals that, so long as the wholesale price of a pay television services exceeds the cable company rebate a pay television service would offer its exhibitors, then the prices paid by consumers will be higher under a

wholesaler/retailer arrangement. The First Choice Canadian application suggests that prices will be elevated $3/month. The average of pricing information in all applications suggests a price elevation of $4/month.

Evaluation of the efficiency of various methods of pricing cable television services is difficult because the efficiency gains produced by obtaining information through the use of a pricing mechanism (such as pay-per-program) must be weighed against the efficiency losses resulting from the fact that the price will exclude potential viewers who would have watched the programs at zero resource cost. Pay-per-channel does not promote programming efficiency as effectively as pay-per-program because consumers do not vote for individual programs but, in their decision whether or not to subscribe to the pay channel, they do vote for the package of programs offered by the pay channel network. If the pay channels opt for specialized formats the loss of programming efficiency will not be serious because, by voting for a particular pay channel system, the subscriber is voting for the type of programming offered by that system. Universal pay is program inefficient. A combined tier of pay-television offerings would be less program efficient than separate tiers while the effect on pricing efficiency of such an arrangement is indeterminate.

After reviewing a number of cable and pay television pricing studies we turned to the empirical portion of our work. Since pay television was not yet in operation at the time of this study, no

investigation of pay television pricing in Canada on the basis of published data was possible.

(a) The Demand for Cable Television in Canada

Our demand estimates provided strong evidence of the importance of monthly subscription rates as a determinant of the number of cable subscribers with a single dollar increase in the rate reducing subscribers by 1,357. Demand elasticity was estimated at -.85, again reinforcing the important role that price plays in the mind of the consumer when he is making his decision on whether to subscribe or not.

The results also indicated that 87% of new households passed could be expected to become cable subscribers and that the penetration rate should not be expected to change as a result of system extension. For instance, a 20% increase in the number of households passed should yield a 20% increase in the number of cable subscribers.

In the price equation among the most interesting findings were those regarding the role played by system age and average rate of return. The age results showed monthly cable rates declining by 11.4 cents for each year a system has been in operation. With respect to average rate of return, although the quantitative magnitude of the effect is unknown because of the scaling of the confidential data, there is some indication that stations characterised by higher rates of return charge somewhat lower prices. There is some indication in the results that

systems owned by the 10 largest cable groups charge somewhat lower monthly rates.

While there is no evidence of any statistical relationship between the number of hours of community programming carried and the monthly cable rate, the results do suggest that increased community programming does detract slightly from the number of subscribers to a cable system. The average number of cable subscribers to the systems in our sample was 17,223. The results indicated a loss of 271 subscribers for each hour of community programming added.

One of the most important results from this study was the finding that a re-specification of the quality of service variable(s) to take account of the diminishing marginal utility of an additional signal can yield extremely useful results for the quality of service variable. Take, for example, the situation where 9 channels are available on a cable system in a community where none are available off-air. Such a set of offerings would be evaluated as 6 units of the quality of service variable and would increase the monthly subscriber charge by $1.37. The effect on demand would be an increase of 5,868 cable subscribers. Where there are already 7 channels available off-air in the community, the quality of service variable would only stand at 2.71 and both of the above quantitative measures would be roughly halved. Therefore, in evaluating the worth to the community of the cable system serving it, it is crucial that not only the number of cable channels added by the system be considered but that also

the number of channels available off-air be taken into account.

Results indicate that a doubling of the quality of service is associated with a 20% increase in subscribers and an 8.4% increase in monthly cable rates.

The overall interpretation to be given to the income variable is somewhat unclear since income has a positive coefficient in the monthly subscription rate equation and a negative coefficient in the number of subscribers equation. The price results indicate that a $1000 increase in personal disposable income would add 13.5 cents to monthly cable rates while the demand equation shows a drop of 427 in the number of cable subscribers.

(b) The Demand for Cable Television in the United States

Examination of cable service installation charges revealed, rather than being an operator trade-off between installation charges and monthly charges, that systems with higher installation charges also had higher monthly subscription rates (by 4.5¢ per dollar of installation charge or an elasticity of .15).

Demand equation estimates indicated the number of cable subscribers to have a price elasticity of -1.04 (falling slightly short of the 95% level). This price elasticity estimate is consistent not only with the Canadian results in the previous chapter but in general with previous studies by others.

The number of households passed was found to be an important determinant of the number of cable subscribers but the relationship estimated varied from 44 subscribers per 100 households in the linear model to 81% in the log-linear model.

Older cable systems were found to have slightly lower monthly prices and significantly larger numbers of subscribers (18% more subscribers as a result of system age doubling). These support the hypothesis that older systems could be expected to have lower costs and hence lower prices as well as greater numbers of subscribers because of system maturity effects.

Availability of pay-television service on a cable system was found to be associated with 11% lower basic cable monthly rates perhaps reflecting cross-subsidization of basic cable by pay-television in order to increase the subscriber base from which pay-subscribers are drawn. Pay-television availability played a significant role in increasing the number of system subscribers to basic cable (by 10,885 or alternatively 36%).

Income levels appear to be totally unrelated to either monthly prices or numbers of subscribers to basic cable in the U.S.

Population of the community in which a cable system is located appears to have no impact on subscribers numbers but a modest positive influence on monthly cable rates (3¢ for 100,000 population increase or 4.8% higher price for a doubling in population).

(c) The Demand for Pay-Television in the United States

The most important pricing finding was the identification of the powerful influence of monthly pay-TV subscription rates on the number of pay-TV subscribers. Each additional dollar in the rate cut pay subscribers by roughly 3500. Price elasticity was estimated at -1.31.

The number of subscribers to a system's basic cable service had a powerful influence on both pricing and demand for pay-television with an additional 10,000 basic cable subscribers adding 13¢ to the monthly pay rate and 3,710 to the pay-subscriber count.

Since pay-TV is still relatively new there has been no time for cost savings from system age to work themselves into prices. The number of years pay service has been available is, however, an important influence on subscriber numbers with each additional year of availability linked to an addition of 2,200 subscribers. This effect can, of course, be expected to moderate as the pay-TV system matures.

Showtime and Home Box Office are shown to be unambiguously more attractive in terms of attracting pay subscribers with Showtime drawing 8,000 additional pay-subscribers, Home Box Office 7,000 (each roughly 50%) compared to other pay services. Results indicate monthly pay rates to be 66¢ higher for Showtime service, and 57¢ lower for HBO compared to other pay services.

Higher income communities have more pay-TV subscribers than lower income communities. A $1,000 median income difference accounted for an 850 difference in pay subscriber count. Income elasticity was estimated to be .64.

Systems located in larger (by population) communities had a few more pay-TV subscribers.

Overall, the findings of this research provide little support for continued regulation of the cable television industry. New forms of competition for cable television are on the horizon. This is not to suggest all is well at present. The present offering of all pay services and non-programming services as separate tiers limits cross-subsidization between the various services and is more program efficient than a combined tier. The same approach could well be applied to basic cable offerings. Pay-per-channel, the payment method actually adopted by the systems beginning in 1983, is less program efficient but more price efficient than pay-per-program, making it impossible to conclude on theoretical grounds which is superior. Other things being equal cable systems which are part of a group holding appear to charge slightly less. The wholesaler/retailer arrangement adopted in Canada for pay television has resulted in a price escalation to consumers of the order of $3-$4 per month. Pay television subscribers are cross-subsidizing basic cable subscribers.

These are the performance results in a regulated environment. There seems lttle reason to believe that consumers would be disadvantaged by an elimination of cable television regulation. In fact, in a deregulated environment the effects of new sources of competition such as ABC's pay-TV available scrambled over the air, direct broadcast satellites as well as video discs and cassettes are likely to very effectively limit the monopoly power of cable operators in the long run.

The major exception to this argument may be felt to be in the area of program content. At the level of basic cable our research provides no evidence of an economic rationale for community channels. If such a ratonale exists then such channels would continue to operate in a deregulated environment; if not, they might require direct subsidization making apparent to the taxpayer the resource costs of this service. In the case of pay television, deregulation could be coupled with explicit revenue surtaxes (with the proceeds earmarked for Canadian program production subsidies) or the present system of implicit taxes can be continued - so long as the economic viability of the entire industry is not undermined by excessive interference in content decisions.

1. Chapter 1. Introduction

Pricing in the cable television industry is a topic of interest to both regulators and cable industry operatives. This interest arises from the industry's recent development of the technological capability and desire to offer a much wider range of services, such as pay-television and non-programming, than heretofore. With the emergence of these new services it becomes necessary to reconsider the appropriateness of the CRTC's "combined tariff" policy of 1975, its policy on the separation of non-programming services from programming, and the entire isue of tiered pricing which is currently the subject of CRTC hearings. The chapters which follow present both a theoretical and empirical analysis of pricing in the Canadian cable-television industry.

This chapter is comprised of brief sections providing an introduction to the nature of cable services, a brief history of the regulatory policy towards cable, and an outline of the study. We do not include a section on the size, ownership, and financial characteristics of the industry as this has been adequately covered in other studies.[1]

1.1 The Nature of Cable Services

Cable services can be divided into three types: basic (unlike the CRTC we define this to include augmented channels, if any), pay, and non-programming. Typically, basic services consist of channels of programming of Canadian and U.S. television broadcasting stations, some of which may be available to households over-the-air; automated channels such as those showing the time, weather and news; and cable channels showing community programming and the House of Commons' proceedings. The basic cable service is offered as a single tier, that is there is one price of access for the service and it is not possible to subscribe to some elements of the service but not others. There is no charge for usage (viewing programs) on the basic service. If the number of channels offered is more than 12 the subscriber needs a converter to receive these additional channels. The Rogers systems currently provide 24 to 36 augmented channels and charge $5.50 per month to households who wish to rent a converter.[2] This does not mean that the additional channels comprise a separate tier, however, as it is not a price charged for the service as such any more than the price of the television set itself. In fact a converter is built into many recently manufactured television sets. A recent survey in Toronto revealed that 73% of all cable subscribers have a converter.[3]

Pay services can be offered on a universal, pay-per-channel, or pay-per-program basis. The services beginning in 1983 are all pay-per-channel whereby the cable subscriber has the option of

paying for access to the pay channel and the programs are then 'free'. Universal pay involves a price for access to the pay channel which is mandatory for all basic cable subscribers. 'Pay-per-program' usually involves a discretionary payment for access to the channel in addition to a charge per program viewed. To receive universal pay a subscriber to basic cable would need a converter if the universal pay were shown on an augmented channel. The subscriber to pay-per-channel would need a converter and a decoder, to unscramble the picture, while the subscriber to pay-per-program would need a converter and addressable decoder capable of metering viewing. Maclean Hunter expect the price to the subscriber to be in the range of $175 to $220 for an addressable descrambler converter, and $75 to $90 for an add-on unit for subscribers who already own a converter.[4] The Cablecom Corporation in Saskatchewan is also thinking in terms of the addressable or programmable type of decoder in the $50 to $150 price range.[5] These units have the capability to be used for pay-per-program as well as pay-per-channel. They also have the advantages that signal theft is more difficult and fewer servicemen are necessary because messages can be sent from the head-end to any of the boxes changing the signal received in the home from a scrambled to an unscrambled one (when the household begins a subscription) and vice versa.[6]

The pay services beginning in 1983 will, in all probability, be delivered by cable. It is worth noting, however, that some applicants for regional licences proposed STV, direct

over-the-air broadcasting of a scrambled signal, and MATV, and that in the relatively near future DBS will become an alternative method of delivery. Also, CRTC Notice 1982-44 envisages the possibility of more than one exhibitor in the same market.[7]

Non-programming services, which are again only just beginning to be offered, may involve videotex services such as Telidon, teletext services, and burglar and fire alarm services. The CRTC has been approving non-programming services, on an experimental basis, across Canada since March 1979.

1.2 Regulatory Policy Towards Cable

The history of cable in Canada has been one of the CRTC fighting a rearguard battle, against public pressure and the cable lobby, to protect Canadian over-the-air broadcasters from new competition. The CRTC viewed such protection as necessary to provide Canadian broadcasters with the financial resources required to pay for Canadian programming. In the early years this protection took the form of trying to prevent or limit the importation of the signals of U.S. stations by microwave. In the mid and late 1970's it took the form of delaying the introduction of pay television.

Immediately after its formation the CRTC was faced with the issue of whether cable companies should be permitted to use microwave technology to import the signals of U.S. stations to Canadian cities, such as Edmonton and Calgary, well removed from

the border. In its December 3, 1969, Public Announcement, the CRTC stated:

> the rapid acceleration of such a process throughout Canada would represent the most serious threat to Canadian broadcasting since 1932 before Parliament decided to vote the first Broadcasting Act. In the opinion of the Commission, it could disrupt the Canadian broadcasting system within a few years.[8]

A policy to prevent such microwave importation proved untenable, however, in the face of public pressure, and a policy statement issued in July 1971 allowed up to three distant U.S. signals to be carried by microwave. Currently, by the Public Announcement of March 1979, cable is allowed to carry all the U.S. signals generally available over-the-air in the franchise area. If microwave technology is involved, not more than three U.S. commercial and one U.S. non-commercial station, but no distant Canadian station, can be carried.

Although the CRTC has gradually accepted the inevitability of permitting cable to import increased U.S. competition for local stations, it has pursued other policies aimed at protecting the financial well-being of these stations. The July 1971 policy statement permitted cable licensees to delete advertising on U.S. stations and substitute programs on non-local stations by identical signals from a local station. The CRTC has also tried to initiate the idea of compensation payments from cable companies to broadcasters, on the grounds that the cable companies receive the off-air programming free-of-charge, but the only instances of these have been a few systems that volunteered such payments as part of their initial application for a license.

Since 1971 another approach the CRTC has followed to promote Canadian programming has been to require cable systems to establish and operate a community channel. In 1975 the CRTC suggested that 10% of gross subscriber revenue be allocated to this purpose but it lacks the authority to enforce this.

When we examine pay television we find Canada was very early into the field with the Toronto suburb of Etobicoke served with pay-television on an experimental basis between 1960 and 1965. Currently, however, pay-television is confined to Teletheatre in Saskatchewan and a few hotels. Teletheatre comes under provincial jurisdiction because it is made available on a closed circuit basis by Sask Tel, the provincial common carrier for cable as well as telephone services, and not through broadcasting receiving undertakings. Teletheatre is available to most subscribers for $10 per month.

This situation is in contrast to that in the U.S. where Home Box Office has established a pay-television network by satellite delivery of programs to earth stations tied in with cable head-ends. In the U.S. there are now about 22 program services available to U.S. cable operators through satellite, only four of which, the so-called 'super-stations', are broadcasters. Even by June 1977, about 15% of U.S. homes could receive pay-television.

The apparent success of Home Box Office spurred the demands of the cable lobby to introduce pay-television to Canada. For a number of years the CRTC performed a holding action to prevent

such introduction because of the presumed adverse financial effects on Canadian broadcasters. In a December 1975 policy statement, the CRTC indicated that the time was not ripe for the potential disruption caused by the introduction of pay-television. Jeanne Sauve, Minister of Communications at the time, did not seem to share this negative attitude and in a statement of June 2, 1976, invited a reconsideration of a Canadian pay-television system. The CRTC did reconsider and in its report Report on Pay-Television, March 1978, concluded that a single national agency, probably private, should be established with promises of performance to include "the minimum percentage of gross revenue to be allocated exclusively to Canadian programming", and "the percentage of net profits to supplement funding for Canadian programming". No such agency was set up, however.

In part to combat the proliferation of unlicensed earth receiving stations, the CRTC in April 1981 issued a decision approving certain applications to ensure the extension of service to remote and underserviced areas. At the same time they issued a public announcement calling for applications for pay-television service. The CRTC stated that consideration of applications would be guided by the recommmendation of the Committee on Extension of Service to Northern and Remote Communities (Therrien Committee) that pay-television in Canada should:

a. contribute to the realization of the objectives set out in the Broadcasting Act and strengthen the Canadian broadcasting system;
b. increase the diversity of programming available to Canadians; and
c. make available high quality Canadian programming from new programming sources by providing new opportunities and revenue sources for Canadian producers currently unable to gain access to the broadcasting system. Indeed the ability to open that system to currently neglected or under-utilized sources of Canadian programming will be a major criterion in the consideration of pay television proposals.[9]

Hearings on these applications were held during September and October 1981 with the final decision issued March 18, 1982.

The Commission set out its view of the objectives of Canadian pay-television in its March 18 decision. They consider it:

> an integral part of the Canadian broadcasting system which should play an important role in achieving the objectives of the broadcasting policy for Canada set out in Section 3 of the Broadcasting Act. Through its capacity to generate revenue, pay television should contribute significantly to the broadcasting system by increasing the diversity of programming available to all Canadians from coast to coast and by enhancing the quality and distinctiveness of Canadian programs. Pay television should provide new opportunities and revenue sources for the program production industry in Canada, particularly for producers currently unable to gain access to the broadcasting system. Pay television should also provide new opportunities for developing programs that reflect the various regions of Canada and should provide new programming in both official languages.[10]

1.3 Outline of the Study

In Chapter 2 we examine the pay applications and the CRTC decision on these applications. The aspects stressed are those relevant to the pricing of cable service. Besides providing

background, the primary purpose of the examination is to identify issues and topics worthy of further analysis.

The theory of price determination with respect to cable services is considered in Chapter 3. On purely theoretical grounds it is possible to draw useful insights and conclusions with respect to issues such as tiering, the economic efficiency of alternative methods of pricing pay television and pricing non-programming services, and the implications for pricing of alternative relationships between the pay television organizations and the cable companies. The theoretical analysis also allows us to identify determinants of demand for various cable services and determinants of the prices for various cable services. These determinants are later included as independent variables in our demand and price models to be estimated in Chapters 5 and 6.

Chapter 4 reviews the price determination literature. This includes econometric and simulation studies of the demand for basic cable and pay services. This review is useful to identify variables that should be considered in our own empirical work, econometric techniques that might be employed, and results that can be compared to our own.

An empirical examination is undertaken, in Chapter 5, of the demand for basic cable services in Canada and the pricing of basic services by Canadian cable companies. This should allow us to answer questions with respect to the demand elasticity, income

elasticity, whether the pricing is consistent with profit maximization, whether the price is consistent with quasi-regulation by the CRTC, whether demand and price are sensitive to the quality of service offered, and whether group ownership affects pricing.

A direct analysis of pricing behavior in the Canadian pay-television industry is, of course, not possible because the industry has not yet actually marketed its product. Experience in the United States, however, may well provide some guidance as to what may be expected to occur in Canada. Accordingly the pricing policies and consumer acceptance of pay-television in the one hundred largest American systems are analyzed in Chapters 6 and 7.

Chapter 8 comprises a discussion of policy implications, and identification of subjects worthy of further research.

FOOTNOTES

1 See, for example, S. McFadyen, C. Hoskins, D. Gillen, Canadian Broadcasting: Market Structure and Economic Performance, The Institute for Research on Public Policy, Montreal, 1980, Chapters 2 and 12, and M. Lafontaine, B. Savard, G. Darves-Bornoz, G. Gauthier, V. Nguien, G. Jolivet, A Feasibility Study for a Canadian Satellite Program Package. Report prepared for Department of Communications, Ottawa, by Tamec INC., March 1980.

2 Information provided by C. D. Watson, President, Rogers Cablesystems Inc., in a letter to the authors, dated May 31, 1982.

3 Information provided by D. H. Hinds, Vice-President, Operations, Maclean Hunter Cable TV, in a letter to the authors, dated June 9, 1982.

4 Ibid.

5 Information provided by I. McCallum, Executive Director, Cablecom Corporation, in a letter to the authors dated May 26, 1982.

6 See G. Colvin, "A Scrambler's Gamble in Pay TV", Fortune, June 14, 1982, pp. 129-136.

7 CRTC - Public Notice 1982-44, dated May 31, 1982, Pay Television - Phase II Call for Applications to Exhibit Pay Television Services.

8 Canada, Canadian Radio-television and Telecommunictions Commission, The Improvement and Development of Canadian Broadcasting and the Extension of U.S. Television Coverage in Canada. Public Announcement, December 3, 1969.

9 Canada, Canadian Radio-television and Telecommunications Commission, Committee on Extension of Services to Northern and Remote Communities, Report, Ottawa: CRTC, 1981.

10 Canada, Canadian Radio-television and Telecommunications

Commission, Decision CRTC 82-240, Canada, CRTC, March 18, 1982, p. 9.

2. Chapter 2. The Pay-Television Applications and the Decision: Identification of Economic Issues

In this chapter the pay applications and the CRTC decision on these applications will be examined. The aspects that will be examined are those relevant to the pricing of cable services. Throughout our examination, issues and topics worthy of analysis in Chapter 3 will be identified.

2.1 Examination of the Applications

The CRTC Call for Applications for Pay Television Service[1] resulted in 57 proposals, 28 (12 national and 16 regional) of which the CRTC judged to be of sufficient merit to be included in the public hearings. The examination and analysis in this section is based on these 28 applications. The aspects of the applications that are examined are those relevant to the pricing of cable services.

We first consider the methods of exhibition proposed by the applicants as cable is not the only method of delivering pay-television to the consumer. Second, the method of payment is examined; pay television can take the form of pay-per-channel, pay-per-program, or universal. Third, the level of payments proposed are discussed. Fourth, we examine alternative proposals for the relationship that should exist between the cable companies and pay-television organizations. Of particular

interest is the question of whether it is the cable company or the pay-television organization that sets the price to the consumer.

2.1.1 Method of Delivery

In its "Call for Applications for Pay-Television Services" the CRTC stated that pay-television "could be delivered to the public by over-the-air transmitters, by cable or by any other appropriate means".[2]

The applicants for a national licence envisage, at least initially, exhibition by cable companies, with, typically, satellite distribution to cable headends. In a number of applications the possibility was raised of adding or switching to DBS at a later date. Thus First Choice Canadian Communications discussed the possibility of adding DBS to uncabled markets, while Performance: The Canadian Network and the Independent Producers Television Workshop (IPTW) both suggested the possibility of an eventual switch to DBS if it should become economically feasible.

Most of the applicants for a regional licence also envisaged exhibition by cable. A notable exception was the Newfoundland Broadcasting Company Ltd. which proposed STV, direct over-the-air broadcast, to subscribers in the St. John's area. Ont-TV, while primarily exhibiting by cable, proposed, in the name of a subsidiary, to apply to the CRTC for an over-the-air exhibition

license to serve Toronto. Premiere Alberta Television Ltd. as well as exhibiting by cable, proposed direct distribution to hotels and apartment buildings, and also indicated it would like to consider DBS delivery to households.

This review suggests that initially delivery of national pay-television will be by cable. Although STV is an alternative, nearly all the regional applicants also advocate cable delivery. Eventually delivery may be by DBS but not at this time. As noted earlier, CRTC Notice 1982-44 raises the possibility of more than one exhibitor in the same market.

2.1.2 Method of Payment

There are three models of pay-television. There is pay-per-channel, much the most common method in the U.S., whereby the viewer pays a monthly rate for having the option to watch programming on an additional channel; pay-per-program, whereby the household pays for each program, or part of a program, watched; and universal whereby each subscriber to basic cable services has to pay an extra amount each month to support the additional channel.

In its "Call for Applications for Pay Television Service" the CRTC stated that:

> After considerable deliberation, the Commission has concluded that pay television service should be treated as a premium, discretionary service, available at the option of the subscriber rather than on a mandatory, universal basis.[3]

This appears to preclude universal pay but another statement left the door ajar:

> The Commission sees distinct advantages in the implementation of a pay-per-channel system in the first instance, but nevertheless is prepared to consider proposals for the introduction of other systems where applicants are able to demonstrate this would provide clear benefits in terms of the stated objectives to be realized from the introduction of pay television service. In all cases, the Commission will be hesitant to accept proposals which preclude the eventual adaptation of any proposed system to pay-per-program capability.[4]

With these guidelines it is scarcely surprising that nearly all applicants opted for pay-per-channel since it is the CRTC's preferred method and since it is also easier to adapt pay-per-channel equipment to a pay-per-program capability. However, two applicants, one national and one regional, proposed the universal approach. Telecanada Inc. proposed a mandatory charge of $2.50 a month for a national service while Arts Inter-Media proposed a $0.30 surcharge for all cable subscribers in Metropolitan Toronto. Telecanada, which proposed a mixed offering of films, children's programs, TV drama, short films, specials, and NFB material, claimed that a univeral system was necessary to provide funds for program production. Arts Inter-media proposed a strong emphasis on cultural programming of minority interest.

The three models, in particular the economic welfare implications of each, will be examined in Chapter 3.

The question of pricing by 'tiers' of cable service also arose from the applications. Astra-Bellevue Pathe proposed two

channels, a general-appeal channel plus a minority interest channel with a cultural component. The two channels would be packaged together and sold to cable companies for a combined rate of $10 per month. Presumably, if the applicant had been successful, the cable company would also offer both channels as a package or 'tier' to households. This raises the question of whether pay-television channels should be offered to households in separate tiers or as one combined tier. This issue will be examined in Chapter 3.

2.1.3 Level of Payment

The only guide, provided by the CRTC's "Call for Applications for Pay Television Service", to the appropriate monthly charge per channel was that:

> In keeping with the user-pay approach to discretionary services, the commission is unwilling to see a cross-subsidy of pay television service by regular cable subscribers. The Commission is aware of the difficulties of determining the costs of a service that is distributed on facilities simultaneously used for other purposes. Nevertheless, the commission will expect applicants to propose procedures for identifying, estimating and separating these costs.[5]

Some of the implications of this statement will be considered in the next chapter. Here we confine our comments to the level of payment the pay applicants considered appropriate given this guideline. All the prices indicated are for the first year of operation. In examining the price a distinction must be made between the monthly rate paid by the subscriber and the monthly rate received by the pay-television applicant. Two of the

applicants, First Choice Canadian Communications, an applicant for a national licence, and Premiere Alberta Television Ltd., envisaged the pay-television organization setting the price to the subscriber with the cable company being paid on a per subscriber or a channel access lease rate respectively. Most of the applicants envisaged a wholesaler/retailer relationship with the cable company paying the wholesale price to the pay-television organization and then setting the retail price to the subscriber. Hence of ten applicants who suggested a price to the final subscriber, only two were suggesting that they will actually control this price. The retail price quoted by the other eight applicants was based on what they considered would be a reasonable per subscriber add-on for the cable companies. This add-on averaged a little over $4.00, ranging from $3.40, suggested by Ont-TV, to $5.40, suggested by Fiestavision, another Ontario region applicant. With this proviso, the average monthly rate to subscribers was approximately $13.00. The range was from $10.00 for Ont-TV to $20 for Premier Alberta. A number of applicants stated a wholesale price but made no assumptions about the additional rate charged by the cable companies. Hence more companies, 18 in total, provided a wholesale price, the average of which was approximately $8.00. The range was from $5 for IPTW to $10 for Worldview, a B.C. region applicant. If the average assumed add-on by cable companies were included this would give a price to the final subscriber to a little over $12.00.

As mentioned, the typical price to the subscriber of around $12 or $13 was, in most cases, based on the assumption of the pay-television applicants concerning how much cable companies can be expected to add-on to the wholesale price. As we will see in the following sub-section and in Chapter 3, if the relationship between the cable company and the pay-television organization is a wholesaler/retailer arrangement there will be a conflict in interest between the two concerning the retail price to be charged to the subscriber, with the cable company interests being served by a higher price. Hence there is reason to suppose the cable company add-on may be more than the approximately $4 assumed, and the typical retail price higher than $12 to $13.

2.1.4 The Relationship between Pay-television Organizations and Cable Companies

Most of the pay-television applicants envisaged a wholesaler/retailer relationship with the cable companies who would exhibit their programming. The pay-television organization sells wholesale, on the basis of a monthly rate per subscriber, to the cable company which determines its own 'mark-up' and hence the retail price charged to households. This is the relationship generally found in the U.S., and is the arrangement advocated by the cable companies, some of whom are themselves pay-television applicants.

The application by First Choice Canadian Communications argued that the wholesaler/retailer relationship is not desirable

because it permits the cable company to increase the retail price to its own advantage but to the detriment of the pay-television organization, and, ultimately the program producers. (The CRTC in its Call for Applications for Pay Television Service has as an objective the provision of "new opportunities and revenue sources for Canadian producers".) Instead, First Choice advocated that the pay-television organization should set the retail price and compensate the cable companies through a monthly rate per subscriber. This rate would be negotiated with ultimate arbitration, if necessary, by the CRTC. To illustrate its argument, First Choice provides the following numerical example:

Division of Monthly Revenue

with Subscriber Fees of $12 and $15

At $12.00

Total revenue (1 million subscribers at $12)	$12.0 million
Revenue retained by cable industry ($4.50 per subscriber, or 37.5%)	$4.5 million
Revenue retained by pay licensee and pay program producer ($7.50 per subscriber, or 62.5%)	$7.5 million

At $15.00

Total revenue (750,000 subscribers at $15)	$11.2 million
Revenue retained by cable industry ($7.50 per subscriber, or 50%)	$5.6 million
Revenue retained by pay licensee and pay program producer ($7.50 per subscriber, or 50%)	$5.6 million.

This example compared the scenario where the pay-television organization has control over the retail price, charges subscribers $12.00 a month, and compensates cable companies by paying them, $4.50 per subscriber, with the scenario where the cable companies set the retail price, they are assumed to choose $15 a month, and compensate the pay-television organization at a

rate of $7.50 per subscriber. It can be seen that under the $15 price the cable company receives more revenue even though the increase in price from $12 to $15 was assumed to result in a decrease in total revenue from subscribers from $12 million to $11.2 million. The decrease in total revenue from subscribers associated with the price increase in this example implies a price elasticity of more than one with the increase in price causing a more than proportional decrease in the quantity demanded. The increase in the cable industry's share of total revenue more than compensates it for the decrease in the size of the total revenue. In this example, under the wholesaler/retailer arrangement, the cable industry would be better off at a retail price of $15 than $12 as long as the number of subscribers remains above 600,000. The implications of this example will be generalized and further developed in Chapter 3.

Premiere Alberta Television Ltd. also advocated that the pay-television organization should have control over the monthly price to subscriber households. Instead of compensating the cable industry on a per subscriber basis, however, it argued for a channel leasing arrangement with content/carriage separation and equality of access at set tariffs. The implications of this arrangement are that the cable company receives a flat fee irrespective of the number of subscribers to pay-television and that again the price charged to the subscriber will be lower than under a wholesaler/retailer relationship. This will also be analyzed in Chapter 3.

2.2 The Decision

Despite concerns over the economic viability of any one pay-television system faced by other Canadian competitors the Commission approved applications for one general interest and one performing arts channel on a national basis as well as regional licensees in Alberta, Ontario, the Atlantic provinces, and British Columbia. General interest pay-television licensees are not allowed to produce their own programming or to buy it from a related company.

The Commission opted for a competitive rather than a monopolistic market structure apparently on the basis of arguments that:

> a single buyer would wield an undue advantage over Canadian as well as foreign producers and that competitive market incentives would ensure greater quality and diversity of programming, a heightened sensitivity to consumer tastes, increased funding for the Canadian production industry and more outlets for artistic expression.[6]

All applications approved were pay-per-channel and thus involved a discretionary payment. The commission noted:

> Supporters of discretionary services emphasized the need for pay television to be accountable and responsive to consumer choice. They suggested that a universal system would be imposed on consumers whether they wanted it or not and that it would therefore be insensitive to market realities. By their very nature, discretionary licensees, they contended, would be more motivated to offer attractive programming packages for which viewers would be ready to pay. It was also suggested that the licensing of discretionary services would encourage greater diversity and quality of programming as a response to viewers' demands, and provide more opportunities for the subsequent exposure of Canadian programming on

conventional television.[7]

However, the door was left open for a system of universal pay in the future. Indeed the CRTC seemed to find the concept of a universal system attractive and noted:

> A desirable way of ensuring the evolution of a distinctively Canadian pay television service may well be through the adoption of a universal pay television service ... because of its guaranteed revenue base, a universal service would have the ability to inject substantial revenues into the development of quality Canadian programs.[8]

The Commission did not consider it feasible to introduce universal pay, though, until a number of problems were resolved, one of which was the shortage of an available VHF channel on many basic cable systems. It noted that:

> This is a question that can best be considered in the context of the broader issue of the appropriate allocation of various types of cable services among available channels and the related matter of service tiering.[9]

Public hearings are to be held on this issue.

These views on the desirability of universal pay were not unanimous. A minority opinion was included which rejected this approach on the grounds that it would require people to pay for something they do not want and would provide devastating competition for discretionary pay services.[10]

To ensure non-discriminatory access to exhibition facilities no present owners of cable television systems were granted pay-television licenses. Future ownership transfers of this nature are also subject to prior approval. Advertising is not to

be permitted on pay-television.

Although all successful applicants spelled out proposed rate structures (see Table 2.1), the Commission opted to regulate pay-television rates at neither the wholesale (distributor to exhibitor) nor the retail level. The need for wholesale level rate regulation is dismissed with the statement:

> Given the discretionary nature of the services licensed in this decision, the Commission is not convinced of the need to regulate the level of such rates."[11]

Retail rate regulation was analysed in more detail with the Commission noting:

> The concerns expressed by the national general interest licensee, and others, that excessive charges by exhibitors, such as cable systems, would reduce market penetration of this new service. This, in turn, could have a detrimental impact upon financial returns to distributors and consequently on their ability to meet their objective of acquiring a substantial quantity of new, high quality Canadian programming. It may even be that some exhibitors could have an incentive to risk lower market penetration levels, and therefore lower returns to distributors, by proposing relatively high exhibition charges in an attempt to maximize their profits.
>
> On the other hand, it must be borne in mind that the services now being licensed are discretionary, and that all players involved in the chain of delivery have an incentive to ensure the successful introduction of pay television. In addition, the Commission is cognizant of the complexity, the regulatory workload and the paper burden inherent in the establishment of an effective retail rate regulation system given the difficulties in determining elasticity of demand for these new services and the different cost structures of the hundreds of potential exhibitors.
>
> Accordingly, the Commission will not at this time regulate the retail rate for pay television services. Licensees and potential exhibitors are encouraged to arrive at negotiated retail rates which compensate exhibitors for their costs and provide them with a fair

> return on their investments without undermining the Commission's objectives for pay television. Should such negotiations fail, the Commission will consider establishing an arbitration process or, if necessary, a system of rate regulation.[12]

Thus, the CRTC recognised there may be a conflict in interest between distributors (pay television organizations) and exhibitors (cable companies) and that the Commission, albeit reluctantly, may have to assume the role of arbitrator, or, as a last resort, rate regulator.

With respect to Star Channel's "request that all subscribers of the national service in Atlantic Canada also be required to buy Star Channel's service",[13] the CRTC also addressed the issue of combined pay channel tiers. The CRTC turned down "such a tied sale requirement".[14]

Table 2.1

Proposed Monthly Wholesale (Distributor to Exhibitor) Rates of Successful Pay-television Applicants

Applicant	Proposed Monthly wholesale rate per subscriber
First Choice Canadian	$7.50
Alberta Independent Pay Television	8.75 (rising to $10.35 in the fifth year)
Ontario Independent Pay	8.75 (rising to $10.35 in the fifth year)
Star Channel Services	12.00 (rising .50 per year)
Lively Arts Market Builders	8.00
World View Television Ltd.	10.00 (rising to $12.00 in years three to five)

FOOTNOTES

1 CRTC, Call for Applications for Pay Television Service, Public Notice, Ottawa, 21 April 1981.

2 Ibid, p. 3

3 Ibid, p. 6

4 Ibid, p. 8

5 Ibid, p. 7

6 CRTC, Decision CRTC 82-240, op. cit., p. 5

7 Ibid, p. 9.

8 Ibid, pp. 14-15

9 Ibid, p. 15

10 See Ibid pp. 67-70

11 Ibid, p. 31.

12 Ibid, pp. 31-32.

13 Ibid, p. 54

14 Ibid, p. 54

3. Chapter 3. Theory of Price Determination for Cable Services

In this chapter we analyze many of the issues raised in Chapter 2. Some of the analysis is relevant to our choice of variables in our empirical models in Chapters 5, 6 and 7.

In Section 3.1 we provide background by examining, in simple economic terms, the demand for cable services. Pricing of cable services is examined in Section 3.2. This includes the pricing of basic services, non-programming services, and pay services, and the implications, for the latter, of the relationship between the pay television organizations and the cable companies. Section 3.3 considers the effects on economic efficiency of different methods of pricing pay services. Section 3.4 examines tiering issues.

3.1 The Demand for Cable Services

In this section we examine the economics of the demand for basic cable services, pay services (which can be offered on a universal, pay-per-channel, or pay-per program basis), and non-programming services. Prior to this we provide background by considering the value of viewing options.

3.1.1 The Value of Viewing Options

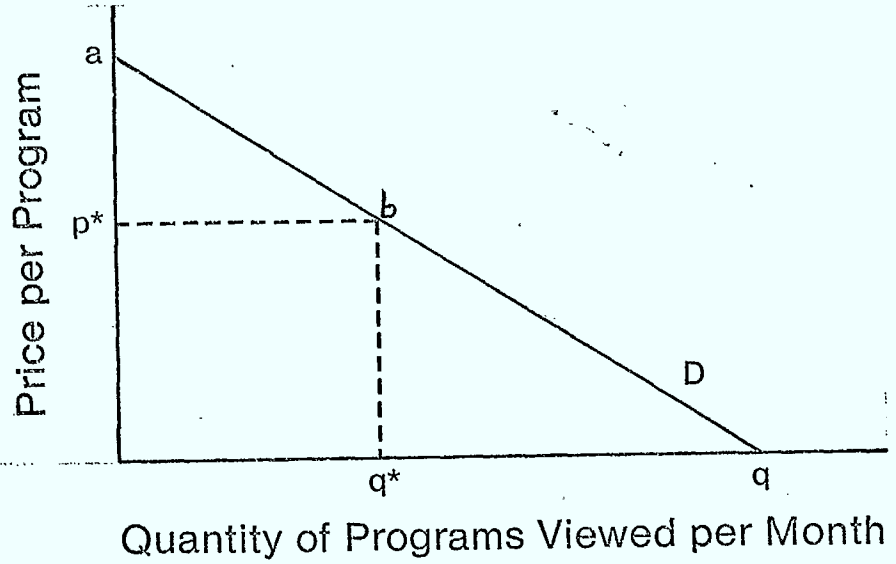
The service sold by cable-television companies can be regarded as additional viewer options in each half hour. These

extra options are provided, as a combined package, by the basic service and, in addition, will soon include pay channels. As provision of an extra channel provides an extra option, the demand for an additional channel and the demand for an additional option are synonymous.

The monthly value of an additional option to a potential subscriber is the sum of the maximum price he would be willing to pay for each of the programs viewed on that channel during the month. The value of programs viewed would be equal to the area under the demand curve, in Figure 3.1, up to the quantity viewed. For basic cable, pay-per-channel, and universal pay, the price per program is zero; and hence the quantity demanded is q and the value of programs viewed is given by area oaq. The demand curve is drawn negatively sloped indicating that the potential subscriber would be willing to pay more for some programs than others. As with demand curves for other goods, a major determinant of the location of the demand curve for program viewing on a cable channel will be the availability of substitutes. The closest substitutes are the viewing options available without becoming a subscriber to this cable channel; the more such alternatives there are available, the further to the left the demand curve and the lower the value, oaq, attached to this additional option.

Basic cable service usually provides the potential subscriber with a number of additional options per half hour through the provision of the programming of television stations

Figure 3.1 Demand, by a Potential Subscriber, for Programs on a Cable Channel.



unavailable (with satisfactory reception) over-the-air. If the basic service does provide more than one additional viewing option, this does not affect the essence of the analysis above, but the horizontal axis, in Figure 3.1, should now be interpreted as the quantity of programs viewed on the additional channels. The value of the basic service is again shown by oaq. For the basic cable service, the closest substitutes would be the over-the-air alternatives available. Ceteris paribus, the more over-the-air options there are the further to the left the demand curve for basic cable service and the lower the value of this service to the potential subscriber.

There are different modes of pricing possible for pay television. Universal pay and pay-per-channel do not charge for individual programs and hence q would be demanded and oaq would be the value attached. However, if the mode of pricing is pay-per-program, at a price of p* per program, only q* would be demanded and the value of the option would be oabq*. The most obvious substitutes for pay television are each of the over-the-air alternatives plus each of the options added by the basic cable service.

In this section we have concentrated on one determinant of the location of the demand curve for viewing on an additional channel provided by cable, namely the television programming available to the non-subscriber. The availability of other substitutes, such as video discs and tapes, theatres, and general entertainment opportunities, can also be expected to affect the location of the demand curve. For most goods or services, per capita or household income is also relevant with, for a 'normal' good, the demand curve located further to the right the higher the income.

Of course, the location of the demand curve for programs, viewed on a channel delivered by cable, also depends on the type and quality of programs offered by that channel. For example, our expectation would be that a pay channel offering primarily first-run movies would be more attractive to many potential subscribers than, say, a channel offering programming similar to a Canadian commercial channel.

3.1.2 The Demand for Basic Cable Services

To obtain basic cable services the consumer has to pay a flat fee per month. There is generally an initial installation charge as well. To simplify our analysis of the monthly rate or price we initially assume a zero installation charge.

Subscribers to basic cable services are effectively buying the opportunity to view programs shown by television broadcasting stations unavailable, or available only with poor reception, over-the-air. In most cable franchises the majority of these additional stations are American. As we have seen, *ceteris paribus* it is not the total number of channels of television broadcasting available on cable that is important to the demand for basic cable services, but rather the number of additional channels provided. Thus for an individual (or household) with access to basic cable services, his demand curve, shown as a_1q_1 in Figure 3.2, can be viewed as the demand for programs on these additional channels.

Given access to programming available only on basic cable, the quantity demanded of these programs depends on the price charged for them. But there is no price charged per program on basic cable, so the demand by the potential subscriber with demand curve a_1q_1 would be q_1. The consumer surplus (that is, the sum of the differences between the maximum price the potential subscriber would be willing to pay for each program viewed and the actual price he pays for each program viewed) the potential

Figure 3.2. Demand for Programs by a Potential Subscriber with Access.

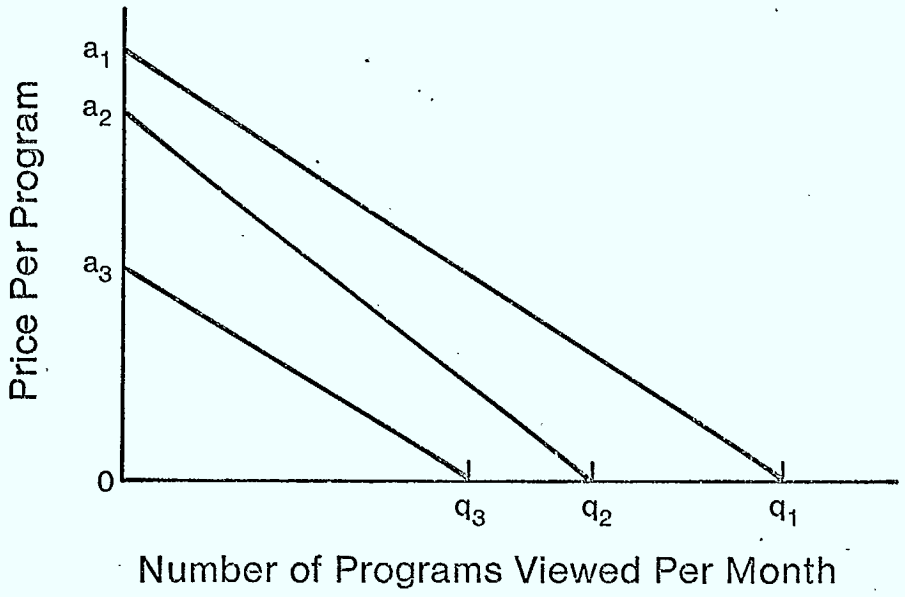
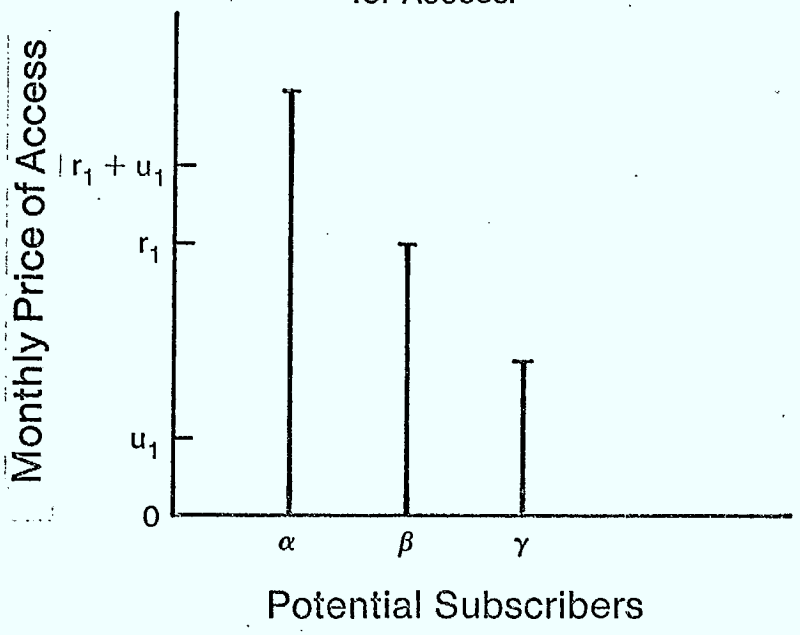


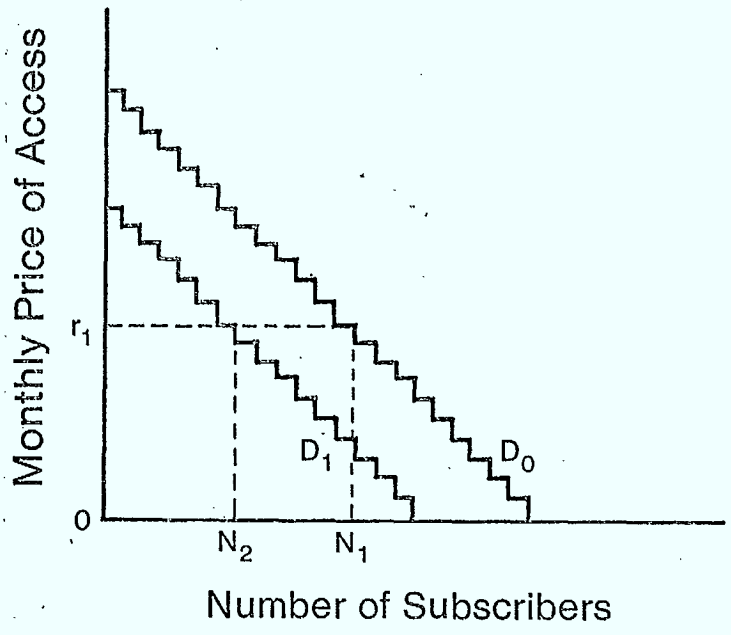
Figure 3.3. Consumer Surplus and Demand for Access.



subscriber would obtain from viewing q_1 programs at zero price is the area under the demand curve, $0a_1q_1$. We will denote the consumer surplus for this potential subscriber by S_1, that is S_1 = area $0a_1q_1$. The consumer surplus will, of course, vary from individual to individual depending on the utility or benefit obtained from viewing programs. Let us suppose there are two other potential subscribers in the market with demand curves a_2q_2 and a_3q_3 respectively. It is obvious that the consumer surplus, S_2, of potential subscriber 2, is less than S_1, and that the consumer surplus of potential subscriber 3, S_3, is less than S_2.

A potential subscriber will become an actual subscriber if his consumer surplus equals or exceeds the monthly price charged for access to basic cable. In our three potential subscriber market, where the monthly price for access is r_1, and the consumer surplus of the potential subscribers is indicated by the height of the vertical lines from alpha, beta, and gamma in Figure 3.3, individual 1 will subscribe because $S_1 > r_1$, 2 will subscribe because $S_2 = r_1$, whereas 3 will not subscribe because $S_3 < r_1$. With potential subscribers ordered by descending order of consumer surplus, as they are in Figure 3.3, we can directly derive a stepped aggregate demand curve showing the number of subscribers for any given monthly access price. For a market with a large number of potential subscribers such an aggregate demand curve is shown by D_0 in Figure 3.4. Thus at a monthly price of r_1 the number of actual subscribers is N_1.

Figure 3.4. Aggregate Demand for Access.



We now relax the assumption of a zero installation (and/or disconnection) price. An individual who would subscribe at a zero installation price would not subscribe if the sum of the present value of the net benefit received each month, $S - r_1$, the consumer surplus minus the monthly price of access, is less than the installation price. For individual 2, $S_2 - r_1 = 0$ and hence he would be a non-subscriber at any positive installation price. Thus the presence of a positive installation price will shift the aggregate demand curve downwards. The higher the installation price the fewer the number of actual subscribers at any given monthly price for access.

Let us suppose that the installation price is χ, where $\chi > 0$, and that this shifts the aggregate demand curve to D_1. From Figure 3.4 we see that at this installation price the number of subscribers is N_2 rather than N_1.

An alternative way of analyzing the effect of the installation charge is to add the monthly equivalent of the installation price to the monthly price of access. However, the monthly equivalent of a given installation price will vary with the potential subscriber's time horizon. His time horizon will depend on such matters as how long he expects to be in his current house, and how sure he is that he will wish to remain a cable subscriber. In a world of uncertainty, before subscribing to basic cable a potential consumer is not sure what value he will attain from viewing. The marginal consumer may wish to subscribe for a short, experimental period, to determine this.

To obtain an idea of how the time horizon affects the monthly equivalent of the installation charge, let us compare, using an illustrative numerical example, the monthly equivalent assuming an infinite time horizon with that assuming a one year horizon. For purposes of this example, we assume an installation charge of \$20 and an annual rate of interest of 15%. For an individual with an infinite time horizon the annual equivalent is \$20 x .15 = \$3.00, which, ignoring the time value of money within a year, is equivalent to \$0.25 a month. This is obviously very small compared with a monthly price of access of tyically around \$8.00. For an individual with a one year horizon, again ignoring

the time value of money within the year, the monthly equivalent is a much more substantial $1.67. This suggests that for the marginal subscriber, with his potentially short time horizon, the size of the installation charge may have a disproportionate effect on his decision whether or not to subscribe.

It should be noted that in this sub-section we have implicitly assumed that the individual (household) owns a television set regardless of whether he subscribes to cable. Thus it is not necessary for the present value of the net benefit received each month to exceed the price of the television set. We will continue to make this assumption throughout this section.

3.1.3 The Demand for Universal Pay

Universal pay involves a small mandatory monthly price for access on top of the monthly price for access to basic cable services. The two applicants who proposed a universal system suggested prices of $0.30 and $2.50 per month respectively. There is no price charged per program viewed on a universal channel. The potential subscriber only has the choice of subscribing to basic cable plus universal pay or of not subscribing to either. In effect, they become a combined tier.

The demand for universal pay can be considered as an extension to our analysis of the demand for basic cable. To simplify our exposition we assume a zero installation charge for both basic cable and universal pay.

Because of the zero price per program, the consumer surplus from universal pay is the entire area under the demand curve for viewing programs on this channel.

Where a potential subscriber's consumer surplus from viewing programs on the universal pay channel is denoted by J, and the monthly price of access to the universal pay channel by u, then a potential subscriber will actually subscribe to the combined tier if:

$$J + S - (r + u) \geq 0.$$

Rearranging, this condition can also be expressed as:

$$J - u \geq r - S.$$

An individual who subscribed to basic cable, before the introduction of universal pay, must have $r - S \leq 0$. Thus the condition, for subscribing to the combined tier, may be satisfied even where $J - u < 0$, that is the net benefit, the consumer surplus minus the price, from universal pay is negative.

An individual who did not subscribe to basic cable must have $r - S > 0$. Hence he may not subscribe to the combined tier even where $J - u > 0$.

To illustrate, refer to Figure 3.3 where the monthly rates for basic and universal are r_1 and u_1 respectively, and we have three potential subscribers with consumer surplus from basic cable of S_1, S_2, and S_3 respectively. We will similarly denote the consumer surplus from universal pay for the three individuals by J_1, J_2, and J_3 respectively. The monthly price for the

combined tier is r_1 and u_1. Individual 1, because $S_1 > r_1 + u_1$, will subscribe to the combined tier even if $J_1 = 0$, that is he never views a program on the universal pay channel. Individual 2, the marginal subscriber to basic cable with $S_2 = r_1$, will subscribe to the combined tier if $J_2 \geq u_1$. Individual 3, who did not subscribe to basic cable because $S_3 < r_1$, will only subscribe to the combined tier if J_3 is large enough to not only cover the direct price, u_1, but also the negative net benefit, $S_3 - r_1$, from basic cable.

With u being small and $S > r$ for most basic cable subscribers, only for the marginal subscriber will $S = r$, it seems probable that the vast majority of basic cable subscribers would subscribe to the combined tier after the introduction of universal pay. Indeed the low monthly price for access to universal pay is justified by this expectation. For those who subscribe to the combined tier even though $J - u < 0$ there is an element of cross-subsidization, with basic cable services subsidizing universal pay. There is cross-subsidization in the sense that the subscribers to the combined tier are forced to pay for universal pay, which they would not demand if it was a separate tier offered at price u, in order to get access to the basic cable services that they do want. The size of the cross-subsidy can be regarded as $u - J$ and is made up from the net benefit, $S - r$, received from basic cable services.

It is possible that an individual will subscribe to the combined tier although he did not subscribe previously to basic

cable. For such a case $J - u \geq r - S$ even though $r - S$ is positive. There would, in this instance, be a cross-subsidy of basic cable services by universal pay. We would expect such cases to be relatively few and unimportant, however.

In its Call for Applications for Pay TV Service, the CRTC stated that "in keeping with the user-pay approach to discretionary services, the Commission is unwilling to see a cross-subsidy of pay TV services by regular cable subscribers".[1] Universal pay would seem to violate this condition. It is surprising, therefore, that in its Decision on the applications, the CRTC reports:

> The Commission has found persuasive the arguments presented at the public hearings that a desirable way of ensuring the evolution of a distinctively Canadian pay television system may well be through the adoption of a universal pay television service ... . Because of its guaranteed revenue base, a universal service would have the ability to inject substantial revenues into the development of quality Canadian programs.[2]

The 'guaranteed revenue' reflects the expectation that, because of the cross-subsidy from basic cable, few basic cable subscribers would not subscribe to a combined basic cable/universal pay tier. The CRTC (and the two applicants who proposed this form of pay TV) seems to be looking at universal pay as a way of ensuring a subsidy for Canadian programming, particularly of a cutural nature, that it suspects would not be economically viable if offered as a separate tier. The inference is that the number of subscribers expected for such a pay channel if operated as a separate tier charging approximately $15 a month is sufficiently small that less revenue would be generated than

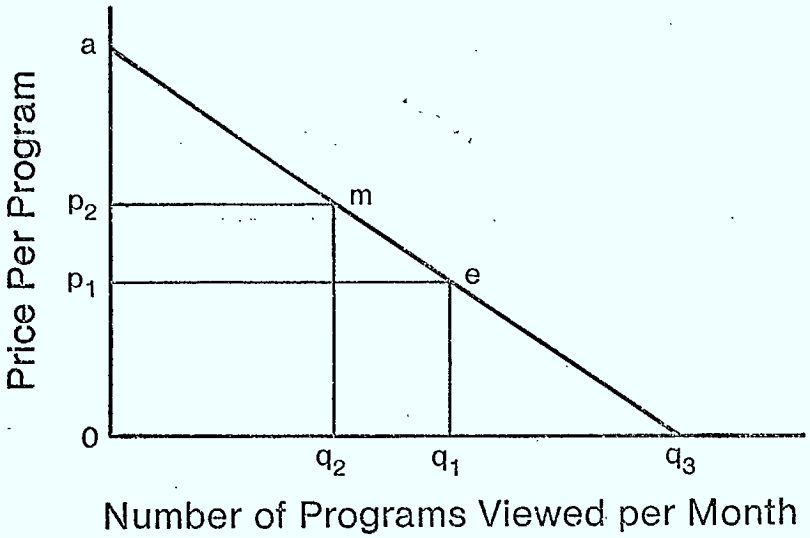
by changing all cable subscribers an extra $1 or so. The CRTC attitude to universal pay is thus contradictory to say the least.

3.1.4 The Demand for Pay-Per-Channel

Pay-per-channel involves a monthly price of access on top of the monthly price for access to basic cable services. There is no price charged per program viewed. As the service is discretionary, a separate tier, a person can subscribe to basic cable services without subscribing to the pay channel. However, assuming the pay channel is delivered by cable, and no other broadcasting undertaking is received to exhibit pay in the same market[3], a person cannot subscribe to the pay channel without subscribing to basic cable services. There may be an installation fee charged.

We first examine the demand for a pay-per-channel service by subscribers to the basic cable service. The analysis is similar to that for the demand for basic cable services. Where aq_3, in Figure 3.5, is a potential subscriber's demand curve for watching programs on a pay channel, q_3 will be demanded at the zero price charged per program and hence the consumer surplus is the area $0aq_3$. An individual will actually subscribe if his consumer surplus from the pay channel, denoted by F, is greater than or equal to the monthly price of access, j. F, which will vary from individual to individual, can therefore be regarded as the maximum price an individual would be willing to pay for access to the channel. If the installation fee for the pay channel is zero,

Figure 3.5. Demand for Pay Programs by a Cable Subscriber.



ranking basic cable subscribers in descending order of F gives an aggregate stepped demand curve for access to the pay-per-channel service. As in the case of basic cable, a positive installation charge will shift this aggregate demand curve to the left, the higher the charge the greater the shift.

A descrambler, and in some cases a converter, will be necessary to view a pay channel. For the subscriber to basic cable to subscribe to the pay channel, the net benefit from the pay channel must be greater than, or equal to, the rental rate or the monthly equivalent of the purchase price of the descrambler and/or converter.

For an individual who does not subscribe to basic cable, assuming a zero installation price for both basic cable and pay, and ignoring the cost of the converter and decoder, the condition necessary for subscription to the pay-per-channel service is:

$$F + S - (j + r) \geq 0$$

$$\text{or } F - j \geq r - S \text{ where } r - S > 0.$$

This condition is similar to that necessary for a non-subscriber to basic cable to subscribe to a combined basic/universal tier. The net benefit, consumer surplus minus price, from the pay-per-channel service, must at least offset the negative net benefit from having to subscribe to the basic service. If more than one pay-per-channel service is available then the condition becomes that the sum of $F - j$, for each pay channel where this is positive, must at least offset $r - S$. If there is an installation charge for basic cable and/or the pay channel(s) and we recognize the need for a descrambler and possibly a converter, then the present value of $F - j$ per month must not only offset the present value of $r - S$ per month but also the costs of the descrambler (and converter if required).

Where a non-subscriber to basic cable becomes a subscriber in order to obtain access to a pay channel there is an element of cross-subsidy in the sense that it is only the net benefit he receives from the pay channel that persuades him to subscribe to basic cable. If he had the choice he would subscribe to the pay channel but not the basic cable.

The non-subscriber to basic cable services has already demonstrated a lack of satisfaction from the programming service available on basic. If the programming on the pay channel were similar in nature then it would seem extremely unlikely that his consumer surplus from pay, F would not only be greater than j but offset r - S.[4] It only seems reasonable that this might occur if pay offers him something quite different that he does want. It thus seems likely that the cross-subsidy would be from a minority interest channel, such as a cultural channel, to basic cable, rather than from a general interest pay channel.

As the subscribers to basic cable services are more likely than non-subscribers to demand access to a pay channel, the location of the demand curve for access to pay is affected by the number of subscribers to the basic service. The more subscribers a system has to its basic service the further to the right the location of the aggregate demand curve for access to the pay channel. In addition, on grounds already enumerated with respect to the demand for basic cable service in sub-section 3.1.2, the fewer the number of channels offered on basic cable (including those also available over-the-air), the higher the quality of offerings on the pay channel, the fewer the other entertainment alternatives, and the greater the per capita income, the further to the right the location of the aggregate demand curve for access to a pay channel.

Finally it may be noted that, as the price of access for pay-per-channel is greater than the increase in basic rate when

universal pay is added, the number of subscribers will be fewer and the consumer surplus less.

3.1.5 The Demand for Pay-Per-Program

Under pay-per-program a subscriber is charged a price per program viewed. In addition, there will normally be a monthly price for access to at least cover additional billing and converter descrambler costs. These costs are incurred as a result of subscription and do not vary according to the amount of viewing by the subscriber. In the absence of an access charge there would be no deterrent to becoming a subscriber and money would be lost on some subscribers who are very light viewers. The literature also suggests that two-part tariffs are a profitable strategy from demand side considerations.[5] This would suggest a likely access price in excess of the incremental costs of subscription. This monthly price of access can be expected to be considerably less than for pay-per-channel, however, where it is the sole source of pay TV revenue.

If the price per program, in Figure 3.5, is set at p_1, then q_1 programs will be demanded. The consumer surplus is area p_1ae, the difference between $oaeq_1$, the maximum a subsciber would be willing to pay for q_1 programs, and op_1eq_1, the amount the consumer actually pays for q_1 programs. If the retailer, usually the cable company, although it could be the pay TV organization, charges different prices for different programs, for example more for a first run movie than a variety special, then he may capture

some of this consumer surplus. It should be noted that, compared to pay-per-channel, area q_1eq_3 represents a welfare loss. It is consumer surplus under pay-per-channel but is lost under pay-per-program because subscribers forego $q_3 - q_1$ because they are not willing to pay price p_1 for these additional programs.

A subscriber to basic cable services will demand access to pay-per-program if his consumer surplus, denoted by H, is greater than or equal to the price of access, denoted by w. If we rank cable subscribers in descending order of H we can again derive their aggregate stepped demand curve for access to the channel, with the height of the steps equalling H. This is shown, assuming a price per program of p_1, in Figure 3.6, as D_1. We see that at a monthly price of access of w_1, N_1 subscribers to basic cable will wish to subscribe to the pay-per-program channel, whereas at a monthly price of access of w_2, N_3 will wish to subscribe. Of course, if no access price is charged the number of subscribers will be N_4.

If the price per program is increased to p_2, our subscriber, in Figure 3.5, will decrease his demand for programs to q_2 and his consumer surplus will decrease to area p_2am. Thus his consumer surplus H will decrease. This will be true of all cable subscribers and the result will be to shift the aggregate demand curve for access to the pay channel downwards. In Figure 3.7, D_2 represents the aggregate demand curve for access at a program price of p_2, and the number of subscribers falls to N_2 at a monthly price of access of w_1.

Figure 3.6. Aggregate Demand for Access to a Pay Channel.

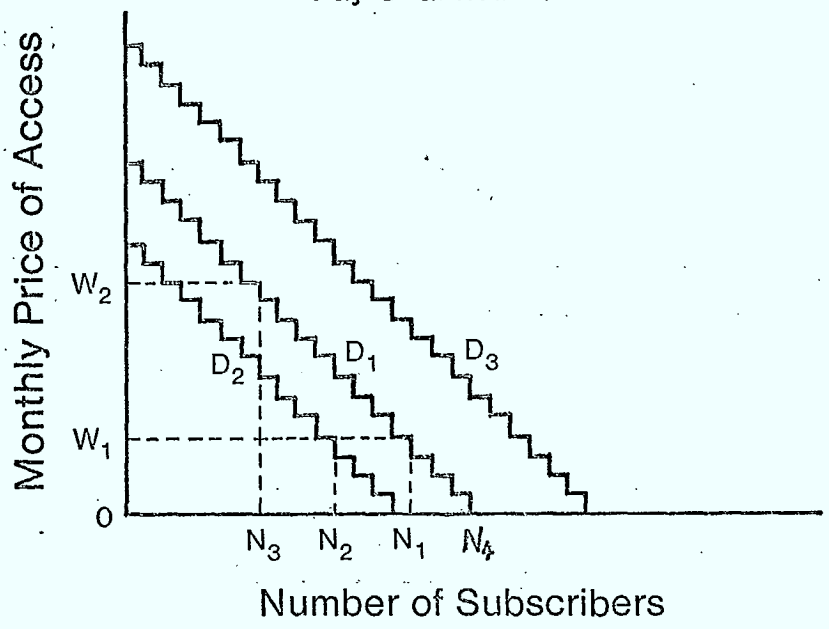
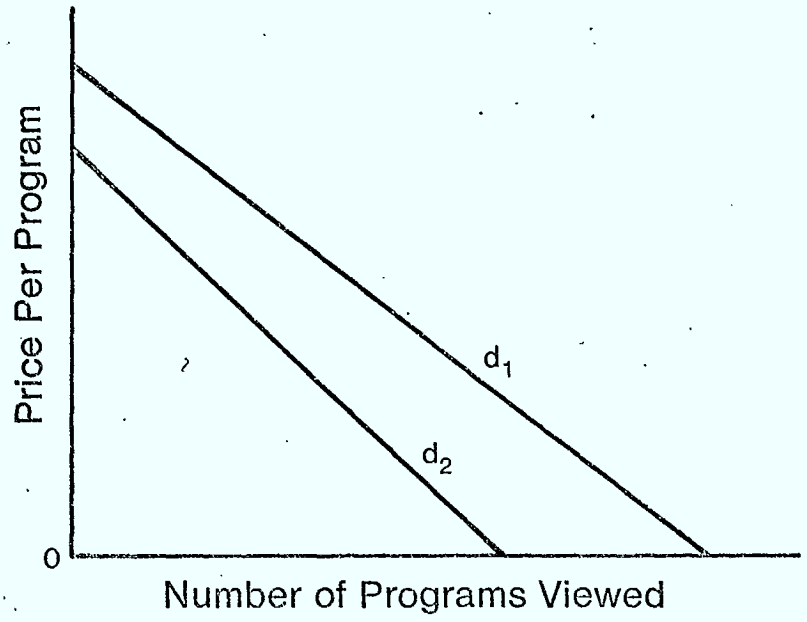


Figure 3.7. Aggregate Demand for Pay Programs.



Pay-per-channel can be viewed as a special case of pay-per-program where the price of a program is zero. At a zero price per program the aggregate demand curve for access shifts upwards and is represented by D_3 in Figure 3.6.

However, not only does the price per program affect the demand for access but the price of access affects the aggregate demand for viewing programs.[6] Let us suppose the price per program is p_1, and hence the aggregate demand curve for access is D_1. If the monthly price of access is w_1, then the number of pay subscribers is N_1, but if the monthly price of access is w_2, the number of pay subscribers would only be N_3. The aggregate demand for viewing programs at any given price per program will be equal to the number of subscribers multiplied by the number of programs each subscriber views. But, as we have seen, the number of subscribers is a function of the access price. Hence an increase in access price from w_1 to w_2 causes a leftward shift of the aggregate demand curve for viewing pay programs from d_1 to d_2 in Figure 3.7. The horizontal intercepts of these demand curves are relevant to pay-per-channel where the price of each program is zero.

For the non-subscriber to basic cable to become a subscriber to the pay-per-program channel, and by necessity, basic cable services, then:

$$H + S - (w + r) \geq 0$$

$$\text{or } H - w \geq r - S, \text{ where } r - S > 0.$$

This is the same form of condition as for pay-per-channel and the discussion of the latter again applies.

3.1.6 The Demand for Non-Programming Services

Non-programming services would be offered on a discretionary basis to basic cable subscribers. For services such as fire alarms and burglar alarms it would only seem to be practical to charge solely on the basis of a price for access to the service. Other services, such as videotex or teletex, could also charge in this way or alternatively on the basis of a price per unit consumed as well as a (smaller) price for access. Dependent on the method of charging for such services the analysis of section 3.1.4 or 3.1.5 above applies.

A subscriber to basic cable services would subscribe to a non-programming service if his consumer surplus from monthly access to the service is greater than or equal to the sum of the monthly price of access and the monthly equivalent of the purchase price of the hardware necessary to use the service, for example the terminal necessary for Telidon. The latter is substantial. For the non-subscriber to basic cable services to become a subscriber to a combined basic cable/non-programming service tier, however, would require that the net benefit (consumer surplus minus access price minus monthly equivalent of the purchase price of the hardware) from the non-programming service at least offset the negative net benefit from having to also subscribe to the basic cable service. For such an individual

the non-programming service would, in effect, be subsidizing the basic cable service.

3.2 Pricing of Cable Services

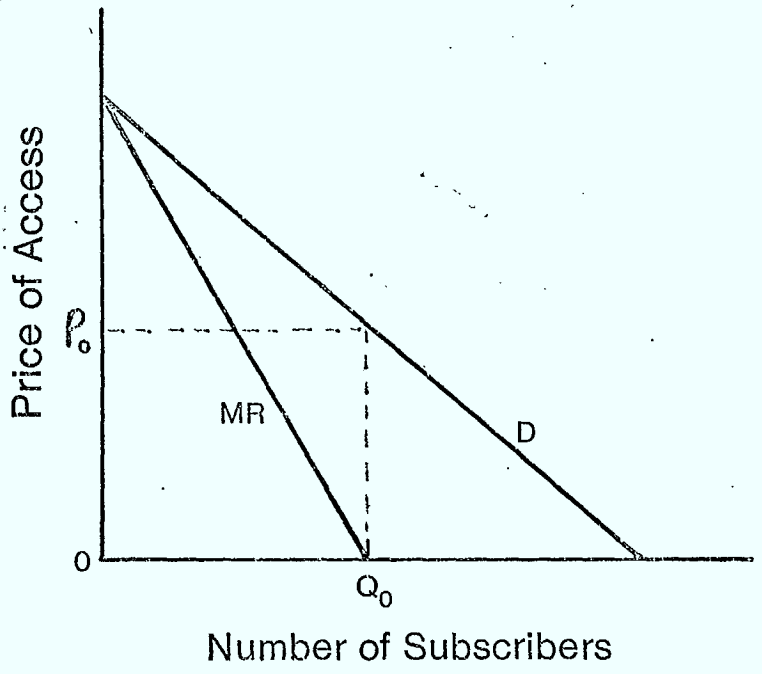
This examination of pricing of basic cable services, non-programming services, and pay services is based on the usual microeconomic behavioral assumption of profit maximization.

3.2.1 Pricing of Basic Cable Services

A mature cable system, with trunk lines, feeder lines, headend equipment and so on in place, would incur only minor incremental costs as a result of an additional subscription. Usually an installation charge covers the initial hook-up cost, and the only remaining marginal costs would be the extremely small costs of billing and maintenance with respect to the tapoff from the feeder line and the new line running into the house. In addition, even if, for example, $20 of the hook-up cost is not recouped immediately by an initial hook-up charge, this is still only equivalent to $0.25 a month at an interest rate of 15%.

If we regard the marginal cost as zero then profits will be maximized by charging a monthly price of access to basic cable of P_0 in Figure 3.8. At this price MR = MC = 0. The implication is that the point price elasticity of demand is unity. The effect of billing and incremental maintenance costs is that the price would be very slightly above P_0, the number of subscribers a little

Figure 3.8. Price of Basic Cable Services.



less than Q_0, and the price elasticity just above unity. It should be noted that the price identified here is that associated with profit maximization. To the extent that the basic cable price is a quasi-regulated price it might be expected to be lower than this.

An alternative presentation is in terms of calculus. Again ignoring the minor variable costs, if P is the price of the basic cable service, Q is the number of subscribers to the basic service, T is the total fixed costs of providing the service, and V is the profit to the cable company from providing the basic service, then:

$$V = PQ - T.$$

Assuming a linear demand curve, $P = a - bQ$, and substituting for P gives:

$$V = aQ - bQ^2 - T.$$

To find the profit maximizing output, we find the first derivative and set it equal to zero:

$$dV/dQ = a - 2bQ = 0.$$

Rearranging gives:

$$Q = a/2b.$$

Substituting for Q in the demand equation gives:

$$P = a - b.a/2b.$$

Simplifying, we find:

$$P = a/2.$$

As the profit maximizing price for basic cable services is equal to a/2 we see that it depends only on the vertical axis intercept of the demand curve. A change in any variable that causes an increase in "a" will increase the profit maximizing price. In Section 3.1.2 of this chapter we identified some variables that can be expected to affect the location, and hence the value of "a", of the demand curve for access to the basic cable services. Following that discussion we would expect the fewer the number of channels available over-the-air, the more additional channels provided by basic cable, the lesser the other entertainment opportunities, and, assuming it is a "normal" good, the greater the per capita income, then the higher the price for cable services. Hence variables to capture these influences will be included in the models used, in Chapters 5 and 6, to estimate the price of basic cable services.

3.2.2 Pricing of Non-Programming Cable Services

Where the non-programming service is charged solely on the basis of a price for access and the marginal cost of providing access to an additional subscriber is virtually zero, the analysis applicable is exactly the same as for basic cable services and the profit maximizing price is again a/2.

Where the marginal cost of providing access to an additional subscriber is not zero then V, the profit from providing the non-programming service, is given by:

$$V = PQ - T - MQ$$

where M is the constant marginal cost of providing access to an additional subscriber, T is the total fixed costs associated with providing the service, P is the price of access to the service, and Q is the number of subscribers to the service. Assuming a linear demand curve, $P = a - bQ$, for the non-programming service, and substituting gives:

$$V = aQ - bQ^2 - T - MQ.$$

Profit maximization implies:

$$dV/dQ = a - 2bQ - M = 0.$$

Rearranging and simplifying gives:

$$Q = (a - M)/2b$$

Substituting for Q in the demand equation gives:

$$P = a - b(a - M)/2b.$$

Simplifying gives:

$$P = (a + M)/2.$$

For some non-programming services, such as Telidon, it is practical to charge on a usage basis rather than solely for access. If this approach is followed and only a small charge for access is made in order to cover costs to the cable company which vary with the number of subscribers, rather than the usage by an individual subscriber, then the profit maximizing price, assuming a linear demand curve, for actually using the service is given again by:

$$P = (a + Y)/2$$

where Y is the incremental cost associated with the consumption of a unit of service and "a" is the vertical axis intercept of the demand curve for using the service.

3.2.3 The Pricing of Pay TV Services and the Implications of Alternative Relationships between Pay TV Organizations and Cable Companies

The applications envisaged three types of relationship. The first, supported by First Choice, envisaged the pay-television organization as determining the price to the subscriber and paying the cable company a set monthly fee per subscriber. The second scenario, assumed by most of the applicants, envisaged a wholesaler/retailer relationship between pay-television and cable, with cable, as the retailer, paying the pay-television organization, the wholesaler, a set monthly fee per subscriber and determining the price to the subscriber. A third scenario, supported by Premiere Alberta Television Ltd., envisaged that the

pay-television organization would set the price to the subscriber and lease the channel from the cable company at a set tariff.

We will examine the profit maximizing price charged to the subscriber under each of these scenarios assuming, for simplification, a linear demand curve and an absence of any costs other than under scenarios 1 and 3, the payment to the cable company, and under scenario 2, the payment to the pay-television organization. The effect of relaxing this cost assumption will then be examined.

Where P_1 represents the price to the subscriber under scenario 1, Q is the number of subscribers, J is the rebate per subscriber per month paid to the cable company, and V_1 is the profit of the pay-television organization:

$$V_1 = P_1Q - JQ$$

Assuming a linear demand curve $P_1 = a - bQ$ then:

$$V_1 = aQ - bQ^2 - JQ$$

To find the profit maximizing output we set the first derivative equal to zero:

$$dV_1/dQ = a - 2bQ - J = 0.$$

Rearranging and simplfying gives $Q = (a - J)/2b$.

Substituting for Q in the demand equation gives:

$$P_1 = a - b[(a - J)/2b]$$

Simplifying gives: $P_1 = (a + J)/2$.

Under scenario 2, where P_2 represents the price to the subscriber under scenario 2, K is the wholesale price per

subscriber per month paid to the pay-television organization, and V_2 is the profit of the cable company,

$$V_2 = P_2Q - KQ$$

The profit function of the cable company is obviously of the same kind as that faced by the pay-television organization in scenario 1, and similarly the profit maximizing price is given by

$$P_2 = (a + K)/2.$$

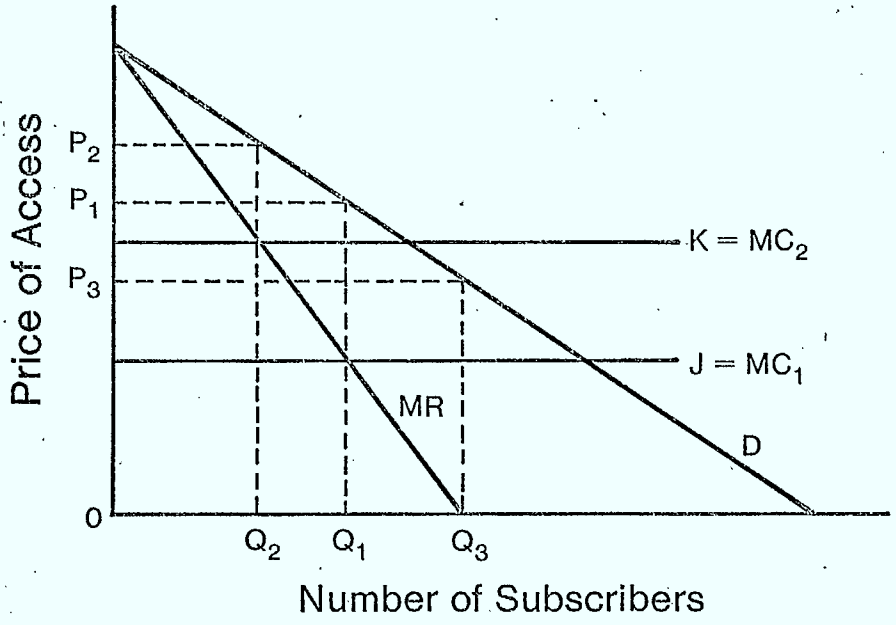
Hence the relative size of P_1 and P_2 is dependent on the relative size of J (the rebate per subscriber per month paid to the cable company) and K (the wholesale price per subscriber per month). In the applications the average value assumed for J was just over \$4.00 and that for K about \$8.00. Recent reports suggest that at introduction of pay the J:K ratio will be about 45:55.[7] Thus the evidence is that $J < K$. As the costs of programming have to be paid by the pay organization and the cable company has no comparable expenditure from exhibiting pay television this is entirely reasonable. Thus we assume $J < K$ and hence the implication is that $P_1 < P_2$. This is shown graphically in Figure 3.9. If, for illustrative purposes, the value of J is taken as \$4.00, K as \$8.00, and a, the vertical axis intercept of the demand curve, is assumed to be say \$24, then

$$P_1 = (24 + 4)/2 = \$14$$

$$P_2 = (24 + 8)/2 = \$16.$$

Under scenario 3, where P_3 represents the price to the subscriber, F is the lease payment per month paid by the pay-television organisation to the cable company, and V_3 is the

Figure 3.9. Price to the Pay Channel Subscriber Under Aternative Scenarios.



profit to the pay-television organization:

$$V_3 = P_3Q - F$$

Assuming a linear demand curve $P_3 = a - bQ$ then:

$$V_3 = aQ - bQ^2 - F$$

Profit maximization implies:

$$dV_3/dQ = a - 2bQ = 0$$

Rearranging gives:

$$Q = a/2b$$

Substituting for Q in the demand equation gives:

$$P_3 = a - b[a/2b]$$

Simplifying

$$P_3 = a/2$$

Thus P_3 is the lowest of the three prices. In Figure 3.9 it is

the price associated with a marginal revenue (MR) of zero. As the lease payment is fixed (i.e. does not vary with the number of subscribers), marginal cost is zero and profits are maximized by charging the price that maximizes total revenue. The level of a fixed cost does not affect the profit maximizing price. With a = $24, as assumed in the numerical example, P_3 would equal $12.

We now relax the assumption of no costs other than the payment to the cable company for exhibiting, under scenarios 1 and 3, and the payment to the pay-television organization under scenario 2. As we have seen, other fixed costs will have no effect on price. However, there will be other variable costs such as additional billing costs. There is evidence that these costs are small. Coaxial Analysts Incorporated, a consulting firm with extensive experience in the introduction of pay television in the United States, has estimated that the typical incremental operating costs of cable companies in the United States in a mature year are around $0.50 per subscriber per month.[8] In addition to the cost of billing customers, this figure includes costs of marketing, servicing and repairs, and the cost of disconnecting customers who do not wish to continue the service. Cable companies can be expected to charge separately for disconnection in order to deter "churn". At least one firm (Capital Cable in Edmonton) has even gone so far as to levy a separate administrative charge on pay-television customers to cover billing costs. Also, the marketing costs of mature systems need not vary directly with the number of subscribers. Thus $0.50

would seem, if anything, a high estimate of the additional marginal cost. It is worth noting that there is no reason to suppose billing costs would be higher under one scenario than another. For example, First Choice, in proposing scenario 1, indicated that billing would still be done by the cable companies, only under this scenario the cable companies would be acting as the agent for the pay organization in this regard. Thus other variable costs such as billing costs, will shift each of the marginal cost (mc) curves, in Figure 3.9, up by a similar small amount and result in increases in price under each scenario. For example, in scenario 3, the profit maximizing price will be slightly higher than the price which maximizes total revenue. Thus the absolute price level will be a little higher under each scenario but our analysis of relative prices is still valid.

All indications are that scenario 2, the wholesaler/retailer relationship between pay-television organizations and cable companies, will essentially be the one applicable when pay is introduced into Canada. This is the scenario favoured by the cable companies and the relationship already established in the U.S. In Chapter 2 we saw that the CRTC, in its Decision, encouraged negotiation of the retail rate between pay organizations and exhibitors. In the early years the cable companies appear to have the much stronger bargaining hand as each, in the main, profitable and well-established, cable company 'negotiates' a retail and wholesale price with the three infant

pay systems. The CRTC appears to believe that its willingness to license non-cable broadcasting undertakings to exhibit pay-television, including the possibility of more than one license in the same market,[9] introduces an element of competition that increases the bargaining power of the pay organizations. In the initial years, at least, there is little reason to expect there will be any real competition between exhibitors. The cable companies have their infra-structure in place and the incremental costs, such as those associated with an earth station to receive satellite transmission of pay signals, is relatively small. It is difficult to imagine alternative methods of exhibition, such as STV, being able to establish themselves and compete, and difficult to believe such potential competition will have any significant effect on the retail price. Hence, in the early years, we anticipate the 'negotiated' price will be close to P_2. In the not too distant future, however, this might change. For example, improvements in technology might permit the price of small satellite dishes to come down sufficiently that a substantial portion of households own one. If this happens then DBS exhibition would be a viable alternative and the bargaining power of the pay organizations would be much greater so that they could expect to be able to negotiate retail rates for cable exhibition significantly below P_2. They might even be successful in imposing a relationship closer to scenario 1 and its associated retail price.

Some recent evidence supports our contentions that, at least initially, the cable companies have the much stronger bargaining position and that the retail prices at the introduction of pay television will reflect this. As we noted in Chapter 2, the applications by potential pay organizations tyically envisaged a retail price of $12.00 to $13.00. This figure was comprised of a wholesale price received by the pay organization of about $8.00 and a belief, by the applicants, that the appropriate cable company add-on was $4.00 or a bit more. We observed in Chapter 2, and our analysis in this section confirms this expectation, that a higher retail price, with an associated higher margin per subscriber, is likely to be in the interest of the cable companies. Consistent with this and our belief that the cable companies are in the stronger bargaining position, we find that it appears the actual price for pay channel at introduction will be about $15.00 to $16.00. For the two national channels this compares to $12.00 envisaged by the First Choice application ($7.50 to First Choice and $4.50 to the cable company) and $12.50 envisaged by Lively Arts ($8.00 to Lively Arts and $4.50 to the cable company). It has recently been reported that, at the advent of pay television, about 45% of the subscriber fee will be kept by cable companies.[10] This is compatible with the cable companies retaining most of this addition in subscriber fees and consistent with them deciding they will be better off with a higher retail price and, hence, a higher margin per subscriber on a smaller volume of subscribers. It should be recalled that, by coincidence, the First Choice application provided a numerical

example, reproduced and discussed in Chapter 2, that showed, under assumed but reasonable demand conditions, that a cable company would be better off with a retail price for a pay channel of $15 per month than a price of $12 per month whereas the reverse would be true for the pay organization.

3.2.4 The Determinants of the Price for a Pay Channel

Under the three scenarios we found, in 3.2.3, that assuming a linear demand curve, $P = a - bQ$, for access to a pay channel, the profit maximizing prices, respectively, are:

$$P_1 = (a + J)/2$$

$$P_2 = (a + K)/2$$

$$P_3 = a/2$$

where J and K are constant marginal costs. Thus, for a given marginal cost, we see that under each scenario, price is a function of "a", the vertical axis intercept of the demand curve; the greater "a" the higher the price. Hence any variable that can be expected to affect the value of "a" can be expected to affect price.

In Section 3.1.4 we identified some variables that can be expected to affect the location, and hence the value of "a", of the demand curve for access to a pay channel. We would expect "a" to be larger, and hence the monthly price of access higher, the greater the number of subscribers to the basic cable service, the fewer the number of channels available on basic cable (including those also available over the air), the fewer the other

entertainment opportunities, and the greater the per capita income. Thus these variables, or proxies for them, will be considered in our pay price model to be estimated in Chapter 7.

3.3 Economic Efficiency and the Pricing of Cable Services

With respect to the provision of television programming the literature indicates two competing concepts of economic efficiency and competing criteria with respect to the price that promotes such economic efficiency.

One strand of thought promotes marginal cost pricing efficiency with consumers charged the marginal cost associated with their viewing of an additional program. Thus Samuelson states:

> Here is a contemporary instance. The Federal Communications Commission is now trying to make up its mind about permitting subscription television. You might think that the case where a program comes over the air and is available for any set owner to tune in on is a perfect example of my public good. And in a way it is. But you would be wrong to think that the essence of the phenomenon is inherent in the fact that the broadcaster is not able to refuse the service to whatever individuals he pleases. For in this case, by use of unscramblers, it is technically possible to limit the consumptions of a particular broadcast to any specified group of individuals. You might, therefore, be tempted to say: A descrambler enables us to convert a public good into a private good; and by permitting its use, we can sidestep the vexing problems of collective expenditure, instead relying on the free pricing mechanism.
>
> Such an argument would be wrong. Being able to limit a public good's consumption does not make it a true-blue private good. For what, after all, are the true marginal costs of having one extra family tune in on the program? They are literally zero. Why then prevent any family which would receive positive pleasure from tuning in on

> the program from doing so? Upon reflection, you will realize that our well-known optimum principle that goods should be priced at their marginal costs would not be realized in the case of subscription broadcasting. Why not? In the deepest sense because this is, by its nature, not a case of constant returns to scale. It is a case of general decreasing costs. So long as increasing returns prevail in the actual range of consumption, we know that perfect competition will not be self-preserving and market behavior is unlikely to be optimal.'[11]

Similarly, Ohls argues:

> Once the programs have been created and sent over a system with channels and programs fixed, the marginal cost of having an additional subscriber tuned into them is zero. Hence in a completely optimal world, actual viewing time would be priced at zero."[12]

Finally, to quote from a more recent paper by Baldwin, Wirth and Zenaty:

> Because the cost of producing a public good is independent of the number of persons who consume it, the marginal cost of allowing one more person to consume the good is zero. Economic efficiency therefore requires that the price of the public good be set equal to this marginal zero cost. Consequently, the pay cable (both per-program and per-channel) method of program delivery is flawed by a 'zero price inefficiency'.'[13]

Thus marginal cost pricing efficiency in the context of the provision of television programs that are a public good with a zero short-run marginal cost, suggests that a price of zero should be charged. Free, advertising sponsored, television is consistent with this notion of efficiency.

The other concept of efficiency is program type efficiency. It entails the provision of the number and mix of programming that maximizes the value of television services and requires an optimal allocation of resources "in the first instance to

television, and secondly, within television, among types of programs".[14] This concept of efficiency has been promoted by authors such as Minasian and Goldberg.[15] The pay-per-program method of pricing is consistent with this concept of efficiency as:

> A subscription system allows "proportional" representation, since rates take different weights (different prices paid for different kinds of programs) and reveal the voters' subjective evaluation of the program ... (it) enables individuals, by concentrating their dollar votes to overcome the "unpopularity" of their tastes.[16]

The concensus in the literature is that in the public good case the two concepts are in conflict. For example, Noll, Peck and McGowen state:

> The nature of a television broadcast precludes a solution which meets all the efficiency criteria as satisfactorily as does a prefectly competitive industry producing a private good. Leaving aside the problem of income distribution, no structure will both ensure equality of price and marginal cost and produce the socially most desirable mix and number of programs.[17]

Similarly, Ohls sums up as follows:

> The key question ... is whether the efficiency gains produced by obtaining information through the use of a pricing mechanism outweigh the efficiency losses resulting from the fact that the price will exclude poential viewers who could have watched the program at zero resource cost.[18]

In the same context Baldwin, Wirth and Zenaty state that "since these efficiency criteria are contradictory, there can be no first best solution to the problem".[19] Finally, Samuelson writes:

> The merits of or demerits of subscription TV cannot be settled by an appeal to abstract reasoning or principles. Imperfections of one arrangement must be weighed against imperfections of another. Value judgements must enter into the final resolution.[20]

The approach we adopt, in this section, to assessing the relative merits, from an efficiency standpoint, of universal pay, pay-per-channel, and pay-per-program, is that advocated by Samuelson.

3.3.1 Marginal Cost Pricing Efficiency

Television programs are a public good as a television program costs the same to produce and distribute irrespective of the number of viewers who choose to watch it. Hence the marginal cost, to the pay television network and the cable company and to society, of one more viewer for a particular program is zero. Pricing efficiency requires that when the marginal cost is zero the price should also be zero.

Pay-per-program television obviously violates this pricing rule. It is inefficient because consumers who would like to watch the program (that is, would choose to view at zero price), but are not prepared to pay the price asked, will lose the utility or consumer surplus they would have obtained by viewing. This loss was identified in Section 3.1.5 of this chapter.

Universal pay is relatively efficient as few people can be expected to drop cable because of the small mandatory monthly charge, and for those consumers who keep cable the cost of viewing an additional program on the universal pay channel is zero.

Pay-per-channel is more price efficient than pay-per-program but less than universal pay. For cable households who choose to pay the monthly flat fee to subscribe to the pay channel, the price of watching an additional program is zero. Hence they will watch all programs giving them a positive utility. However, non-subscribers will forego this utility as the payment of the monthly flat-fee is a pre-condition to being able to view.

3.3.2 Program Type Efficiency

Programming efficiency is satisfied by pay-per-program because, through the price they reveal they are willing to pay, viewers can indicate the intensity of their demand for an individual program. Pay-per-program can thus be expected to foster minority programming as long as the intensity of demand by minority-interest viewers is sufficient to provide enough revenue to make production of such programming economically viable.

The opposite extreme is 'free' advertising sponsored television where the only concern of the advertiser is whether a viewer watches a program and where the intensity of his demand for such a program is irrelevant. As is well known, this approach promotes common denominator programming.

Universal pay television provides very little information about the intensity of demand for different types of programming. The only method consumers have of voting against the programming on the universal channel is to refuse to have cable and hence

forego basic cable services as well. As we have seen in Section 3.1.3 of this chapter, because the mandatory monthly charge for universal pay would be small and because most subscribers to basic cable are enjoying a net benefit from these basic services, very few subscribers to basic cable are likely to vote against the combined basic/universal tier even if they do not approve of the programming shown on the universal channel. Hence this threat is not substantial enough to influence the programming offered on a universal pay channel and this method of pay television cannot be expected to promote programming efficiency.

Pay-per-channel does not promote programming efficiency as effectively as pay-per-program because consumers do not vote for individual programs but, in their decision whether or not to subscribe to the pay channel, they do vote for the package of programs offered by the pay channel network. If the pay channels opt for specialized formats the loss of programming efficiency will not be serious because, by voting for a particular pay channel system, the subscriber is voting for the type of programming offered by that system. In the United States the pay channels have become increasingly single format with channels specializing in feature films, adult movies, cultural events, sports, news, and minority language programming. The applications for Canada display a reasonable degree of specialization. In addition, in support of the contention that pay-per-channel may not be much less program efficient than pay-per-program, we note that the vote for an individual program under pay-per-program is

made without adequate information as consumers cannot properly evaluate an individual program before viewing it. In effect, even under pay-per-program, it can be argued that a consumer is often voting for a program type rather than for an individual program.

3.3.3 Summary and Conclusion

None of the alternative models of pay television meet both criteria for economic efficiency. Pay-per-program is program efficient but in terms of marginal cost pricing efficiency is the worst of the three alternatives. Universal pay is relatively marginal cost price efficient but is the most inefficient from a programming viewpoint. Baldwin, Wirth & Zenaty conclude that because pay-per-program is efficient in one respect whereas pay-per-channel is efficient in neither "obviously per-program pay cable is more economically efficient than per-channel pay cable".[21] However, as there is a trade-off between the two efficiencies and pay-per-channel is superior in terms of pricing efficiency, no such conclusion is self-evident. Indeed we have argued that pay-per-channel, while less program efficient than pay-per-program, may still rank reasonably well in this respect. In addition it is considerably more price efficient.

Consumer attitudes to flat-fee and measured rate pricing alternatives is of relevance to the pay-per-channel versus pay-per-program debate. Some evidence of these attitudes, with respect to charging for local telephone service, is provided by Mitchell. In States of the U.S. where there has been a choice,

Mitchell reports that a "significant number of subscribers take the flat rate at usage levels well below the monthly breakeven point".[22] Two possible reasons for this are put forward. First, consumers do not know beforehand what their demand will be in a month and may prefer a certain flat-fee payment to an uncertain, fluctuating one. Second, consumers may not wish to feel 'cost-conscious' every time they use the service. We suggest that this experience is also relevant to pay television. Indeed, it may go a long way to explaining the relative lack of success of attempts to introduce pay-per-program in the United States.

As there is a trade-off in efficiencies, no firm conclusion can be reached with respect to the relative merits of pay-per-channel and pay-per-program. Our own judgement is that, if the pay channels become very specialized, the balance may be slightly in favour of pay-per-channel. There is also some evidence, in the context of telephone services, that consumers prefer flat fee to measured rate pricing. In addition, of course, the technology needed to measure program viewing makes pay-per-program more expensive.

3.4 Tiering

This section considers firstly the implications of combined tiers of pay channels and, secondly, the more general issue of the optimal approach to tiering.

3.4.1 Separate or Combined Tiers of Pay Channels

Our analysis so far has assumed that there would be a separate access price for each pay channel. An alternative is a combined tier of two (or more) pay channels which would involve a single monthly price of access with the consumer having the option to subscribe or not to this combined tier. A tier comprised of two channels was proposed by Astra-Bellevue Pathe. Also Star requested that, in Atlantic Canada, their channel be offered as a combined tier with a national general-interest pay channel; the CRTC turned this request down.

This issue can also be analyzed in terms of the two criteria for economic efficiency. Particularly if the combined tier includes channels offering different program formats, which is the case with the application by Astra-Bellevue Pathe for a general-appeal channel and a cultural channel, then this approach is less program efficient than having separate tiers. Separate tiers are more program efficient because they allow consumers to vote for the programming offered on one channel but against the programming offered on the other. The combined tier prevents consumers making this distinction. If consumers choose to subscribe to the combined tier, their decision provides the pay television network with no information about the relative demand for the format on each individual channel within the tier.

The implications for pricing efficiency are less straightforward. The question is whether more programs will be

watched on two channels if they are in a combined tier or if they are in separate tiers.

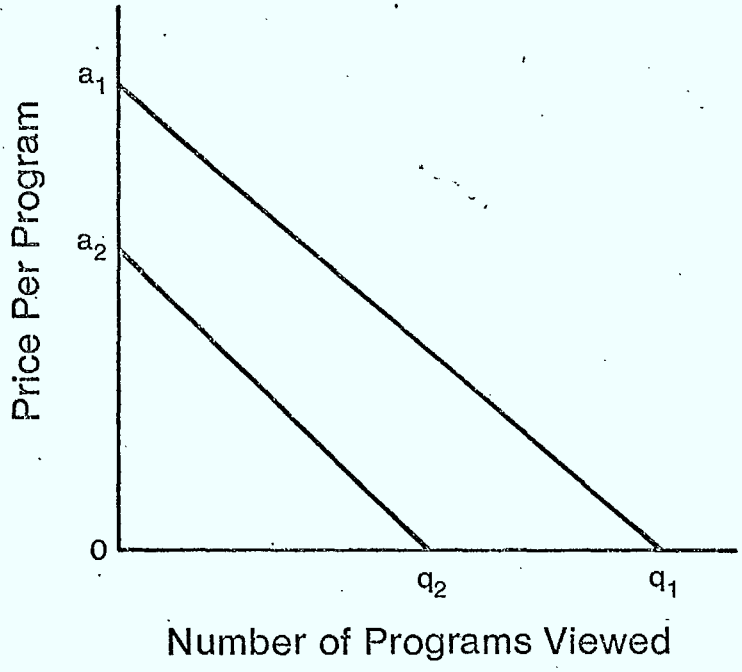
To simplify the analysis of this question we assume a combined tier of two pay channels with a monthly price of access equal to the sum of the price of access that would be charged for each channel if they were operated as separate tiers, a zero price per program, and zero installation charge.

Suppose we have a basic cable subscriber with demand curves, in Figure 3.10, of a_1q_1 for watching programs on the first channel and a_2q_2 for watching programs on the second channel. If he has access, his consumer surplus would be oa_1q_1, denoted by F_1, from viewing q_1 programs on the first channel, and oa_2q_2, denoted by F_2, from viewing q_2 programs on the second channel. If the price of access to the combined tier is $j_1 + j_2$, where j_1 and j_2 are the prices, respectively, that would be charged for the two channels if they were operated as separate tiers, then the basic cable subscriber would subscribe to the combined pay tier if:

$$F_1 + F_2 - (j_1 + j_2) \geq 0.$$

If $F_1 - j_1 > 0$ and $F_2 - j_2 < 0$, or if $F_1 - j_1 < 0$ and $F_2 - j_2 > 0$, the individual may[23] or may not subscribe to the combined tier, depending on whether the inequality above is satisfied, whereas he would subscribe to one of the channels if they were operated as separate tiers. Thus, when aggregated for all basic cable subscribers, we cannot determine whether more or fewer programs will be viewed on the pay channels if they are offered

Figure 3.10. Demand for Programs on Two Pay Channels.



as a combined tier rather than as separate tiers.

With their distinct program efficiency advantage and with no conclusion possible with respect to price efficiency, we favour separate tiers over combined tiers.[24]

3.4.2 Optimal Tiering

A number of the matters examined in this chapter have relevance to the more general issue of the optimal method of tiering or pricing cable services. With respect to a combined tier of pay channels we noted that a combined tier would be less program efficient than separate tiers while the effect on pricing efficiency is indeterminate. Similarly, in our examination of

universal pay, which involves a universal pay/basic cable service combined tier, we noted universal pay is program inefficient. We concluded against offering pay channels as a combined tier and against universal pay on these grounds. In our discussion of the demand for pay-per-channel, pay-per-program, and non-programming services, we noted that for the non-subscriber to basic cable services, but not to the subscriber, the advent of a pay or non-programming service would face him with the choice of accepting a combined tier comprised of the basic service plus the new service. In order to obtain the new service the individual would have to subscribe to the basic cable service which he had previously rejected as a separate tier.[25] As we observed, for someone who does subscribe to the combined tier, the new service is, in effect, subsidizing the basic cable service. In addition, it is not allocatively efficient because it would appear that such a consumer is voting in favour of basic cable services but in fact this is not the case.

A conclusion that can be drawn from this is that a consumer should not have to pay for a basic cable service in order to be able to subscribe to a new pay or non-programming service offered on cable. All the consumer, who does not subscribe to the basic cable service, should have to pay for the new service, in addition to the monthly price of access (and any user charge), is the installation price to cover the cost of hook-up and any other incremental costs.

Our analysis suggests similarly that the basic service should be broken up into separate tiers. As presently constituted, the basic service of a typical cable company is comprised of channels of Canadian networks and perhaps independents, U.S. networks and perhaps independent channels, PBS, a cable community programming channel, and automated channel(s). All of these channels are in essence a single combined tier as they are available for a single price of access.[26] Again this is undesirable as a consumer cannot pay to receive, for example, PBS, without paying for the other additional channels not available over-the-air. If the process of tiering were costless it would seem desirable to offer each channel as a separate tier. However, it is not costless as a decoder (to unscramble a signal that would need to be scrambled by the cable company) or a negative trap would be necessary to prevent a consumer from viewing a channel for which he had not paid. Also billing costs would obviously be greater. Perhaps a reasonable compromise, involving grouping of similar channels likely to appeal to the same viewers, would be that Canadian stations available over-the-air (and perhaps the cable community and automated channels) be offered as a first free tier, other Canadian stations be offered as a second tier, U.S. network and independent stations as a third tier, and PBS as a fourth tier. The cable subscriber would automatically get the first tier and then any other tier(s) he wishes to pay for. The rationale for the first tier being 'free' of a monthly access price is that the stations involved are available over-the-air, and hence a person

would not subscribe to cable just to get their signals; a desire to support Canadian broadcasters; and CRTC's signal carriage priorities. New subscribers to the first tier would have to be charged an installation price, however, to cover the hook-up cost.

FOOTNOTES

1 CRTC, Call for Applications for Pay TV Service, op. cit., p. 7

2 CRTC, Decision CRTC 82-240, op. cit., p. 14-15

3 This possibility is envisaged by CRTC Public Notice 1982-44, op. cit., p. 1.

4 One difference that will exist, however similar the normal programming, is that the pay channel will not have advertising. For someone who dislikes television advertising, a pay channel will provide more utility than a similar commercial channel offered as part of the basic service.

5 See W. Oi, "A Disneyland Dilemma: Two-Part Tariffs for a Mickey Mouse Monopoly", Quarterly Journal of Economics, February 1971, pp. 77-96.

6 There is a close analogy here with the demand for telephone services and the analysis applicable is similar. See L. D. Taylor, "The Demand for Telecommunications: A Nontechnical Exposition", pp. 93-105, in M. Crew (editor), "Issues in Public Utility Pricing and Regulation, Lexington Books, 1980.

7 Patricia Best, "Pay-TV on its Way Ready or Not", The Financial Post, November 13, 1982, p. 1.

8 See First Choice Application. op. cit., p. 3.21.

9 See CRTC Public Notice 1982-44, op. cit., p. 1.

10 See Patricia Best, The Financial Post, op. cit., p. 1.

11 P. Samuelson, "Aspects of Public Expenditure Theories". Review of Economics and Statistics, May 1958, Vol. XL, No. 2, p. 335.

12 J. C. Ohls, "Marginal Cost Pricing, Investment Theory and CATV", The Journal of Law and Economics, Vol. XIII(2), October

1970, p. 441.

13 T. F. Baldwin, M. O. Wirth and J. W. Zenaty, "The Economics of Per-Program Pay Cable Television", Journal of Broadcasting, Vol. 22, No. 2, Spring 1978.

14 J. R. Minasian, "Television Pricing and the Theory of Public Goods", Journal of Law and Economics, Vol. 7:75, (1964), pp. 71-86.

15 See J. R. Minasian, op. cit., and V. Goldberg, "Marginal Cost Pricing, Investment Theory and CATV: Comment", Journal of Law and Economics, Vol. XIV(2), October 1971, pp. 514-516.

16 J. R. Minasian, op. cit., p. 75

17 R. G. Noll, M. J. Peck and J. J. McGowen, Economic Aspects of Television Regulation, Washington, DC, The Brookings Institute, 1973, p. 57

18 J. C. Ohls, "Marginal Cost Pricing, Investment Theory and CATV: A Reply", The Journal of Law and Economics, Vol. XIV(2), October 1971, p. 517.

19 T. F. Baldwin, M. O. Wirth and J. W. Zenaty, op. cit., p. 149

20 P. Samuelson, "Public Goods and Subscription TV: Correction of the Record", Journal of Law & Economics, October 1964, pp. 81-83.

21 T. F. Baldwin, M. Wirth and J. Zenaty, op. cit, pp. 143-154.

22 B. M. Mitchell, "Alternative Measured Service Structures for Local Telephone Service", pp. 107-123, in M. Crew (editor), op. cit.

23 If the individual does subscribe to the combined tier even though $F-j < 0$ for one pay service again the issue of cross-subsidization arises.

24 It should be noted here that the issue we have examined is where individuals are given only the option of subscribing or not to a combined tier. This is different from the case where the pay

channels are offered separately but a 'volume discount' is available if two or more tiers are chosen.

25 This would not be true of a consumer in a market where there is also another broadcasting undertaking licensed to exhibit pay. However, for the hitherto non-subscriber to cable who still chooses to obtain pay through cable, the following observations still apply. In addition, the possibility of competition between exhibitors does not invalidate the generality of our conclusion that a subscriber to a pay cable tier should not be obliged to subscribe to basic cable services.

26 It is true that if the basic service consists of more than twelve channels then a converter is necessary to be able to view the additional channels. Converters are built-in to many recently manufactured television sets. Where a consumer does not own such a set he has the option to buy or rent, the latter usually from the cable company. Even if he chooses the latter option, he is renting hardware and not paying a price for access to the additional channels and hence this cannot be regarded as a separate tier.

4. Chapter 4. Review of the Price Determination Literature

In this chapter we review five studies of the Canadian cable industry and one study, using U.S. data, of relevance to the introduction of pay television to Canada. In our reviews we particularly examine the models and techniques used to estimate the demand for cable services and the results obtained. This is of special interest because, in Chapters 5 and 6 we undertake our own econometric estimation of the demand and price functions for basic cable and pay television services.

The studies reviewed are:

1. L. Good, An Econometric Model of the Canadian Cable Television Industry and the Effects of CRTC Regulation, Ph.D. thesis, University of Western Ontario (1974).
2. International Institute of Quantitative Economics (IIQE), Economic Study of the Financial and Market Characteristics of the 16 Largest CATV Companies in Canada, (June 1974). This study was undertaken for the Department of Communications.
3. I. Silver, P. Jacobson, K. May, and M. C. McCracken, An Econometric Model of a Cable Television System, (June 1975). This study, using Canadian data, was undertaken for the CRTC.
4. J. Hatch, I. Kmiec, P. Kuzdrall, and R. More, PATV Simulation Study, (Four Phases, 1980-81). This study, simulating the introduction of pay television to Canada, was undertaken for the Department of Communications.

5. S. McFadyen, C. Hoskins, D. Gillen, Canadian Broadcasting: Market Structure and Economic Performance, The Institute for Research on Public Policy, Montreal, 1980, Ch. 12.
6. H. S. Hothi and R. G. Bodkin, "An Explanatory Study of the USA Demand for Pay TV in the mid-1970's", Eastern Economic Journal, Vol. VI, No. 1, January 1980, pp. 39-51.
   This study was initiated by the Research Branch of the CRTC. Although, of necessity, it uses U.S. data, it was undertaken because of its relevance to Canadian policy makers who were under pressure to permit the introduction of pay television to Canada.

4.1 Good Study

4.1.1 Methodology and Results

The purpose of this econometric study was to provide an understanding of the cable industry and the impact of CRTC regulatory policy. Regression techniques were used to estimate a simultaneous model of the demand, price and cost relationships. OLS estimates indicated that the model is simultaneous - the number of subscribers is a function of price, price is a function of cost, and cost is a function of the number of subscribers. As a result instrumental variables estimation was also employed.

In the demand equations, the dependent variable was the overall penetration rate defined as the ratio of the number of subscribers to the number of dwelling units passed by cable. The independent variables were:

HR = monthly rate cable system charges home subscribers

N = population of metropolitan centre in which cable system is located - this is a surrogate for the entertainment alternatives available to the subscriber

Y = average income of metropolitan centre in which cable system is located

L = amount spent annually by cable system on local programming

A = age of system in months. It is assumed that the

system approaches ultimate penetration over time at a decreasing rate ($-1/A^2$)

Q = quality of off-air reception index having a value of zero to one.

NS = network signals

IS = independent signals

ES = educational services

DS = duplicate signals

RS = aggregate of educational, duplicate and independent signals.

Relative service variables

In the double log demand equations, all independent variables have the right sign and are significant except for the non-network relative service variables and, in some equations, the price variable. Where price is significant it is inelastic being in a range from -.05 to -.69.

The price equations have HR as the dependent variable. Average cost, income, program expense and network signal variables have the expected signs and are significant. The penetration rate, the microwave variable and the quality of off-air reception index are not significant explanatory variables.

In the cost equations the dependent variables are DEP, depreciation, and OPEX, operating expenditures less local programming expenditures. The equations, corrected for heteroscedasticity explain depreciation in terms of cable miles

and operating expenses in terms of number of subscribers and whether the system employs microwave. Only in subscriber equations estimated by instrumental variables are any of the variables not significant. However, similarity of point estimates generated by the least squares and instrumental techniques suggest it is more reasonable to retain quadratic and cubic cost terms at lower levels of significance than to conclude that the cost equation is linear.

On the basis of his cost equations, Good concludes that the average cost curve is U-shaped whereas marginal cost is increasing throughout because strength and quality of the signal alternate as we move from the headend. As system length increases, amplifiers must be spaced closer together and better equipment used. For subscribers, both average and marginal curves are U-shaped.

Good suggests that price regulation in the consumer interest is effective and that prices are lower than they would be in the absence of regulation. Evidence that rates are below profit and revenue maximizing levels is provided by the estimated demand equations indicating that cable systems are currently operating on the inelastic portion of demand schedules.

As well as quasi-regulating prices, the CRTC increases the costs which cable systems must bear by means of regulatory requirements. If cost regulations apply differentially across cable systems based on profitability, then profits can be reduced

without making marginal systems unprofitable. This has also been done by the CRTC.

4.1.2 Evaluation of the Study

Good's claim that cable systems are operating on the inelastic portion of the demand schedule is not substantiated because he has not estimated a demand curve, which should be measured in terms of the number of subscribers as a function of price, but a share equation with peculiar properties (for example, if firm size increases, penetration rate falls). At the time of Good's study many of the cable systems were not fully wired and hence the denominator in his dependent variable is correlated with time. This criticism, in respect of other studies using the penetration rate as the dependent variable, has been developed by Crandell and Fray.[1]

Another problem is that Good segmented costs into operating and fixed and estimated two equations. He used the fixed cost equation to evaluate scale economies and the operating cost function to examine economies of density. However in neither case did he hold the alternative variable constant, so it is not clear what the economies of density are, holding firm size constant. Also, he fails to segment cable miles into above and below ground and does not note that the optimal size of plant measured in cable miles is much smaller for a firm that employs below ground cable than for one that uses above ground cable because below ground cable is much more expensive.

4.2 IIQE Study

The authors contend the multi-faceted problem of cable television regulation is still an open issue and, through their socio-economic and financial review of the 16 largest CATV companies in Canada (in 1972 this represented only 8.7% of all cable systems operating but accounted for approximately 55% of all CATV subscribers), attempt to facilitate an understanding of the structure of the cable television industry.

The study includes demand and cost models and their estimation, and a financial profile of the industry.

4.2.1 The Demand Model and its Estimation

The authors present the results of regression analysis on the "large" system data using a demand side model of the following form:

$$PR = \left(1 - \frac{P}{I}\right)^{1/Y}$$

where PR represents the penetration ratio, P represents the mean annual subscriber fee, I represents the mean annual income of subscribers, and Y is a linear function of various explanatory variables.

The effective mean annual price to subscribers (P) was determined from the ratio of total subscriber revenue to total number of subscribers for each system. This definition thus combines the revenue from monthly rates and installation charges. This is unsatisfactory, as we noted in Chapter 3, because

different household time horizons make it difficult to construct a combined price which is at all meaningful. In any case this is a poor way to attempt it. Based on this definition of price, the authors estimated the price elasticity to be -0.34.

Two measures of mean annual income (I) were used. The first was gross family income (IG) and the second, labelled net income (IN), was a measure of discretionary income after providing for the necessities of life using the "poverty-line" level.

The following explanatory variables were considered:

ℓnX_{pc} - logarithm of the ratio of the number of primary Canadian network stations available via cable to the number of Canadian primary network stations available over-the-air

- logarithms of similar ratios for duplicate Canadian network stations (ℓnX_{DC}), independent Canadian stations (ℓnX_{IC}), educational Canadian stations (ℓnX_{EC}), primary U.S. network stations (ℓnX_{PU}), duplicate U.S. networks stations (ℓnX_{DU}), independent U.S. stations (ℓnX_{IU}), and educational U.S. stations (ℓnX_{EU}).

DBC - dummy variable indicating a big city system

$\ell n\bar{C}_A$ - logarithm of advertising cost per potential subscriber

$\ell n\bar{C}_p$ - logarithm of live programming expenditures per potential subscriber.

DAP - dummy variable indicating automated programming availability (news, weather, etc.)

ℓnT - logarithm of the age of the system.

Effects of changes in the most significant explanatory variables upon the penetration ratio (PR) is indicated by the following estimated elasticities:

Explanatory Variable	Elasticity
ℓnX_{PC}	0.500
ℓnX_{DU}	0.286
ℓnX_{IU}	0.271
$\ell n\bar{C}_A$	0.227
$\ell n\bar{C}_P$	0.131
DBC - big (0)	0.476
- not big (1)	0.713

As would be expected, the PC and IC variables have a positive effect on PR. Surprisingly DU, which *a priori* would not seem important, is the other significant quality of service available. Advertising expenditures ($\bar{C}_A$) and, for some reason, live programming expenditures, also have a positive elasticity. The smaller elasticity when the system is in a big city, revealed by the DBC dummy variable, suggests the greater alternative

entertainment opportunities in large cities results in a lower penetration rate.

This demand model, because it uses the penetration ratio, rather than the number of subscribers, as the dependent variable, is subject to the same criticisms as we enumerated with respect to the Good study in this respect.

4.2.2 Cost Structure Model

A simplified model of the operating cost structure for a typical CATV system is explored. The basic model explains how costs (advertising and sales promotion, general and administrative, technical services, programming, and depreciation) are related to the volume of services provided, represented by the number of subscribers (Q) and size of the cable system in miles (CM):

$$C = \alpha_0 + \alpha_1 Q + \alpha_2 Q^2 + \alpha_3 Q^3 + \alpha_4 \cdot CM$$

Regressing this equation against the sample data the authors were able to explain 94% of the variation in the observations with a simplified model having just three non-zero coefficients:

α_1 : fixed costs of about \$429,140

α_2 : 0.6041

α_3 : -0.001617

For an average system having 50,000 subscribers and a penetration ratio of about 0.54, the derived cost curve corresponds to a marginal cost of about \$49 and an average cost of \$35. The mean

revenue per subscriber was $51.76. The authors conclude that, assuming the typical system is a price taker with respect to this industry-wide "accepted" price level, and hence marginal revenue equals average revenue, then this result indicates the typical system is operating at a point which maximizes profit. However, we consider that the assumption on which this conclusion is based is not supportable. Cable companies have a monopoly in their franchise area. A monopolistic industry structure is not compatible with an infinitely elastic demand curve.

4.2.3 Financial Profile of the CATV Industry

All measures of profitability indicated a strong upward trend in profits, with steady growth from year to year. These were the result of the economies of scale available in the "larger" CATV companies and the higher operating and financial leverage inherent in the industry. When related to similar profit meaures for Canadian manufacturing companies, the profit measures for the CATV industry were well above average. For example, CATV's gross margin was 48% in 1971 and 57% in 1973, compared to 22.5% in 1973 for Canadian manufacturers as a whole. Similarly the industry's return on equity was 22% in 1972 and 18% in 1973 compared to the corresponding figure for the Financial Post's sample of the corporate sector of 12%. However, the growth of profits had tapered off as market penetration ratios reached saturation levels.

Commercial risk, or volatility of revenues over time, is considered by the authors to be negligible. Another dimension of risk is the financial risk induced by the leverage of debt financing. As the CATV industry is capital intensive, some companies have resorted to extensive debt financing with concomitant introduction of financial risk. The third element of risk is related to the large portion of costs which are fixed. Fluctuations in revenues will be amplified by this operating leverage and introduce a significant downside risk including possible default on debt and lease financing. The authors contend the most significant source of risk to the CATV industry is government regulation and its effect upon the perceptions of investors.

It should be noted that the authors' analysis of risk does not consider systematic risk, which measures the volatility of a stock's return to returns on the market portfolio. Modern finance theory suggests that systematic risk is the only risk relevant to investors as they can eliminate non-systematic risk through diversification. Elsewhwere, we calculated the systematic risk for some broadcasting stocks, including Canadian Cablesystems Ltd. and Maclean-Hunter Ltd.[2] Modern finance theory also suggests that a return-risk trade-off is established in capital markets and hence return performance can only be assessed in relation to the return premium per unit of relevant risk. We again attempted such an assessment of the performance of some broadcasting stocks in our 1980 study.

4.3 Silver, Jacobson, May, and McCracken Study

The purpose of the study was, through an econometric model of a cable system, to examine the behaviour of the cable system operator and the effects of the various policy instruments available to the CRTC. The study included a demand model and its estimation, cost models and their estimation, and simulations.

4.3.1 The Demand Model and its Estimation

Although the penetration ratio (ratio of subscribers to potential subscribers) is the most commonly used dependent variable in studies of cable television demand, the authors opt to use the absolute level of subscribers. Their reason for this choice is the difficulties in controlling for size of license area and habit formation among subscribers in the data base available.

As in other studies, quantity and quality of the cable service provided is considered to be a prime determinant of the demand for subscriptions. However, several arguments are presented for not using indexes of service quantity based on comparing numbers of channels offered on cable with those available off-air. Instead, the authors choose a service measure based on ex-post viewing patterns of subscribers and non-subscribers. After experimentation, the index adopted was:

$$Q_6 = \frac{\sum_{i\varepsilon K} t^c_i \Big/ \sum_{i\varepsilon m} t^c_i}{\sum_{i\varepsilon K} t^o_i \Big/ \sum_{i\varepsilon n} t^o_i}$$

where

t^{C}_{i} = household hours per week spent viewing the ith channel on cable

t^{O}_{i} = household hours per week spent viewing the ith channel off-air

M = set of cable channels available

N = set of off-air channels available

K = set of channels available in both modes (i.e. M∩N).

This index measures the extent to which viewing hours are shifted away from the channels available in both modes to the additional channels unique to cable reception. The value of the index decreases as the impact of cable increases.

Because of expected differences between the subscription rates of "direct" (owner-occupied dwellings) and "indirect" (bulk contract rental accommodations) markets, the demand function is divided. An important assumption made, and one we would seriously question, is that the price, to both direct and indirect subscribers, is exogenously determined and hence does not vary in relationship to demand for cable services.

The demand function employed is given by:

SUBSi = fi(EXSALE, INCOME, QVAR, AGE, MRATEi, CRATEi, WIRDi, (WIRDi ÷ WIRDi-1))

where:

SUBSi = number of subscribers at the end of the year of type i (i = 1 for direct subscribers, i = 2 for indirect subscribers)

EXSALE = annual promotional expenditures by the cable system

INCOME = mean household income in the serviced area

QVAR = a measure of quantity of service provided (Q6)

AGE = age of the cable system

MRATEi = monthly rate per subscriber type i

CRATEi = connect rate per subscriber type i

WIRDi = units wired per subscriber type i (i = 1 for owner-occupied houses, i = 2 for bulk contract apartments)

WIRDi ÷ WIRDi-1 = proportionate annual change in units wired for each subscriber type.

Ordinary least squares regression was performed on the logarithms of the cross-sectional data available with the following results.

Demand for cable subscriptions, both direct and indirect, -0.44 and -0.15 respectively, is inelastic with respect to monthly subscription rate. The authors indicate problems with the -0.15 estimate, however, because of the smaller sample size available for indirect subscribers and the possibility of inaccurately reported monthly rates.

Variations in the connect rate do not appear to have a significant effect upon subscription demand although there is thought to be considerable measurement error across the sample analyzed.

At least for direct subscribers, the clearest impact on demand results from poor quality, off-air services. Local programming does not appear to have a significant impact upon demand. The quantity of service variable (Q_6) has a negative elasticity of -0.46.

The elasticity of demand for cable subscriptions with respect to homes wired is +0.85 and apartments wired is +0.88.

4.3.2 The Cost Model and its Estimation

The authors develop models for each of the components or sub-divisions of fixed costs and of variable costs. Fixed costs are sub-divided into head-end costs, distribution costs, subscriber drop costs, and overhead expenditures. Variable costs are sub-divided into technical expenses, sales expenditure, local programming expenditure, and administrative and general expenses.

Estimates indicated that economies of scale were not apparent in distribution system costs with respect to total cable miles. However, the cost per mile of cable increases with increased density of dwelling units bypassed.

Cost elasticity of the distribution system with respect to length of aerial wiring is estimated to be nearly three times the elasticity with respect to length of total buried and conduit wiring. This result is contrary to some assumptions, made in the literature, about economies realizable by simultaneous installation of cable system and other utility lines.

In general, the authors find no indication of diseconomies of scale. That is, average costs are either constant or declining with respect to increasing size.

4.3.3 Simulations with the Model

The authors illustrate use of their models to analyze the effects of several simulated policy options. The technique used is to compare the results of a "control" simulation, based upon assumptions about the exogenous and endogenous starting values for a cable system, with the results obtained by varying one or more variables relevant to the policy being investigated.

They find that system size, subscription price and viewing options have quantitatively important effects upon subscriptions, revenues and costs of a cable system. Consequently, policy instruments which affect the former variables may substantially alter system profitability.

Because of the relative inelasticity of demand for cable subcriptions, changes in the monthly subscription rate have a significant effect upon system revenues. However, this also leads to changes in the level of local programming which alters costs in the same direction as revenues.

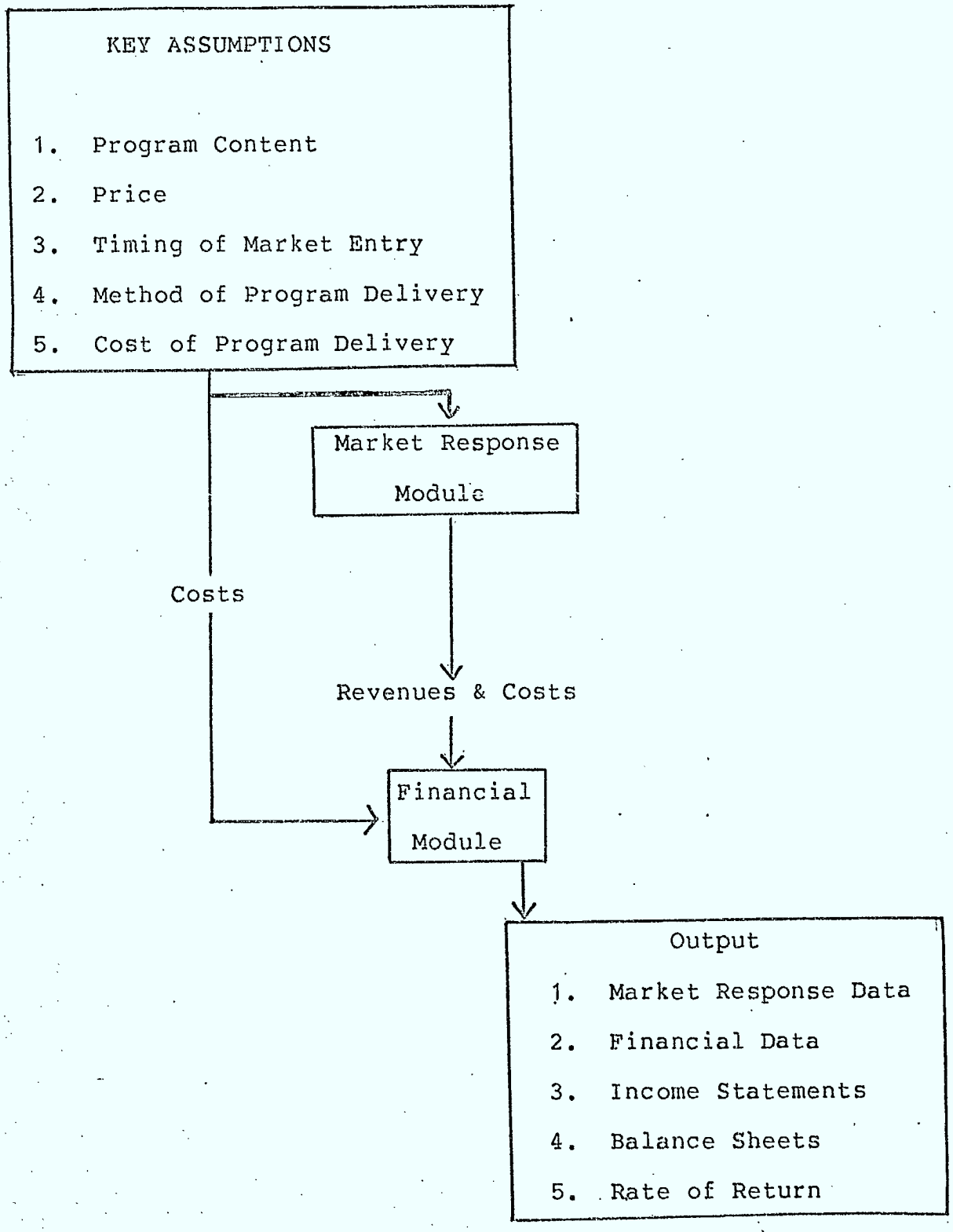
Simulations examining system growth indicate the low marginal costs of adding additional subscribers. However, the effects upon system revenue of changes in the connect rate are

negative. But subscribers and expenditures may either increase or decrease, depending upon the level of additional promotional expenditures undertaken to counteract the effect of higher connect rates.

4.4 Hatch, Kmiec, Kuzdrall and More Study

The study develops a 40 quarter market response model designed to simulate consumer response to PATV and the corresponding revenue that response produces in any market, and a financial module that generates a network-income statement and balance sheet per quarter as well as an internal rate of return per quarter. The simulation is undertaken for a pay per program network (Phase I and Phase II) and a pay per channel network (Phase III and Phase IV). In both cases three alternative price scenarios and three alternative program content scenarios are examined.

An overview of the model is provided by the authors as follows:



Individual market response factors for each of the 38 Census Market Areas have in part been derived from a former study by Hatch, More & Shaw[3] The relative response of twelve major urban CMA's to PATV was evaluated using a ranking model based on six market characteristics; namely per capita disposable income, TV viewing intensity, per capita movie receipts, per capita market for goods and services, per capita color TV ownership, and growth rate in per capita movie receipts.

4.4.1 A Pay Per Program Simulation Model

In Phases I and II, nine price/content scenarios are examined assuming prices per program of $2, $3, or $4 and low, base or high program content. It is assumed, for the base case of $3 per program and base content, that there will be an ultimate PATV sign-up rate of 25% and that each new average household subscribing to PATV will view 10 programs in the first quarter, 9 in the second quarter, 8 in the third quarter, 7 in the fourth quarter and 6 in each quarter thereafter. They cite evidence to support such estimates, but the empirical evidence on which to base this is extremely scarce because there have been very few examples of pay-per-program PATV in the U.S. In any case the sensitivity to price poses problems because the price is comprised of three components; namely, the one-time charge to connect PATV - assumed to be $10, the constant monthly charge for PATV which includes lease of the black box - assumed to be $3 a

month, and the variable view fee - assumed to average $3 per program.

For the base content case the relationships between price per program and the penetration rate, number of subscribers, and number of programs watched, is expected to be:

Price per program	% of cabled households expected to subscribe to PATV	Number of PATV households	Steady state average household view rate per quarter
$2	24	1,238,000	8
$3	20	1,010,000	6
$4	16	763,000	4

The internal rate of return of the pay-TV network is extremely sensitive to these estimates, and similar estimates associated with different content scenarios. The internal rate of return per quarter, expressed as a percentage, for each of the nine price/content scenarios is:

	Content Scenario		
Price per program Scenario	Low	Base	High
Low $2	0	0	0
Base $3	0	9.6	17.6
High $4	0	8.7	17.4

The model is a deterministic one and does not allow for the incorporation of probabilistic information. The internal rate of return generated for the pay-TV network is extremely sensitive to expectations concerning the effects of price and content on consumers willingness to subscribe to PATV and the number of programs they watch if they do subscribe. Thus while two scenarios provided a quarterly internal rate of return of over 17% (over 90% on an annual base), five scenarios did not provide a positive return. Yet the dearth of pay per program PATV means that the expectations, which generate these returns, have little empirical foundation.

4.4.2 A Pay per Channel Simulation Model

In Phase III, to investigate price and content behaviour of pay-per-channel PATV, the simulation model, consisting of a Market Response module and a Financial module, was run using nine(9) price/content scenarios with content assessed according to the number of new foreign films, new live events, new Canadian films, and Canadian content.

In Phase IV, the authors report on three groups of simulation runs to assess the economics of various price/foreign content scenarios, various Canadian content scenarios, a Quebec only network, and cable company operating economics.

Perhaps the most interesting result in both Phase III and Phase IV is that the rate of return to the Pay-TV network, for

any given content scenario, varies inversely with price in the $8-$12 a month range. For this to be possible the elasticity of demand must be greater than one with a decrease in price from $12 to $10 and again from $10 to $8 resulting in an increase in subscriber revenue which more than compensates for any extra costs associated with having more subscribers. It is interesting to note that the current applicants for a pay-television licence do not believe this is the case because the subscription price that most are suggesting is much higher than $8.

Also of interest is the size of the internal rate of return generated for the network. In Phase III this is 64.8% per quarter (638% per year) for the low price/high content scenario and 24.5% per quarter (140% per year) for the base price/base content scenario. Because of assumptions of higher content profiles and higher ultimate PATV sign-up rates, the returns in Phase IV are even larger with the internal rate of return of the low price/high content scenario being over 100% per quarter (over 1500% per year). These returns are not credible and serve to cast doubt on the estimates and expectations on which they are based.

The development of a deterministic simulation model for examining price and content behaviour of pay per channel PATV provides an efficient means of testing various relationships but at the cost of introducing rigidity. The authors adopt a particular set of relationships without fully examining the reality or evidence for those relationships.

Some particular criticisms of the assumptions adopted by the authors with respect to the market response model are:

a. Although the authors quite clearly outline several differences between Canadian and American PATV situations, they proceed to develop a participation rate curve based on a non-mathematical fitting to U.S. data.

b. No specific allowance is made in the participation rate curve for differences between high-density and low-density service areas.

c. No allowance is made for the use of alternative technological choices as the service system size increases.

d. The subjective market response (MR) factor for each consumer market area (CMA) is assumed to be constant through time.

e. No allowance is made for the possible existence of a competitive pay-television network.

Criticisms of the financial model are:

a. No exploration or allowance is made for different financing strategies.

b. Several assumptions are made which may significantly distort the financial results obtained. The authors assume no taxes, and no debt financing charges.

A general criticism is the authors' failure to undertake any meaningful sensitivity analysis. It is difficult to discern which, if any, of the various parameters and fixed cost elements

are influencing the reported market responses or financial returns.

The model also fails to come to grips with the risks involved in a PATV venture. The two modules, market response and financial, are deterministic rather than probabilistic in nature. Another facet of this failing is the use of market response curves which are unrealistic in that PATV sign-up rates never decline no matter what connect (P_c) or quarterly viewing (P_q) fees are charged.

Although it is understandable that the authors should wish to update some of their estimates as they move from one phase of the study to another, this does have the unfortunate consequence that many of their results are not comparable. Thus the pay per program results cannot be compared with the pay per channel as there are differences in assumptions with respect to the timing of market entry, the number of initial subscribers, fees paid to producers, and content scenarios. Similarly the assumed cost of uplink facilities, and transponders is significantly less in Phase IV than Phase III, with the consequence that the pay-per-channel results in the two phases are not comparable.

4.5 McFadyen, Hoskins, Gillen study

This study, using 1975 data, employed a sample of 175 Canadian cable systems.

In the demand equation the number of subscribers is the dependent variable, and the independent variables include the average charge per subscriber, the average income of the area, the population of the area, the amount spent on local programming, and the age of the system. The authors note a deficiency is the lack of a quality of service variable.

The evidence indicates a price elasticity of -1.1. Marginal revenue is approximately $28 per subscriber per year which is less than marginal cost of approximately $33 per year. This suggests the price is less than that associated with profit maximization. It is consistent, however, with CRTC regulation of the price. The population variable is positive and significant and the authors claim that this is consistent with it being a scale variable.

Price equations are also estimated. Besides including most of the same variables as the demand equation, the penetration rate and amount spent on local programming are included in recognition that the price is a quasi-regulated one and that the CRTC might be influenced by such factors. As expected the effect of local programming expenses is positive but its influence is negligible. There is also evidence that subscription rates are lower for older systems and higher penetration rates. The latter

is explained as follows:

> First, as the penetration rate increases, fixed costs are spread over more units of output, and second, the penetration rate is similar to a "load factor" and as the load factor increases average costs decrease.[4]

4.6 Hothi and Bodkin Study

This econometric study of the demand for pay TV in the United States was initiated by the research branch of the CRTC. The topic was considered of relevance to Canadian policy makers in the mid and late 1970'S because of pressure to introduce pay TV to Canada. The study uses data for 72 cable systems for the end of the first quarter of 1976.

The authors constructed a number of multiple regression models in both arithmetic and log form. The dependent variable, demand for pay-TV services, was specified in three alternative forms:

1. The total number of pay subscribers for a given pay-TV system (PS)
2. Pay penetration (PP) defined as the percentage of basic cable subscribers who also subscribe to pay-TV. Where the number of cable subscribers is denoted by CS then:

   $$PP = (PS/CS).100.$$

3. Pay penetration (PP') defined as the percentage of the total number of homes passed by the cable system that have pay-TV. Where the number of homes passed is HP then:

   $$PP' = (PS/HP).100.$$

   This specification was discarded because the estimated equations proved unsatisfactory. The probable explanation is that HP does not distinguish between households passed that subscribe to basic cable and those that do not. Obviously the effective price that has to be paid to obtain pay is less for

the first group than the second.

The independent variables were:

1. The monthly subscriber fee (PR) for pay-per-channel. All the cable systems examined had pay-per-channel rather than pay-per-program or universal pay.
2. The median income (I) by urban area.
3. The age of the pay service (AGE).
4. Population (POP), which is considered a proxy for other entertainment opportunities.
5. The service available on the basic cable system. One specification used was an index (CH) derived by assigning different weights to different channels depending on their type and the quality of their technical reception. An alternative specification was to define service in terms of NI, E, and D variables, where NI represents the raw number of unduplicated network channels and independents (these were combined because the number of unduplicated network channels was invariably 3), E represents the number of educational channels, and D represents the number of duplicated network channels.
6. The quality of pay service (HBO), a dummy variable that signified whether or not the pay service was Home Box Office.
7. The number of cable subscribers (CS) when PS was the dependent variable. CS indicated the size of the potential market. The cable penetration ratio (CP) was sometimes included when PP was the dependent variable.

Contrary to expectations the price variable was usually insignificant. In half of the 26 equations income was significant and the elasticity indicated was around unitary or higher suggesting pay may be a "luxury" good. Age usually had a negative effect suggesting a "novelty effect" attracting subscribers in the first few years after introduction of pay. Contrary to expectations, the population variable had a positive effect on demand. Hothi and Bodkin suggest it may be serving as a proxy for cable penetration.

The results for the cable service index (CH) were disappointing. The index was not significant in any of the 11 equations and only had the expected negative sign in four of these cases. When the channels were broken down, the number of duplicate stations had the expected negative sign, indicating a substitution effect with pay, but the number of educational channels had a positive sign indicating a complementary relationship. These conflicting effects probably explain the disappointing results for CH. Interestingly, NI was usually insignificant. The authors were not sure whether this was due to relatively little variation in this explanatory variable.

Consistent with the authors' expectations, HBO did have a positive effect on demand for pay.

In both arithmetic and log form CS was found to be a highly significant determinant of PS. In arithmetic form the results indicate that there is one more pay subscriber for every four to

five additional basic cable subscribers. In log form the results indicate an elasticity of a little less than unity.

Another highly significant result is that PP is negatively related to CP, the greater the basic cable penetration the lower the proportion of cable subscribers who also subscribe to pay TV.

This is an interesting study but a major reservation is that Hothi and Bodkin do not explain what determines the demand for basic cable services, yet their results, which they gloss over in this respect, indicate that the number of cable subscribers (CS) is a highly significant determinant of PS. The reason for this is easily explained. As we noted in Chapter 3, if a person subscribes to basic cable, the additional expenditure necessary to obtain a pay service is the monthly pay rate, whereas the non-subscriber has to pay the monthly rate for basic cable as well as the monthly rate for pay itself. One would expect that major determinants of CS would be the price for basic cable and the quantity/quality of service offered. The quantity/quality of the service offered by basic cable is a function not only of the channels available on cable but also the channels available off air. It is the improvement in viewing options that the subscriber is paying for. The channels available off-air are not included in Hothi and Bodkin's specifications. The channels available by cable are included but their rationale for inclusion is that they are entertainment substitutes and hence can be expected to have a negative effect on the demand for pay. However, the foregoing discussion suggests that the channels available on cable have

another influence, in this instance positive. Given the channels available off-air, the more channels available on basic cable the greater the number of cable subscribers (CS) and hence the greater PS. It may be this influence, not recognized by Hothi and Bodkin, that explains why their CH index results are so disappointing.

To get round such problems we adopt, in Chapter 6, a two-stage least squares approach to estimating the demand for pay TV in the United States. In the first stage CS is the dependent variable, and in the second stage, where PS is the dependent variable, the fitted CS is included as an explanatory variable.

A minor point is that Hothi and Bodkin did not consider the installation fee for pay TV as an explanatory variable. For someone who is uncertain whether or not to subscribe to pay and is considering subscribing for a trial period, the size of the installation fee may be a significant determinant of whether to go ahead with the trial. In our model specification in Chapter 6, the installation fee will be included as an independent variable.

FOOTNOTES

1 see R. W. Crandell and L. L. Fray, "A Re-examination of the Prophecy of Doom for Cable Television", The Bell Journal of Economics & Management Science, Vol. 5, No. 1, Spring 1974, pp. 264-289).

2 S. McFadyen, C. Hoskins and D. Gillen, op. cit. pp. 131-143.

3 See J. Hatch, R. More, and D. Shaw, A Study of the Financial Implications of a Pay Television Industry in Canada, a Consulting Report to the Department of Communications, Government of Canada, October 1976.

4 See McFadyen, Hoskins, and Gillen, op. cit., p. 233.

5. Chapter 5. The Demand for Cable Television in Canada

The present study of the demand for cable television in Canada has two purposes:

1. first, to identify and measure the importance of those factors influencing the prices charged for cable television service in Canada and the numbers of households subscribing and
2. secondly, to obtain measures of the value of viewing options to Canadians. Such measures will provide some idea of the value which consumers will place on the forthcoming Canadian pay-TV channels.

Our treatment of the demand for cable television rests on a partial equilibrium framework in which we attempt to establish the demand relationship for a particular form of entertainment rather than for entertainment generally. In this latter case general macroeconomic variables such as unemployment, income distribution and shorter work weeks would be relevant variables. We take the view, however, that the work-leisure time allocation has been made and that our task is to determine which variables influence the demand for cable, i.e., how is time allocated within the leisure component. In this sense we argue that the demand for cable is basically like that of any economic good; it is a function of its own price, the size of the potential market, the quality of service provided, the availability of alternative types of entertainment, and the income level of consumers.

5.1 Econometrics and Economic Models

Measurement of the relative importance of the various factors influencing the demand for cable television requires the use of the tools of econometrics. Once the most important economic variables have been identified they must be defined and the relationships between them specified in what are termed economic models. Econometric techniques provide a way of measuring these economic relationships.[1]

The estimated models improve our understanding of the demand function, not only permitting the testing of hypothesized relationships but also revealing hitherto unsuspected relationships. In addition, the estimated model can be used to predict the value of certain variables in the future (forecasting), and simulate the impact of various policies on certain economic variables of interest (policy evaluation).

We have constructed, from economic theory, models to try and understand the important and significant variables influencing the number of subscribers to and prices of cable-television systems in Canada. To estimate the models we have used regression analysis, the most common of econometric techniques.

Economic relationships are measured with the use of regression techniques. The most general model could be expressed as

$$Y = \alpha + \beta X + u$$

where Y represents a dependent variable, such as a television station's ad rate, X is an explanatory variable, such as audience size, α and β are parameters we wish to estimate, and u is a stochastic disturbance term (random variable) which represents unmeasurable influences. This model basically says that the value of Y is determined by the values of X and by the value of the disturbance term u. The "way" X and u determine Y is governed by the value of α and β.

What we wish to do is obtain estimates of α and β, which for the given values of X, best predict the value of Y. If we have estimates of α and β, say $\hat{\alpha}$ and $\hat{\beta}$, we could predict Y, as $\hat{Y}$;

$$\hat{Y} = \hat{\alpha} + \hat{\beta}X.$$

Recalling that $\hat{Y}$ is an estimate of the true value of Y, the difference between Y and $\hat{Y}$ is an error term, e. Therefore,

$$e = Y - \hat{Y}$$

where e represents the amount by which $\hat{Y}$; either under or over predicts Y. These errors are known as residuals. One can express the residuals with the knowledge that $\hat{Y} = \hat{\alpha} + \hat{\beta}X$, as

$$e = Y - \hat{\alpha} - \hat{\beta}X.$$

We clearly want a model which predicts Y as accurately as possible or, alternatively, we wish to minimize the amount by which $\hat{Y}$ deviates from Y. The method by which we achieve this is to minimize the sum of the squared residuals and this is know as the principle of least squares. More formally, we select values of $\hat{\alpha}$ and $\hat{\beta}$ which minimize

$$\Sigma e^2 = \Sigma(Y - \hat{\alpha} - \hat{\beta}X)^2$$

For the simple model used in this illustration, the value of ^ and ^, using the least squares principle, will be given by

$$\hat{\alpha} = \overline{Y} - \beta\overline{X}$$

$$\hat{\beta} = \Sigma[(Y-\overline{Y})(X-\overline{X})]/\Sigma(X-\overline{X})^2$$

where $\overline{Y}$ and $\overline{X}$ are the mean (average) values of Y and X.

To return to the case of cable television pricing let us hypothesize that a cable system's monthly charge to subscribers depends not only on the quality of service provided but also on the average income of subscribers. If X_1 represents quality of service and X_2 represents average income of subscribers, then the relationship can be expressed as

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + u$$

Computer programs using the method of least squares can be used to estimate this relationship, providing values of all parameters. We are interested primarily in the estimated values of $\hat{\beta}_1$ and $\hat{\beta}_2$. $\hat{\beta}_1$ is interpreted as the change in monthly charge to subscribers (Y) for a one unit change in the quality of service (X_1) assuming the average income of subscribers (X_2) is held constant. Similarly, β_2 is the change in the monthly charge to subscribers for a one unit change in the average income of subscribers holding the quality of service (X_1) constant. Thus if $\hat{\beta}_1 = .2$ then a 10 unit change in quality of service can be expected to result in a 2 unit change in the monthly charge to subscribers.

Once $\hat{\alpha}$ and $\hat{\beta}$ have been estimated they are tested for their reliability using tests of significance. The most frequently used test in this research is the t-test which applies to individual coefficients. The purpose of the test statistics is to determine if $\hat{\alpha}$ and $\hat{\beta}$ are truly significantly different from zero (or some other critical value) or whether the value obtained is pure chance. Since $\hat{\alpha}$ and $\hat{\beta}$ are estimates we can only say with some "probability" that the estimated value is not equal to zero. The coefficients $\hat{\alpha}$ and $\hat{\beta}$ are generally expressed as being statistically significant at the 90%, 95% or 99% level. This means that if the coefficient is significant at the 90% (.90) level, there is only a probability of .1 that it will be outside of the narrow range of

$\hat{\beta}$ ± 2 times the standard error of $\hat{\beta}$.

Another measure of "reliability" for the whole equation is the R^2, also called the coefficient of determination. The R^2 varies between 0 and 1. An R^2 of .60, for example, signifies that 60% of the variation in the dependent variable (y in our example) is "explained" by $\alpha + \hat{\beta}X$. The higher the R^2 the better the model fits and the more reliable is the model for predictive purposes.

5.2 Relationship to Previous Studies of the Demand for Cable Television

The present study is an extension of earlier work we have done on the cable television industry (with David Gillen).[2]

Chapter 4 contained a review of this material as well as Canadian studies by Irving Silver *et al.*,[3] Leonard Good,[4] and I.I.Q.E.[5] American studies that are also relevant include the early work of Comanor and Mitchell,[6], Park[7] and the Noll, Peck and McGowan book[8] as well as contract work by Charles River Associates and the Center for Metropolitan Planning and Research at Johns Hopkins University.[9] These studies have been adequately reviewed by Silver *et al.* and Arthur D. Little.[10]

These studies are of interest in that they attempt to apply basic demand theory to the case of the product delivered by cable television companies. In general they postulated that quantity demanded is a function of price charged, household income, age of the system and various measures of the quality of the service.

Before turning to an examination of the results of our empirical work it makes sense to first identify the major differences between this study and previous work in the area. These are:

a. This study analyses aggregate data, whereas some of the most recent work is based on micro (or survey) data.
b. The measure of demand for cable is the number of cable subscribers rather than the penetration rate.
c. Both logarithmic and non-logarithmic functional forms are used (rather than just logarithmic).
d. Rather than channel counting variables a cable-television quality variable taking into account the declining marginal utility of additional channels is used.

5.2.1 Analysis based on aggregate rather than survey data

The Charles River Associates and Johns Hopkins studies develop disaggregative demand models of household choice behavior. The effect of various factors on the probability of a household's subscribing to cable television is estimated using survey data. The application of binary choice models to the case of cable television - where the issue is whether to subscribe or not - appears to offer promising research opportunities but since funding was not made available to assemble the requisite data base, analysis on these lines was not possible in this study.

5.2.2 Demand measured number of subscribers than the penetration rate

Previous work by Comanor and Mitchell,[11] Park,[12] Noll, Peck and McGowan[13] and Good[14] has centered on the penetration rate (the ratio of subscribers to households passed by cable) as the measure of demand. This poses conceptual problems in that the penetration rate is not really a measure of demand but rather of market share. There are also potential estimation problems unless the influence of the denominator (households passed) is weak relative to the relationships between the main series (subscribers, price, age, income).[15]

Rather than use the penetration rate, this study used total subscribers as the measure of demand. This characterization allows an evaluation of the effects of market size as well as the

traditional variables. One difficulty with both this measure and the penetration rate is the failure to segment direct and indirect subscribers. Direct subscribers are those in single family dwellings while indirect subscribers live in large units such as apartment buildings. Since the average charge per subscriber will be influenced by the costs of servicing, and costs vary between these two different types of units, some information is lost by failing to segment subscribers and using the average charge per subscriber.

5.2.3 Both logarithmic and nonlogarithmic functional forms used

All previous studies (by other authors) based on aggregate data have used logarithmic formulations of the demand equations in order to permit the direct reading of elasticities and to reduce any undue impact of large systems. The shortcoming of this approach is that direct measurement of the absolute (as opposed to the percentage) change in the dependant variable for a given change in each independent variable is not possible. To permit both types of measurement all models in this study have been estimated in both logarithmic and non-logarithmic functional forms

5.2.4 Cable television quality variable takes into account declining marginal utility of additional channels

Previous aggregate data based studies with the exception of Silver *et al.*[16] have attempted to account for the quality of

service of cable-television systems by counting the numbers of channels of various types added by each system (for example: primary networks, independent, educational, duplicate network affiliates). This approach has been adopted because of the desirability of measuring the relative importance to subscribers of each of the various types of channels and also because of the view (based on audience ratings) that these relative values were likely to be quite different. However, as we have argued in Chapter 3, since the marginal value of an additional channel is a function of the total number of channels available to the viewer rather than the number of a particular type, this approach makes it impossible to take into account the strong possibility that an additional channel of whatever type is likely to be worth less to a subscriber with many other options open to him than to a subscriber with few other channels from which to choose.

This is basically an empirical question. Use of variables counting channels of various types permits examination of differences between the various types but ignores diminishing marginal utility; use of a total channels added variable requires the aggregation of unlike channels but permits a proper recognition of the role of diminishing marginal utility in the overall picture. The results reported by Good hold for all previous studies, viz. "The disappointing feature of the demand equations is the failure of the non-network signals (independents, duplicates, educational) to be statistically significant either individually or in aggregate."[17] Our results

using an overall channel count and reflecting the diminishing marginal utility of an additional channel follow shortly.

5.3 Determinants of the Monthly Subscription Rates and Demand for Basic Canadian Service

We are concerned with the determinants of both demand for cable television and prices in the industry. The dependent variable in the demand equation was simply the number of subscribers to each cable system; in the price equation it is the monthly subscription charge paid by direct subscribers.[18] In the log-linear versions these variables, as well as all independent variables, appeared in natural log form.

In the demand equation the fitted (see below) monthly subscription rate appears as an independent variable. Following basic demand theory (in which perverse cases such as the Giffen good are considered unusual) a negative sign should be expected for this variable, i.e. higher monthly subscription rates should, other things being equal, be expected to reduce the number of subscribers to a cable system.

5.3.1 System Characteristics

In a comprehensive study of the cable television industry, as in our previous work, considerable attention would be given to the cost structure of the firms and the implications of this cost structure on pricing. In our analysis of cable pricing we focus

on certain salient features of cable systems and hypothesize relationships between these characteristics and monthly subscriber rates.

In the case of age of the system in years (denoted AGE) it is hypothesized that older systems will have lower monthly charges. The basis for this view is the ability of older systems to charge lower prices because of their lower costs (since their capital equipment will have been purchased at lower cost and will have been depreciated to a greater extent). Of course the ability to charge lower prices need not translate into lower prices in the case of a firm with market power but since the regulator, the CRTC, examines each firm's cost structure before approving rate increases there seems to be good reason to expect the older firms to exhibit lower monthly charges. Previous studies (Silver et al. and Hothi and Bodkin)[19] have used age as a dependent variable in the demand equation.

Since the regulator as well as examining the firm's cost also pays particular attention to its rate of return there is good reason to expect that firms with a higher average rate of return in the last two years (denoted AVRR) will be those with lower monthly charges.

Group ownership, i.e. a system belonging to one of the largest cable groups (denoted by GRP) is a more complicated situation. On the one hand, it might be felt that large groups have market power transcending their monopoly power in individual

markets - perhaps in terms of more effective negotiation of rate increases with the CRTC. This would mean group owned systems would be expected to exhibit higher rates. On the other hand, it could well be the case that large groups achieve cost savings not available to their smaller competitors. If this were the case, and if the CRTC were to effectively pass on these cost savings to consumers then group ownership could be expected to be associated with lower monthly charges.

When we turn to estimation of the demand equation, price and number of households passed by cable become important factors. As noted, the number of subscribers to a cable system is expected to be an inverse function of price. Subscriber numbers should, however, be a direct function of households passed since this is a scale factor and a greater number of potential subscribers would certainly, under normal circumstances, be expected to lead to a larger number of actual subscribers.

5.3.2 Quality of Service Offered

The number of hours of community programming provided each week by the cable system (denoted HRS) is an element of service quality given great attention in CRTC regulations. If this programming adds to the satisfaction of consumers it should be possible for systems to capture payments for this in higher prices. Or, another way of looking at the situation: if the CRTC is the only real "demander" for this type of programming, is it willing to reward the operators that provide more community

programming with higher prices? Frankly, in this case the null hypothesis of no effect was more appealing to the investigators but including this variable in the study does provide answers to these questions.

A more basic and much more important element of product quality relates the basic service provided by cable television - the reception of more and better quality signals. We have dealt with signal quality by assuming that if a cable system is located within the B contours of a broadcast station that the signal is available off-air at a satisfactory level of quality. If the system is not so located we assume that this is a new signal provided by the system.

As was indicated above it is in the evaluation of signals added where this study makes a considerable departure from preceding studies.[20] The use of channel counting variables, as in previous studies, means all signals added are valued equally. This makes little sense since clearly adding two channels where none are available off-air adds much more to viewer satisfaction than does the adding of two channels where, say, eleven are available off-air. The increases in consumer satisfaction provided by the various cable systems (denoted QUAL) can be expected to be reflected in the monthly prices of these systems.

The way in which consumer satisfaction increases as the cable system adds channels must be spelled out before the QUAL variable can be introduced into the model. First, to permit

comparisons across systems it has been assumed that the subscribers to the various sytems do not differ in their ability to derive satisfaction from an additional television signal. In addition, if cable television offerings are subject to the law of diminishing marginal utility then it is to be expected that, while total satisfaction derived from cable television will increase as the total number of signals increases, it will increase at a decreasing rate.

Various mathematical functions will meet these conditions. Two were investigated in detail in this study. The first, a logarithmic function, has total subscriber satisfaction from television equal to $\ell n\ x$ (where x is the total number of channels carried). The value of each additional channel is here equal to $1/x$ so that the ninth channel, for instance, adds only 1/9 as much to subscriber welfare as does the first.

The second function considered has total subscriber satisfaction from television equal to $2\sqrt{x}$. The value of each additional channel is equal to $1/\sqrt{x}$ so that the ninth channel would add 1/3 as much to subscriber satisfaction as the first. Just how rapidly the value of each additional channel declines is, of course, solely an empirical question. Our investigations indicate that this second formulation where that satisfaction from television is equal to $2\sqrt{x}$ provides a superior explanation of the Canadian cable television industry.

The value of cable television service to consumers is not a simple function of the total satisfaction derived from all television signals delivered. Some (usually) of these are available off-air at no charge. Delivery of these on a cable service adds only some small element of convenience and, for those within the station's B contour but not within its A contour, some small improvement in signal quality. The consumer satisfaction available from free off-air stations must accordingly be subtracted from the measure of total consumer satisfaction from all television signals to arrive at a measure of the quality of service QUAL of any particular system. For example, using our $2\sqrt{x}$ function, a cable system adding 9 channels where none are available off-air increases consumer satisfaction by 6 units. The same 9 channels added in a community where 7 channels are available off-air increases consumer satisfaction by only $2\sqrt{16} - 2\sqrt{7}$ units. Table 5.1 displays the calculated total increase in consumer satisfaction for various combinations of off-air and cable-added channels. These values will be used in subsequent interpretation of this variable.

It is recognized that our QUAL variable does not encompass all elements of quality of service. It cannot, for example, capture the diversity and balance of offerings or the artistic/cultural merit of the programming.

doubled. (Mean age is 9.0 years.) Both coefficients are significant at the 95% level.

The results on AVRR, although significant only at the 90% level of confidence, are interesting. Although the CRTC systematically uses rate of return information in evaluating requests for rate increases it appears to do so to little effect. Scaling of our data by the Department of Communications to preserve confidentiality makes it imposible to interpret the quantitative magnitude of these effects in the linear model. The log-linear model, however, since it provides a direct elasticity estimate, is able to show that a doubling of the rate of return can be expected to result in only a 2.5% decrease in monthly subscription rate.

The results in group ownership, although not statistically significant, do suggest that group owned cable systems have lower rates.

5.6.2 Quality of Service Offered

On the question of community programming the null hypothesis is strongly maintained. There is no evidence that increased hours of community programming provided by cable systems is in any way reflected in their monthly subscription rates.

On the other hand, the quality of service variable is significant at the 95% level of confidence in both the linear and log-linear models. The estimated coefficients tell us that one

TABLE 5.1

Total Addition to Consumer Satisfaction of Channels

Available Only via Cable Television

Number of channels available off-air	Number of Channels Added by Cable Television									
	1	2	3	4	5	6	7	8	9	10
0	2.00	2.83	3.46	4.00	4.47	4.90	5.29	5.66	6.00	6.32
1	0.83	1.46	2.00	2.47	2.90	3.29	3.66	4.00	4.32	4.63
2	0.64	1.17	1.64	2.07	2.46	2.83	3.17	3.50	3.80	4.10
3	0.54	1.01	1.43	1.83	2.19	2.54	2.86	3.17	3.46	3.75
4	0.47	0.90	1.29	1.66	2.00	2.32	2.63	2.93	3.21	3.48
5	0.43	0.82	1.18	1.53	1.85	2.16	2.46	2.74	3.01	3.27
6	0.39	0.76	1.10	1.43	1.73	2.03	2.31	2.58	2.85	3.10
7	0.37	0.71	1.03	1.34	1.64	1 92	2.19	2.45	2.71	2.95
8	0.34	0.67	0.98	1.27	1.55	1.83	2.09	2.34	2.59	2.83
9	0.32	0.63	0.93	1.21	1.48	1.75	2.00	2.25	2.49	2.72

5.3.3 Local Market Characteristics

In the case of a normal economic good increases in the level of consumer income (Y80) can be expected to result in greater consumer demand and, other things being equal, higher prices to the consumer. It is always possible, of course, that cable television may properly fall in the class of goods known as inferior goods on which consumers spend less as their incomes increase. In this latter case higher levels of consumer income would be associated with lower monthly subscription charges to cable television.

Consistent with a number of previous studies,[21] population of the community in which the cable system is located (POP) has been introduced as a proxy for the availability of other entertainment alternatives. Communities with larger populations can be expected to have more movie theatres, sporting events, etc., all of which compete for the consumer's entertainment dollar. Accordingly, it is expected that in these larger communities monthly cable television subscription charges will be lower.

5.4 Model Specification

As in subsequent chapters, in the case of price, a formal structural model that examines separately demand and supply side influences and permits the determination of equilibrium values is

not used. It is assumed that firms in the cable-television industry are profit maximizers and the price equations which are fitted are reduced forms that are completely specified and adequately describe firm, local market and ownership characteristics. Monthly subscription rates were estimated by regressing these rates on the relevant explanatory variables as discussed in the previous section.

Estimation of the numbers of cable subscribers is somewhat more complicated. In order to allow for interdependency between numbers of cable subscribers and monthly cable subscription rates a two-stage least squares model is used. It acknowledges joint dependency, but is able to produce an unbiased estimate of the cable subscriber-subscription rate relationship. First, monthly subscription rate estimates are prepared by regressing these rates on all explanatory variables in the model. Then, these fitted rate values are used as one of the explanatory variables in the estimation of numbers of cable subscribers.

Both the rate equation and the cable subscriber equation were estimated in both linear and log-linear (with all except dummy variables in natural logs) form.

5.5 The Data

Data was required for variables in four categories:

a. the dependent variables,

b. system characteristics,

c. quality of service, and

d. local market characteristics.

Both the number of subscribers to each system (with no breakdown as to direct versus indirect subscribers) and the monthly charge to subscribers was available for all systems in Canada from the June 1981 edition of Matthews CATV.[22]

This same source also included the numbers of households passed by cable in each system as well as information as to whether the system was group owned, i.e. in this case, whether it was owned by one of the ten largest multi-system operators.[23] The remaining items of cable system characteristics, age and average rate of return, were supplied by the Statistical Information Services of the federal Department of Communications. For the period 1972-1979, first year of operations was based on the first year operating revenues were reported. From 1962-1972 it was based on the first year the system reported capital investment in its head-end facilities. As no data was available prior to 1962, systems which actually began operations in earlier years were shown as 19 years old.

Rate of return data was provided for each cable system based on the calculation (Profits before income tax)/(Net fixed assets i.e. at historical cost less standardized depreciation). This information was supplied for 1978 and for 1979. The variable AVRR was calculated by obtaining the arithmetic mean of the rate of return for the two years. Since this information is drawn from

the confidential data provided by firms in their Annual Return: Cable Television to Statistics Canada it was necessary for the Statistical Services Branch to disguise the actual data points by introducing a scaling factor unknown to the investigators. Therefore in interpreting the results of the rate of return variable the direction of change is known but the exact magnitude of influence cannot be ascertained.

In the area of quality of service the number of hours per week of community programming was found in Matthew's CATV. This list also shows for each system the complete slate of signals delivered. To determine whether a particular signal was available off-air (i.e. whether the cable system was located within the station's B contours) required a careful analysis of contour maps supplied by the Department of Communications. If a system was located within the A or B contours of a station it was judged to receive that signal over-the-air. Contour maps were not available for PBS stations. They were classified as receivable over-air if all other stations broadcasting from the community in which the PBS station is located are received off-air in the area where the cable system is located. This information on the complete slate of signals delivered and the list of those available off-air permit calculation of the quality of services variable QUAL.

In the case of local market characteristics 1980 personal disposable income data was drawn from census information[24] and 1980 population from Financial Post: Canadian Markets 1981.[25]

TABLE 5.2

Cable Television (Canada): Monthly Subscription Rates

	Linear Model	Log-linear Model
Dependent variable	Monthly subscription rate (dollars)	Natural logarithm of monthly subscription rate
Independent variables:		
Constant	7.32 (15.21)**	1.95 (12.30)**
AGE (in years)	-1.14 (5.82)**	-.25 (5.76)**
AVRR (average rate of return	-7.35 (1.78)*	-0.25 (1.84)*
GRP (group owned)	-3.63 (1.43)	-0.36 (1.05)
HRS (of community programming)	0.13 (.34)	.0079 (.44)
QUAL (quality of service)	.229 (2.05)**	.084 (3.01)**
Y80 (1980 income in thousands)	.135 (2.00)**	.084 (1.13)
POP (100,00 population of the community)	-.021 (1.29)	-.0013 (.14)
Mean value of dependent variable	7.49	1.99
R^2	.23	.26
n = number of cable systems	225	197

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

The original data included information on 374 cable systems - almost the entire population. Missing information, mainly on rate of return and age reduced the data set to 225 observations in the case of the price equations; 197 in the case of the cable subscribers equations.

5.6 Empirical Results: Monthly Subscription Rates

The results of the estimation of Canadian monthly cable subscriber rates are displayed in Table 5.2. It can be seen that the linear model is able to account for 23% of the variation in monthly subscription rates (26% for the log-linear model). The mean monthly rate for all 225 systems in the linear estimates is $7.49. The constant term which reflects the influence of relevant variables excluded from the model is significant in both equations at the 95% level of confidence ($7.32 in the linear model and 1.95 in the log-linear model).

5.6.1 System Characteristics

The results support the hypothesis that older cable systems can be expected to have lower monthly subscription rates. The -.114 estimated coefficient on AGE in the linear model indicates that a system 10 years old would be expected to have a monthly subscription rate $1.14 lower than a new system. The log-linear results also support the basic hypothesis with the -.25 coefficient indicating a 25% decline in price when age is

unit of consumer satisfaction from cable television is valued at 22.9¢ and that a doubling of the level of consumer satisfaction (mean value 2.04) can be expected to result in an 8.4% increase in price. Recall that overall consumer satisfaction from television was found to vary as $2\sqrt{x}$ where x is the number of channels available. Thus a cable system adding 9 channels where none were available off-air adds 6 units of consumer satisfaction which would serve to increase the monthly charge by $1.37.

In the case where the 9 channels were added to an existing base of 7 the quality variable increases only 2 16 - 2 7 = 2.71 units. This would add only $0.62 to the monthly charge.

5.6.3 Local Market Characteristics

The evidence indicates at the 95% level, that monthly cable rates can be expected to be higher in high income communities by $0.13 for every $1000 in income. The income elasticity although positive is small and statistically insignificant.

The population results, although statistically insigificant do suggest that larger communities may have lower cable rates.

5.7 Empirical Results - Number of Cable Subscribers

The results of the estimates of numbers of cable subscribers are displayed in Table 5.3. It can be seen that the linear model is able to account for 99% of the variation in number of cable

subscribers (98% for the log-linear model). The average number of subscribers for all 225 systems in the linear estimates is 17,223. All estimated coefficients in the linear model are statistically significant at the 95% level with the exception of income which is significant at the 90% level. In the log-linear model, all coefficients are significant at the 95% level with the exception of population which is significant at the 90% level and hours of community programming and income which are statistically insignificant. The constant term, reflecting the influence of excluded variables, is 10,831 in the linear model and 1.41 in the log-linear model.

5.7.1 System Characteristics

In the estimation of a demand equation, it is to be expected that price will play an important role and that it will be negatively related to the number of subscribers. The results provide strong substantiation on both of these points. The results of the linear model show that a single dollar increase in the monthly cable rate can be expected to reduce the number of subscribers to the system by 1,357 from a mean value of 17,223. The estimated price elasticity is -.85, indicating that a 10% increase in the monthly cable rate can be expected to result in an 8.5% decrease in the number of cable subscribers. In Chapter 3 we showed that the profit maximizing price would be associated with a price elasticity of unitary or a little higher. Our result, however, is quite consistent with a regulated price.

TABLE 5.3

Cable Television (Canada): Number of Subscribers

	Linear Model	Log-linear Model
Dependent variable	Number of subscribers	Natural logarithm of number of subscribers
Independent variables:		
Constant	10,831.67 (303)**	1.41 (3.77)**
FCR (fitted monthly subscription rates	-1357.56 (3.06)**	-.85 (5.42)**
HP (households passed)	.866 (118.9)**	.98 (49.43)**
HRS (of community programming)	-271.78 (2.00)**	.023 (1.00)
QUAL (quality of service)	977.80 (2.53)**	.197 (5.69)**
Y80 (1980 income)	-427.74 (1.92)*	.035 (.38)
POP (population of the community)	-120.94 (1.99)**	-.022 (1.68))*
Mean value of dependent variable	17,223	8.68
R^2	.99	.98
n = number of cable systems	225	197

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

As would certainly have been expected, the number of households passed is an important determinant of the number of subscribers to a cable system. The linear model results show that an additional 1000 households passed can be expected to increase subscriber count by 866. The estimated .98 coefficient in the log-linear model means that whenever the number of households passed increases by a particular percentage that the same percentage increase in the number of cable subscribers can be expected.

In the mature Canadian cable industry, there seemed to be little justification for including system age as a determinant of the number of subscribers. Average rate of return and group ownership also lack any theoretical justification for their inclusion in the demand equation.

5.7.2 Quality of Service Offered

The statistical significance of the hours of community programming variable in the linear model is somewhat surprising. All 225 systems in the sample televise an average of 2.95 hours of community programming per week. The results show that an increase of a single hour per week in community programming is associated with a loss of 272 cable subscribers. Therefore the subscriber loss, although statistically significant, is of minor economic significance.

Results for the quality of service variable provide strong evidence of the important role played by a properly specified quality of service variable in the determination of the demand for cable television. Change of a single unit in the quality of service variable in the linear model adds 978 cable subscribers. In terms of the example we have dealt with earlier, where adding 9 cable channels in a community where none are available off-air, increases the quality of service variable by 6 units. It can be seen that the total increase in cable subscribers of 5,868 is very substantial in comparison to the mean value of 17,223. Again, where the 9 channels were added in a community where 7 were available off-air, the quality of service variable would have risen only 2.71 units and have accounted for only 2,650 subscribers.

Results for the quality of service variable in the log-linear model indicate an elasticity of .2. Interpretation of this requires reference to Table 5.1 to determine the percentage increase in the quality of service variable made possible by the addition of various numbers of cable television channels. For instance, in a zero off-air situation, adding 9 cable channels results in 6 units of quality of service, whereas adding 4 channels results only in 4 units of quality of service. Therefore, the additional 5 channels have increased the quality of service variable from 4 to 6 or alternatively, by 50%. Since a 100% increase in the quality of service variable would increase the number of subscribers by only 20% then this increase in cable

channels from 4 to 9 will result in only a 10% increase in the number of cable subscribers.

5.7.3 Local Market Characteristics

The estimated coefficient of the income variable is significant only in the linear model and there only at the 90% level. The coefficient in that model does suggest that cable systems in higher income communities will have fewer subscribers, specifically 428 fewer subscribers for each $1000 increase in personal disposable income. This result appears somewhat inconsistent with the results of the price equation where higher incomes were associated with higher prices.

Results on the population variable supported the entertainment-alternatives interpretation of this variable with a negative sign being found in both equations. The implications were modest in a quantitative sense with an additional 100,000 community population reducing the number of cable subscribers by 121. In the log-linear model a doubling of community population reduced cable subscribers by 2%.

5.8 Conclusions

Despite the lack of a cost component in the present work examination of the salient variable on the demand side has provided a number of useful insights.

5.8.1 System Characteristics

Our demand estimates provided strong evidence of the importance of monthly subscription rates as a determinant of the number of cable subscribers with a single dollar increase in the rate reducing subscribers by 1,357. Demand elasticity was estimated at -.85, again reinforcing the important role that price plays in the mind of the consumer when he is making his decision on whether to subscribe or not.

The results also indicated that 87% of new households passed could be expected to become cable subscribers. The results also indicated that the penetration rate should not be expected to change as a result of system extension. For instance, a 20% increase in the number of households passed should yield a 20% increase in the number of cable subscribers.

In the price equation among the most interesting findings were those regarding the role played by system age and average rate of return in pricing. The age results showed monthly cable rates declining by 11.4 cents for each year a system has been in operation. On average rate of return, although the quantitative magnitude of the effect is unknown because of the scaling of the confidential data, there is some indication that stations characterised by higher rates of return charge somewhat lower prices. The effect, however, appears to be minor in that the elasticity estimate from the log-linear model suggests a price only 2.5% lower as a result of a doubling of a systems average

rate of return.

There is some indication in the results that systems owned by the 10 largest cable groups charge somewhat lower monthly rates. Possibly this indicates some passing through to consumers of cost savings resulting from scale economy.

5.8.2 Quality of Service Offered

While there is no evidence of any statistical relationship between the number of hours of community programming carried and the monthly cable rate, the results do suggest that increased community programming does detract slightly from the number of subscribers to a cable system. The average number of cable subscribers to the systems in our sample was 17,223. The results indicated a loss of 271 subscribers for each hour of community programming added.

One of the most important results from this study is the finding that a re-specification of the quality of service variable(s) to take account of the diminishing marginal utility of an additional signal can yield extremely useful results for the quality of service variable. Take, for example, the situation where 9 channels are available on a cable system in a community where none are available off-air. Such a set of offerings would be evaluated as 6 units of the quality of service variable and would increase the monthly subscriber charge by $1.37. The effect on demand would be an increase of 5,868 cable subscribers.

Where there are already 7 channels available off-air in the community, the quality of service variable would only stand at 2.71 and both of the above quantitative measures would be roughly halved. Therefore, in evaluating the worth to the community of the cable system serving it, it is crucial that not only the number of cable channels added by the system be considered but that also the number of channels available off-air be taken into account. The results reported in this study take both of these factors into account and as well allow for diminishing marginal utility of additional offerings.

The elasticity estimates in the log-linear model indicate that a doubling of the quality of service is associated with a 20% increase in subscribers and an 8.4% increase in monthly cable rates.

5.8.3 Local Market Characteristics

The overall interpretation to be given to the income variable is somewhat unclear since income has a positive coefficient in the monthly subscription rate equation and a negative coefficient in the number of subscribers equation. The price results indicate that a $1000 increase in personal disposable income would add 13.5 cents to monthly cable rates while the demand equation shows a drop of 427 in the number of cable subscribers.

The results on population support the entertainment-alternatives interpretation of this variable. In the price equation there is a suggestion that communities with larger population enjoy lower cable rates while in the demand model an increase of 100,000 in the community's population results in a relatively minor 120 person drop in the number of cable subscribers. Therefore, this result, although analytically interesting, is of modest economic significance.

FOOTNOTES

1 Two useful sources with an interesting blend of practical and theoretical material are R. S. Pindyck and D. L. Rubinfeld, Econometric Models and Economic Forecasts, New York: McGraw-Hill, 1976 and G. S. Maddala, Econometrics, New York: McGraw-Hill, 1977.

2 Stuart McFadyen, Colin Hoskins and David Gillen, Canadian Broadcasting: Market Structure and Economic Performance, Montreal: Institute for Research on Public Policy, 1980, pp. 223-243.

3 I. Silver, P. Jacobson, K. May and M. C. McCracken, An Econometric Model of a Cable Television System, prepared on contract for the Canadian Radio-Television Commission, Ottawa: Informetrica, 1975.

4 L. M. Good, An Econometric Model of the Canadian Cable Television Industry and the Effects of CRTC Regulation, unpublished Ph.D. dissertation, University of Western Ontario, 1974.

5 I.I.Q.E., Economic Study of the Financial and Market Characteristics of the 16 Largest CATV Companies in Canada, June 1974.

6 William S. Comanor and Bridger M. Mitchell, "Cable Television and the Impact of Regulation", The Bell Journal of Economics and Management Science, Vol. 2, No. 1, Spring 1971, 154-212.

7 Rolla E. Park, "Prospects for Cable in the 100 Largest Television Markets", The Bell Journal of Economics and Management Science Vol. 3. No. 1, Spring 1972, 130-150. Also see R. E. Park, Prospects for Cable in the 100 Largest Television Markets, The Rand Corporation, R-875-MF (October 1971).

8 Roger G. Noll, Merton J. Peck and John J. McGowan, Economic Aspects of Television Regulation, (Washington, DC: The Brookings Institution, 1973), Appendix A.

9 Charles River Associates, Inc. (CRA), and Michael Berkowitz and

Company, (Orinda, California), Analysis of the Demand for Cable Television, prepared for the U.S. Department of Commerce, Office of Telecommunications under Contract No. 2-35009 (April 1973), and
The Johns Hopkins University, Center for Metropolitan Planning and Research [K. C. Lyall, R. A. Duncan, C. F. DeKay, J. E. Gorster and S. D. Hisleey], Economic Feasibility of a Cable System for Cleveland (Baltimore, Maryland: January 1976). Both of these were not available to us. Our summary notes are based on the material appearing in Appendix A of Arthur D. Little Inc., Pay Television Services via Direct Broadcast Satellite: Demand and Impact in the 1980's, prepared for Comsat General Corporation, May 1980, pp. A19-A32.

10 See Silver *et al.*, op. cit., pp. 3-5 and Appendix A of Arthur D. Little, Inc., Pay Television Services via Direct Broadcast Satellite: Demand and Impact in the 1980's, prepared for Comsat General Corporation, May 1980, pp. A19-A32.

11 William S. Comanor and Bridger M. Mitchell, op.cit.

12 Rolla E. Park, op.cit

13 Roger G. Noll, Merton J. Peck and John J. McGowan, op.cit.

14 L. M. Good, op.cit

15 I. Silver, P. Jacobsen, K. May, and M. C. McCracken, op.cit., pp. 4-3 - 4-4.

16 Ibid. The Silver study used an index of viewing patterns reflecting the extent to which people reallocated their viewing to cable-only channels.

17 L. M. Good, op.cit., p. 15

18 Attempts to estimate the determinants of cable installation charges were unsuccessful. This may result from the diminished significance of installation charges in the overall revenue picture of mature systems.

19 See Silver et al., op. cit., and Hothi and Bodkin, op. cit..

20 Always noting the unique, but ex post, use of viewership data by Silver *et al*.

21 See, for example, Hothi and Bodkin, op. cit.

22 Robbie and Neil Oakley, eds., Matthews CATV, Pointe Claire, Quebec: Matthews and Partners Ltd., Vol. 10, No. 2, June 1981.

23 The ten largst cable groups (by subscriber count at June, 1981) were Bushnell, Cablecasting, Cablenet, Capital, CUC, Maclean Hunter, Moffatt, Premiere, Rogers, Selkirk and Videotron/Cablevision Nationale.

24 Statistics Canada, Census of Canada 1976. Population: Geographic Distributions, Ottawa: Minister of Supply and Services Canada, 1979.

25 Financial Post, Canadian Markets 1981, Toronto: Maclean-Hunter, 1980.

6. Chapter 6. The Demand for Cable Television in the United States

An analysis of the demand for basic cable service in the United States is really an integral part of a comprehensive examination of pay-television in that country. In addition such a study permits useful comparisons with the results of the study of Canadian cable television and thereby enhancing the meaning and usefulness of the latter.

6.1 Relationship to Other Studies of the Demand for Cable Television

To ensure comparability between the Canadian and American cable studies the statistical approach developed in the previous chapter has also been adopted in the U.S. study. This means that the U.S. basic cable analysis differs from previous research on this topic in many of the same ways as the Canadian analysis, namely:

a. use of aggregate rather than micro (survey) data
b. measurement of demand for cable as number of cable subscribers rather than penetration rate
c. both logarithmic and non-logarithmic functional forms are estimated.

There is, however, one area - quality of service offered - where our U.S. data is not of the same standard as our Canadian

data and therefore the interesting quality of service results of the Canadian study cannot be replicated.

6.2 Determinants of the Monthly Subscription Rates and Demand for Basic U.S. Service

The dependent variables in the two models are monthly subscription rates and number of cable subscribers. Again fitted monthly subscription rate is used as one of the independent variables in the estimation of the demand equation with the expectation that its estimated coefficient will have a negative sign.

6.2.1 System Characteristics

Since financial information was not available for U.S. cable systems it was not possible to include any measure of average rate of return in the price estimates.

The installation charge levied on each new subscriber to the basic cable service was added as an explanatory variable in the price model. Our initial expectation was that system operators might trade off higher installation charges for lower monthly subscription rates.

American cable systems have not reached the same level of maturity as Canadian systems. Accordingly it was deemed appropriate to include system age as an explanatory variable in

the demand model. It is hypothesized that as systems mature, i.e. become older, they will increase their subscriber count.

6.2.2 Quality of Service Offered

The number of hours per week of community programming was not available for U.S. systems. In any event in the largely de-regulated U.S. environment such a measure would be subject to quite different interpretation.

In addition, with the resouces available, it was not possible to construct an adequate quality of service variable. What is needed is precise information on exactly what signals are delivered by each cable system and information on exactly which of these signals are freely available off-air. It is the latter which is difficult to obtain. In the Canadian case the signal contour maps of all relevant broadcasting stations were examined to determine whether or not their off-air signal was freely available to subscribers. To carry out this task for the sample U.S. systems would entail considerable additional effort. An attempt was made to provide a rough estimate by counting all signals delivered to the cable system via microwave as cable-only and all signals available to it off-air as available off-air to subscribers. These rough estimates proved too crude to provide useful statistical measures however.

It was possible to introduce one measure of quality not available in the Canadian data. This was a dummy variable PAY

taking the value 1 when pay-television service was available on the cable system zero when it was not. It is hypothesized that availability of pay-television service should serve to increase the attractiveness of the basic cable service to potential subscribers and permit the charging of higher prices. The latter hypothesis must be viewed as very tentative since it is always possible that cross-subsidization between pay-television and basic cable might lead to lower basic cable rates in an attempt to broaden the subscriber base from which pay-subscribers will be drawn.

6.2.3 Local Market Characteristics

The initial hypothesis with regard to the population and income variables parallel those in the Canadian analysis. Population is expected to serve as a proxy for other entertainment alternatives and hence to appear with a negative coefficient in both the subscription rate and demand equations. If cable television service is a normal, as opposed to an inferior good, the income variable should be characterized by a positive coefficient in both equations.

6.3 Model Specification

The two models used parallel closely their Canadian counterparts with the exception of the variable changes just noted. Again fitted monthly subscription rates are used as an

independent variable in the numbers of cable subscribers equation in order to take into account possible joint interdependency between cable rates and numbers of subscribers.

6.4 The Data

Data on all variables with the exception of income and community population were obtained from Television Factbook: Services Volume 1981/82.[1] For the 77 larger systems per capita effective buying income and community population for 1979 were obtained from Sales and Marketing Management: 1980 Survey of Buying Power.[2] For twenty-one smaller systems population data was obtained from the Factbook. To obtain an income figure it was necessary to first identify the county in which the system was located using the Factbook. Income information for each county was then obtained from Sales and Marketing Management.

6.5 Empirical Results: U.S. Monthly Subscription Rates

The results of the estimation of U.S. Monthly cable subscriber rates are displayed in Table 6.1. The linear model is able to account for 30% of the total variation in monthly subscriber rates; the log-linear model 31%. The constant term (6.78 in the linear model; 1.63 in the log-linear) is significant at the 95% level of confidence in both equations.

TABLE 6.1

Cable Television (U.S.): Monthly Subscription Rates

	Linear Model	Log-linear Model
Dependent variable	Monthly subscription rate (dollars)	Natural logarithm of monthly subscription rate
Independent variables:		
Constant	6.78 (9.47)**	1.63 (5.85)**
CI (cable installation charge)	.0455 (2.54)**	.152 (3.06)**
AGE (in years)	-.0355 (2.24	-.060 (1.99)**
GRP (group owned)	-.267 (.81)	.091 (1.99)**
PAY (service available)	.262 (.95)	-.111 (2.01)**
Y80 (1980 income)	.0025 (0.83)	.036 (.51)
POP (population of the community)	.0300 (4.31)**	.048 (3.72)**
Mean value of dependent variable	7.69	2.03
R^2	.30	.31
n = number of cable systems	98	95

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

The average monthly subscription rate for the 98 systems in the sample is $.69; mean value of the natural logarithm of monthly subscription rates is 1.63.

6.5.1 System Coefficients

All of these coefficients, with the exception of group ownership in the arithmetic model, are significant at the 95% level of confidence.

Our initial hypothesis that system operators might trade off higher installation charges for lower monthly subscription rates was not supported. Results in the linear model indicate rather that each additional dollar of cable installation charge is associated with a 4.5¢ increase in monthly charge (mean $7.70). The log-linear results show a doubling of the installation fee to be linked to a 15% increase in the monthly charge. Contrary to our hypothesis it appears that systems located in favourable environments and offering high quality service charge more both for installation and on a monthly basis.

The estimated coefficients for age are consistent with the Canadian results. Older systems have lower monthly subscription rates. The effect is of smaller magnitude than in the Canadian case with each additional year of age for U.S. systems being associated with a decrease of 3.5¢ in the monthly charge. In the log-linear model a doubling of system age (average age 15.5 years) is associated with a 6% decline in monthly cable charge.

The group ownership dummy variable, statistically significant only in the log-linear model, shows cable systems belonging to a multi-system operator to have monthly subscription rates 9% higher than non-group owned systems. This provides an interesting contrast to the Canadian situation where systems belonging to the ten largest cable groups had lower rather than higher monthly rates. An interpretation of the Canadian result was that in a regulated environment cost savings of group owned systems were being passed forward to consumers. It would appear that in the unregulated U.S. environment either these group cost savings do not exist or that they are not being passed forward to the consumers. Alternatively it appears that multi system operators are better able to take advantage of whatever local market power they may have than are non-group-owned systems.

6.5.2 Quality of Service Offered

As noted above, hours of community programming and a direct quality of service variable are not available for the U.S. sample. The pay-television dummy variable is, however, available, and its coefficient in the log-linear model is significant at the 95% level of confidence. The size of the coefficient shows the monthly subscription charge of those systems offering pay-television service to be 11% lower than the monthly charge of systems without such service.

Our initial hypothesis was that the very availability of pay-television would increase the attractiveness of basic cable

and lead to higher basic cable prices. As we will see momentarily, there is evidence in the demand equation results to support the proposition that pay-television availability increases the attractiveness of basic cable. Operators fail to translate this increased attractiveness into higher basic cable monthly subscription charges possibly because of a desire to broaden the subscriber-base from which pay-subscribers will be drawn.

6.5.3 Local Market Characteristics

The income variable failed the statistical significance tests in both equations suggesting that basic cable service rates in the U.S. are set without regard to the level of income in the community.

Results for the population variable contradict the findings of the Canadian analysis where increased community size led to lower monthly rates. In the U.S. larger community population is associated with higher monthly basic cable rates in both the linear and log-linear models (with both results significant at the 95% level of confidence). The economic significance of the results is relatively modest however with each 100,000 additional people in the community adding 3¢ to the basic cable monthly rate or alternatively a doubling of community population (sample average 744,000) leading to a 4.8% monthly rate increase.

6.6 Empirical Results: U.S. Number of Cable Subscribers

The estimated demand equations for U.S. basic cable service are displayed in Table 6.2. The linear model accounts for 83% of the variation in the number of cable subscribers but it has limited explanatory power with only two variables (households passed and age) significant at the 95% level of confidence. The log-linear model provides a much better fit to the U.S. basic cable data. It is able to account for 95% of the variation in the natural log of monthly subscription rate with four variables (the constant, households passed, age, and the pay-television dummy) significant at the 95% level of confidence.

TABLE 6.2

Cable Television (U.S.): Number of Subscribers

	Linear Model	Log-linear Model
Dependent variable	Number of subscribers	Natural logarithm of number of subscribers
Independent variables:		
Constant	23,343 (.62)	2.80 (2.02)**
FCR (fitted monthly subscription rates	-3450 (.72)	-1.04 (1.61)
HP (households passed)	.438 (11.04)**	.81 (13.82)**
AGE (in years)	-7.30 (.03)	.18 (2.47)**
PAY (service available)	10,885 (2.95)**	.36 (2.54)**
Y80 (1980 income)	195.17 (.53)*	.016 (.11)
POP (population of the community)	-173.93 (1.20)**	.037 (.81)
Mean value of dependent variable	34,137	9.94
R^2	.83	.95
n = number of cable systems	98	95

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

6.6.1 System Characteristics

The estimated coefficients for fitted monthly subscription rates have the expected negative sign and in the case of the log-linear model an implied price elasticity of -1.04. It is interesting to note that, in the unregulated setting of the U.S., this price elasticity is consistent, as we demonstrated in Chapter 3, with profit maximization. The estimated coefficients in the linear model falls far short of statistical signficance but the elasticity estimate would be statistically significant at the 11% level.

The households passed variable which is statistically significant indicates in the linear model an increase of 438 cable subscribers for every additional 1000 households passed or in the log-linear model an elasticity of .81.

The estimated coefficient for system age, statistically significant in the log-linear model, shows the monthly cable rate rising by 18% when age is doubled.

Both of these results are in accord with *a priori* reasoning.

6.6.2 Quality of Service Offered

The statistically significant estimated coefficient for the pay-television dummy variable in both models provides strong support for the hyothesis that the availability of pay-television plays an important role in increasing the attractiveness to

consumers of basic cable service. An increase of 10,885 subscribers (average number for all systems is 34,137) is indicated in the linear model; an increase of 36¢ in the log-linear model.

6.7 Local Market Characteristics

Income levels and community size (in terms of population) appear to have little influence on the numbers of subscribers to basic cable service in the U.S.

6.8 Conclusions

Examination of cable service installation charges revealed, rather than being an operator trade-off between installation charges and monthly charges, that systems with higher installation charges also had higher monthly subscription rates (by 4.5¢ per dollar of installation charge or an elasticity of .15).

Demand equation estimates indicated the number of cable subscribers to have a price elasticity of -1.04 (falling slightly short of the 95% level). This price elasticity estimate is consistent not only with the Canadian results in the previous chapter but in general with previous studies by others.

The number of households passed was found to be an important determinant of the number of cable subscribers but the

relationship estimated varied from 44 subscribers per 100 households in the linear model to 81% in the log-linear model.

Older cable systems were found to have slightly lower monthly prices and significantly larger numbers of subscribers (18% more subscribers as a result of system age doubling). These support the hypothesis that older systems could be expected to have lower costs and hence lower prices as well as greater numbers of subscribers because of system maturity effects.

Availability of pay-television service on a cable system was found to be associated with 11% lower basic cable monthly rates perhaps reflecting cross-subsidization of basic cable by pay-television in order to increase the subscriber base from which pay-subscribers are drawn. Pay-television availability played a significant role in increasing the number of system subscribers to basic cable (by 10,885 or alternatively 36%).

Income levels appear to be totally unrelated to either monthly prices or numbers of subscribers to basic cable in the U.S.

Population of the community in which a cable system is located appears to have no impact on subscribers numbers but a modest positive influence on monthly cable rates (3¢ for 100,000 population increase or 4.8% higher price for a doubling in population).

FOOTNOTES

1 Television Factbook: Services Volume 1981/82, Edition No. 51, 1981, Washington: Television Digest Inc.

2 Sales and Marketing Managment: 1980 Survey of Buying Power, Vol. 125, No. 2, January 28, 1980, New York, New York.

7. Chapter 7. The Demand for Pay-television in the United States

Studying the demand for pay-television in the U.S. improves our understanding of this industry in the American context. Hopefully, this improved understanding will permit the generation of useful insights into how pay-television will fare upon its introduction into Canada.

7.1 Relationship to Other Studies of the Demand for Pay-Television

Aside from the study by Ian Gale,[1] which examined pay-television and basic-cable pricing in a pairwise sample of comparable Canadian and U.S. markets, only one study of pay-television pricing has been identified. This is the Hothi and Bodkin study[2] done for the U.S. in the mid-1970's which was carefully reviewed and analyzed in Chapter 4. The present study adopts the same general approach as Hothi and Bodkin but differs in several important respects.

1. Fifteen of the twenty-six equations estimated by Hothi and Bodkin have pay-television penetration rate as the dependent variable. We have not estimated the determinants of the pay-television penetration rate because in our view it is not really a measure of the demand but of market share. Penetration rate estimation also poses statistical problems unless the influence of the denominator (cable subscribers) is weak relative to the relationships between the main series

(subscribers, price, age, income, etc.).

2. Hothi and Bodkin make no attempt to estimate the determinants of pay-television monthly subscription rates as we have done.
3. The generally statistically insignificant and wrongly signed channel-counting quality variables used by Hothi and Bodkin have not been included in our models. As mentioned in the previous chapter, resource constaints prevented us from constructing a quality variable with a sound theoretical foundation for the U.S. data base.
4. Hothi and Bodkin ignore the influence of the pay-television installation charge on the number of pay subscribers (and, of course, on the monthly pay-television subscription rate which they do not estimate).
5. Although Hothi and Bodkin found the number of cable subscribers to be an important determinant of the number of pay-television subscribers they do nothing to examine the determinants of the former. Also, their various models make no allowance for possible interdependency between numbers of pay subscribers and numbers of cable subscribers, possibly biasing their results.

7.2 Determinants of the Monthly Subscription Rates and Demand for U.S. Pay-television Services

The dependent variables in the two models are monthly pay-television subscription rates and numbers of pay-television subscribers. The fitted number of cable subscribers is used as

one of the independent variables in the price and demand equation estimation.

7.2.1 Related Prices

The theoretical analysis in Chapter 3 demonstrated that in the case of linear demand functions the monthly subscription rates for both basic cable and pay-television will be a function of the vertical intercept of each. Unfortunately, since there is no predictable relationship between the intercepts of the two demand functions, theory provides little guidance as to the nature of the expected relationship betweeen monthly basic cable rates and monthly pay-television rates. Similarly, it is not clear how the level of basic cable and pay-television installation charges should be expected to influence the size of the pay-television monthly subscription rate.

Since all four prices are costs to be borne by pay-television subscribers one thing that is clear is that all four can be expected to be negatively related to the numbers of cable subscribers. Since many potential pay-television subscribers may already be basic cable subscribers the monthly and installation charges for pay-television can be expected to be of greater economic and statistical significance in the demand estimates.

7.2.2 System Characteristics

On the basis of our analysis in Chapter 3 it is hypothesized that systems with larger numbers of basic cable subscribers will have higher monthly pay-television subscription rates. There is, of course, strong reason to expect that such systems will have larger numbers of pay-television subscribers.

Because of the immaturity of the U.S. pay-television system it is hypothesized that the number of pay-television subscribers will be positively related to the number of years pay-TV has been available. This same immaturity can be expected to minimize the influence of pay-TV age or costs and consequently on pay-TV monthly subscription rates.

As in the case of basic the nature of the relationship between group ownership and monthly subscription rates is not evident on the basis of *a priori* reasoning.

7.2.3 Quality of Service Offered

Three categories of service quality are distinguished: Home Box Office, Showtime, and all others. Home Box Office is the largest established pay-TV program provider and is considered in trade literature "the" premiere competitor. Showtime is the second most widely represented program provider in our sample of systems. It is hypothesized that these well-established program providers will permit operators to charge higher monthly pay-TV subscription rates and attract greater numbers of subscribers.

7.2.4 Local Market Characteristics

It is hypothesized that higher levels of income will permit the charging of higher monthly pay-TV subscription rates and that they will be associated with larger numbers of pay-TV subscribers.

Population of the community, on the other hand, if it serves as a proxy for the availability of entertainment alternatives, can be expected to be negatively associated with both monthly rates and numbers of subscribers to pay-TV.

7.3 Model Specification

The two models estimated closely parallel their counterparts in the two preceding chapters with the exception of the introduction of the additional variables considered above. Fitted number of cable subscribers is used as an independent variable in the estimation of both the rate and demand models in order to allow for interdependency between numbers of cable subscribers and both monthly pay-TV rates and numbers of pay-TV subscribers.

7.4 The Data

Information on pay-TV monthly subscription rates and installation charges as well as number of years of pay-TV availability and programming provider identification were all obtained from Television Factbook: Services Volume, 1981/82.[3]

7.5 Empirical Results: U.S. Pay-Television Monthly Subscription Rates

The U.S. pay-TV monthly rate estimation results are displayed in Table 7.1. The log-linear specification proved inappropriate in this case and the results for this specification are not reported. The linear model, however, is able to account for 32% of the variation in pay-TV monthly subscription rates. The constant term, estimated at 9.83, was significant at the 95% level of confidence. The average monthly rate for all 81 pay-TV systems in the sample was $9.25.

7.5.1 Related Prices

As in the basic cable analysis there is evidence that higher installation charges are associated with higher monthly subscription charges. The magnitude of the effect is very modest however. An additional dollar of basic cable installation charge is associated with a 3.2¢ increase in the monthly rate; an additional dollar of pay-TV installation charge with 2.4¢ monthly rate increase. The first of these results falls short of significance at the 90% level of confidence; the latter is significant at the 90% level.

In another, more economically important result (significant at the 90% level), a one dollar increase in the basic cable monthly subscription rate is associated with a 22.8¢ decrease in the monthly pay-TV rate.

TABLE 7.1

Pay Television (U.S.): Monthly Subscription Rates

	Linear Model
Dependent variable	Monthly subscription rate
Independent variables:	
Constant	9.83 (9.01)**
CI (cable installation charge)	.032 (1.60)
CR (cable monthly	
CR (cable monthly absorption rate)	-.228 (1.90)*
PI (pay installation charge)	.024 (1.66)*
FCS (fitted number of cable subscribers)	.000013 (2.58)**
PAGE (years of pay-TV availability)	.056 (.66)
GRP (group owned)	.356 (.90)
SHOW (Showtime)	.66 (1.67)*
HBO (Home Box Office)	-.57 (1.85)*
Y80 (1980 income)	-.029 (.94)
POP (100,00 population of the community)	.0046 (.50)
Mean value of dependent variable	9.25
R^2	.32
n = number of systems with pay television	81

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

7.5.2 System Characteristics

As was hypothesized, the number of years of availability of pay-television had no statistically significant influence on monthly pay-TV rates. Group ownership also proved insignificant.

In the only result significant at the 95% level of confidence in this specification, an increase in the number of basic cable subscribers was found to increase monthly pay-TV rates by 13¢ for each 10,000 additional basic cable subscribers. This result is consistent with the hypothesis based on our theoretical analysis in Chapter 3.

7.5.3 Quality of Service Offered

Both Showtime and Home Box Office programming proved to be statistically significant, at the 90% level, determinants of monthly pay-TV subscription rates. However, while Showtime is shown to add 66¢ to pay-TV monthly rates we find that Home Box Office detracts 57¢ from these rates; this latter result appears anomalous.

7.5.4 Local Market Characteristics

The estimated coefficients for local market income and population were not statistically significant.

TABLE 7.2

Pay Television (U.S.): Number of Subscribers

	Linear Model	Log-linear Model
Dependent variable	Number of subscribers	Natural logarithm of number of subscribers
Independent variables:		
Constant	8,782(303)**	-5.03 (1.71)*
CI (cable installation charge)	160 (.68)	.25 (.95)
CR (cable monthly subscription rate)	-1641 (1.09)	.77 (1.38)
PI (pay installation charge)	393 (2.25)**	_
PR (pay monthly subscription rate)	-3471 (2.37)**	-1.31 (1.96)**
FCS (fitted number of cable subscribers	.371 (5.88)**	1.166 (4.74)**
PAGE (years of pay-TV availability)	2201 (2.11)**	.39 (1.88)*
SHOW (Showtime)	8068 (1.66)*	.51 (2.04)**
HBO (Home Box Office)	6931 (1.82)*	.49 (2.41)**
Y80 (1980 income)	854.03 (2.29)**	.64 (1.82)*
POP (population of the community)	279.33 (2.50)**	.059 (.54)
Mean value of dependent variable	19,183	10.53
R^2	.61	.61
n = number of cable systems	81	77

[1] Figures in parentheses are t-statistics
* Significant at the 90% level of confidence
** Significant at the 95% level of confidence

7.6 Empirical Results: U.S. Pay-television Number of Subscribers

The estimated demand equations for U.S. pay-television are shown in Table 7.2. Each model accounts for 61% of the variation in numbers of pay-TV subscribers. The constant term in the linear model is statistically significant. The average number of pay-television subscribers for all 81 systems in the sample is 19,183. In the log-linear model the constant term is significant at the 90% level with the mean value of the dependent variable 10.53.

7.6.1 Related Prices

Neither basic cable monthly subscription rates nor installation charges have a statistically significant influence on numbers of pay-TV subscribers in either model.

The monthly pay-TV subscription rate has the hypothesized negative sign in both equations and is significant in both at the 95% level. A loss of 3,471 pay subscribers for every one dollar rate increase, or alternatively a price elasticity of -1.31 are indicated.

The results for the pay-TV installation charge are also significant at the 95% level. While the positive sign is not in accord with our original hypothesis the small estimated coefficient indicates an increase of only 393 pay-TV subscribers from a one dollar increase in the pay-TV installation charge. This variable, because of its interdependency with other

variables in the log form, was excluded from the log-linear model.

7.6.2 System Characteristics

The number of basic cable subscribers was significant at the 95% level in both equations. The results show 371 pay-TV subscribers being added for each additional 1000 basic cable subscribers. Alternatively in the log-linear model a doubling of the number of basic cable subscribers, from the 44,077 average, would be associated with a 117% increase in pay-TV subscribers.

The results for number of years of pay-TV availability are also in accord with our hypotheses. In the linear model an additional year of pay-TV is associated with 2,201 additional subscribers (mean 19,183) while in the log linear model a doubling of the time available (mean 4.5 years) linked to a 39% increase in pay-TV subscribers (significant at the 90% level).

7.6.3 Quality of Service Offered

The results for the Showtime and Home Box Office variables support our hypotheses except for the fact that Showtime appears more attractive than Home Box Office. Both are significant at the 95% level in the log-linear model and at the 90% level in the linear model. Showtime affiliation appears to add 8068 pay subscribers (or 51% in the log-linear model). Home Box Office affiliation is almost as attractive, adding 6931 subscribers (or

49% in the log-linear model).

7.6.4 Local Market Characteristics

Both income levels and community population are significant at the 95% level in the linear model. The income result is in accord with our hypothesis with each increment of $1000 in median income associated with an additional 854 pay-TV subscribers. The log-linear model income result shows 6.4% increase in pay-TV subscribers for a 10% increase in median income (90% level).

The results for community population (significant at the 95% level in the linear model; not significant in the log-linear) do not support the interpretation of this variable as a proxy for entertainment alternatives to pay-TV. The indicated influence of population is modest, however, with a 100,000 increase in the population of the community in which the cable system is located being associated with only 279 additional pay-TV subscribers.

7.7 Conclusions

The most important pricing finding was the identification of the powerful influence of monthly pay-TV subscription rates on the number of pay-TV subscribers. Each additional dollar in the rate cut pay subscribers by roughly 3500. Price elasticity was estimated at -1.31.

The number of subscribers to a system's basic cable service had a powerful influence on both pricing and demand for pay-television with an additional 10,000 basic cable subscribers adding 13¢ to the monthly pay rate and 3,710 to the pay-subscriber count.

Since pay-TV is still relatively new there has been no time for cost savings from system age to work themselves into prices. The number of years pay service has been available is, however, an important influence on subscriber numbers with each additional year of availability linked to an addition of 2,200 subscribers. This effect can, of course, be expected to moderate as the pay-TV system matures.

Showtime and Home Box Office are shown to be unambiguously more attractive in terms of attracting pay subscribers with Showtime drawing 8,000 additional pay-subscribers, Home Box Office 7,000 (each roughly 50%) compared to other pay services. Results indicate monthly pay rates to be 66¢ higher for Showtime service, 57¢ lower for HBO compared to other pay services.

Higher income communities have more pay-TV subscribers than lower income communities. A $1,000 median income difference accounted for an 850 difference in pay subscriber count. Income elasticity was estimated to be .64.

Systems located in larger (by population) communities had a few more pay-TV subscribers.

FOOTNOTES

1 Ian Gale, Pay TV Demand in Canada, unpublished working paper, Ottawa: CRTC, Research Directorate, August 27, 1980.

2 H.S. Hothi and R. G. Bodkin, op. cit.

3 Television Factbook, op. cit.

8. Chapter 8. Policy Implications and Future Research

One of the principal objectives of this research has been to gain insight into the factors influencing prices of the various cable services and how these prices influence the demand for such services.

In chapter 2 we raised a number of policy issues worthy of examination. In the first section of this chapter we review these policy issues, and some additional ones, in the light of our theoretical analysis in Chapter 3 and empirical results in Chapters 5, 6 and 7. In the second section we make some suggestions with respect to future research.

8.1 Policy Implications

8.1.1 Tiering

In its Decision' on the Applications the CRTC mentioned that the whole issue of tiering has to be resolved and that public hearings are to be held on the matter.

In Chapter 3 we argued that all pay services and non-programming services should be offered as separate tiers and that, as far as is practical from a cost viewpoint, the services currently combined in the basic tier should be separated into individual tiers. Households should be able to subscribe to any individual tier for the price of that tier and the installation

charge. The theoretical basis for this recommendation was two-fold. Firstly, separate tiers are more program efficient while the effect on pricing efficiency is indeterminate. Secondly, households should not have to pay for services they do not want. We have more to say on the latter in our discussion of cross-subsidization but note that our empirical results, reported in Chapter 6, with respect to the pay dummy indicate that for the average U.S. system 11,000 subscribers to basic cable services, or 36%, subscribe only because it is a pre-requisite to being able to pay for access to a pay channel.

8.1.2 Cross subsidization

In its Call for Applications for Pay Television Service the CRTC states that it "is unwilling to see a cross-subsidy of pay television service by regular cable subscribers."[2] Our theoretical analysis suggests that this fear is misplaced and that, given current and proposed tiering arrangements, some cross-subsidization in the opposite direction is to be expected. The cross-subsidy would arise through some households, who would reject basic cable services as a separate tier, subscribing in order to be able to pay for access to one or more pay channels (or non-programming services). In light of our empirical results with respect to the pay dummy, the size of the cross-subsidy for the average U.S. system would be equal to 11,000 multiplied by the difference between the price of the basic service minus the average maximum price the subscribers in this category would be

willing to pay for basic services as a separate tier.

8.1.3 Pay Price Regulations

In its Decision[3] the CRTC states that "the Commission will not at this time regulate the rate for pay television services". However, the CRTC does recognize there may be a conflict of interest between pay television organizations and cable companies with respect to the level of retail price and that the Commission, albeit reluctantly, may have to assume the role of arbitrator, or, as a last resort, rate regulator.

While sympathizing with the CRTC's reluctance to get involved, our analysis in Chapter 3 indicates that the conflict in interest between the parties is a very real one. In the absence of CRTC intervention it seems likely, given the balance of power, that the wholesaler/retailer relationship advocated by the cable companies will become established, just as it has in the U.S. Unfortunately, this relationship is associated with higher retail prices and lower revenues to the pay-television organizations and hence also independent Canadian program producers, than alternative scenarios advocated by several pay applicants. In the long run, competition, actual or potential, may arise between cable and non-cable exhibitors of pay television. If this occurs it will exert a downward pressure on prices. We do not believe, however, that such competition will occur in the near future.

8.1.4 Method of Pricing: Universal versus Pay-per-channel versus Pay-per-program

In terms of economic efficiency we argued, in Chapter 3, that there is a trade-off between programming efficiency and pricing efficiency and that there is no clearly superior method. Universal pay is the most price efficient but the least program efficient. We rejected this method, however, on the basis that it involves a subsidy of pay by basic cable subscribers. We thus agree with the minority, but not the majority who found the method conceptually appealing, viewpoint of the Commissioners as expressed in the Decision[4] on the applications. Similarly, we are opposed to the inclusion of access to non-programming services in the basic tier. When comparing pay-per-channel, the method that will actually be used by the systems beginning in 1983, and pay-per-program, we note that pay-per-channel is less program efficient but more price efficient and that, at least on theoretical grounds, no firm conclusion can be drawn concerning which method is better. Pay-per-channel has the advantage that it is less costly as metering of hours watched is not necessary.

8.1.5 Group Ownership

One of the major policy issues long facing the CRTC has been the impact of ownership structure on economic performance in the various sectors of the broadcasting industry. One of the key facets of this issue has been the question of whether group ownership (i.e. the ownership of two or more television stations,

radio stations, or cable systems by a single firm) is a major factor in worsening the economic performance of the industry concerned.[5] The principal area of concern is usually that group ownership may lead to unduly high levels of prices and profits.

The results of our work in the present study is somewhat ambiguous. All evidence in the Canadian basic cable study points in the direction of lower monthly basic cable rates in the case of group-owned cable systems. This evidence is, however, statistically weak. The American evidence points to higher basic cable and pay-TV monthly rates for group owned systems but again this evidence is only statistically strong in the case of basic cable.

Overall, although the evidence is only suggestive, it does indicate that CRTC regulation may play some useful role in constraining the basic cable pricing policies of group owners in Canada when comparison is made with the relatively unregulated U.S. environment.

8.1.6 Regulation of Cable System Size

Day-to-day regulation of cable-television requires decision-making on the question of the appropriate territorial boundaries and ultimately the numbers of subscribers to various cable systems. Rational decision-making requires information as to the economic consequences of allowing systems of various size to evolve.

One aspect of this question which is new to Canada concerns the effect that variation in the number of basic cable subscribers has on the pricing and demand for pay-television. On the latter our results show pay-subscribers increasing by 370 when the number of basic cable subscribers rises by 1000 (or alternatively an 11% increase in pay-subscribers for a 10% increase in basic cable subscribers).

On the pay-TV pricing question it appears that an additional 10,000 basic cable subscribers can add 13¢ to the monthly pay-TV subscription rate - a modest but not immaterial sum.

8.1.7 Canadian Content Regulation on Pay-TV

Examination of U.S. pay-television highlights the importance of programming quality to the success of pay-TV. The difference between Showtime, Home Box Office and the other services are very marked. Both Showtime and Home Box Office attract 50% more pay-subscribers than do other services (8,000 for Showtime, 7,000 for HBO). Systems with Showtime service charge 66¢ per month more than the 'other' group; HBO 57¢ less.

These results demonstrate the crucial role that quality programming plays in attracting consumers to pay-television services. Canadian content regulations, or for that matter any other programming regulations, which made it impossible for Canadian pay-TV services to provide programming of the highest quality could very sharply undermine the demand for their service

and hence their economic viability.

8.1.8 Basic Cable Quality Regulation

It is of vital importance to both firms and regulators to understand exactly what it is selling to consumers.

Both parties should properly be guided by measures of the quality of service provided consumers. Previous work has focused on unsuccessful measurement of the value to consumers of different programming formats. Our work suggests that the value of additional oferings is influenced more by what is already available to consumers than by the programming content of the new offering itself. We have argued, and presented empirical evidence to support the view, that a proper measure of quality of service provided by a cable system should take into account not only the number of channels added by the cable service but also the number available freely off-air and the overall diminishing utility of additional extra channels. (It should be noted that it is not possible to measure the value of marginal channels of <u>different</u> program content using aggregate data.) Thus, for instance, adding 9 channels where none were available off-air would add $1.37 monthly to the value of the basic cable service. Adding these same nine channels on a service in a community where there were 7 off-air channels would add only 62¢ monthly to the value of basic cable service. In the first situation 5,868 additional subscribers would be attracted to basic cable while in the second only 2,650 additional subscribers would be attracted.

While the actual parameters estimated here may not be of direct policy relevance, an understanding of the proper nature of the quality of service variable can permit improved pricing decision-making by both private and public sector parties.

8.1.9 Community Programming Viability on Cable

The CRTC have long pressed cable operators to provide community programming. This programming of course costs money to produce. There is absolutely no evidence that it is demanded by subscribers or is associated with increases in basic cable television monthly rates. Our evidence certainly calls into question the economic rationality of such a requirement.

8.2 Cable De-regulation

Overall, the findings of this research provide little support for continued regulation of the cable television industry. With new forms of competition for cable-television on the horizon there seems little reason to believe that consumers would be disadvantaged by an elimination of cable television regulation. In fact, in a deregulated environment the effects of new sources of competition such as ABC's pay-TV available scrambled over the air, direct broadcast satellites as well as video discs and cassettes are likely to very effectively limit the monopoly power of cable operators in the long run.

The major exception to this argument may be felt to be in the area of program content. At the level of basic cable our research provides no evidence of an economic rationale for community channels. If such a ratonale exists then such channels would continue to operate in a deregulated environment; if not, they might require direct subsidization making apparent to the taxpayer the resource costs of this service. In the case of pay television, deregulation could be coupled with explicit revenue surtaxes (with the proceeds earmarked for Canadian program production subsidies) or the present system of implicit taxes can be continued - so long as the economic viability of the entire industry is not undermined by excessive interference in content decisions.

8.3 Directions for Future Research

As we argued in our original research proposal, the best way to develop hard specifics on pricing for a new service such as pay-television is to gather and analyze a set of microdata concerning actual decisions individual Canadian consumers have made in the marketplace.

Such an approach is based in the first instance on a conceptual model of the factors that determine consumers' decisions with regard to television services. The new pay-television service will contain these factors in a particular mix not currently available to consumers. But in other

combinations these factors are now available and are being purchased. By analyzing data on actual subscription decisions by consumers in the marketplace where the factors are available it is possible to quantitatively assess the importance of each factor. With this knowledge about the determinants of the demand for currently available television services, it is then possible to simulate the demand for the re-combined mix which will be offered as the new service.

Gathering such a micro-data base costs money but it would certainly seem that the usefulness of this information for reaching at least preliminary assessments of a variety of up-coming technological advancements would be very great.

An investigation of the socio-economic implications of cable and pay-television deregulation of cable should be undertaken at the earliest opportunity with special attention being paid to the experience of France, Great Britain and the United States in these areas.

Another area of worthwhile research would be an active monitoring and analysis of the actual experience, including the marketing aspects, both at the program provider and cable delivery level, of pay-television during its early years in Canada.[6]

FOOTNOTES

1 CRTC, Decision CRTC 82-240, op. cit., p. 15.

2 CRTC, Call for Applications for Pay Television Service, Public Notice, Ottawa, 21 April 1981, p. 7.

3 CRTC, Decision CRTC 82-240, op. cit., pp. 31-32.

4 Ibid, pp. 14-15 and 67-70.

5 We have examined group ownership as well as cross-ownership in detail for television and radio in our earlier book, McFadyen, Hoskins, and Gillen, op. cit.

6 The best recent example of the usefulness of analyzing survey data to provide information on pricing and potential demand for a new service is the study on DBS done for Comsat General Corporation by Arthur D. Little, op.cit.

BIBLIOGRAPHY

Adcom Research Ltd., Cable TV Repeat Programming , January 1980.

Arthur D. Little Inc., Pay television Services via Direct Broadcast Satellite: Demand and Impact in the 1980s, prepared for COMSAT General Corp., May 1980.

Babe, Robert E., Cable Television and Telecommunications in Canada, East Lansing, MI: Graduate School of Business Admin., Michigan State U., 1975.

Babe, Robert E., The Impact of Cable Television on Viewing Time of Canadian Television Stations, Carleton Economic Papers, No. 73-20, Ottawa: Carleton University.

Babe, Robert E., Public and private regulation of cable television: a case study of technological change and relative power, Canadian Public Administration, Vol. 17, No. 2, Summer 1974, pp. 187-225.

Baer, W.S. and Pilnick, C., Pay television at the crossroads, Santa Monica, CA: Rand Pub. P-5159, April 1974.

Baer, Walter S., Botein, Michael, Johnson, Leland L., Pilnick, Carl, Price, Monroe E., and Yin, Robert K., Cable Television: Franchising Considerations, New York, N.Y.: Crane, Russak & Company, Inc., 1974.

Barnett, Harold and Edward Greenberg, "On the Economics of Wired City Television", American Economic Review, 58, June 1968, pp. 503-508.

Barnett, Harold, "Perspectives on Cable TV Regulation", In Shepard and Cres Regulation in Further Perspective.

Barnett, Stephen R., Cable Television and Media Concentration, Part 1: Control of Cable Systems by Local Broadcasters, Stanford Law Review, Vol. 22, January 1970, pp. 220-239.

Beigie, Carl E. and Plowright, Teresa, The Cable Industry and Telecommunications in Canada.

Bell Canada, Submission on Pay TV Service to CRTC Public Meetings on Extension of Service to Northern and Remote Communities, unpublished submission, March 3, 1980.

Berner, Richard Olin, Constraints on the Regulatory Process, A Case Study of Regulation of Cable Television, Cambridge, MA: Ballinger Publishing Co., 1976.

Besen, S. M. and Mitchell, B. M., Review of Noll, Peck & McGowan "Economic Aspects of Television Regulation", The Bell Journal of Economics and Management Science, Vol. 5, No. 1, Spring 1974, pp. 301-319.

Besen, S.M., "The Value of Television time: Some Problems and Attempted Solutions, Reply", Southern Journal of Economics, April 1978, pp. 1016-18.

Besen, Stanley M., "The Economics of the Cable Television 'Consensus'", Journal of Law and Economics, Vol. 17, No. 1, April 1974, pp. 39-51.

Blum, Eleanor, Basic Books in the Mass Media, Urbana, IL: University of Illinois Press, 1980.

Braeutigam, Ronald R., "An Analysis of Fully Distributed Cost Pricing in Regulated Industries", The Bell Journal of Economics, Vol. 11, No. 1, Spring 1980, pp. 182-196.

Braunstein, Y. M., "Economic Effects of State Regulation of Cable Television", Proceedings of the Sixth Annual Telecommunications Policy Research Conference, Lexington, MA: D. C. Heath and Company, 1979, pp. 413-424.

Burke International, Attitude Study, Pay TV, Toronto, Edmonton, Montreal, for Toronto Star, BIRL #71-558, Toronto: Burke International, January 1981.

Buttrum, Keith, The Cable TV Industry in Canada, Basic Issues in Canadian Mass Communication, Montreal: McGill University, 1973.

Cablesystems Pacific, A Cable Communications Proposal for the City of Portland, Oregon, Portland, OR: Cablesystems Pacific.

Canada - Minister of Supply and Services, Canadian Broadcasting and Telecommunications: Past Experience, Future Options, Hull: Canadian Government Publishing Center, 1980.

Canada, Canadian Radio-Television Commission, "Subscription pay-television", Pay-television background research paper, Ottawa: CRTC, March 1978.

Canada, Canadian Radio-Television Commission, Report on Pay-Television (March 1978), Ottawa: Ministry of Supply and Services Canada, 1979.

Canada, Canadian Radio-Television Commission, Universal Pay Television, Pay television background research paper, Ottawa: CRTC, March 1978.

Canada, Canadian Radio-Television Commission, Pay-television CROP Inc., Pay television background research paper, Ottawa: CRTC, March 1978.

Canada, Canadian Radio-Television Commission, Annual Report 1977-78, Ottawa: CRTC, 1978.

Canada, Canadian Radio-Television Commission, "Pay-per-program pay-television", Pay-television Background research paper, Ottawa: Canadian Radio-Television Commission, March 1978.

Canada, Canadian Radio-television and Telecommunications Commission, CRTC Facts Digest on Broadcasting and Telecommunications in Canada, Ottawa: CRTC, December 1980.

Canada, Canadian Radio-Television and Telecommunications Commission. Cable Television: Survey of the Community Channel, A Report on the 1978 CRTC Survey, Ottawa: CRTC, March 1979.

Canada, Canadian Radio-Television and Telecommunications Commission, A review of certain cable television programming issues, Ottawa: CRTC, March 26, 1979.

Canada, Canadian Radio-Television and Telecommunications Commission, TV LOGS System, Sample Reports, Ottawa: CRTC: 1981.

Canada, Canadian Radio-Television Commission, Call for Applications for Pay Television Service, Ottawa: CRTC, 21 April, 1981.

Canada, Canadian Radio-Television Commission, Pay-TV Digest: Pay television and Cable-satellite Service in Canada and the Unit, Ottawa: CRTC, September 1981.

Canada, Canadian Radio Television Commission, Policy Statements on Cable TV.

Canada, Canadian Radio Television and Telecommunications Commission, Policies Respecting Broadcast Receiving Undertakings (Cable Television), Ottawa: CRTC, 1975.

Canada, Canadian Radio Television Commission, Canadian Broadcasting "A Single System" - Policy Statement on Cable Television, Ottawa: Broadcast Planning and Development, Radio Television Development, July 16, 1971.

Canada, Canadian Radio Television Commission, Cable Television in Canada, Ottawa: Information Canada, 1971.

Canada, Canadian Radio-television and Telecommunications Commission, The 1980's: A Decade of Diversity: Broadcasting, Satellites and Pay-TV, Ottawa: CRTC, 1980.

Canada, Canadian Radio-television and Telecommunications Commission, CRTC Public Notice 1982-44.

Canada, Department of Communications, Statistical Information Services, Statistical Extracts - Canadian Television Channels carried by U.S. Cable Television Systems, Ottawa: Department of Communications, August 1981.

Canada, Department of Communications, Statistical Information Services Division, Cable Television Industry Charts and Graphs, Ottawa: Department of Communications, September 1981.

Canada, Department of Communications, Analysis of CRTC call for pay-television license applications, April 21, 1981.

Canada, Department of Communications, A Federal Discussion Paper on Satellite Distribution of Television Programming and Pay-television, Toronto: Department of Communications, October 16-17, 1979.

Canada, Department of Communications,Technical Planning and Analysis Branch, Television Distribution by Satellite: Capabilities and Implications, Ottawa: Department of Communications, April 1978.

Canada, Department of Communications, Pay Television, unpublished working paper, Ottawa: Department of Communications,

December 1979.

Canada, Statistics Canada, Transportation and Communications Division, Cable Television Statistics, 1980, Communications, Vol. 11, No. 3, Ottawa: Statistics Canada, July 1981.

Canada, Statistics Canada, Inter-corporate Ownership: Notes, Definitions and Index, Vol. I, Ottawa: Statistics Canada, March 1978.

Canadian Association of Broadcasters, DBS and Teletext: Twin Opportunities for Broadcasting in the 1980's, March 1981.

Canadian Broadcasting Corporation, A Measure of the Impact of Cable TV in Canada as of November 1967, Ottawa: CBC Research Department, 1968, 1969, 1970.

Canadian Broadcasting Corporation, Extension of Service to Northern & Remote communities, Submission to the CRTC, Ottawa: CBC, March 1980.

Canadian Cable Television Association, Getting Pay-TV to work for Canada, 1979 CCTA Annual Convention Special Report, Ottawa: CCTA, 1979.

Canadian Cable Television Association, Pay Television Service, Ottawa: Canadian Cable Television Association, July 20, 1981.

Chin, Felix, Cable Television: A Comprehensive Bibliography, New York, NY: IFI, Plenum Data Corp., 1978.

Christensen, Gary L., Current Developments in CATV and Pay Television, New York, NY: Practising Law Institute, 1977.

Comanor, W.S. and Mitchell, B.M., "Cable Television and the Impact of Regulation", Bell Journal of Economics and Management Science, Vol. 2, No. 1, Spring 1971, pp. 154-212.

Committee for Economic Development, Broadcasting and Cable Television, Policies for Diversity and Change, April, 1975.

Cooper, Harriet, Regulation and Control in Canadian Mass Media, Basic Issues in Canadian Mass Communication, Montreal: McGill University, 1973.

Crandall, Robert W., "The Profitability of Cable Television: An Examination of Acquisition Prices", Journal of Business, Vol. 47, No. 4, October 1974, pp. 543-563.

Crandall, Robert W., and Fray, Lionel L., "A Re-examination of the Prophecy of Doom for Cable Television", The Bell Journal of Economics and Management Science, Vol. 5, No. 1, Spring 1974, pp. 264-289.

Crew, Michael A., Issues in Public-Utility Pricing and Regulation, Lexington, MA: Lexington Books, 1980.

Cross, John G., "Incentive Pricing and Utility Regulation: Reply", Quarterly Journal of Economics, February 1972, pp. 145-147.

CROP, Inc., Attitudes Regarding Pay TV in Canada, CROP Omnmibus 80-5, prepared for CRTC, Montreal: CROP, Inc., November 1980.

Dawson, Donald A., The Canadian Radio-Television Commission and the Consumer Interest, Hamilton: McMaster University, 1972.

Edmunds, Hugh H., Programming Considerations in Pay Television and Home Video, prepared for the Department of the Secretary of State by Edmunds Communications Ltd., March 1980.

Ellickson, Bryan, "Hedonic Theory and the Demand for Cable Television", The American Economic Review, Vol. 69, No. 1, March 1979, pp. 183-189.

Emerick, Kathleen, "Let's talk about it", SAT Guide, November 1981, pp. M10, M38-M41.

Ferns, Pat, No pay-TV Without Us, edited version of an address to CCTA, Broadcaster, October 1980, pp. 66-67.

First Choice Canadian Communications Corporation, Pay Television Application.

Fisher, F.M., Ferrall, V.E., Jr., "Community Antenna Television Systems and Local Television Station Audience", Quarterly Journal of Economics, Vol. 80, 1966, pp. 227-251.

Foster Advertising Ltd., Foster Reports: New Video Technology and its Impact on Commercial Communication, September 1981.

Foundation '70, "A Cable is a Very Big Wire", Yale Review of Law and Social Action, Vol. 2, No. 3, Spring 1972, pp. 199-297.

Fox, Francis, Interview with Betty Kennedy, CFRB, October 22, 1980.

Frost and Sullivan, Inc., The CATV Market, June 1978.

Gale, Ian, Pay TV Demand in Canada, unpublished manuscript, Ottawa: CRTC, 27 August, 1980.

Gillen, David W., An Approach to Estimating Costs for Cable Television, unpublished working paper, Edmonton: University of Alberta.

Gillespie, Gilbert, Public Access Cable Television in the United States and Canada, New York: Praeger Publishers, Inc., 1975.

Goldberg, V., "Marginal Cost Pricing, Investment Theory & CATV: Comment", Journal of Law and Economics, Vol. XIV(2),

October 1971, pp. 514-516.

Goldenberg, Susan, "Canadian Cable - It's Aggressively Seeking Viewers South of the Border", Barron's, Vol. 60, No. 52, December 29, 1980, pp. 11, 16-20.

Goldenson, Leonard H., "Competition in the Television Industry: Will you have to pay to see the next Olympics?", Vital Speeches, Vol. 47, No. 2, November 1, 1980, pp. 57-60.

Good, L., An Econometric Model of the Canadian Cable Television Industry and the Effects of CRTC Regulation, London: University of Western Ontario, 1973-74.

Goodfriend, H.E. and Pratt, F.T., "Community Antenna Television", Financial Analysts Journal, March 1970. pp. 48-57.

Gormley, William T. Jr., "How Cross Ownership Affects News Gathering", Columbia Journalism Review, Vol. 16, No. 1, May/June 1977, pp. 38-39, 42-43, 46.

Graftstein, J.S., The Broadcasting Act & Cable Ownership: An Overview.

Grant, Peter S., Broadcasting and Cable Television - Regulatory Handbook, Vol. 1, Toronto: The Law Society of Upper Canada, University of Toronto, 1973.

Grant, H.A., Technological Inspiration for New Services: Satellite Communications, CCTA 23rd Annual Convention,

Vancouver: Canadian Cable Television Association, May 26-29, 1980.

Hamburg, Morton I., All about Cable: Legal and Business Aspects of Cable and Pay Television, New York: Law Journal Seminars Press, 1979.

Hartle, Douglas G., An Appraisal of some of the increased Concentration Implications of the Rogers proposal, unpublished presentation at CRTC, July 24, 1978.

Harvard Business School, Home Box Office Inc., Boston, MA: Harvard Business School, 1976.

Hatch, J., Kmiec, I., Kuzdrall, P., and More, R., PATV Study Phase One: A Pay per Program Simulation Model, for Department of Communications, February 15, 1980.

Hatch, J., Kmiec, I., Kuzdrall, P., and More, R., PATV Study Phase Two: A Pay per Program Simulation Model: Sensitivity of Network Economics to Variations in Program Content and Price, for Department of Communications, March 31, 1980.

Hatch, J., Kmiec, I., Kuzdrall, P., and More, R., PATV Study Phase Three: A Pay per Channel Simulation Model: with Sensitivity Analysis of Network Economics to Variations in Program Content and Consumer Price, for Department of Communications, June 16, 1980.

Hatch, J., Kmiec, I., Kuzdrall, P., and More, R., PATV Study Phase Four: Use of a Pay per Channel Simulation Model to Assess the Economic Impact of Variations in Price,

Total Program Content, Percentage of Canadian Content, and Percentage of French Language Content, for Department of Communications, March 31, 1981.

Hickling-Johnston Limited, Strategies for a Canadian Communications Contender, February 24, 1980.

Hill, Arthur, "Comsat Sets DBS Proposal", Satellite Communications, February 1981.

Horowitz, Ira. "The Implications of Home Box Office for Sports Broadcasts", The Antitrust Bulletin, Vol. XXIII, No. 4, Winter 1978, pp. 743-768.

Hothi, H.S. and R. G. Bodkin, "An Exploratory Study of the demand for Pay TV in the U.S.A. in the Mid-1970's", Eastern Economic Journal, Vol. 6, No. 1, January 1980, pp.39-51.

Howkins, John, "Canada's Communications Kaleidoscope", Intermedia, Vol. 8, No. 6, November 1980, pp. 6-9.

International Institute of Quantitative Economics, Economic Study of the Financial and Market Characteristics of the 16 Largest CATV Companies in Canada, Final Report, study prepared for Department of Communications, June 1974.

Johnson, A.W., General Representation to the CRTC Public Hearing on Applications to Originate Pay Television Services, Ottawa: CBC, September 24, 1982.

Johnson, L.L., The Cabinet Committee Report to the President on Cable Communications, Santa Monica, CA: Rand Pub., February 1974.

Johnson, Leland L., Cable Television and the Question of Protecting Local Broadcasting, Santa Monica, CA: Rand Corporation, October 1970.

Johnson, Leland L., The Future of Cable Television: Some Problems of Federal Regulation, Santa Monica, CA: RAND Corp., January 1970.

Johnson, R.C. and Blau, R.T., "Single versus Multiple-system Cable Television", Journal of Broadcating, Vol. 18, No. 3, Summer 1974, pp. 323-346.

Joint Action Committee on Pay-TV and Satellite Policy, Programming for Performance Restructuring Canadian Television for the 80's, March 1980.

Joskow, P. L., "Pricing Decisions of Regulated Firms: A Behavioral Approach", Bell Journal of Economics, Vol. 4, No. 1, Spring 1973, pp. 118-140.

Kagan, Paul Associates Ltd., The Pay TV Newsletter News Bulletin, Carmel, CA: Paul Kagan, various.

Kalba, Konrad K. and Guite, M., Service Innovation in the U.S. Cable TV Industry: the role of subscriber scale and other factors, February 12, 1980.

Kalba, Konrad K., Savage, M. and Rosenthal, M.H., U.S. Telephone Industry entry into residential broadband communications , February 19, 1980.

Kestenbaum, Lionel, Common Carrier Access to Cable Communications: Regulatory and Economic Issues , 1971.

Kiefl, John Barrett, A Study of Mass Communication: Cable Television in Canada, Boston, MA: Boston University, 1973.

La Pierre, D. Bruce, "Cable Television Programming and the Promise of Programming Diversity", Fordham Law Review, Vol. XLII, 1973-74, pp. 25-124.

Law Society of Upper Canada, Dept. of Continuing Education, Broadcasting and Cable Television: Law and Administrative Practice, Communications Law Workshop Materials, Toronto: The Law Society of Upper Canada, May 23-24, 1973.

Lawrence, John E., The Regulatory and Licensing Power of the CRTC, Some notes on CRTC Regulations, Licence Conditions and Developments in the Regulatory Process.

Leland, H.E. and Meyer, R.A., "Monopoly Pricing Structures with Imperfect Discrimination", Bell Journal of Economics, Vol. 7, No. 2, Autumn 1976, pp. 449-462.

Levin, Harvey J., "Televisions' Second Chance: a retrospective look at the Sloan Cable Commission", The Bell Journal of Economics and Management Science, Vol. 4, No. 1, Spring 1973, pp. 343-365.

Liebowitz, S.J., Copyright Obligations for Cable Television: Pros and Cons, Ottawa: Consumer and Corporate Affairs, Canada, 1980.

Littlechild, S.C., Elements of telecommunications and economics, Stevenage (UK): Peter Peregrinus Ltd., on behalf of the Institute of Electrical Engineers, 1979.

Lyall, K.C., DeKay, C.F., Duncan, R.A., Gerster, J.W. and McConnell, M., The The Economics of Cable Television in Urban Markets: A Case Study for Baltimore, Vol. I, Baltimore, MD: Johns Hopkins University, February 1975.

MacAvoy, Paul, Deregulation of Cable television, Ford Administration paper on regulatory reform, Washington, DC: American Enterprise Institute, 1977.

MacDonald, D. and Rumsey, F., Paytriation - Fulfilling a Canadian Promise, Ottawa: Institute for Research for Public Policy, June 1981.

Manitoba, Minister of Consumer Corporate and Internal Services, Broadcasting and Cable Television: A Manitoba Perspective, Winnipeg: Queen's Printers, 1974.

McManus. J. and Acheson, K., The Economics of Horizontal Merger and Concentration in the CATV Industry, prepared by Gosford Consulting Ltd., July 6, 1978.

Media Research Division, A.C. Nielsen Co. of Canada Ltd., NBI Nielsen Broadcast Index, Reference Supplement, 1981.

Melody, William H., Analysis of Public Interest Issues Raised by Proposal of Rogers Telecommunications to take over control of Canadian Cable Systems and Merge the two companies into one, Simon Fraser Univ., Burnaby, B.C., July 1978.

Minasian, J. R., "Television Pricing and the Theory of Public Goods", The Journal of Law and Economics, Vol. 7:75, (1964), pp. 71-86.

Mitchell, B.M., "Cable, cities and copyrights", Bell Journal of Economics and Management Science, Vol. 5, No. 1, Spring 1974, pp. 235-263.

Mitchell, Bridger M., "Alternative Measured-Service Structures for Local Telephone Service", in M. Crew (ed.), Issues in Public-Utility Pricing and Regulation, Lexington, MA: Lexington Books, 1980, pp. 107-123.

Noll, R.G., Peck, M.J. and McGowan, J.J., Economic Aspects of Television Regulation, Studies in the Regulation of Economic Activity, Washington, DC: Brookings Institute, 1973.

O'Reilly, Robert E., An analysis of the Canadian CATV Industry, Unpublished thesis, Saskatoon: University of Saskatchewan, 1972.

Oi, W., "A Disneyland Dilemma: Two-Part Tariffs for a Mickey Mouse Monopoly", Quarterly Journal of Economics, February 1971, pp. 77-96.

Ohls, J.C., "Marginal Cost Pricing, Investment Theory and CATV",

The Journal of Law and Economics, Vol. XIII(2), October 1970, pp. 439-460.

Ohls, J.C., "Marginal Cost Pricing, Investment Theory and CATV: A Reply", The Journal of Law and Economics, Vol. XIV(2), October 1971, pp. 517-519.

Owen, Bruce M., "Public Policy and Emerging Technology in the Media", Public Policy, Vol. XVIII, No. 4, Summer 1970, pp. 539-552.

Panko, R.R., Edwards, G.C., Panchos, K. and Russell, S.P., Analysis of Consumer Demand for Pay Television, Stanford, CA: Stanford Research Institute, May, 1975.

Panzar, John C., "The Pareto Domination of Usage-Insensitive Pricing", Proceedings of the Sixth Annual Telecommunications Policy Research Conference, Lexington, MA: D. C. Heath and Company, 1979, pp. 425-436.

Park, R.E. (editor), The Role of Analysis in Regulatory Decisionmaking, The Case of Cable Television, Lexington MA: Lexington Books.

Park, R.E., Audience Diversion due to Cable Television: An application of Nonlinear, Nondiagonally Weighted Generalized Least Squares, Santa Monica, CA: Rand Pub., March 1980.

Park, R.E., Audience Diversion due to Cable Television: Response to Industry Comments, Santa Monica, CA: Rand Pub., November 1979.

Park, R.E., Audience Diversion due to Cable Television: A Statistical Analysis of New Data, Santa Monica, CA: Rand Pub., April 1979.

Park, R.E., "The Value of Television time: some Problems and Attempted Solutions, Comment", Southern Journal of Economics, April 1978, pp. 1006-15.

Park, R.E., "Cable Television, UHF Broadcasting, and FCC Regulatory Policy", Journal of Law and Economics, Vol. 15, No. 1, April 1972, pp. 207-231.

Park, R.E., "The Growth of Cable TV and Its Probable Impact on Over-the-air Broadcasting", The American Economic Review, Vol. LXI, No. 2, May 1971, pp. 69-73.

Park, Rolla Edward, "Prospects for cable in the 100 largest television markets", The Bell Journal of Economics and Management Science, Vol. 3. No. 1, Spring 1972, pp. 130-150.

Polskin, Howard, "Inside Pay-cable's Most savage War", Panorama, March 1981, pp. 55-57 and 97-99.

Posner, Richard A., "The Appropriate Scope of Regulation in the Cable Television Industry", The Bell Journal of Economics and Management Science, Vol. 3, No. 1, Spring 1972, pp. 98-250.

Posner, Richard A., Cable Television: The Problem of Local Monopoly, Santa Monica, CA: Rand Corp., May 1970.

Posner, Richard A., The Probable Effects of Pay Cable Television on Culture and the Arts, New York, NY: Praeger, 1974.

Premiere Alberta Television Ltd., Pay Television Application.

Rheaume, Gilles C., Brazeau and Jean G., Canadian Pay-TV: An Economic Analysis of its Method of Payment, February 1980.

Roman, Andrew J., "Competition for Cable Licences", In Search, Summer 1980, pp.12.

Ross, L., Economic and Legal Foundations of Cable Television.

Salewsky, Udo, "CRTC Commissioned Survey Shows up to 37% Likely to Subscribe to Pay TV", Cable Communications, April 1981, pp. 24-25.

Samuelson, P., "Aspects of Public Expenditure Theories", Review of Economics and Statistics, May 1958, Vol. XL, No. 2, pp. 332-338.

Samuelson, P., "Public Goods and Subscription TV: Correction of the Record", Journal of Law and Economics, October 1964, pp. 81-83.

Schmidt, Robert, "Cable: USA Tests New Uses", Intermedia, Vol. 7, No. 6, November 1979, pp. 25-26.

Scott, James D., No. 61, "Bringing Premium Entertaiment into the Home via Pay-cable Television", Michigan Business Reports, Ann Arbor, MI: U. of Michigan, 1977.

Shields, Roy, "Can the networks survive pay-TV?", Canadian Business, June 1980, pp. 74-81.

Silver, I., Jacobson, P., May, K., and McCracken, M.C., An Econometric Model of a Cable Television System for Canadian Radio-Television Commission, Ottawa: Informetrica Ltd., June 1975.

Smith, Ralph Lee, Ownership Policy and the Cable Industry, Yale Review of Law and Social Action, Spring, 1972, pp 263-274.

Smith, Ralph Lee, The Wired Nation, New York, NY: Harper, 172.

Smith, Warner T., "Which Way Pay TV?", Telephone Engineer and Management, Vol. 85, No. 2, January 15, 1981, pp. 89-91.

Station Representatives Association, Inc., Satellites and Broadcast Stations, A Guide to Present and Potential Satellite Technology, Uses, Regulation and Economic Impact, New York, NY: SRA, Inc., 1980.

Steiner, Robert L., Visions of Cablevision, Cincinnati: Steven Wilder Foundation, 1973.

Swinton, Katherine, "Advertising and Canadian Cable Television - a Problem in International Communications Law", Osgoode Hall Law Journal, Vol. 15, No. 3, December 1977, pp. 544-590.

Taylor, John P., "NCTA convention finds cable system operators emphasizing 'nonbroadcast' programming", Television/Radio Age, May 21, 1979.

Taylor, Lester D., Telecommunications Demand: A Survey and Critique, Cambridge, MA: Ballinger Pub. Co., 1980.

Taylor, Lester D., The Demand for Telecommunications: A Nontechnical Exposition, from Crew, Michael A., "Issues in Public-Utility Pricing and Regulation", Lexington, MA: Lexington Books, 1980, pp. 93-106.

Telecommunications Research Group, Final Report on Potential Effects of Pay-TV Development on Canadian Television Program and Film Production and Distribution Capabilities, submitted to Department of Communications, Burnaby: Simon Fraser University, May 5, 1976.

The Canada Consulting Group, World-Scale Competitive Positioning in Canada's Cable Industry, February 20, 1980.

TAMEC Inc., Feasibility study for a Canadian Satellite Program Package, prepared for Department of Communications, Ottawa: March 1980.

U.S. Federal Communications Commission, FCC Staff Report on Cable TV Cross Ownership Policies, Washington, DC: FCC,

November 17, 1981.

Uri, N.D., "The Pricing of Public Utility Service When Demands are Interdependent", Malayan Economic Review, April 1979, pp. 35-48.

Westell, Dan, "Initial Financial Loss Predicted for Pay-TV", Globe and Mail, 27 July, 1981.

Williamson, Oliver E., "Franchise Bidding for Natural Monopolies - in General and With Respect to CATV", The Bell Journal of Economics, Vol. 7, No. 1, Spring 1976, pp. 73-104.

Wilson, Thomas A., Cable Systems Mergers and the Realization of Scale Economies, July 24, 1978.

Woods Gordon & Co.; The Impact of Cable Television on the Canadian Broadcasting System, A Report to the Canadian Cable Television Association, Toronto: Woods Gordon & Co., May 1975.

Wright, Colin, "Round one of CRTC Hearings Generates More Questions, But No Answers", Marketing, October 12, 1981, pp. 10-11.