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ABSTRACT

Any notion that Community Antenna Television systems (CATV) could be a major instrument for change is predicated on its widespread use. It is also predicated on the assumption that CATV can yield profits in excess of those necessary to induce CATV investment, or a "surplus." Unless CATV could potentially generate high profits, no surplus will be available to finance new services. Based on an examination of existing CATV operations and a hypothetical nationwide operation, an analysis suggests that a completely unfettered cable environment (one unhampered by Federal Communications Commission (FCC) restrictions) would generate a substantial surplus of revenues over true resource costs to society. One possible use of the surplus is simply to permit unregulated cable development, by "bribing" various interests, the FCC, the broadcasting industry, local government, and program producers, not to fight development. Another use is the purchase of certain non-remunerative services, such as providing public broadcasting with free access to channels. Finally, part of the subscription cost could be refunded to the viewer.
(JK)

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PROSPECTS AND POLICIES FOR CATV

by

John J. McGowan, Roger G. Holl and Merton J. Peck

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John J. McGowan, Roger G. Noll and Merton J. Peck

Community Antenna Television systems (CATV) have been heralded simultaneously as a panacea for most of the ills which beset the broadcast medium and as a technical change which will add little to existing television capabilities. This paper investigates the factual basis for these two views and sets forth predictions and prescriptions for the future of CATV.

Any notion that CATV could be a major instrument for change is predicated on its widespread use. It is also predicated on the assumption that CATV can yield profits in excess of those necessary to induce CATV investment, or a "surplus." Unless CATV could potentially generate high profits, no surplus will be available to finance new services.

The existence of a potential surplus does not necessarily mean that CATV systems are likely to be extremely profitable. The surplus potential could, and indeed already has, set off a race among likely claimants to capture part of it. The rivals include: local governments, who see CATV franchise fees as a new tax source; the proponents of more local community television or public television, who see CATV as a way to finance such services; potential new sources of programming, who see in cable development the possibility for gaining access to viewers; local school boards, who see CATV as a way to provide instructional services; and finally, various groups and individuals who envisage a whole range of new communication services that might be subsidized by CATV.

The first section of this paper deals with the problem of estimating the size of the CATV surplus and the intimately related question of the extent of CATV acceptance. The second section of this paper examines the consequences for over-the-air broadcasting of the "standard" CATV system. The third section examines the possibilities for augmenting the standard CATV system with new television services that might pay their own way, such as pay television, common carrier channels which would be rented to various community organizations, and program originations by the CATV operator which are advertiser-financed. In the fourth section, several proposals for using the surplus are discussed, and in the last section some general policy conclusions are set forth.

THE FUTURE PROSPECTS FOR CABLE TELEVISION

Without significant penetration in the 100 largest television markets, which contain 87 per cent of all television homes, the cable television industry will remain an interesting curiosity of minor economic and social consequence. An appraisal of probable CATV penetration in these markets is therefore essential for assessing the future of CATV, even though such an appraisal must be rather speculative. First, public policy has severely constrained the growth of CATV in the largest markets by prohibiting distant signal importation. As a result, the probable degree of CATV penetration in these markets must be inferred almost entirely from data on the acceptance of CATV in markets with quite different over-the-air viewing alternatives than typically prevail in the 100 largest markets. Second, the regulatory constraints placed on CATV systems in these markets in the future will influence their prospective profitability and, hence, the likelihood that CATV service will be offered in these communities.

To deal with the first of these problems the determinants of CATV penetration were estimated from a statistical analysis of a selected sample of large CATV systems. Existing cable television systems provide a means for testing the intensity of demand for different types and numbers of stations. The typical cable television system operates in a locality with few over-the-air viewing alternatives, either because the number of stations in the area is small, or because the topography of the area prevents good signal reception of all or most channels. Cable systems earn revenue by selling access to a larger number of good quality signals. Presumably, the greater the difference between cable and over-the-air options, the higher the price viewers are willing to pay for cable service. Alternatively, for a given price, the more channels offered on the cable in excess of the off-the-air options, the greater the fraction of households abutting the cable that will subscribe. Accordingly, a least-squares regression analysis of the determinants of CATV penetration in a sample of 31 systems, each of which had at least 10,000 subscribers, was performed.¹ The results are shown in Table 1. The estimated demand equation was then used to estimate the degree of penetration which three hypothetical CATV systems would achieve in markets with various over-the-air viewing alternatives. The results are presented in Table 2.

System 1 provides minimal service in the larger markets; that is, the only advantage offered is improved reception of existing local signals. In the smaller markets (with fewer than three local network affiliates), the system offers signal quality improvement plus sufficient signal importation

1. A detailed exposition of the derivation and estimation of the model is contained in an unpublished appendix to this paper, and can be obtained from the authors.

Table 1. Regression Results

Constant	D ₁	D ₂	D ₃	X _A	X _I	X _D	R ²
.0031	-.0053	.0077	-.0216*	.0385*	.0098*	.0086*	.520*
	(.0071)	(.0077)	(.0078)	(.0093)	(.0053)	(.0046)	

Notes: Figures in parentheses are standard errors. (*) Indicates significance at the five per cent level or better on a one-tailed test. All variables were deflated by the square root of the age of the system before the parameters were estimated. The dependent variable is the natural logarithm of the ratio of the fraction of median income going to other purposes than cable subscription fees to the fraction of homes along the cable route that subscribe to cable service. The dependent variables are:

D₁ = one if system offers automated time-news-weather, zero otherwise.

D₂ = one if system originates programs, zero otherwise.

D₃ = one if system imports an educational station, zero otherwise.

X_A = the natural logarithm of the ratio of one plus the number of networks on the cable to one plus the number of networks available off-the-air.

X_I and X_D are similar to X_A, but refer to independents and network duplicates. Local UHF independents are not included in the denominator of X_I.

Table 2. Estimated Per Cent of Homes
Subscribing to CATV According to
Number of Over-the-Air Viewing Alternatives

Over-the-air Alternatives		Estimated	Cable	Penetration
<u>Affiliates</u>	<u>VHF Independents</u>	System No. 1	(per cent) System No. 2	System No. 3
3	3	10.5	49.5	63.8
3	2	10.5	55.0	66.1
3	1	10.5	60.5	69.4
3	0	10.5	69.1	74.0
2	0	61.0	79.3	82.3
1	0	79.2	85.8	87.3
0	0	88.4	90.8	93.2

Notes: System 1 provides for all local signals plus sufficient importation of affiliated stations to provide three-network service.

System 2 provides for all local signals, sufficient importation to provide for three-network service, plus four independents in addition to local VHF independents.

System 3 is the same as System 2 except that one channel of network-type programming is offered in place of one imported or local UHF independent signal.

to provide three-network service. The estimates indicate that such a system could expect high penetration in smaller markets, but very low penetration in the large markets.

System 2 differs from System 1 in that it provides three network affiliates, all VHF independents receivable off-the-air, a public broadcasting station, plus four more independent stations. (The four extra independents would be either local UHF or imported stations.) In most markets, cable systems would provide three network affiliates, plus four imported independent stations. In medium-size markets with one or more local UHF independents, System 2 would provide fewer than four imported independent signals. In larger markets with some independent VHF and UHF stations, two or fewer signals would be imported. The estimates indicate that System 2 would obtain five or six times as many subscribers in the larger markets as System 1, and nearly three times as many nationally.

System 3 provides three networks, three independent signals in addition to local independent VHF stations, public broadcasting, plus an additional channel offering programs similar to existing network fare in quality and audience appeal. (System 3 is the same as System 2 except that a fourth national network has replaced an independent station.) As Table 2 indicates, this system would achieve substantially higher penetration than System 2 in markets with the greatest number of over-the-air VHF viewing alternatives.

Table 3 shows estimated nationwide penetration of these three systems. The first two columns show the percentage and number of homes which would subscribe to each system if given the opportunity. These penetration rates were determined by weighting the penetration rates of Table 2 by the proportion of TV homes with the relevant over-the-air viewing alternatives.

The third and fourth columns of Table 3 show the estimated fraction and number of TV homes likely to subscribe to the various systems, considering that not all parts of the nation are likely to be offered cable service. On the basis of profitability calculations presented in detail further on, cable is unlikely to be installed in areas with fewer than 350 subscribing homes per square mile, which is roughly a population density below 1,000 per square mile.

Roughly ten per cent of American households with television receivers live in rural areas that have population densities under 1,000 per square mile; few of these areas are likely to be offered cable service by private investors regardless of the quality of over-the-air options. In addition, another two per cent of the viewing population lives in urban areas in which more than half of the population is poor and which, therefore, are unlikely to be wired. Of the population living in the top 100 markets, we assume that roughly 15 per cent live in areas with signal reception problems that make cable development profitable despite the number of local over-the-air signals. The remaining population in markets three through 100, leaving out New York and Los Angeles, will subscribe to cable in sufficient numbers to make cable development profitable only if signal importation -- System 2 -- is permitted. Finally, even the two markets with numerous over-the-air options, which contain 13 million TV homes (20 per cent of the national total), will develop cable if cable offers a fourth network-like option.

Based on these assumptions and observations the fraction of households that will be offered cable service will be 20 per cent for System 1. Of the homes offered service, 35 per cent will be outside the top 100 markets; 50 per cent will be in markets three through 100; and 15 per cent will be in the

top two markets. System 2 will cause virtually complete wiring of markets three through 100, but no change in the other markets, which means that about 73 per cent of the nation's homes will be offered service. Finally, System 3 leaves only very low-density rural and urban poverty areas unwired; together, these constitute 12 per cent of the population.

Several aspects of the estimates in Table 3 are worth emphasizing. First, in the absence of distant signal importation or some other advantage to stimulate penetration in the 100 largest markets, no more than ten million television homes can be expected to subscribe to cable television. Second, distant signal importation alone is sufficient to change dramatically the likely level of CATV penetration to almost 50 per cent of all TV homes in the country. Third, the estimates suggest that penetration is highly unlikely ever to exceed two-thirds of TV homes. As a result, there will continue to be a substantial public interest in maintaining over-the-air broadcasting; therefore the possible impact of CATV growth on the viability of over-the-air broadcasting cannot be ignored. In sum, without distant signal importation a national cable system will not be developed, and even with distant signals cable will still not become a ubiquitous public utility like power or telephones.

The foregoing analysis is based upon assumptions about the costs and profits of cable systems. CATV profitability in the 100 largest markets depends crucially on the regulatory constraints that will be imposed. Rather than attempt to guess what these constraints will ultimately be, we have chosen to estimate the profitability of System 2 in the absence of regulatory constraints. In a later section, we estimate the effect on the surplus of various regulatory constraints and public interest requirements.

Table 3. Estimated Nationwide Penetration
of Hypothetical CATV Systems

	<u>Homes subscribing if all homes offered the service</u>		<u>Expected households subscribing^a</u>	
	(per cent)	(millions) ^b	(per cent)	(millions) ^b
System 1	24	14.5	15	9
System 2	64	38.6	48	29
System 3	72	43.0	61	37

^a Assumes homes offered service if 350 homes per square mile are likely to subscribe, the minimum size required for an operation that is sufficiently profitable to induce investment.

^b Based on a total number of TV households of 60 million.

To estimate the long-run profitability -- that is, profitability when ultimate penetration is achieved -- total revenues for systems of various size were assumed to be \$90 per subscriber per year. This is the geometric mean of the prices listed by the CATV systems in the sample on which our analysis of penetration was based. Estimates of the cost for various size systems were derived from information in a report prepared for the National Cable Television Association by William S. Comanor and Bridger M. Mitchell.² In constructing the cost estimates CATV systems were assumed to have 12-channel capability, which is sufficient to provide the level of service envisioned in our hypothetical System 2 in all markets. In addition, the costs of importing distant signals are not included in the cost estimates for specific system configurations since these costs can vary so much among systems. The annual revenue required to support a four-channel microwave interconnection system is between \$75 and \$100 million per year, or \$3-\$4 per year per subscriber for System 2 (assuming straight-line depreciation and an eight per cent return to capital). The same capacity for distant signal importation will probably be provided eventually by a domestic communications satellite at an even lower cost. Consequently, the cost of importing distant signals is not an important determinant of the profitability or viability of a national CATV system.

Estimates of the costs, profits, and rate of return on investment for various types of systems (Table 4) show that a simple cable system providing nothing particularly innovative in programming is, in the absence of loss-creating regulatory requirements, very profitable. Compared to the average

2. William S. Comanor and Bridger M. Mitchell, "The Economic Consequences of the Proposed FCC Regulations on the CATV Industry," National Cable Television Association, (1970).

Table 4. Revenue, Costs, Profits and Rates of Return on Investment for CATV Systems, by Location and Size of System.

<u>Core Cities in Top 100 Markets</u> ^{a/}					
System size in number of subscribers in tenth year					
	<u>3500</u>	<u>5000</u>	<u>10,000</u>	<u>25,000</u>	<u>50,000</u>
Total revenue	315.0	450.0	900.0	2250.0	4500.0
Operating costs	147.1	182.9	300.8	619.1	1186.8
Depreciation	62.9	87.1	167.6	409.0	808.9
Net profit ^{b/}	105.0	180.0	431.6	1221.9	2504.3
Investment	629.3	870.8	1675.7	4090.5	8089.4
Rate of return ^{b/} (per cent)	33.0	41.3	51.5	59.2	61.8
Profits on sales (per cent)	33.0	40.0	48.0	54.3	55.7
<u>Outlying Communities in Top 100 Markets</u>					
System size in number of subscribers in tenth year					
	<u>2000</u>	<u>5000</u>	<u>10,000</u>	<u>25,000</u>	<u>50,000</u>
Total revenue	180.0	450.0	900.0	2250.0	4500.0
Operating costs	72.5	162.4	280.9	636.5	1193.0
Depreciation	32.0	74.4	144.2	350.6	692.7
Net profit	75.5	213.2	474.9	1262.8	2614.3
Investment	320.3	743.6	1441.7	3506.3	6927.4
Rate of return (per cent)	47.1	57.3	65.9	72.0	75.5
Profits on sales (per cent)	41.9	47.4	52.8	56.1	58.1
<u>Communities Outside the 100 Largest Markets</u>					
System size in number of subscribers in tenth year					
	<u>2000</u>	<u>3500</u>	<u>5000</u>	<u>10,000</u>	<u>15,000</u>
Total revenue	180.0	315.0	450.0	900.0	1350.0
Operating costs	70.3	122.4	157.4	270.6	400.8
Depreciation	30.4	50.4	70.0	148.3	219.8
Net profit	79.3	144.2	222.6	481.1	727.4
Investment	304.0	503.5	700.3	1482.7	2198.1
Rate of return (per cent)	52.2	57.3	63.6	64.9	66.2
Profits on sales (per cent)	44.1	45.8	49.5	53.5	53.9

- continued -

Table 4 (continued)

Notes: a/ Revenue, cost, profit and investment figures are thousands of dollars.

b/ Net profit and rate of return are before provisions for income tax, and are based on the average value after depreciation of the system during a ten-year life. Two factors operate in opposite directions to alter these profitability calculations. First, for the first few years, the number of subscribers is below the final penetration rate; given the high profits as a per cent of revenues of the system, this will not mean the system will lose money in initial years, but profits initially will be much lower. On the other hand, the expected life of a cable system is longer than the ten-year life normally assumed for purposes of depreciation allowances. On balance, the profitability estimates in the table are probably low. The actual life of the system is ten years longer than the life of the system for purposes of depreciation. After the full cost of the system has been depreciated, the depreciation allowance in the table becomes an addition to net profits. This transfer of depreciation allowance to profits in the last ten years is far more important than the initial year or two of below-maximum subscriber penetration.

annual pre-tax profits for American industry of 20 per cent of investment, the cable profit rates of 40 to 70 per cent are very respectable, although not higher than for the broadcasting industry generally.

The pre-tax profits of cable System 2 for the entire nation depend to some degree on the size-distribution of the local systems that will be built. If the nation were wired in the most efficient way, taking advantage of all possible economies of large-size systems, the total pre-tax profits could be as large as \$1.4 billion, after deducting \$75 million in signal importation costs not shown in the table. If only fairly small systems are constructed, serving 3,000 subscribers each, profits would be only \$1.1 billion. For purposes of further analysis, we shall assume the appropriate figure to be between these two extremes, or \$1.25 billion.

To calculate the "surplus" available for other uses, the profits necessary to induce private enterprise to construct the cable system must be deducted from the gross profits calculated above. The estimated cost of constructing cable System 2 with medium-sized cable systems is \$4.450 billion. The mean book value of cable investment, using straight-line depreciation, is about half of initial investment; hence, the necessary profits to induce cable investment are about \$450 million, assuming an average pre-tax profit rate of 20 per cent. Subtracting these profits from the gross profit potential of \$1.25 billion leaves a "surplus" of \$800 million.

This figure should be regarded as a low estimate of the potential surplus. Most experts believe that the Comanor-Mitchell cost estimates are too high since numerous small systems charge prices that would not cover their estimated costs. Even so, the main conclusions of this paper are largely

unaffected by even a large error in the cost estimates. If the total system annual costs derived from the Comanor-Mitchell estimates, \$1.26 billion including depreciation, are one-third too high -- certainly a maximum error -- the surplus is \$570 million higher: costs decline \$420 million and profit requirements decline \$150 million. While this provides extra latitude for attaching a few relatively low-cost services to cable, it still does not permit the more spectacular proposals, as will be discussed below. If, as is more likely, Comanor-Mitchell are no more than ten or 15 per cent high in their cost estimates, the total surplus is in the range of \$1 billion dollars.

The estimates of ultimate cable penetration and profitability contained in Tables 3 and 4 are more optimistic than other estimates, notably those of Comanor-Mitchell and of Rolla E. Park.³ The most important reasons for these differences are the following:

(1) The functional form of the estimated equation. The model used herein suffers from much greater complexity than the equations used by others; however, in deriving from theoretical concepts an equation most likely to be representative of reality, we concluded that the type of equation estimated herein is the only estimatable function that has reasonable theoretical justification.

(2) The data base. Others use much larger samples of cable systems. Normally this is a good idea; more data is usually better than less. Unfortunately, in this instance, the interesting part of the cable industry is the development in larger cities. The sample used herein includes all the larger cable systems. Adding more observations on small, "Ma and Pa" cable companies would be unlikely to provide information about the future of

3. Rolla E. Park. "Potential Impact of Cable Growth on Television Broad-

cables in big cities. These problems are borne out by comparing Comanor-Mitchell's results with another estimate of their equation using our data.⁴ The Comanor-Mitchell equation reestimated from our sample is many times more significant statistically than Comanor-Mitchell's own estimate.

(3) The price assumption. The assumption that subscribers will pay, on the average, \$90 annually for cables is higher than most cable systems actually charge -- and most analysts normally assume. Most cable systems have published fees of about \$5 per month plus an installation fee of \$15 to \$25. The large-city systems in our sample were not typical of cable systems generally, listing slightly higher monthly charges and much higher installation fees. But even those systems probably did not, on the average, charge as much as list prices would suggest. In a mailed survey of about 40 cable systems conducted in the spring of 1971, we found that few systems actually charge the full list price for cable service. The installation fee and the monthly service charge for the first month or two after service begins typically are either waived or reduced as a promotional device. About two-thirds of the systems surveyed actually charged between \$58 and \$65 annually, although the average "list" price was nearly \$70. Nevertheless, several systems actually charged more than \$75, with no apparent effect on penetration rates (no analysis has ever found a significant relationship between penetration rates and prices). Furthermore, the systems in the sample which was used to estimate expected penetration of cables do have, on the average, higher listed prices than the systems that responded to the mailed questionnaire.

4. United States Federal Communications Commission, "Comments Regarding the Public Interest in Commission Rules and Regulations Relating to Cable Television, Signal Importation and the Development of UHF Independent Commercial Stations," submitted by John J. McGowan, Roger G. Noll, Merton J. Peck, Docket #18397-A, (February 10, 1971).

In light of these facts, we conclude that cable systems could charge as much as \$7 monthly (plus a \$15 installation fee) without significantly reducing penetration rates. Of course, essentially the same number of homes would be offered cable service if fees were considerably lower. At the conventionally-assumed \$60 to \$65 annual revenue per subscriber, only systems in the areas having the lowest population densities or penetration rates would cease to be profitable. In nearly all areas, profits would simply be at the levels conventionally earned in other industries. In the remaining areas, cable would be likely to be developed anyway, charging a price above \$65 annually, since the higher price is both feasible and profitable. Thus, the potential surplus from cables is most accurately represented by the profitability at the higher price, although one potential use of the surplus is simply to charge less than revenue-maximizing prices.

THE IMPACT OF CATV GROWTH ON OVER-THE-AIR BROADCASTING

Since CATV systems increase subscribers' viewing alternatives, viewing patterns differ between subscribers and non-subscribers. This affects the audience size and advertising revenues of over-the-air broadcasters. In particular, local VHF stations -- especially network affiliates -- can normally expect to attract smaller audience shares among cable subscribers than among non-subscribers. The effect of CATV growth on UHF broadcasters is more complicated. On the one hand, the quality of UHF signals is equal to that of VHF when both are transmitted over cable. UHF stations should, other things being equal, attract a larger share of the cable audience than of the over-the-air audience. On the other hand, the importation of distant signals works against this effect by dividing the cable audience among more stations.

Table 5 contains the regression results of a model to predict audience shares of stations. Table 6 uses these results to estimate the effect of System 2 on the local audience for VHF network affiliates, as well as for both VHF and UHF independents.⁵

In only two instances does System 2 seriously erode local audiences. First, network affiliates in single- and two-station markets suffer audience declines of 50 and 30 per cent, respectively.

Second, VHF independents in the large markets would also experience large local audience losses. At the same time, VHF independents are the stations most likely to be imported into other markets, which would tend to increase the station's total audience. Since the total number of VHF independents in the entire nation is only 19, seven of which are in New York and Los Angeles, nearly all would probably be extensively imported if the limitations on distant signal importation were substantially relaxed or removed. Of course, a local viewer is worth more to the station than a distant viewer, since local advertisers are not generally willing to pay for the latter. A VHF independent may earn anywhere from 15 to 50 per cent of its advertising revenues from local sponsors, with most averaging about 25 per cent.

From the estimates of the effect of more competition on an independent VHF station's audience, the effect of signal importation on advertising revenues can be estimated. Suppose that a distant viewer is only worth two-thirds as much as a local viewer, and that all cable systems (as in System 2) import four independents. An independent that is one of three VHF independents in a market would have no loss in total revenues if the number of subscribers

5. The procedures used to construct these estimates are described in an unpublished appendix to this paper that can be obtained from the authors.

Table 5. Regressions Estimates of the Determinants of Share of ADI Homes Viewing Affiliated and Independent Stations ^{a/}
(Figures in parentheses are standard errors)

$$S_A = .427D_1 + .445D_2 + .420D_3 - .036U - .209\ln(1 + N_A) - .214\ln(1 + N_I)$$

$$(.027) \quad (.029) \quad (.029) \quad (.030) \quad (.028) \quad (.027)$$

$$R^2 = .915$$

$$S_I = .051 - .041U + .0009\ln(1 + N_I)$$

$$(.007) \quad (.006) \quad (.005)$$

$$R^2 = .588$$

Notes: ^{a/} D_1 = 1 if the observation refers to an A&C affiliate, zero otherwise.
 D_2 = 1 if the observation refers to a CBC affiliate, zero otherwise.
 D_3 = 1 if the observation refers to an NBC affiliate, zero otherwise.
 U = 1 if the observation refers to an UHF station, zero otherwise.
 N_A = number of network signals.
 N_I = number of independent signals.

^{b/} The independent station equation was not used to estimate the cable and over-the-air shares since the estimated coefficient for the impact of increased competition on independent station audience size is positive (although not significantly different from zero). This unreasonable result can be explained by two facts: only New York and Los Angeles have more than one VHF independent and the audience share of UHF independents is very small. As a result the data are not sufficient to provide a good estimate of the effect of increased competition on independent station audiences. The estimates in Table 6 are based on the assumption that the impact of increased competition from independent stations on independent and affiliate audiences is the same, producing the following equation:

$$S_I = .051 - .014 \ln(1 + N_I).$$

Table 6. Effect of Penetration of System #2 on Local Station's Local Audience

Over-the-Air Alternatives		% Change in Local Audience by Type of Station			
VHF Affiliates	VHF Independents	UIF Independents	VHF Affiliates	VHF Independents	UIF Independents
3	3	1	*	-16.0	+70.0
3	1	1	-3.8	-24.0	+100.0
3	1	0	-3.8	-24.0	n.a.
3	0	0	-7.6	n.a.	n.a.
3	0	2	-7.6	n.a.	+145.0
3	0	1	-7.6	n.a.	+145.0
2	0	0	-28.5	n.a.	n.a.
1	0	0	-50.0	n.a.	n.a.

Notes: n.a. = not applicable.

* = less than -1.0 per cent.

to distant CATV systems carrying its signal were one-half the number of homes subscribing to CATV systems operating in its home market. An independent VHF station, operating in a market in which it is the only over-the-air independent, would maintain the same revenues if it were carried on distant CATV systems having a total subscription equal to the homes subscribing to CATV locally.

The estimates presented above are roughly consistent with the observed results of signal importation in two California cities, Bakersfield and San Diego. In both cities cable systems import seven Los Angeles stations -- three affiliates and four VHF independents.

In San Diego, during February, 1970, the Los Angeles independents were watched by an average of 5.6 per cent of subscribers to the cable (about 20 per cent of the cable audience) from sign-on to sign-off, compared to .5 per cent of non-CATV homes.⁶ The San Diego UHF independent was viewed, on the average, by .84 per cent on-the-cable and .52 per cent off-the-air -- a gain of 60 per cent, but still only slightly better than half as large an audience as the average Los Angeles independents. Total viewing of all stations was 26 per cent of homes off-the-air and 28 per cent off-the-cable. If the increase in total viewing was entirely due to the increased access to independents, then (in the absence of signal-duplicating importation of networks) the percentage decline in the average audience of San Diego affiliates would have been 13 per cent (3.1/22.8).

In Bakersfield, the three local network affiliates dominate the non-CATV market. During the November, 1968, survey period, the three network affiliates

6. All the data on San Diego and Bakersfield were taken or derived from the FCC Staff Report, "The Economics of the TV-CATV Interface." Federal

captured a 94 per cent share. The remaining six per cent of the audience was shared about equally by Los Angeles network affiliates and independents. On the cable, the Bakersfield network affiliates captured only 57 per cent of the homes watching television. The Los Angeles network affiliates increased their audience share to 15 per cent, while the Los Angeles independents captured a 14 per cent share. On the cable, 29 per cent of all homes were, on the average, viewing from sign-on to sign-off, compared to 27 per cent off-the-air. Again assuming that the total two per cent increase in viewing -- the same increase as in San Diego -- is attributable to the addition of viewing options, the Bakersfield network affiliates lost nine per cent of their audience to the imported independents.⁷

7. A facile explanation repeatedly offered to minimize the importance of the San Diego and Bakersfield results is that these two cities are within the "orbit" of Los Angeles, dominated by the latter in some important socioeconomic way, so that the interests of San Diego and Bakersfield residents in Los Angeles stations does not generalize. This explanation is wrong on several counts. Perhaps most important is the fact that both cities are more than 100 miles from Los Angeles. A very large fraction of the American population lives as close to one of the nation's large cities. For example, within the "orbit" of New York is every community from Springfield, Massachusetts to Wilmington, Delaware. Second, the explanation probably is based upon a misconception of the size and historical position of San Diego and Bakersfield. The population of the San Diego metropolitan area is well over one million -- larger than Atlanta, Miami and New Orleans. Its proximity to Mexico, a very large naval installation, and an extensive aerospace industry give it a character much different from Los Angeles. Bakersfield is the commercial center of the southern part of the California Central Valley, and as such is oriented toward agriculture-related industries. Third, an impressive number of cities and towns have cable systems either importing or seeking to import Los Angeles signals. Among the places that during January and February of 1971 either applied for or received permission from the Federal Communications Commission to import the signals of Los Angeles independents are: El Paso, Texas; Deming and Gallup, New Mexico; Douglas, Arizona; Fort Collins, Greeley, and Leadville, Colorado; and Scottsbluff, and Alliance, Nebraska. The orbit of Los Angeles is ubiquitous, indeed! Similarly, Deer Lodge, Montana, and Dickinson, North Dakota have requested permission to import signals from Salt Lake City, Utah; meanwhile a microwave company in Utah has asked permission to deliver San Francisco signals

The available evidence, while tentative at best, indicates that network affiliates might lose as much as 15 per cent of their audience to imported signals, but most likely around ten per cent. Since half of the homes in System 2 subscribe to cable, this means a national loss in network audience -- and consequently of advertising revenues -- of somewhere between four and seven per cent. Since profits as a percentage of sales for networks and affiliates taken together are normally between 15 and 20 per cent, signal importation should cause network system profits to fall by at least 20 per cent, and by at most 50 per cent. For the stations in wired areas with extensive signal importation, profits will fall by more than this. The average VHF affiliate earns profits much higher than the networks, being equal to 25 to 30 per cent of sales. Between one-fourth and one-half of these profits will be erased if the station operates in a market with no independents, and if 80 per cent of the homes subscribe to signal-importing cables (without network duplication); however, these affiliates will still earn profits as a fraction of capital investment that exceed the national average for all types of businesses.

The situation for UHF stations is more serious. As shown in Table 7, the financial position of UHF stations is generally precarious. Half of the UHF network affiliates and 96 per cent of UHF independents lose money. Cable

7 (Cont'd.) to cable companies in its state. Nine cable systems in Delaware would like to import Baltimore stations. The Bartlesville, Oklahoma system wants to import virtually every station in the state of Oklahoma, plus independents from Missouri, Kansas and Texas.

The extensive demand for Los Angeles independents flows from a fourth point: that a strong independent station does not devote itself primarily -- or even importantly -- to programming of principally local interest. The movies, travelogues, game shows, talk shows, reruns, editorialized news programs and even sports events (the Dodgers' and Angels' baseball games, all UCLA and USC sports) which fill the schedules of the Los Angeles independents have national appeal, and cannot be dismissed as potential vehicles for substantially increasing the viewing options available to cable system subscribers anywhere in the nation.

Table 7. UHF Financial Position

	Market Rank					All Stations			
	1-50	51-100	101-150	151-200	over 200				
(All figures in millions of dollars)									
46 Independents									
Revenues	31.3	1.8	-	n.a. ^{a/}	.7	33.8			
Expenses	60.6	4.2	-	n.a.	2.3	67.1			
Profits	-29.3	-2.4	-	-	-1.6	-33.3			
# Profitable	2	0	-	0	0	2			
100 Affiliates ^{b/}									
Net profits	-4.0	+2.8	-2.2	-.8	-1.1	-5.4			
# Losing	11	12	17	4	7	51			
# Profitable	10	23	10	3	3	49			
169 Stations ^{c/}									
Revenues						114.0			
Expenses						157.2			
Net profits						-43.2			
Distribution of Net Profits (Number of Stations)									
	\$400 to 1000	\$200 to 400	\$100 to 200	\$ 0 to 100	-\$50 to 0	-\$100 to -50	-\$200 to -100	-\$400 to -200	below \$-400
44 Affiliates	2	12	9	25	12	7	10	9	8
48 Independents	0	0	1	1	0	3	8	10	25

a/ Two independents (unprofitable) operate in these markets, but the data are not available.

b/ Six of these stations are repeaters, and three of them are profitable.

c/ Includes two full-time independents (see note a/) and 21 stations that operated part-time in 1969.

development is likely to be most extensive in the areas served by UHF affiliates, and many of these stations would be severely damaged financially by a ten per cent decline in audience and advertising revenues. For the UHF independents, the picture is so bleak that even a doubling of audience will not pull many stations into the black. Most of these stations now operate only a few hours a day; costs would be much higher if a full broadcast day were attempted. Thus Table 7 understates by a considerable amount the revenue increase necessary to make these stations financially secure enough to provide services anywhere approaching the role originally envisioned for them by the FCC when the UHF frequency allocation was made 20 years ago.

The policy response contemplated by the FCC is to limit distant signal importation to protect UHF affiliates in small markets and UHF independents in the medium-size markets where most of them operate. After a few years, when all operating television sets are capable of receiving UHF and when further cable development in some areas improves the quality of the received UHF signal, the FCC hopes that the audience for UHF television will rise enough to make UHF viable. Unfortunately, the prospects for this policy are not bright. More than half of the television receivers in use can receive UHF; a doubling of the audience for UHF, as all sets become capable of UHF reception, simply is not good enough to pull many UHF stations out of the red, particularly in the areas where they are needed most -- the middle-to-small markets areas. With or without cable development, UHF's are going to be in financial difficulty for many years. Thus, a signal importation ban would not be likely to provide a sufficient boost to UHF to bring it to the point of fulfilling the role the FCC has in mind, despite sounding the death-knell of widespread cable development in the nation.

SUPPLEMENTAL CATV SERVICES

Some supplemental services proposed for CATV will generate revenues in excess of incremental costs, and hence represent ways to enlarge the CATV surplus. Others will generate revenues that are at least equal to the incremental costs they impose on the system. Since the standard system can generate subscription revenues that will cover costs, users of the basic system will be no worse off if these supplemental services are added at prices that recoup incremental costs. The social gains from CATV are enhanced if a service is added which is sufficiently desired by consumers so that it at least pays its own way. Another important characteristic of these services is that if the additional revenues more than cover costs, CATV operators will find it profitable to offer such services and market forces alone will insure their provision.

CATV CHANNEL CAPACITY AND SUPPLEMENTAL SERVICES

The availability of CATV channels is a key determinant of the number of supplemental services that can be offered. To illustrate this, consider the standard 12-channel system. Seven channels would be required for the three networks and four independent signals. Another channel would be needed for a public broadcasting channel. More channels would be required where over-the-air VHF independents are available. This would leave only two to four channels for supplemental services.

To offer a wide range of services means incurring extra costs for the construction of 20-channel systems. Twelve and 20 are the two choices with the lowest costs per channel, given present technology, although there is some hope of pushing the latter number up to 24 or 25.

Comanor and Mitchell provide perhaps the most detailed cost comparison of 12- and 20-channel systems; their data are the basis for the following conclusions:

1. As between the two principal means for obtaining at least 20-channel capacity -- laying two cables or transmitting additional signals on one cable at frequencies adjacent to existing VHF assignments -- the latter is considerably cheaper. In addition, the dual-method can result in intercable interference. The fuller use of frequencies around the VHF band requires higher performance amplifiers that add \$300 per mile to the cost of distribution cables. Each home set must be provided with a converter which, including installation, costs between \$20 and \$25.

2. The construction of 20-channel capacity including provision of converters to each subscriber would increase capital costs by about 20 per cent over the costs of 12-channel systems. Capital costs are about one-third of total costs, so that additions to capacity increase total costs for the entire system by about seven per cent, or \$100 million. The costs per hour of these channels are low. To take a typical example, a 10,000-subscriber system would incur additional costs of about \$5 per hour per channel in providing eight extra channels. This is very low compared to the costs of programming and transmission -- live programming costs at minimum \$50 an hour plus talent costs.

3. The costs for the 20-channel system consist largely of the converters required for each subscriber. It would be possible to construct a 20-channel system and delay the provision of converters until the 20 channels are in use. As 20-channel systems come into use, sets should be manufactured with this capacity just as sets are now

manufactured to receive UHF broadcasts. This is particularly attractive because the cost of 20-channel capacity is only about \$10 if it is built into the TV receiver at the time of manufacture.

4. The 20-channel capacity on the cable must be constructed at the outset. Converting an existing 12-channel system to 20 channels is extremely expensive; indeed, Comanor and Mitchell report that "the cost of rebuilding an existing system is often somewhat higher than the cost of constructing a new system, since service to subscribers must be maintained during the construction period."

5. Given the major difference in costs of new construction versus conversion it is probably worthwhile to require all new systems to have at least 20 channels. Some operators may have such short time horizons that they will build 12-channel systems.⁸

6. The more visionary uses of CATV require 40 or more channels. Costs begin to rise sharply when multiple cables must be laid or when one cable must be equipped to carry frequencies not around the VHF band (such as, for example, the UHF band). Barring a technological breakthrough, requiring many more than 20 channels in all but the largest systems yields very uncertain benefits at a very high cost.

8. Most new systems still have 12 or fewer channels. In the first two months of 1971, of 11 systems for which data are available, six were installing 12 channels, and one venturesome soul is installing five channels. (Data from various issues of "Addenda to Television Factbook," Television Digest, January and February, 1971.)

SUBSCRIPTION TELEVISION

A prime claimant for channel assignments on cable systems could be subscription television (STV), or broadcasting available only to viewers paying a fee to broadcasters.

Until recently, STV had largely been written off by most broadcasters and broadcasting regulators as uneconomic. The principal exception was Zenith-Teco, the manufacturer of devices for transmitting and receiving scrambled signals, which has recently made bids to purchase UHF stations in Chicago and Los Angeles on which they intend to broadcast STV. The majority opinion, contrary to Zenith-Teco optimism, is based on the fact that all four of the STV experiments during the past 15 years -- three on cable, one over-the-air -- financially were either questionable or failures. One STV operation, the Los Angeles system, created sufficient political commotion to cause a state constitutional amendment, later overturned by the courts, to be passed by a referendum of the voters outlawing STV.

Recently, the promise (or threat) of STV has been revived by the prospect that it could be included as one of many services on a cable television system. As only one of many uses of the cable, some of the costs of the system could be shared with other services, improving the chances that STV could prove to be economically viable. This development has not gone unnoticed. Roughly 20 per cent of the local governments issuing cable franchises in the past few months have explicitly forbidden the franchisee to include STV among his services, and last year more than 30 bills were introduced in Congress that would either ban or substantially limit the development of STV.

The thrust of the analysis in this section is that the revived interest in STV is justified. If cable is permitted to develop to the extent described in preceding sections, the chances are good that an economically viable STV system can be constructed.

The Demand for STV

The indications are strong that consumers would be willing to pay a substantial amount for more viewing options, even when provided a full complement of free network and independent stations. According to the estimates of the demand for viewing options described in the first section, if cable systems provided three networks, at least four independent stations and a public broadcasting station, they could increase the number of cable subscribers by nine million, generating additional revenues of about \$800 million, by providing access to another channel with programming similar to that shown by the existing three networks. Even another strong independent station added to the four assumed for System 2 would result in two million more subscribers, or about \$180 million additional revenues. These figures provide rough estimates of the amount cable subscribers would be willing to pay for STV.

The Hartford STV experiment in the mid-1960's provides another source of information. Between 1962 and 1964, roughly four per cent of the homes that could receive the signals of the Hartford STV station subscribed to the pay broadcasts. These subscribers paid, on the average, \$2.17 a week (or about \$113 annually) for STV (see Table 8). In 1971 prices, this figure would be 30 per cent more, or \$147 annually. If cable were permitted to develop to the extent predicted by the economic analysis of the preceding sections, reaching 50 per cent of all TV homes, and if four per cent of the homes with cable service subscribed to an STV service charging

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Table 8. Hartford STV Broadcasts and Revenues, by Program Type, 1962-64.

Program Type	Distribution of Submits to Hartford		Distribution of All Broadcasts		Audience Estimate		Revenue Per Program (All Shows)	
	Number of Programs	Per cent of Programs	Number of Shows	Per cent of Shows	Per cent of All Viewers	Per cent of All Shows	Hartford	Scaled to Nation
Movies	432	72.1	1,937	86.5	5.6	20.1	\$541	\$162,300
Sports	79	13.2	79	4.5	9.8	9.8	401	180,300
Boxing	6	1.0	6	.3	63.3	63.3	3,417	1,025,100
High school basketball	1	.2	1	.1	13.6	13.6	84	25,000
College basketball	2	.3	2	.1	10.7	10.7	226	67,000
Pro basketball	21	3.5	21	1.2	6.6	6.6	168	50,400
College football	5	.8	5	.3	6.2	6.2	133	50,400
Pro hockey	44	7.3	44	2.5	5.3	5.3	149	44,700
Entertainment	35	5.8	97	5.5	3.1	8.7	369	110,400
Opera and ballet	4	.7	6	.3	9.6	14.7	662	193,600
Concerts	4	.7	14	.8	1.1	3.9	175	55,600
Variety	7	1.2	20	1.1	2.7	24.6	733	221,400
Nightclub	6	1.0	13	.7	2.9	8.4	363	109,900
Drama	11	1.8	29	1.6	.9	2.3	102	30,600
Miscellaneous	3	.4	15	.9	n.a.	n.a.	n.a.	n.a.
Educational	50	8.3	57	3.2	.7	.8	5	1,500
Medical (for 100 subscribing doctors)	3	.5	6	.3	9.3 ^b	18.7 ^b	20	60,000
All programs	599	100.0	1,776	100.0	5.5	16.4	455	139,500

Source: "Joint Petition of Zenith Radio Corporation and TECO, Inc. for further Rule Making to Authorize Nation-wide Subscription Television," FCC, March 10, 1965.

^a Record year only.

^b Per cent of 100 doctors for whom program made available; the 100 doctors were less than three per cent of all subscribers.

the same prices as did the Hartford system (corrected for inflation), then the revenues for the subscription service would be about \$175 million.

A detailed breakdown of the revenues generated by specific program types indicates that the strongest unfilled consumer demand is in program categories similar to those that dominate current network schedules. The last column of Table 8 shows the estimated revenue (in 1963 prices) per showing on a national cable system (such as System 2 described earlier) of each type of program broadcast on the Hartford system, still assuming that four per cent of the viewers on cable systems serving half the television homes subscribe to STV. Movies of recent vintage, boxing and several entertainment categories were the most popular STV offerings; only boxing is not offered regularly on free TV. Most of the programs broadcast on Hartford STV were shown several times; the revenues generated by each distinct program for all of its showings were generally about three times the figures shown in the last column of Table 8 (the average number of broadcasts per distinct program can readily be calculated from columns three and five). A fairly recent movie shown three or four times generated revenues of about \$550,000 on the scale of a national cable STV system. An average concert produced revenues from all performances of \$175,000 on a national scale; an average ballet or opera, \$300,000; and a typical nightclub performance, \$225,000.

Considering the characteristics of the Hartford STV operation, it did remarkably well. First, Hartford STV was broadcast by a UHF station with all the attendant problems of any UHF. Since, all other things being

equal, a UHF station will attract about half as large an audience as a VHF station, STV on cable could be expected to do twice as well. Second, as the only STV station operating, the Hartford STV broadcasters could not afford to purchase programming especially for broadcast on STV, just as no single television station -- particularly one capable of reaching a maximum of 100,000 homes --- can afford to produce programs of the same quality as network programming. As a result, the Hartford STV station relied primarily on programs produced for other media: recent movies, films of concerts, plays, operas, nightclub acts, and programs shown on free television elsewhere. Third, the Hartford STV station did not devote itself exclusively to STV, instead showing two or three STV programs daily in prime time. The rest of the time was devoted to free, advertiser-supported television; hence the total revenues of the station were higher than those strictly from STV operation. For all these reasons, Hartford did not really offer network-quality programming. Instead, it was more akin to a strong independent, which makes the revenues it generated consistent with the estimates from cable penetration data.

All of these factors, plus the likelihood that the 30 per cent increase in per capita personal income (corrected for inflation) has undoubtedly increased the amount consumers would be willing to spend on STV, suggest that the \$175-million, national-market-equivalent annual revenue of the Hartford system is too low an estimate for the revenues that could be generated by a strong, national STV service.

Costs of an STV System

To assess the economic viability of STV on cables, the expected revenues must be compared with the expected costs. The most important

cost factor is programming expenses. Networks currently spend about \$175 million each on program production, including all programs either produced by the network or purchased from independent production companies. These figures are a good place to start in estimating the program costs for an STV system since the hope is that STV programs will be similar in quality to existing network programs.

Programming costs do have considerable flexibility, particularly in the longer run of several years, due to a particular peculiarity of the market for programs. A popular television program is almost impossible to duplicate with a different set of actors and writers. Consequently, the talent associated with a successful program has a position similar to a monopolist's in that it can capture some of the higher profits of successful programs as added income. Successful television performers then earn substantially more than they could earn in alternative jobs (movies, nightclubs, radio, etc.). We have statistically analyzed program costs for all types of network programming for several years in the 1960's and have concluded that if an additional one per cent of the national audience watches a program for a year, then the talent fees increase the following year by about \$1,500 more per week than would otherwise be expected. Therefore, the cost of programs for STV will depend to some degree upon the success of the system.

The minimum programming cost is the lowest price that must be paid to induce individuals to work in television rather than elsewhere. Judging from the costs of series that are in their first year or that are marginally successful, these minimum costs are probably under \$150 million annually for a full STV system. Of course, for this amount

STV could offer full daytime and news service similar to the programming now offered by networks; a prime-time, entertainment-only STV system would cost still less.

For specific program types, the Hartford experiment indicates that movies, boxing, opera, concerts, variety and nightclub programs would all be good candidates to generate revenues more than sufficient to cover costs on STV. This list emphasizes a dual role for STV, one of which generally has not been recognized. First, two of the three "high-brow" program categories, opera and concerts, did rather well in Hartford. One, drama, did poorly (the average drama program, shown three times, generated about \$80,000 in revenues on a national scale, which is less than it costs to produce most half-hour situation comedies on free TV), but perhaps drama should not be written off too quickly -- the small scale of the Hartford experiment, with its limited resources for programming, may have been especially telling on the attractiveness of the dramatic programming the system was able to present. Filming and broadcasting a single performance of the Metropolitan Opera or the New York Philharmonic -- neglecting payments to the performers -- would cost on the order of \$50,000 to \$100,000 (assuming the best sound and picture quality); both organizations could earn revenues two or three times these figures on a national STV system. A series of symphony concerts, featuring three broadcasts each of ten separate concerts of the leading orchestras, could generate revenues in excess of production costs of one or two million dollars, a substantial offset to the deficits of American symphony orchestras.⁹

9. How much of this would actually go to the orchestra management and how much would be captured by performers is, of course, incalculable. Most likely the latter sum would be large, at least as long as

The second aspect of STV, generally neglected in the discussion of STV, is the overwhelming support for several "low-brow" entertainment categories. The Hartford station, with its low budget, could not experiment with the staple of free TV, the regular series, but all other categories found in the regular TV fare did very well in Hartford, earning revenues that easily would cover production costs.

Another major cost item for networks is payments to affiliates, totalling about \$100 million annually. The counterpart in a cable STV system would be payments to cable owners for devoting a cable channel to STV. Historically, broadcasters have not had to pay to have their signals carried by cable systems. One reason for this is that regulation has largely dictated which signals can and cannot be carried. Another reason is that cable owners benefit more from carrying signals than do broadcasters. While the increased penetration of a cable system due to the third network varies according to the other options on the cable and the over-the-air options, on the average the third network accounts for about 25 per cent of the cable subscribers. Each cable subscriber is worth \$90 in gross revenues, and close to that amount in profits to the cable owner. (The costs of additional subscribers to a given system are very low.) The network captures roughly 25 per cent of the viewing time of all cable subscribers. The network and its affiliate are paid about three cents per hour for every home viewing their signal, so the network system gains about \$7 per year for each home on the cable system. The gain of the cable owner from providing the network is perhaps \$80 from one-fourth of his subscribers (or \$20 per subscriber), which is triple the gain of the network system.

Cable STV would be quite a different matter. As developed herein, an STV channel charging Hartford prices would not lead to much of an increase in penetration (the increase in consumer welfare from one more

system would therefore have to be induced to broadcast STV, particularly since the latter would bear some collection costs, discussed below. Most likely an arrangement much like that between networks and affiliates would develop between cable owners and STS -- the profitability of STV would be split between them; however, this is not a true "cost" to STV, for any payment slightly above collection costs would induce cable owners to carry STV. Thus we shall consider the counterpart to affiliate payments as a residual, part of the STV "surplus" to be divided among the claimants.

The third major expense of STV is transmission costs. If STV were to use the existing long distance microwave links, as do the networks, the costs would be roughly \$25 million -- about what the networks now pay. STV probably will not pay this much, for the same capacity in a satellite system can be provided considerably cheaper while at the same time reaching all parts of the nation, including areas not served by microwave. While satellite costs can only be estimated with a wide margin of error, a satellite system consisting of a few earth stations that can send signals to the satellite, several thousand stations that can receive signals from the satellite, and three satellite channels would probably have an annual cost of about \$13 million. This cost will decline as satellite technology improves and use increases. In addition, cable systems will have additional costs associated with transmitting the received signal; these will total about \$5 million dollars annually.

The final expense is the "collection cost" -- the extra costs required to prevent viewers from seeing the supposedly pay-broadcasting without paying the fee. The Hartford STV experiment used the most expensive .

possible technology -- broadcasting scrambled signals, and then installing descrambling devices on each subscriber's television receiver. These devices, even if produced in large numbers, would still be likely to cost \$100 each. Amortized over a three-year expected life such devices would increase the annual cost of operating a scrambled-signal STV system over cables by about \$40 per home, or about \$50 million for a system reaching four per cent of the cable subscribers.

The total cost of operating a minimum STV system using scrambled signals would thus be about \$200 million, and perhaps less, depending on program costs. Given the demand estimates outlined previously, the system would be very likely to cover costs. And should twice as high a fraction of cable homes subscribe to STV as did to Hartford, costs would increase by only \$50 million while revenues would exceed \$350 million. This would produce profits exceeding \$100 million annually, which is more than are earned by the three existing networks combined.

The STV collection cost could be reduced substantially by making the revenue-collection process more like periodical subscriptions than theatre admissions. This version would collect a regular monthly fee from a subscriber in return for equipping his TV set to receive a particular channel on the cable system. The cost of this system depends to a significant extent on the receiving capability built in to the television receiver; however, the cost per receiver as presently constructed for implementing this type of STV service is about \$20, assuming mass production. This lowers the total costs of a cable STV system well below \$200 million, making such a system clearly viable even at Hartford penetration rates -- and with substantial profits.

The type of cable service implied by this STV arrangement is much like the following. For \$7.50 monthly (including the amortized installation fee), a subscriber could receive the three networks, several independents (at least four), and public broadcasting. For an additional fee, he could have access to additional service including one channel programmed much like the existing networks or Hartford STV, but free of advertising. A fee of around \$12 monthly would, according to the Hartford results, induce at minimum four per cent and most likely more of the homes receiving the first service also to purchase the second. But a more likely result might be that virtually all of the cable subscribers would pay \$1 a month for the extra service, generating revenues of \$350 million (far above the costs of the system).

Regulation and the Pay-TV Threat

Just because cable STV appears easily worth the costs is certainly no guarantee that it will be permitted to happen. In addition to impediments that might be placed to prevent the expansion of cable service to 50 per cent of all TV homes, there is the ever-present possibility that STV will be made illegal or be so overburdened with restrictions as to be commercially unviable. Legislation pending before Congress and proposals put forth by the Federal Communications Commission would limit both cable and over-the-air STV to programming types not now broadcast on free TV. Banned would be regular series, all but first-run movies, and sporting events broadcast in recent years on free TV. Rules banning STV outright are now pending before Congress, and have been enacted by several local governments.

The spirit behind the FCC proposals is that STV should not be permitted unless it offers entertainment substantially different from that already available on free television. FCC policy is seen as necessary to protect the existing broadcasters from substantial erosion of their patronage and to protect the fanciers of existing TV from losing access to their favorite programs by preventing the imposition of fees for some programs now received free.

The basic concern over STV is that existing networks (or program producers) will find it sufficiently profitable to switch to an exclusively STV system. (Without copyright protection or a ban on signal importation, a mixed system -- free in some localities, pay in others -- is not viable.) The calculations presented above would indicate that this is not really a threat, especially if STV is not allowed to sell advertising; the profitability of cable STV is roughly the same as the profitability of the three existing networks, perhaps even a little less, if the profits of the network-owned affiliates are included in the profits of networks.

If advertising were permitted on STV, the consequences are more difficult to predict. Past experience gives only two guides. The existing network systems are highly profitable (when the profits of affiliates and networks are combined) and, according to the Hartford results, a fairly small fraction of viewers is willing to pay the fairly steep prices charged by Hartford -- about \$12 monthly. But even if 20 per cent, rather than four per cent of cable subscribers were willing to subscribe to STV at \$10 monthly and view STV half of the time, network audiences -- and advertising revenues -- would decline only by

five per cent. This would reduce the profits in the network system by about one-third but still leave the industry with approximately a 20 per cent after-tax rate-of-return on investment -- significantly above average. Meanwhile, the STV system would raise revenues of \$720 million from subscribers and about \$150 million from advertisers. Since there would be no technical limit to the number of such STV systems that could be formed, competition would cause the number of STV systems to increase until profits per system dwindled to average. With costs in the range of \$200 million annually, this would mean that about four STV systems, in addition to the three existing networks, would be viable, all producing programming of roughly the quality now produced by networks. Of course, the STV penetration and viewing figures assumed are very high -- five times as high as Hartford. A reasonable expectation would be a final result much closer to the Hartford projection.

Another common fear is that consumers not purchasing STV, though having access to three networks, might still experience some loss in welfare. Extremely popular network programs might be able to earn higher returns on the STV system, particularly a scrambled signal system charging a fee per program. The audience erosion of network television due to STV would then appear primarily in the disappearance of a few of the most popular network programs (switching to STV), replaced by programs of average quality. Subscribers to STV would also lose welfare, being forced to pay to view the programs that once were free. The result is a net loss in total welfare because the program producers, in switching

to STV, can capture for themselves only the welfare loss of STV subscribers who choose to pay for the program -- only part of the fraction of viewers who are cable subscribers.

Nevertheless, substantial switching is unlikely, even in the most favorable STV environment -- scrambled signals and STV advertising. If five per cent of cable subscribers buy STV, and if 25 per cent of these are willing to pay as much as \$1 to watch, say, an episode of "Bonanza," the STV revenues generated would still be only about \$385,000 per episode, including advertising of about \$10,000. These revenues are less than the series now earns from advertising alone on free network TV.

The preceding analysis really goes much further than is necessary to justify a permissive attitude with regard to STV. As long as cable capacity is reasonably large, and as long as a large fraction of the nation remains unwired, the alleged dangers of STV to the existing broadcasting system are illusory. If cable STV will not create these costs, then it is unnecessary to go to such great lengths proving the benefits of STV. If one is not convinced by the estimates herein of the profitability of STV, then one has even less to worry about in terms of free programs switching to pay, and one can be even more permissive about STV development on cables.

Some steps could be taken toward encouraging STV without immediately adopting a completely permissive attitude. Perhaps the minimal step is to place STV in the hands of nonprofit, public broadcasting. Presumably there is no danger of public broadcasters orienting themselves toward

raiding the networks for existing programs; furthermore, public broadcasting is most likely to undertake programming quite different from the conventional fare. Unfortunately, keeping conventional fare off STV sacrifices most of the potential consumer welfare to be captured through STV development, as Hartford illustrates. Consumers apparently derive much satisfaction from the type of programming on existing stations. In fact, "high-brow" STV is very probably not commercially viable unless it is part of a system devoting considerable time to "low-brow" programming.

The second partial step with respect to STV development is to ban advertising on STV systems. This would have little effect on a Hartford-style STV system appealing to a small fraction of the viewers, since advertising then would account for very little of the revenues of STV. But should STV prove much more successful than Hartford would cause us to expect, a ban on advertising would limit its revenues considerably. If one per cent of System 2's 30 million subscribers watch a given STV program, the advertising potential is less than \$10,000 an hour, but if ten or 20 per cent watch, potential advertising revenues begin to approach the advertising revenues earned by some less popular network programs. Again, the ban on advertising, like the public ownership proposal, has a rather hollow ring. A marginally successful STV operation might become commercially successful only if allowed to pick up a little extra revenue through advertising; an overwhelmingly successful STV system will grow and prosper even without advertising. These results follow from the fact that advertisers are willing to pay very little for a half-hour of a viewer's time; a viewer does not have to be willing to pay very much for viewing time to have his contribution to STV revenues dwarf the contribution of the advertiser.

SALE OF CHANNEL TIME

One broad category of supplemental cable services is the sale by the CATV operator of channel time to various local organizations which would present whatever programming they wished. The CATV operator would be, in effect, a common carrier transmitting programs selected by a diverse group of sponsors - political parties, churches, community organizations, local governments, educational institutions, other nonprofit organizations, or even individuals. If no commercial advertising were allowed, only nonprofit organizations would probably be willing to be customers. Allowing advertising would make such channels competitors with present commercial over-the-air broadcasting, or with advertiser-financed local originations.

If advertising is banned, the common carrier service is designed for those who have something to say rather than something to sell. It is predicated upon the view that some groups in society have limited access to the mass media and yet have information, entertainment, and points of view which they wish to make available to society. These groups might be willing to pay the incremental cost of sending their message over CATV, so that non-viewers would be no worse off and viewers would be gainers. Since these groups may well be very eager to have their messages made available, they, too, would be gainers. The losers would be existing broadcasters, to the extent viewers switch from existing broadcasting to common carrier channels.

Underlying the case for common carrier service is a trio of important questions: (1) What will be the costs of programming on these channels? (2) What will be the cost of various neighborhood systems that might

provide this kind of service on a very localized basis? (3) How large will be the audience and, hence, the value of this kind of service?

The Costs of Channel Leasing

As indicated earlier, the primary costs of channel leasing are associated with the cost of producing the programs. Some insight into these costs are provided by Comanor and Mitchell's study. Based on their data, a minimal system would have to charge between \$50 and \$100 per hour for live origination to cover its operating and capital expenses. Such a charge would provide only a simple studio, a cameraman, and black-and-white transmission. The organization would have to provide all talent, direction, script and properties. For \$15 an hour the same system could transmit video tape and films supplied by the channel renter.

These cost estimates are based on a schedule of ten hours of live origination and 20 hours of film. The costs of this schedule are largely fixed. If a channel could not be filled for the full 30 hours weekly, the cost per hour would rise.

The price would certainly not deter most of the groups enumerated. Lecture hall rental, for example, often runs in excess of \$100. Casual inspection of meetings and lectures offered in even a medium-sized city shows there is probably enough demand to fill the time on the kind of minimal system envisaged here. Television programs are not perfect substitutes for actual meetings with the face-to-face contact that maintains the social cohesion of voluntary organizations, but television broadcasting may provide a better way to generate interest among the general population.

NEIGHBORHOOD CATV SYSTEMS

One way to ensure ample channels is for each neighborhood to have its own CATV system -- each system providing several common carrier channels. Thus, if a central city with 150,000 homes were served by 30 systems instead of three, there would be 150 available channels instead of 15. Fragmentation of audience by neighborhood favors one kind of organization over another. Many potential interests are correlated with income, class and ethnic origin and these factors also delineate neighborhoods. But some organizations have potential audiences spread throughout the city and for these a city-wide system is more efficient. Any organization with a wider following could broadcast on each system, perhaps with tapes, but this would be more expensive than reaching the same audience via an area-wide CATV system. A fundamental objection to neighborhood systems is that they might purchase local cohesion at the risk of further accentuating differences; however, the commercial broadcasting system can be expected to serve these wider interests.

The more fundamental problem with neighborhood systems is that smaller CATV systems are much more expensive than larger systems. This is because the expense of the signal-transmitting equipment at the cable head is almost the same in large and small systems. Using Comanor and Mitchell data, the cost of serving a metropolitan area with small CATV systems (5,000 subscribers) is between 23 and 45 per cent more expensive than with large systems (50,000 subscribers), depending on the size of the city.

These added costs of smaller systems make the neighborhood common carrier channels quite expensive to rent. The costs would increase by another \$100-\$150 per hour over the direct local origination expense of \$50-\$100.

The audience an organization might hope to capture on a 5,000-subscriber cable system (serving about 18,000 people) would be hopelessly small. If the common carrier channel draws an audience share comparable to present local independent stations, it will still have only about 60 homes viewing. And this is a generous estimate for if there were three such channels, they would then together outdraw every independent station in the nation. The cost of the channel to the organization will be between \$150 and \$250 per hour, or at least \$2.50 per home. This is more than 50 times the cost of a viewer on commercial stations, and the basic hourly rate is as high as is charged by a UHF station which reaches 5,000 homes. While some organizations might be willing to so value their message, we doubt there will be enough of them to fill the common carrier channel, since none now buy equally expensive but more attractive time on UHF independents.

For large 50,000-subscriber systems, the cost per viewer for one hour would be approximately 25 to 50 cents per home. This is still much more than advertisers now pay, but at least the total cost is less than half the price of an hour on a UHF independent. And now the system can draw on organizations from a potential population of 180,000.

Audience, Size, Media Access, and the Social Value of Common Carrier Channels

The preceding calculations suggest a fundamental problem concerning the value of the kind of common carrier channel suggested here. Access to the mass media is highly valued because it provides a very large audience at a very low price. Yet it seems extremely unlikely that common carrier CATV will ever provide large audience shares in the areas that it covers. As a result -- even though program costs are relatively low -- the cost per person reached will remain high. Thus, the problem of access to mass media will remain.

The experience of FM radio perhaps illustrates the problem. Local station directors report great difficulty in getting local politicians, religious leaders, authors, and other minor celebrities to appear on FM programs. Yet these persons are eager to appear on national or even local evening television. The difference is, of course, that television provides a great deal of public exposure; FM radio does not. Common carrier cable channels, while they are likely to recoup their costs on larger systems and therefore are certainly worthwhile, nevertheless will not solve the problem of mass media access in any more than a purely technical sense.

ADVERTISER-SUPPORTED LOCAL ORIGINATIONS

One possible role for a cable system operator is to function very much like a local station. The operator could provide programs and sell advertising. The following analysis assumes that one such channel is provided by the operator in a 50,000-subscriber system.

Comanor and Mitchell assume that a cable operator would receive advertising revenues of \$2,200 a year per 1,000 subscribers. If a cable operator earned about the same advertising revenue per viewer as a commercial broadcaster, this would imply an audience rating considerably in excess of that achieved by the most successful VHF independents. Yet with these revenues per viewer, a 50,000-subscriber cable system could afford to provide only about the same programming fare as presented by present UHF independents. If cable revenues per subscriber are scaled down to UHF audience size, the cable system could not even match the program quality of UHF independents. It would rely solely on very old reruns and some local origination, with expenses about the same as common-carrier type programming.

The reasons why this kind of service is likely to be operated at a loss are exactly the same reasons why almost all UHF stations operate at a loss. Faced with network competition, audience shares are low and resulting advertising revenues are sufficient to justify no more than old movies and fourth reruns of off-network shows. Proposals to create local originations on cable are similar to proposals to add a UHF independent station in a very small market with three networks and four strong independents. For the same reasons that an over-the-air station will be a financial failure, so will the local cable origination channel.

Some argue that cable system operators will provide more locally-oriented programming and so capture much bigger audiences than UHF stations. Yet live programming is more expensive than UHF rerun fare and

usually attracts fewer viewers, which is why^x UHF independents do so little of this programming now. The two exceptions to this dismal picture for cable origination are completely automated time, news, and weather, supported by local advertising; and ethnic television. The first succeeds because it is so cheap--a few dollars an hour. The latter is promising because of the size of the potential audience. The only two UHF over-the-air independents that now show a profit are both Spanish-language stations, one in Los Angeles, the other in New York. Among Spanish-speaking people, these stations outdraw the networks. A cable system located in an area with a high concentration of an ethnic group--Spanish-speaking, Polish, Italian or black--might be able to draw a substantial audience and finance itself from the resulting advertising revenues with programming oriented to the specific ethnic group. The success of some ethnic radio stations provides further confirmation of this point.

With several cable systems having an ethnic channel, one could visualize an ethnic network exchanging tapes to improve programming quality. Such a development might well be a major innovation brought about by cable.

DISPOSING OF THE SURPLUS

The preceding analysis suggests that a completely unfettered cable environment would generate a substantial surplus of revenues over true resource costs[#] to society. Just by providing every cable subscriber with viewing options roughly comparable to the options enjoyed by residents of New York and Los Angeles -- the cities with by far the best viewing choices -- unfettered development of cables would generate \$800 million in surplus. In addition, other paying cable services -- STV, common

carrier channels, etc. -- probably could generate at least another \$100 million. On the other hand, providing 20-channel service reduces the surplus by \$100 million. We assume these two negate each other, leaving \$800 million as surplus.

To restate an earlier point, the surplus does not now, and will never, actually exist -- regulation is not as permissive as the estimates presuppose. But every regulation that reduces the surplus -- including lower prices to subscribers -- can be viewed as having a cost equal to the amount by which its imposition causes the surplus to decline.

Numerous possibilities exist for exhausting the surplus. Later in this section, several plausible ones will be investigated; however, we first turn to several possibilities that are unworthy of serious consideration.

DISASTROUS PROPOSALS

We define a disastrous proposal to be one with a net cost that dwarfs the amount of surplus inherent in cable systems, i.e., one whose costs exceed revenues by at least as much as the surplus of the unfettered cable system. The most obvious such disastrous proposal is to ban cable development, thereby sacrificing an enormous amount in consumer welfare. Of course, the net cost of all disastrous proposals is, in the absence of government subsidies, the same as the cost of a cable ban. Regulations that implicitly saddle the cable industry with much more than about \$800 million in costs will probably prevent the industry from developing.

The first disastrous proposal that has been given serious attention is the suggestion that all, or virtually all, of the nation be wired-- including, perhaps, a requirement that all commercial broadcasting leave the air and switch to cables. In the absence of government subsidies,

cable systems could not afford to wire the nation. The unfettered cable environment leaves three areas unwired: most of New York and Los Angeles (over-the-air options are too good to permit much cable penetration); a few areas having high costs (because cables must be laid underground) or relatively low potential revenues (because over-the-air options are fairly good); and the least dense part of rural America.

A cable system cannot cover costs through subscriber revenues if the population density over an eight-square-mile area is less than 350 homes per square mile. If even as many as 90 per cent of the households in these areas subscribed to cables, the revenues generated would be under \$500 million. The cost of providing them with cable service, according to the Comanor-Mitchell estimates, would run to the tens of billions. Even if all individuals living in extremely sparsely populated areas were excluded, wiring only individuals living in areas with a density of 50 or more homes per square mile, costs would still exceed revenues by several billion dollars.

A cross-subsidization scheme, such as has been used to finance wiring rural America with electric power and telephone service, will simply not work with cables. The potential revenues in the system are simply not as large as revenues for other utilities, yet the costs are considerably higher. The surplus to be distributed, between subsidized uses and prices lower than the profit-maximizing level, is much larger in power and telephone communications.

The second unrealistic proposal is to attach a switched broadband communication system to cable television. Estimates of the cost of switched broadband systems runs to trillions of dollars. Since the cable television surplus is so small in comparison with the costs of switched

broadband systems, the latter would have to be virtually self-supporting to be a viable addition to the cable network. If this is the case, switched broadband will develop in any event along with cable systems; however, switched broadband is probably not self-supporting, and its losses -- even if a small fraction of its costs -- are likely to swamp the cable television surplus.

In comparing the cable surplus to these two extreme proposals the principal point is that cable television systems cannot carry unlimited burdens for supporting any technical dream, no matter how costly. While \$800 million is a considerable amount, it is not a lot compared to the cost of many of the dreams that have been propounded for future cable development; it is not even a lot compared to the advertising revenues of the existing television industry, about \$3.5 billion.

REALISTIC PROPOSALS

While the cable television surplus is not enough to purchase our fondest communications dreams, it is still ample to buy two or three ancillary items. This section evaluates some of the possible uses of the surplus. It should be borne in mind that one possible use of the surplus is simply to permit unregulated cable development. If this approach were adopted, almost 50 per cent of cable revenues would be before-tax profits of cable systems; the surplus would then be divided about equally between cable owners and government, the latter share from federal and state income taxes.

"Bribes"

The first class of realistic proposals consists of "bribes" to various interests to persuade them to permit cable development to

take place. Four groups may or may not need to be bribed, or deserve to be compensated, should cable development be permitted: the Federal Communications Commission, the broadcasting industry, local government, and the program producers.

For 20 years the FCC has held that the main hope for greater diversity is the expansion of television into the UHF band. UHF broadcasting has thus far proven to be not far short of disaster; about three-fourths of UHF stations (and all but two UHF independents) lose money, with the aggregate annual loss among the losers being approximately \$45 million. Generally, these stations are too poor to originate local programming or to purchase first-run syndications, the main hopes for greater diversity. Instead, they broadcast a very limited schedule -- often only a few prime-time hours a day -- of either the network feed or, in the case of independents, the cheapest possible television fare--ancient reruns of television series long buried, or grade B movies of a generation past.

UHF is not as good a hope as cable development for increasing viewing options for most viewers; the exceptions to this generalization are probably the large cities, where the small fraction of the audience normally captured by a UHF independent can still be a large audience in absolute size. Nevertheless, some -- including the FCC -- may not wish to abandon their hopes for UHF. If these individuals are in a position to prevent cables from developing, they may have to receive some protection for UHF in order to induce them to permit cable expansion.

The minimum possible cost to extricate cable development from the UHF problem is to use part of the surplus to pay for the type of UHF

programming that the FCC is seeking to promote. Thus, revenues of cable systems could be taxed to finance a UHF Development Fund. The revenues would be dispensed to UHF stations according to the amount of local origination and first-run syndication broadcast on the channel, with the maximum possible payment being the net deficit of the station. In the long run, with cable systems generating revenues of upwards of \$3 billion annually, a two or three per cent tax on cable system revenues easily would be enough to compensate the present losses of existing UHF stations. If the FCC is right in its belief that local service on UHF stations can develop into a prized viewing option, the subsidy will gradually disappear as the UHF's become profitable. If the FCC is wrong, a perpetual bribe of about \$50 million annually will be paid to keep UHF's in business. While the utility of this payment, assuming continued failure of UHF, is open to question, it nevertheless might make possible the full development of cable with its large attendant surplus even after the payment of the bribe.

The second group that might demand a bribe in order not to fight cable development is network affiliates. With the exception of about half of the UHF affiliates, network affiliates are enormously profitable, in most years earning after-tax profits on capital investment of 60 to 70 per cent. According to the estimates presented above, these stations would be the primary losers from unfettered cable development, with perhaps 15 per cent of the audience on cables (7.5 per cent of the national audience) switching to independents or new cable services. Such an erosion of audience would cause the profits of the entire network system to fall by about 40 per cent

(the networks and their affiliates normally earn profits of about 18 per cent of sales). In addition, the three national networks would experience profit reductions of approximately \$10 million each. All of the decline in affiliate profits would be confined to areas served by cable, so that the after-tax profit rate of half the affiliates would fall from 60 per cent to ten per cent of capital investment. While the affected affiliates would still be roughly as profitable as the rest of American industry, this decline would cause an enormous loss in the book value of stations.

The signal importation ban now in effect for the top 100 markets is in the direction favored by affiliates, although they would probably prefer to see the ban expanded to include perhaps 100 more markets. Of course, this is almost a disastrous policy since it requires sacrificing nearly all of the potential cable benefit to protect about \$200 million in network system profits.

Finessing the networks on this issue will be particularly difficult, for the amount of bribe required is apparently quite large. One obvious solution would be to abandon the "local service" doctrine of the FCC for network affiliates. In the Northeast, network affiliates are separated by as little as 40 miles. Allowing mid-Pennsylvania affiliates, for example, of a particular network to combine assets to form one large station and a system of repeaters covering a much broader geographical area would substantially reduce the costs, and raise the profits, of the affiliates. Unfortunately, the FCC holds even more affection for the local service doctrine than for the UHF development dream, and would be

unlikely to permit such consolidation, particularly while the existing stations were still at least marginally profitable. Another solution would be to ease the pressure on the networks to provide "public service" (i.e., unprofitable) broadcasting, replacing it with more popular conventional fare that could earn more revenue. This, too, is unlikely to win many adherents in the public sector.

No really attractive, inexpensive way to buy off the network affiliates appears available should affiliates choose to raise a considerable political issue over cable development and should their political power prove to be insurmountable. We can only point out that society would be much better off paying the network system \$200 million annually to make up for the profit loss resulting from cable than to permit the opposition of the networks to prevent cable development.

The third claimant for the cable surplus is local government. Currently cable franchises are agreeing to pay three to five per cent of revenues to local government to obtain the franchise.¹⁰ For the fully-developed cable system described herein, this would claim around \$100 million of the surplus. In addition, some local governments have toyed with the idea of requiring the cable system owner to provide the local government with one free channel, including minimum programming facilities. The free channel would presumably be used for broadcasting

10. In January/February 1971, various "Addenda to Television Factbook" from Television Digest show that the average franchise fee for the 12 new systems for which data were available was four per cent. One, in Milwaukee, has agreed to pay ten per cent. Of course, one way to dispose of the surplus is through competitive bidding for franchises, which a few localities apparently have practiced.

city council meetings, PTA meetings, and other civic activities. If free programming facilities and technical personnel are provided to local government, this proposal is quite expensive, though not disastrous. The minimum-cost broadcasting arrangement for a cable system costs about \$50 an hour. A 15-hour-a-week service for the local government, offered on all of the approximately 5,000 cable systems we envision as eventually developing, would cost \$200 million annually. If a 4-per cent revenue tax were coupled with a free channel for local government, the total payment to local government would be more than \$300 million annually.

The final claimant on the surplus is program producers who are lobbying for extension of copyright protection to broadcasting. If this lobbying is successful, cable owners will be required to pay for the right to broadcast signals picked up off the air, with broadcasters and program production companies being the prime beneficiaries. The essence of program copyrights is to make possible what amounts to a mixed system of free and subscription TV with individuals subscribing to cables being charged through cable companies for the signals others receive free off the air.

The institution of copyrights for broadcasts would produce an unknown transfer of wealth from cable owners to broadcasters and program producers. The copyright fee would be bargained between cable systems and program producers, with the resulting charge being somewhere between the limits either party can withstand -- i.e., a zero fee and a fee that captures all of the otherwise unclaimed surplus.

The copyright system could be regarded as a vehicle for subsidizing the affiliates and the UHF stations who may need to be bribed in order to permit cable development. This would, of course, require that copyrights be assigned to broadcasters, not networks or program producers (most of the lobbying is for the last group). Such a proposal is highly inefficient, since it causes payments to be paid to the stations that benefit from cable as well as to those that lose. In order to provide a \$200-million copyright payment to the network system and to subsidize the losses of UHF stations, an additional payment would have to be made to the VHF independents that, through widespread importation, are the principal beneficiaries of cable development.

Subsidization of program producers through assigning copyrights to them would lead to increased production costs of programs. The program production industry is highly competitive, with on the order of 100 firms in or on the fringe of the industry. Increases in industry profits have two effects. First, more firms produce and try to sell programs to networks and stations. Second, all firms attempt to gain an edge by increasing product quality and bidding up the price of talent that has a high probability of being purchased by a network or a large number of independents. Assigning copyrights to program producers would, to some degree, cause reassignment of the rights back to networks and stations (in much the same fashion as second-run syndication rights are often sold to the first-run purchaser). The remaining copyright fees retained by the producers would be dissipated in more expensive programming (both quality and salaries would be higher) and in an increase in the ratio of rejected-to-accepted pilot series.

Copyright protection of programs will reduce the number of other services that cable systems can realistically be required to provide. It will replace these with what amounts to a transfer of part of the surplus to that segment of the television industry that is most lucrative: the talent in programs, the strong big-city stations and the networks. While the proposal cannot be termed disastrous, because it would probably not retard cable development seriously, it can be regarded as a highly wasteful use of the surplus.

Public Goods

The second class of possible uses of the surplus is for the purchase of certain non-remunerative services. The FCC's proposed "public dividend" -- a five per cent tax on the revenues of cable systems in the top 100 markets choosing to import signals -- is one example. The funds so collected would be paid to the public broadcasting sector to facilitate its expansion and improvement. In System 2, the "public dividend" would supply about \$75 million annually if all top 100 market systems imported signals. This degree of signal importation is unlikely in an area with two or three independents, for additional imported independents would not add as much to revenues as the cost in "public dividend" payments. If the public dividend were levied on all systems, the proposal would still be realistic, collecting about \$150 million in revenues.

A much more modest provision for public broadcasting is to provide them with free access to channels, including transmission (but not programming) costs. Each channel for public broadcasting, based on the construction of a 20-channel cable system, would cost the national

cable system about \$10 million annually to operate. The suggestion by the Joint Commission on Educational Telecommunications that four channels be provided for instructional and other public television implies a claim on the surplus of about \$40 million.

Another potential use of the surplus is to force cable systems to wire areas that otherwise would not be economic to wire. In smaller communities, cable systems tend lay cable in front of nearly all homes, for smaller communities do not have vast areas of heterogeneously poor families that cannot afford the cable fee. Big cities, of course, do have areas of concentrated poverty. Perhaps five per cent of the homes in these cities would not be in front of the cable, accounting for perhaps two per cent of all wired homes. To extend cable service to these areas would require an annual net cost to cable companies of about \$50 million; if half of the households subscribed at a reduced fee of \$50 annually, revenues of \$15 million could be raised. Thus, insistence that cable companies wire all parts of cities would claim about \$35 million of the surplus.

A final public service proposal for allocating the surplus is to provide government in the large cities with live originations not supported by advertising. This proposal is similar to the near-disastrous proposal that one origination channel (with programming) be provided to local government; however, here the proposal is modified to include only the 75 to 100 most populous markets.

Providing the least expensive form of local origination -- as for common carrier channels, this is about \$50 an hour per system -- incurs

an annual cost, for an eight-hour broadcast day, of \$200,000 per system. For the 5,000 systems foreseen ⁱⁿ System 2, this is an enormous \$1 billion. But it is much less when confined only to large cities, since the cost-per-cable-system is only very slightly dependent upon the number of subscribers to the system. Thus, if half the cable subscribers -- 15 million homes -- subscribe to systems serving 50,000 homes, the cost of eight hours daily of live local origination without advertising is \$60 million. This cost is, of course, highly sensitive to the average size of systems. The proposal to wire each neighborhood independently (perhaps 5,000 subscribers per system) increases the cost of local live originations -- even of the cheapest sort -- for these 15 million homes -- to \$600 million. Least expensive would be to provide each of the 50 largest metropolitan areas with an interconnected cable channel for live originations, sacrificing the idea of fragmentation of the public service origination within each city. This would cost only \$10 million.

These cost comparisons suggest that in the larger cities -- with metropolitan populations of more than 500,000 -- providing free transmission for one live local broadcast is feasible so long as one does not attempt substantial neighborhood fractionalization of the viewers, broadcasting a different live origination to a large number of different areas of the city. Cities ranking in metropolitan population from thirtieth to seventy-fifth would be confined to one common program for all subscribers. The very largest metropolitan areas -- New York, Los Angeles, Chicago -- could afford at most 15 such independently programmed systems (assuming complete cable wiring is forced upon the first two) without exhausting the surplus of their cable systems.

These 15 would, of course, be spread over the entire area, not just within the central city. All of Manhattan, for example, could support five independently-programmed free channels.

Subscribers

The final claimants to the surplus are the subscribers who, according to our estimates, are providing annually \$800 million more than would be necessary to provide the service they are purchasing. A reduction in cable subscription and installation fees of \$25 annually would return the surplus (over minimum system profits) to the subscriber.

The basis for the subscribers' claim on the surplus is that an excise tax on cable fees is not an especially equitable or efficient mechanism for subsidizing unremunerative cable services. For the vast majority of viewers, the motivation for subscribing to cable will be the expansion in conventional viewing options that cable provides. Our statistical analysis of the determinants of cable penetration rates shows that viewers place a very high value on more network programming, a moderately high value on more commercial independent stations, a very little value on more of the other types of stations and originations offered on cables. The Hartford STV experiment also shows that the program types for which viewers have the greatest unsatisfied demand are primarily the types already available in substantial amounts from the present commercial system. These two pieces of evidence indicate that most viewers basically want more conventional viewing options, and will derive little benefit for the unremunerative services laying claim to the surplus. This conclusion is almost tautological: a

service is unremunerative only because too few people view it to encourage anyone -- advertisers, public organizations, or the viewers themselves -- to pay for it.

It does not necessarily follow that the unremunerative services should not be provided. The value of some services to society may exceed the sum of individual values expressed through private markets. Nevertheless, higher cable fees are not the best mechanism for supporting these services, since the cable excise is related neither to the benefits derived by a subscriber nor his financial ability to pay. All cable subscribers will pay the same amount for subsidizing unremunerative services, regardless of their incomes or the satisfaction they derive from the service. This places an especially heavy burden on lower income groups. Furthermore, although statistical analysis has not revealed an important relation between cable fees and penetration rates, it nevertheless seems plausible that some individuals will choose not to subscribe to cables if fees are high enough to produce a surplus of the magnitude discussed here. Particularly inequitable would be to deny some viewers the opportunity to subscribe to cables at a price that covers the cost of providing the basic service because they are unwilling or unable to pay a much higher price that is used to offset the costs of added services they do not want. Thus, the viewer must be regarded as a legitimate, attractive claimant for the cable surplus. This suggests public utility regulation or municipal ownership of cable systems to keep prices roughly in line with costs.