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ABSTRACT

The purposes of this study are (1) to estimate the number of commercial UHF television stations that are likely to come on the air between the present and 1990, and (2) to determine whether spectrum resources already allocated will be adequate in meeting this demand. Collaterally, the study seeks to determine whether some spectrum space now allocated to commercial UHF broadcasting will continue to lie idle and may be subject to reallocation to competing services. Taking 1974 as a base year, the study examines relationships among the existing stations and such variables as the number of television households, the growth of cable television, and the competition from overlapping television markets. It projects the number of stations along various paths into the future depending upon certain assumptions, including new services such as pay television. It concludes that the number of UHF commercial broadcasting stations will continue to rise between now and 1990. However, except for a few scattered markets, existing spectrum assignments appear adequate to accommodate this growth. The report is supplemented by a series of appendices, one of which is a model of the determination of the number of viable UHF television stattions. (WBC)

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PROJECTING THE GROWTH OF TELEVISION BROADCASTING: IMPLICATIONS FOR SPECTRUM USE

PREPARED FOR THE FEDERAL COMMUNICATIONS COMMISSION

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PREFACE

New commercial broadcasting stations constitute one of many groups of claimants to scarce radio frequency spectrum space. A large block of spectrum space has, of course, already been allocated to television broadcasting. Virtually all assignments in the VHF band are in use, but many assignments in the UHF band remain empty. The purposes of this study are (a) to estimate the number of commercial UHF television stations that are likely to come on the air between the present and 1990, and (b) to determine whether spectrum resources already allocated will be adequate in meeting this demand. Collaterally, the study seeks to determine whether some spectrum space now allocated to commercial UHF broadcasting will continue to lie idle and therefore subject, in the public interest, to reallocation to competing services such as land mobile radio. Taking 1974 as a base year, the study examines relationships among the existing stations and such variables as the number of television households, the growth of cable television, and the competition from overlapping television markets. It projects the number of stations along various paths into the future, depending upon certain underlying assumptions--including some affecting new services such as pay television. The basic model underlying the projections in this report is being made available in computer form to the Federal Communications Commission so that the Commission can make its own projections, based on a wide range of alternative assumptions, and can update the model as new information and data become available.

This is one of several studies within Rand's Communications Policy Program, supported by private foundations and by government agencies. Earlier studies have concentrated on the development of cable television, the services it might provide, its impact on over-the-air broadcasting, and its implications for regulatory policy. Other Rand studies in the television field have analyzed the Fairness Doctrine, prospects for the emergence of a fourth television network, the use of telecommunications technology for the delivery of social services, and the impact of television on social behavior.

During the course of the project, several persons provided valuable help. They include Bryan Ellickson, Joseph Grundfest, Bridger Mitchell, and Richard Neu of Rand, Stanley Besen of Rice University, and Bruce Owen of Stanford University. Of course, the authors are solely responsible for the contents of the report.

SUMMARY

Using a wide range of alternative assumptions, we conclude that the number of UHF commercial broadcasting stations will continue to rise between now and 1990. However, except for a few scattered markets, existing spectrum assignments appear adequate to accommodate this growth. In fact, even under our most optimistic assumptions about the growth of UHF stations, our projections indicate that a substantial number of assignments may remain unused in many markets. By shuffling these assignments among various markets in accordance with our projections and taking technical limitations into account, the FCC may be able to clear some additional spectrum space on either a regionwide or nationwide basis for reallocation to other competing services.

These projections are based upon analysis of 1974 data involving the relationship in 197 markets between the number of existing UHF stations and other characteristics of each market including: (1) the size of the market, (2) the number of UHF stations in the market, (3) the fraction of homes in the market that have television sets capable of receiving UHF signals, (4) the fraction of homes in the market that subscribe to cable television, (5) the wealth of the market, and (6) competition from stations outside the market. Based upon estimates of relationships between these variables and the number of existing UHF stations in each market, we project the number of stations in the 100 largest markets to 1980, 1985, and 1990.

In our so-called "base case," where the only changes assumed are population and income growth and the attainment of 100 percent UHF set penetration, the number of UHF stations is projected to grow from about 124 to 194, for a percentage increase well in excess of 50 percent.

With this base case as a point of departure, cable television appears to have rather little effect on the number of UHF stations one way or the other. Under our most extreme assumptions about detrimental effects of cable on UHF development, the number of stations projected in 1990 would run to about 160, in comparison with 194 in the base case--still a

larger number than the 124 operating in 1974.

Without making any judgments as to the technical feasibility of the UHF drop-ins proposed by the Office of Telecommunications Policy, we analyze the effect on UHF of dropping in 76 VHF stations in our list of the top 100 markets. We project that 57 of these VHF stations would be viable. Of course, VHF drop-ins would reduce the number of UHF stations below that of the base case--168 projected for 1990 compared with the 194 in the base case on one projection; 174 compared to 219 using an alternative equation--but again the number of UHF stations would rise from the level of 1974.

We also consider the effects of competition from new services and technologies, including pay television, videodisc and videocassette, fiber optics, and the use of direct broadcast satellites. Assuming that new services siphon off alternatively 10 percent, 20 percent, and 30 percent of the audience from commercial television, we still project some growth in the number of UHF stations. In the most extreme case--30 percent audience-siphoning--the number of UHF stations in 1990 is projected at 167, still substantially more than the 124 operating in 1974.

Even when UHF set penetration reaches 100 percent, as we assume for projections for 1980 and beyond, UHF stations will continue to be handicapped by reception and tuning deficiencies relative to VHF stations. However, the so-called UHF handicap will be reduced over time as UHF stations increase their transmitter power, more people install special UHF antennas, and new television sets with push-button or detent tuners for UHF come into wider use. It is especially difficult to quantify *trends* in the UHF handicap in our model, because changes in the handicap cannot be distinguished from changes in economic conditions and other factors that vary from year to year. Moreover, trends in the reduction of the handicap will be greatly affected by future rulemaking of the FCC with respect to issues of VHF-UHF parity. But making assumptions about reductions in the handicap and/or improvements in economic conditions, we show a substantial stimulation in the growth of UHF--perhaps as many as 290 UHF stations in 1990 in comparison with the 194 projected in the base case. We have also developed a model that *does* disentangle the *elimination* of the UHF handicap from general economic conditions and other factors. With this model we project the effect of the complete disappearance of the handicap (with economic conditions unchanged from 1974) to show a 1990 projection of 280 stations--61 more than the comparable base case projection. *In other words, we project that achievement of complete parity of UHF and VHF by 1990 would result in nearly 30 percent more UHF stations than if the UHF handicap remained at the 1974 level.*

In addition to the preceding projections made on the basis of individual changes or inclusions of assumptions in comparison with our base case, we examine mixed cases involving combinations of developments that may be of particular relevance. Here we find that only under rather extreme assumptions would there likely be *no* growth in the number of UHF stations from 1974. These assumptions include (1) cable penetration reaching a minimum of 50 percent nationwide and ranging up to 85 percent in specific markets, (2) 83 VHF drop-in stations on the air, and (3) 30 percent of the market siphoned off by new video services including pay television and videodisc.

In contrast, we also take an "optimistic" set of assumptions including (1) cable penetration ranging from 30 to 80 percent, (2) no VHF drop-ins, (3) 10 percent of audience siphoned off to new services, and (4) a favorable economic climate and substantial decline in the UHF handicap. Even under these favorable combinations of circumstances, many specific market assignments would remain unused in 1990 and might, then, provide the basis for reassignments and reallocations to other services.

Overall, the following patterns stand out:

- In all cases there is a substantial increase in projected stations between 1974 and 1980, reflecting primarily the achievement of 100 percent UHF set penetration.
- Slower growth is projected after 1980.
- Cable will probably have only a slight negative impact on the number of UHF stations. Even on extreme assumptions, the reduction due to cable in 1990 is less than 17 percent below our base case.

- Loss of audience to new video services such as pay television and videodiscs also has a relatively small impact on projected number of stations. Even a 30 percent audience loss reduces the 1990 projection by only 14 percent.
- The projected impact of VHF drop-in stations is a 14 percent reduction in UHF stations in 1990 based on one projection, and a 21 percent reduction based on an alternative projection.
- The negative impacts of developments above may be easily offset by improvements in economic climate or reductions in UHF reception and tuning handicaps.

All these projections are based on a so-called "viable stations model" based on estimates of relationships between the number of UHF stations operating in 1974 and the other variables listed above. This model yields direct estimates of the number of viable commercial stations in each market. However, when we began our work in late 1973 we expected to use more roundabout ways of projecting the number of viable stations. All would yield projections of stations' profits, and profitability would be used as an indicator of economic viability. We tried three different ways to project television station profits. The first was drawn from the FCC's work statement in its request for proposals, which suggested a procedure with several steps including estimation of television market revenues, partitioning these among stations in the market, and subtraction of estimated expenses to arrive at profit predictions. A second method involved estimating profits directly, rather than as the difference between estimated revenues and estimated costs. A third focused more explicitly on television station behavior in which the station was viewed as a firm that chooses its expenditure level to maximize profits subject to competitive pressure, public service obligations, and other aspects of its environment.

None of the three methods of predicting station profits did a very good job, particularly for stations handicapped by UHF transmission or lack of network affiliation--precisely those stations in which we are most interested in terms of implications for future spectrum needs. Furthermore, even good profit projections would have been dubious indicators of viability, since many stations report losses year after year and still remain on the air. Therefore, we rely on the more direct method of our viable stations model for all projections.

It is unfortunate that none of the three financial models led to useful results. Had they done so, we would have gained insight into how economic factors affect decisions to construct and operate new television stations. Part of the difficulty may lie in differences among financial circumstances of stations apparently equally situated--differences reflecting such factors as skill of management and operating mode--that are difficult or impossible to take systematically into account in econometric modeling. *Another difficulty may be that the financial data supplied to the FCC by the stations are simply unreliable.* With respect to the latter, general and administrative expenses are particularly susceptible to wide variations in accounting treatment. Since the FCC is not in a position to audit financial statements or to cross-check against income tax returns, the seriousness of this problem cannot now be assessed. However, we must emphasize that the reported financial positions of firms in our analysis are quite sensitive to the level of expenditures they report to the FCC. For the industry as a whole, "general and administrative expenses" are about equal to total industry profits. Thus, a 50 percent reduction in general and administrative expenses would increase profits by 50 percent, while a doubling of general and administrative expenses would wipe out profits. Recognizing this problem, the FCC has recently authorized a separate 13-month study to examine ways to improve the reliability of financial data--a decision by the Commission that we strongly support.

These unsuccessful attempts to use station financial data for projecting numbers of stations carry important lessons:

- The large variation observed in the profits of apparently equally situated stations suggests that financial data filed by *individual* stations have little usefulness for policymaking purposes. Although the figures in the *aggregate* are useful in providing an *overall* measure of how well the industry as a whole is doing from year to year, comparisons of individual station performance are questionable because of problems with data reliability and because of differences in station operating modes and other factors that cannot be systematically taken into account. The resulting nonsystematic variation in profits makes it impossible to predict with any precision the smaller, systematic effects of policy changes on station profits.

- Even if it were possible to predict profits, this would not provide a good indication of viability, since many stations report losses year after year and continue in business.
- Total audience increases very little as viewing options increase.
- The problem of the UHF handicap shows up consistently whenever we deal with individual station data, whether it is in terms of revenue shares, profits, or a revenue and expense model.
- To the extent that the large variation in profits of equally situated stations does not reflect simply differences in station accounting practices, then a good deal of flexibility exists in the system; there seems to be room for different modes of station operation, all viable. Certainly stations will react to competition from new technologies by adjusting their operations in ways that soften the impact on profits. Indeed, the relationship between competitive factors and profit is so tenuous that any impact of new technologies on profits may get lost in the static.

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I. INTRODUCTION

As demands for various radio services continue to rise, the problem of scarcity of radio spectrum space becomes increasingly severe. As in the case of other natural resources, such as land, oil, and metals, pressing questions arise as to how best to allocate this resource among competing uses. To be sure, spectrum space is different from other resources in that it is not depleted after use; that is, were over-the-air broadcasting suddenly to cease, the radio spectrum would still exist for other uses unlike, say, coal where once used the resource is gone forever. Still, at any particular time we do observe spectrum congestion, at least in many frequency bands, along with pressures by other users to retain whatever rights they currently have to the use of spectrum space.

THE USE OF RADIO SPECTRUM IN TELEVISION BROADCASTING

A large portion of the usable spectrum has been allocated to television broadcasting--spectrum space which also has other potentially valuable uses, especially in land mobile radio and for government purposes. Of the 930 MHz between 30 and 960 MHz which are especially suitable for these purposes 408 MHz, or about 40 percent of the total, is devoted to television broadcasting in VHF channels 2 to 13, and to UHF channels 14 to 69.*

In view of the large portion of spectrum space allocated to television broadcasting, questions arise as to whether some of this space should be reallocated to other competing needs. With respect to VHF broadcasting, possibilities for reallocations are remote (though possibilities arise for "VHF drop-ins" currently under consideration by the FCC, as discussed in Section V below). For nearly all of the

*Office of Telecommunications Policy, *The Radio Frequency Spectrum: United States Use and Management*, Washington, D.C., January 1973, pp. D-38, E-3. As a result of an FCC rulemaking in Dockets Nos. 18261/2, UHF channels 14 through 20 are being shared with land mobile radio in the largest 25 urban areas, and 84 MHz of spectrum space (UHF channels 70 through 83) have been transferred to land mobile radio.

commercial VHF assignments to specific markets are already in use. Of the 319 assignments made in the top 100 markets, only 29 remained unused in 1974 in the markets shown in Table 1.* Thus, there is little room for reallocating VHF channels to competing uses. Moreover, most

Table 1

UNUSED COMMERCIAL VHF ASSIGNMENTS

Top 100 Markets, Beginning of Year 1974

Market Rank	Market[a]	VHF Assignments	VHF On the Air	Unused Assignments
32	Denver, Colorado	5	4	1
43	Phoenix, Arizona	8	5	3
45	San Antonio, Texas	5	3	2
48	Salt Lake City, Utah	13	3	10
61	Flint, Michigan	3	2	1
67	Wichita, Kansas	11	10	1
81	Albuquerque, New Mexico	9	3	6
85	Sioux Falls, South Dakota	8	6	2
89	Duluth, Minnesota	5	4	1
98	Fargo, North Dakota	6	4	2

SOURCE: Table A-2, Appendix A.

[a]Defined as "area of dominant influence" (ADI) in accordance with usage of the American Research Bureau.

of the unused VHF channels are concentrated in sparsely populated areas of the country where spectrum scarcity poses little problem. All of the unused channels are assigned to outlying communities; none is assigned to the city for which the market is named. The 9 allocations in Albuquerque and 13 in Salt Lake City reflect the fact that the geographical areas of these two markets are very large, covering all or portions

*These and subsequent numbers exclude allocations and stations in six "border" markets, including two in the top 100, Buffalo and San Diego, near the Canadian and Mexican borders, respectively, as described in Appendix A, p. 1.

of several states, so that a large number of assignments are possible. But most of them lie fallow, and may continue to do so into the foreseeable future. Since nearly all VHF channels are already in use, and since our subsequent projections show no decline and at least some increase in the number of stations during the period relevant in this study, we will concentrate our analysis on the prospects for growth of UHF stations.

The situation is far different for UHF. Of the 435 commercial assignments in the top 100 markets, only 124 were in use at the beginning of 1974. This situation reflects the problems that UHF has had throughout its development. Many early TV receivers did not have a UHF tuner; it was only after the all-channel tuner legislation was passed in 1964 that later sets were required to have UHF tuners. Even then, UHF suffered the handicap of receivers having continuous rather than detent tuners, and tuners for which, according to some observers, technical standards were set too low to provide reception generally as good as that on competing VHF channels. More recently, FCC rules have gone into effect to require new sets to have detent rather than continuous UHF tuners in an attempt to reduce or eliminate the disparity between the convenience of tuning VHF and UHF channels. Furthermore, the propagation characteristics in the UHF portion of the spectrum are not as favorable for broadcasting as the lower VHF bands. In some cases, larger and more expensive antennas are required than is the case with VHF. In many places, the viewer can get along with rabbit ears for VHF but has to install a rooftop antenna in order to obtain adequate UHF reception. To the extent that UHF stations go to higher transmitter power, this handicap will also diminish.

However, the manufacture of TV receivers with better UHF tuners is only one of several technological developments that will affect the development of UHF and the use of spectrum in the future. The growth of cable television and the refinement and commercialization of videodisc technology provide the means for television service without use of over-the-air radio spectrum space. Some observers have speculated that in the longer term the continuing growth of cable television into a "wired" nation may very substantially reduce the need for over-the-air broadcasting, so that large chunks of spectrum space can be allocated to other uses.

Thus, several developments operate in opposite directions with respect to pressure on spectrum space. On the one hand, the continuing reduction in the UHF handicap will increase the number of UHF stations on the air. Also, continuing growth in population and in household income will stimulate UHF growth. On the other hand, the continuing growth of cable and the possibility of videodisc technology developing to the point of having an attractive home market could work in the contrary direction.

As shown in Fig. 1, the number of commercial UHF stations has grown, particularly since 1964 (when the all-channel tuner requirements were introduced), although there has been some tapering off in the last four years, perhaps as a consequence of overall depressed economic conditions. From 1974 onward a number of growth paths are plausible. Growth path A, for example, showing a sharp increase in the number of UHF stations, paralleling the growth from 1964 to 1970, might occur if the UHF handicap continues to decline, the number of television households grows rapidly, and no inroads are made by technologies such as cable and video-discs. The more moderate growth path B is an extrapolation of the overall 1954-1974 trend. It might result from a less rapid response in the number of UHF stations to the continuing decline in UHF handicap. Growth path C mirrors the 1954-1970 swing, and would suggest a decline in the number of UHF stations, perhaps under competitive pressure from cable, but eventually an upturn as a consequence of the longer-term decline or elimination of the UHF handicap placing UHF on full parity with VHF. Growth path D shows a continuing decline of UHF stations occurring possibly as a consequence of strong pressures from cable and videodisc, a lack of success in eliminating the UHF handicap, and perhaps a reduction in the growth rate of TV households below previous estimates.

THE FUTURE USE OF SPECTRUM ASSIGNMENTS

In general, then, given these and other pressures, to what extent are new stations likely to come onto the air over the next 10 to 15 years? Will the industry grow to make use of most or all of the unused UHF

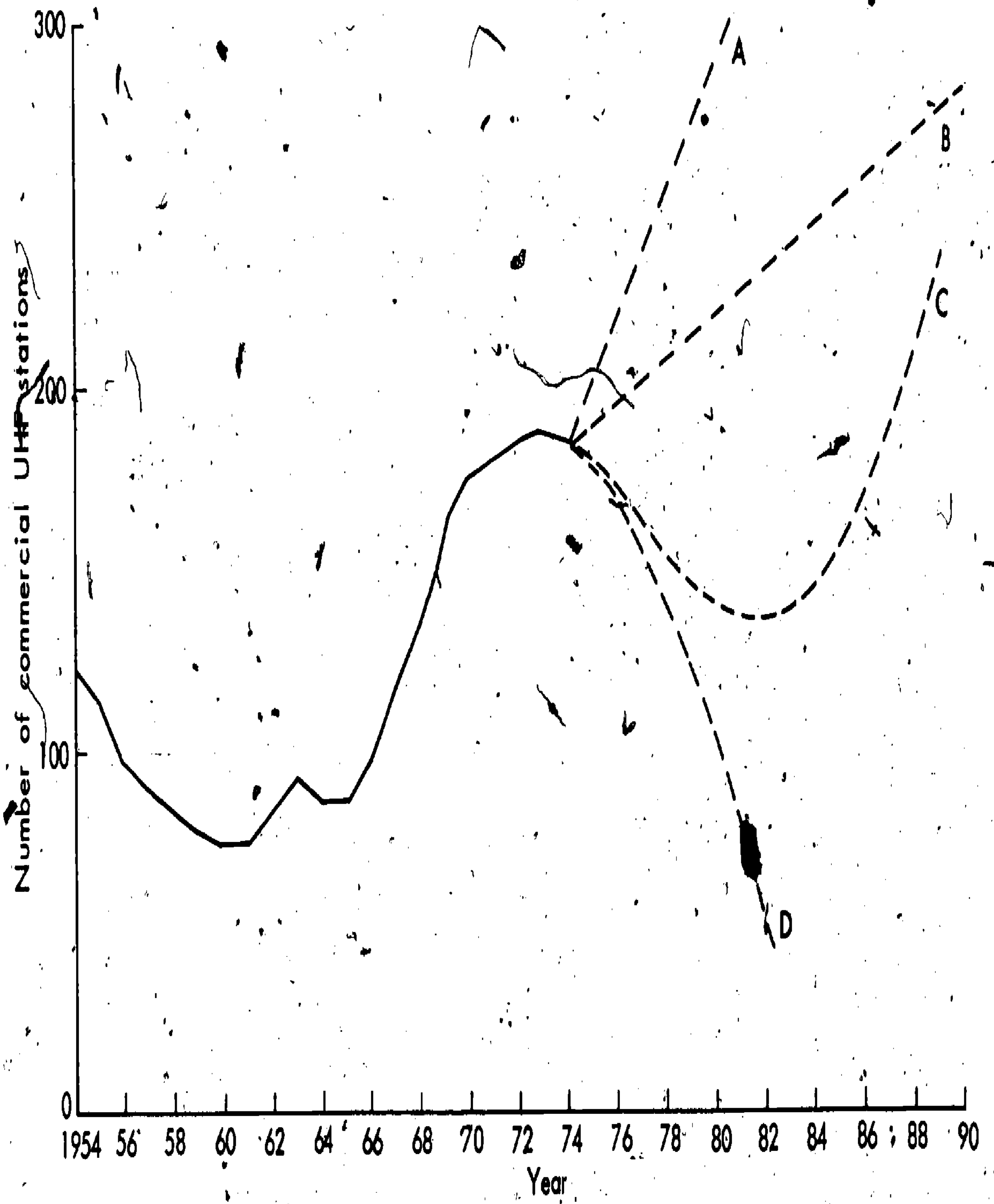

Fig. 1—Growth of commercial UHF broadcasting (all markets) under varying assumptions. Path B is an extrapolation of the trend from 1954 to 1974. For other details, see text.

assignments? Obviously, these questions are difficult to answer since so many factors arise whose effects are difficult or impossible to trace; moreover, new developments that we simply cannot now foresee are almost sure to intrude over a period as long as 10 to 15 years. Despite the uncertainties, pressures on spectrum use will require that the FCC continue to make major decisions about allocations and reallocations of spectrum space. In response to this need, the Rand study involves techniques for projecting the number of commercial UHF stations estimated to operate in individual markets for the years 1980, 1985, and 1990. These projections have been made on the basis of analyzing the major determinants of the number of commercial UHF stations that operated in 1974.

More specifically, we have undertaken a cross-sectional analysis of 197 television markets in the contiguous United States to determine how the number of UHF stations in each market in the base year 1974 was related to such variables as the number of VHF stations in the market, the number of TV households, retail sales per household, and degree to which signals from separate markets overlap to increase viewing of out-of-market signals and hence increase competitive pressures (for example, Washington, D.C., signals being viewed in Baltimore). By projecting the number of TV households and changes in the other variables (based partially on estimates supplied by the Department of Commerce Bureau of Economic Analysis) to the years 1980, 1985, and 1990, and assuming that the same relationships will continue to hold between the number of UHF stations and these variables observed in 1974, we are able to project the number of UHF stations for each market for 1980, 1985, and 1990. In addition, we are able to take other factors into account, such as the continuing growth of cable television, pay television, and use of videodisc technology.

As one would expect, projections of number of UHF stations depend critically on the assumptions made in 1975 about the growth and the effect of new developments such as pay TV. Because this is an area where a good deal of uncertainty exists, and one where the "experts" simply cannot agree on all facets, we resort to the common technique of making alternative assumptions and showing how the results vary as a consequence. In some cases, changing certain assumptions does not make much difference, while in other cases our projections are quite sensitive. This "sensitivity analysis" is therefore important in showing which assumptions are particularly relevant to the results and what kinds of additional information would be required to make improved estimates. In this report we have varied our key assumptions over a wide range and have combined them in what we feel are the most interesting combinations to provide useful inputs for future FCC decision-making. Moreover, our analysis is contained in a deck of computer cards, with instructions for running the computer program, for use directly by the FCC, so that it can include yet other assumptions to derive new and increasingly reliable projections, as additional information and data become available in later years.

Thus, we see our study as an important part, but only one part, of longer term FCC analysis of future spectrum uses. In addition, other work will need to be undertaken by the FCC; for example, projection of demand for mobile radio and other competing uses of radio spectrum and measurement of existing channel loadings. With these additional inputs the FCC will then need to decide how, if at all, assignments to broadcast and nonbroadcast services should be rearranged in order to permit an increase in overall communications service in the public interest.

Thus, if our projections show that in a particular television market only 5 of 7 UHF allocations are likely to be taken up by 1990; then questions will arise as to whether these assignments should be transferred to other neighboring markets or left standing as a contingency or safety margin. Moreover, if the FCC decides that a reallocation of UHF space from television to competing services is appropriate, then questions arise as to how channel assignments can be shuffled among markets, based on our projections of uses in specific markets, so that sufficiently large blocks of spectrum can be cleared on a regionwide or nationwide basis and made available for other services.

One cautionary note: Even if we project accurately the number of stations that will be viable in 1980, 1985, and 1990, this says nothing about whether that particular number is consistent with the public interest in light of the scarcity of spectrum space which is provided "free" to whichever service it is assigned. Since spectrum space, unlike other resources, does not carry a price paid by the user to reflect its value in alternative uses, a particular television station may be economically viable only because it does not pay for its use of spectrum. Studies have been undertaken to examine the feasibility of establishing property rights in spectrum space, analogous to those in the use of land and other resources, and of setting up a market within which those rights could be bought and sold at prices reflecting their values in alternative uses.* Nothing has come of this analysis operationally, partially because of the difficulty of satisfactorily defining property rights in spectrum space. Lacking such marketplace transactions in spectrum, the FCC will have to continue to use its own judgment, under guidance of Congress, about how to allocate spectrum space in the public interest.

OVERVIEW OF THIS REPORT

In Section II, we describe our approach, called the "viable stations model," by discussing the nature of such a model and the advantages and disadvantages of using models particularly in dealing with the kinds of problems faced by the FCC in spectrum management. We show how the model is used for understanding a variety of relationships such as those noted above, and the relative influence of the different variable

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*One of the most extensive studies of the possibilities of setting up private markets in spectrum space is G. E. Tempo, *Electromagnetic Spectrum Management: Alternatives and Experiments*, Santa Barbara, Ca., 1968, available through the National Technical Information Service, PB-184422. This was one of a number of studies conducted for the President's Task Force on Communications Policy, which submitted its final report in December 1968.

We then show how the viable stations model is used for projections, including assumptions about the continued growth in sets capable of receiving UHF and the influence of new services and technologies.

In Section III we apply the model in a so-called "base case"--a more or less neutral case with plausible assumptions about growth of population, income, and UHF set penetration--and show projections for the top 100 markets based on this particular set of assumptions.

In Section IV we describe the possible effects on UHF of cable growth and how results in this case differ from those of the base case, depending again upon a range of assumptions.

In Section V we consider the effects on UHF development of additional VHF "drop-ins." The FCC is currently considering this possibility of new VHF assignments on the basis of a study by the Office of Telecommunications Policy made in 1973-74 suggesting the technical feasibility of additional VHF assignments, and in response to a recent petition filed by the United Church of Christ.

In Section VI we take into account new technologies and services, particularly videodiscs and the use of special pay channels on cable, that could in principle draw audience away from commercial broadcast television.

In Section VII we apply the model under assumptions about improved UHF tuning, reception and increased transmitting power, such that the UHF handicap will be further reduced over time.

In Section VIII we bring together various combinations of the above assumptions, and compare the projections with existing spectrum assignments in the 100 top markets.

The viable stations model is far different from the model we used initially. At the beginning we felt, along with the FCC staff, that the most promising approach would be to project the growth of TV station profits, based on confidential financial data filed by individual stations with the FCC, and from there determine how many stations each market could economically support over the next 10 to 15 years. However, the range of possible errors in our estimates was so great that it became clear that this approach would not be useful for FCC policymaking. Thus, in Section IX we discuss the reasons why these approaches using individual station financial data were not useful, in terms of questionable reliability of the data, and differences in station operating modes and other factors. In Section X we describe the three unsuccessful attempts to use individual station financial data, and discuss the salient lessons to be learned from these approaches.

In Section XI we discuss further research that would be useful in making spectrum allocation decisions based on our own report as a point of departure, including questions of a) how much, if any, UHF spectrum can be released by reallocations that satisfy our projections; b) how much social value the projected stations have; c) the projected demand by competitors for use of the UHF spectrum and the social value of these competing uses; d) the process of updating our model as new data become available.

All of these sections are written for an audience with nontechnical backgrounds. Since it is important that technical aspects be fully laid out for independent appraisal by economists and engineers, the appendices include extensive technical discussion in support of the text. In particular, Appendix A gives a technical description of our "viable stations model," which is the basis for all of our projections.

II. THE VIABLE STATIONS MODEL

In this section we shall describe the basic ingredients of our viable stations model, explain reasons why we use it as an alternative to, say, polling "experts" for their reasoned judgments about the future of broadcasting, and show how it can be used to make future projections of viable stations. The discussion throughout is non-technical. Appendix A describes the model in much greater detail for those interested in the series of data employed and the econometric methods used to estimate the relationships involved in the study.

THE USE OF MODELING

Our way of answering the question discussed in Section I (How many commercial UHF television stations can we expect to be on the air 15 years from now?) is to construct a model--a simplified, abstract representation of the situation. In some ways, our model is like a model airplane that can be "flown" in a wind tunnel to check its aerodynamic characteristics before the full scale airplane is built. The model airplane is much simpler than the real thing; it omits details that are not important for wind tunnel tests. Because it is smaller and simpler, it is much cheaper and easier to work with than the real airplane. One can easily change the shape of the wings on the model, for example, and see what that does to the airflow.

Although our model is mathematical rather than physical, its purpose is much the same. The model describes how the number of UHF stations in a market is influenced by important factors such as the size of the market, the number of VHF stations operating there, and the level of UHF set penetration. These are not things that one can experiment with in reality in order to find out what will happen. But it is easy to "change" them in the model and observe the results. For example, one can increase each market's size to reflect population growth expected by 1990 and see what that does to the expected number of UHF stations.

This is not the only way to answer the question. Among other possibilities, one could poll "experts" for their opinions, draw a line extrapolating past growth into the future (such as appears in Fig. 1 above), or make one's own informed guesstimate.

Obviously, no one method is necessarily more accurate than the others in all cases. But our choice of modeling in the case at hand does have some important advantages over other methods.

One characteristic of modeling that may be an advantage is that is relatively *objective*. Once the model is specified and the data that are to be used to estimate it are chosen, the outcome is determined. The computer takes over, performs the necessary calculations, and prints out the results. In contrast, two experts, given the same information to work with, may come to quite different conclusions.

But of course the computer cannot specify the model in the first place. The analyst must do that, and in so doing he must make subjective choices. Another advantage of modeling is that the results of these (necessarily subjective) choices are *explicit*. Regardless of what confidence can be placed in these results, they are at least in an explicit form that can be compared with results that would be arrived at through alternative quantitative analyses, and they can also be compared with the subjective judgments of those knowledgeable in the field.

Another advantage of modeling is that it provides *a framework for systematic discussion*. If the reader is suspicious of particular results that come out of the model, it is possible to go back into the model to determine how those particular results were obtained. This does not mean that the results from the model are necessarily right and judgments by the reader wrong; but that it can provide the basis for reconciliation through collection of additional data, or by changing the structure of the model.

Finally, modeling is better adapted than alternative techniques for systematically exploring the effects of changing assumptions. As we shall show throughout this study, one can include a wide range of assumptions, such as changes in the growth rate of cable television, the reduction over time in the UHF handicap, alternative estimates of population growth, and other factors, to indicate how our overall projections are affected and by how much. Again, the model is certainly not guaranteed to provide accurate results; but it does provide *a framework whereby alternative assumptions can be included* to show the degree to which each affects the results.

On the other hand, modeling is certainly no panacea. By necessity it omits aspects of reality, especially those *aspects that cannot be quantified*. For example, we cannot take precisely into account variations in quality of UHF reception that occur from all local geographic peculiarities, such as hills near the center of town, tall buildings in particular cities, and variations in the local electromagnetic environment. In this case data are simply not available in a systematic enough form to place in a model; and in this case we can only hope that such local factors are inconsequential in comparison with those that can be taken into account. Modeling is necessarily a simplification of the real world, which if successful, is able to encompass the *major* elements that merit consideration while omitting those of lesser importance. But we should also note that these same problems plague subjective judgments about the future. The "expert" would be at no less of a loss to try to take into account such aspects as local geographical quirks scattered throughout the country in making any reasoned judgment about the overall growth of broadcasting over the next 10 to 15 years.

Modeling also suffers the problem of not being able to deal with *things for which we do not have data*. For example, in our analysis of the UHF handicap, it would be useful to have data on the disadvantage arising from the difference between continuous tuning and detent tuning, in order to quantify the effect of the phased introduction of detent tuning on UHF viability. But there are no records of the penetration of sets with detent tuners in individual markets, and even if there were, penetration is almost certainly too low to have a detectable influence on UHF stations.

Also modeling cannot eliminate inherent uncertainty. For example, we cannot tell at what point in a businessman's profit and loss calculations he decides that it would be economically attractive to build and operate a broadcasting station. Partly the problem arises because of *differences* in opinion among businessmen as to the conditions under which they would or would not undertake certain actions.

Finally, and perhaps most importantly, modeling cannot deal with *unforeseen developments*. Over the next 10 to 15 years all manner of things can take place that could compromise the value of any projections we made now. A major world depression, or sustained world prosperity going beyond the bounds of what we have observed in the past, wars and their global effects, and innumerable other factors can arise to render any projection wide of the mark. This is, of course, a problem endemic to any kind of forecasting, whether based on the reasoned judgments of the experts, or on a wide variety of quantitative analyses. Still, decisions must be made on the basis of one's expectations about what the future will hold. Thus, decisions may in hindsight turn out to be wrong, but we would hope wrong only for reasons that were simply impossible to take into account at the time the decisions were made. It is in this spirit that we proceed to construct a model that may lead to better reasoned decisionmaking in a world that necessarily is subject to high levels of uncertainty and one in which the emergence of unforeseen developments is inherent.

ELEMENTS IN THE MODEL

In its most basic terms the model examines the relationship between the number of active commercial UHF* stations in a particular market and a number of characteristics or variables we observe in that market. These variables include:

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*Note that both the data used to estimate our model and the projections based on the model represent stations actually broadcasting, and do not include construction permits or stations that have gone off the air.

- The size of the market, measured by the number of television households. Holding everything else constant,* we would expect to find more UHF stations in larger markets.

- The number of commercial VHF stations in the market. The more competing VHF stations, the fewer UHF stations we would expect.

- The fraction of homes in the market that have television sets capable of receiving UHF signals. The greater this is, the more UHF stations there should be.

- The fraction of homes in the market that subscribe to cable television service. This could affect the number of viable UHF stations either way. On the one hand, cable systems usually carry in television signals from other markets. This fragments the local audience and tends to decrease the number of viable UHF stations. On the other hand, cable improves reception quality of UHF, and this ought to increase the number of UHF stations. The net effect of cable depends on how these two effects balance out.

- The wealth of the market, as measured by retail sales per television household. We would expect wealthier markets to support more UHF stations.

- Competition from stations outside the market. Some markets overlap with adjacent markets more than do others. In high-overlap markets, out-of-market stations can be an important additional source of competition for local stations, and may tend to depress the number of viable UHF stations.

In addition, the model allows for the effect of other variables that are assumed to influence the number of UHF stations indirectly. These variables, which we expect to affect cable or UHF set penetration (which in turn affect the number of UHF stations) are:

- Over-the-air reception quality. The worse this is (on average in a particular state), the greater the cable penetration we would expect to find in that state.

- Whether or not the market is one of the top 100. If it is, we expect lesser cable penetrations both because of a variety of restrictions that the cable television rules have imposed on operations in these markets and because of the generally good over-the-air service.

*The qualification "holding everything else constant," though unstated, applies throughout this list.

- Whether or not public television service in the market is available only on UHF. If so, we expect somewhat higher cable and UHF set penetration.

The assumed relationships among all of these variables are fully described in Appendix A.*

COLLECTING THE DATA

As the first step in making our estimates, we determine the quantitative values for these variables for the year 1974 for each of the 197 markets in the U.S. listed in Appendix A, Tables A-2 and A-3. To take just one example, we find that in New York, market no. 1, two commercial UHF and six commercial VHF stations were on the air; the market contained 6,167,000 television households; 79 percent of the homes had television sets capable of receiving UHF signals; 4 percent of the homes subscribed to cable television service; retail sales per TV household amounted to $6,163; and there was little competition from stations outside the market, measured by our "overlap" value of .960 as defined in Appendix A.

FITTING THE MODEL TO THE DATA

As the second step, we use the statistical technique called regression analysis, using the cross-section of data for all 197 markets, to estimate the strength of relationships between these variables and the number of UHF stations.** This results in a rather complicated formula in which each of the variables is given its separate weight. The weights are chosen to make the formula fit the data on the actual number of UHF stations as well as possible.

In principle, doing regression analysis is much like drawing a line that passes as close as possible to points plotted on a graph. An example is shown in Fig. 2. Say the dots represent the number of UHF stations in several different markets. The farther are the dots

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*See particularly Fig. A.9, p. 160, and the accompanying discussion.

**For technical details, see Appendix A.

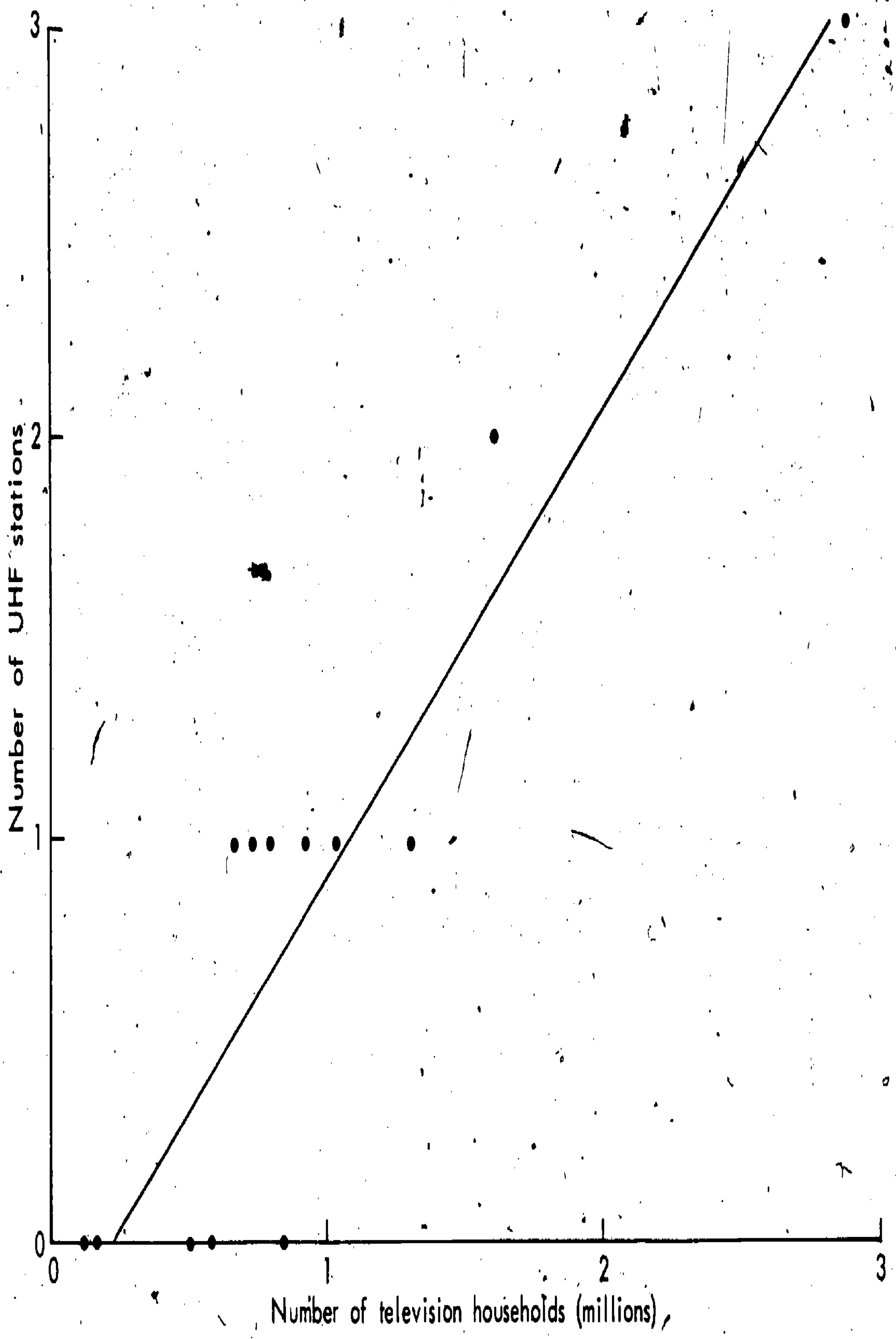

Fig. 2—Relationship between number of television households and number of UHF stations in a television market

to the right, the bigger the market; and the higher up they are, the more UHF stations in the market. Clearly there is a tendency for larger markets to have more UHF stations. Most people, if asked to draw a straight line that summarizes this tendency, would draw it pretty close to the one shown in the figure. Regression analysis "draws" lines like that, but it does it mathematically.

Our model is more complicated than the example in Fig. 2 in two ways. First, the model relates the number of UHF stations to all of the variables listed above, not just the size of the market. That means that we have to use *multiple* regression to sort out the separate effects of the different variables.

Second, ordinary multiple regression, like the line in Fig. 2, summarizes the association between variables, but it does not say anything about causation. We would seriously mislead ourselves if we were to look only at the association between number of UHF stations and UHF set penetration (the fraction of homes with receivers capable of receiving UHF signals) in making our projections. The problem is that causation runs both ways. Higher UHF set penetration should help UHF stations by increasing the audience they can reach and putting them on a more even competitive footing with VHF stations. Thus increased UHF set penetration should increase the number of viable UHF stations. But it works the other way, too. An increase in the number of UHF stations increases the level of UHF set penetration. With more UHF stations on the air, people have stronger incentive to buy a set that can receive UHF. In making our projections, we are only interested in the former effect. UHF set penetration will soon reach 100 percent in all markets, and we want to know what that will do to the number of UHF stations they can support.

In a similar way, cable penetration may both influence and be influenced by the number of UHF stations. We discussed above how cable may either help or hurt UHF stations. Going the other way, UHF stations may help cable, since better reception of UHF is one motive for subscribing to cable service.

In estimating our model, we use an econometric regression technique (called two-stage least-squares) that lets us separate out the effect of UHF stations on UHF set penetration from the effect of UHF set penetration on UHF stations, and the effect of UHF on cable from the effect of cable on UHF.

Of the several variants of the model that we estimate in Appendix A we choose one (Equation 1, Table A.9) for most of the projections in this report. It does a good job of fitting the data, but at the same time is a relatively simple equation. More complicated equations do not improve the fit enough to justify choosing them. We shall refer to this equation as our "basic quadratic equation" in the sections that follow.

ILLUSTRATIVE RESULTS OF THE MODEL

The results of our various estimates are for the most part consistent, both among themselves and with our prior expectations. Larger markets and markets with fewer VHF stations support more UHF stations, as expected.* Increased UHF set penetration has a dramatic effect on number of UHF stations. A 10 percent increase in UHF penetration is consistently estimated to increase the number of viable UHF stations by even more than 10 percent.

The effect of market wealth, measured by retail sales, on number of UHF stations is positive in almost all of our estimates, but it is always small and statistically insignificant. The effect of overlap with adjacent markets is usually estimated to be negative, that is, the greater the overlap, the less attractive is the market for UHF, as we would expect. But the relationship is not strong enough to be statistically significant.

The effect of cable is particularly important, and the evidence on this is mixed. In most of the variants of the model that we estimated, cable has a small and insignificant negative impact on UHF--so small that a 1 percent increase in UHF set penetration would more than offset a 10 percent increase in cable penetration. In one or

*With a minor exception noted in the section on VHF drop-ins below.

two other variants, the effect goes the other way, and cable is estimated to help UHF slightly (but statistically insignificantly). On balance, one must say that there is no clear evidence that cable affects UHF one way or the other. Apparently the help that cable gives UHF in terms of improved reception approximately offsets the harm from carriage of distant signals.*

CALIBRATING THE MODEL FOR MAKING FUTURE PROJECTIONS

With these relations affecting the number of UHF stations established, we are then able as a third step to estimate the values for the variables in later years (for example, increase the number of television households for 1980, 1985, and 1990) in order to determine what effect this will have on the expected number of UHF stations in the same time period. We can also include the effects of new technology, such as videodiscs, by making alternative assumptions about the extent to which videodiscs might reduce the potential audience (again measured by TV households). Similarly, we can vary assumptions about the effects of cable television and pay television. We also make alternative assumptions about changes in the UHF handicap as it affects the growth of UHF broadcasting.

But in making these projections, there is one final step involving "calibrating" the model to improve its accuracy. Based on our cross-section analysis for 1974, we were able to predict the number of UHF stations that would operate in 1974, and in this case, be able to compare our predictions with the *actual* number of stations that were on the air in that year. As one would expect, since our model is not able to take all considerations into account, the predicted number of stations is not exactly the same as the actual number. In some cases we overestimate the number of stations, and in other cases we underestimate.

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*In making estimates of UHF viability, question arises as to whether certain markets or stations should be removed from analysis if they are obviously unusual. For example, New York and Los Angeles (and possibly others) might be deleted because of their size. We have done this in some of our computer runs and found our results are not significantly affected. Moreover, this approach raises the question as to where to stop in deleting particular markets. Some UHF stations program in Spanish and others are operated by religious groups supported by donations. However, there are only a few scattered stations of these types and, given our large data base, it is most unlikely that their deletion would make a significant difference.

In New York, for example, in the "base case" analysis discussed in Section III we estimate 3.4 stations in 1974, while in fact there were only 2 UHF stations operating. In Los Angeles, on the other hand, we calculate 4.8 stations, while a larger number, 6, were operating in 1974.

For each market we take the difference between the predicted and actual numbers for 1974 and apply this "constant adjustment factor" to our projections for 1980, 1985, and 1990 as well. This adjustment is based on the assumption that whatever elements were operating in each of the markets to cause errors in our estimates for 1974 will continue to operate to the same degree, so that for any given market our projections would, if unadjusted, continue to overestimate or underestimate the number of stations by the same amount as was the case for 1974. While the assumption of an unchanging "error factor" in each market is open to question, to include this factor is better than not making any adjustment at all. Thus, to carry our New York example a bit further, the difference of 1.4 between 3.4 and 2 stations is also subtracted from our projections for New York for 1980, 1985, and 1990. In our "base case" discussed in Section III, we first project 5.4 stations in 1980, but we then adjust by subtracting the factor of 1.4 to arrive at a projection of 4 stations, and similarly for 1985 and 1990.

It may seem strange to the reader that we estimate numbers of stations in fractions rather than rounding upward or downward to whole numbers. However, retaining fractions conveys useful information. For example, estimates of 3.4 and 2.6 would both round to 3 stations. But we would have more confidence that at least 3 stations would operate if our estimate is 3.4, rather than 2.6. To avoid loss of information, we show the number of stations projected for each market to the nearest tenth in the tables that follow.

III. BASE CASE ASSUMPTIONS AND PROJECTIONS

The projections in this section assume only gradual change between 1974 and 1990. We assume that

1. The number of television households in each market goes up in proportion to population growth projected for that market
2. Retail sales per household go up in proportion to per capita income projections*
3. UHF set penetration reaches 100 percent by 1980
4. Cable penetration does not increase beyond 1974 levels
5. VHF allocations do not change (there are no VHF "drop-ins")
6. The UHF tuning and reception handicap does not change
7. New developments such as pay television and videodiscs make no inroads on the audience for conventional commercial programs.

We make these assumptions *not* because we think that is what is going to happen. Instead, they just represent a neutral base case, to which other projections can be compared to see the effects of developments excluded here.

RESULTS USING BASIC QUADRATIC EQUATION

The results of using our preferred equation and the assumptions given at the start of this section to project numbers of viable UHF stations by market are shown in Table 2. We show projections for the top 100 markets only, since it is in these markets that spectrum scarcity is most likely to be acute.

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*Per capita income and population growth estimates are taken from the Bureau of Economic Analysis (BEA), Department of Commerce, 1974 *OBERS Projections, Volume II, Economic Areas.*

Table 2

BASE CASE PROJECTIONS USING BASIC QUADRATIC EQUATION

	MARKET		1974 PROJ (1)	1974 PROJ (2)	1980 PROJ (1)	1980 PROJ (2)	1985 PROJ (1)	1985 PROJ (2)	1990 PROJ (1)	1990 PROJ (2)
1	NY	NY	3.4	2.0	5.4	4.0	5.6	4.3	6.0	4.6
2	LA	CA	4.8	6.0	6.5	7.7	6.9	8.2	7.4	8.6
3	CHCAGO	IL	1.7	3.0	2.1	3.5	2.2	3.6	2.3	3.7
4	PHIL	PA	1.7	3.0	2.2	3.4	2.3	3.5	2.4	3.6
5	DTROIT	MI	1.1	2.0	1.5	2.4	1.6	2.5	1.7	2.5
6	BOSTON	MA	1.4	2.0	2.0	2.6	2.0	2.7	2.1	2.8
7	SF	CA	1.0	3.0	1.5	3.5	1.6	3.6	1.7	3.7
8	CLVLND	OH	1.3	2.0	1.7	2.4	1.8	2.5	1.9	2.6
9	WASH	DC	1.0	1.0	1.3	1.4	1.4	1.5	1.5	1.6
10	PITT	PA	0.8	0.0	1.5	0.7	1.5	0.7	1.6	0.8
11	STLOUS	MO	0.7	1.0	1.1	1.5	1.2	1.6	1.3	1.6
12	DALLAS	TX	0.8	1.0	1.3	1.5	1.3	1.5	1.4	1.6
13	MINN	MN	0.4	0.0	1.1	0.7	1.2	0.8	1.3	0.9
14	BALT	MD	0.8	1.0	1.2	1.4	1.3	1.5	1.4	1.6
15	HOUSTN	TX	1.2	2.0	1.5	2.3	1.6	2.4	1.7	2.5
16	INDPLS	IN	0.5	1.0	1.0	1.5	1.1	1.5	1.1	1.6
17	CINCI	OH	0.8	1.0	1.2	1.4	1.3	1.5	1.4	1.6
18	ATLANT	GA	1.0	2.0	1.5	2.5	1.5	2.6	1.6	2.6
19	HARTFD	CN	1.4	2.0	1.9	2.5	2.0	2.6	2.1	2.6
20	SEATLE	WA	0.3	0.0	0.9	0.6	0.9	0.7	1.0	0.7
21	MIAMI	FL	0.7	1.0	1.1	1.5	1.2	1.5	1.3	1.6
22	KANCTY	MO	0.7	1.0	1.2	1.4	1.3	1.5	1.3	1.6
23	MILWAU	WI	0.9	1.0	1.2	1.3	1.3	1.4	1.4	1.5
25	SACRA	CA	0.7	1.0	1.2	1.4	1.2	1.5	1.3	1.6
26	MEMPH	TN	0.4	0.0	1.1	0.7	1.2	0.8	1.2	0.9
27	COLUMB	OH	0.6	0.0	1.0	0.4	1.1	0.5	1.1	0.6
28	TAMPA	FL	1.0	1.0	1.4	1.4	1.5	1.5	1.6	1.6
29	PORTLN	OR	0.3	0.0	0.8	0.5	0.9	0.6	1.0	0.7
30	NASHVL	TN	0.4	0.0	1.1	0.8	1.2	0.8	1.3	0.9
31	NEWORL	LA	0.7	1.0	1.0	1.3	1.1	1.4	1.2	1.5
32	DENVER	CO	0.4	0.0	0.9	0.5	0.9	0.6	1.0	0.7
33	PROVID	RI	0.7	0.0	1.1	0.4	1.2	0.5	1.2	0.6
34	ALBANY	NY	0.5	0.0	1.0	0.5	1.1	0.6	1.1	0.6
35	SYRACU	NY	0.4	0.0	0.8	0.4	0.9	0.4	0.9	0.5
36	CHARLS	WV	0.4	0.0	0.9	0.5	1.0	0.6	1.0	0.7
37	GRNDRP	MI	0.5	0.0	1.0	0.6	1.1	0.6	1.2	0.7
38	LOUSVL	KY	1.3	2.0	1.7	2.4	1.8	2.5	1.9	2.6
39	OKCITY	OK	0.4	0.0	1.0	0.6	1.1	0.7	1.2	0.7
40	BIRM	AL	1.1	1.0	1.5	1.5	1.6	1.6	1.7	1.7
41	DAYTON	OH	1.2	1.0	1.6	1.5	1.7	1.5	1.8	1.6
42	CHARLT	NC	1.2	2.0	1.7	2.5	1.8	2.6	1.9	2.7
43	PHOENX	AZ	0.4	1.0	0.8	1.4	0.9	1.5	1.0	1.5
44	NORFLK	VA	0.6	1.0	0.9	1.4	1.0	1.4	1.1	1.5
45	SANANT	TX	0.5	1.0	1.0	1.5	1.0	1.5	1.1	1.6
46	GRNVLE	SC	0.3	1.0	1.0	1.7	1.0	1.7	1.1	1.8
47	GRNBRO	NC	0.3	0.0	0.9	0.6	0.9	0.6	1.0	0.7
48	SALTLK	UT	0.3	0.0	0.9	0.6	1.0	0.7	1.1	0.8
49	WLKSBR	PA	4.2	3.0	4.9	3.7	5.1	4.0	5.4	4.2
50	LITLRK	AR	0.2	0.0	0.8	0.6	0.9	0.7	1.0	0.7

Column (1): Raw projection.
Column (2): Adjusted projection.

Table 2 (contd.)

	MARKET	1974 PROJ (1)	(2)	1980 PROJ (1)	(2)	1985 PROJ (1)	(2)	1990 PROJ (1)	(2)
52	TOLEDO OH	1.1	1.0	1.5	1.4	1.6	1.5	1.7	1.6
53	OMAHA NE	0.2	0.0	0.8	0.5	0.8	0.6	0.9	0.6
54	TULSA OK	0.3	0.0	0.8	0.6	0.9	0.7	1.0	0.7
55	ORLAN FL	0.6	0.0	1.1	0.5	1.1	0.6	1.2	0.6
56	ROCHES NY	0.5	0.0	0.8	0.4	0.9	0.4	1.0	0.5
57	HARISB PA	2.3	2.0	2.7	2.5	2.9	2.6	3.0	2.7
58	SHRVPT LA	0.2	0.0	0.9	0.6	0.9	0.7	1.0	0.8
59	MOBILE AL	0.2	0.0	0.8	0.6	0.9	0.7	0.9	0.8
60	DAVENP IA	0.4	0.0	0.8	0.4	0.9	0.5	0.9	0.5
61	FLINT MI	1.2	1.0	1.5	1.4	1.6	1.5	1.7	1.5
62	GRNBAY WI	0.3	0.0	0.8	0.5	0.8	0.5	0.9	0.6
63	RICHMN VA	0.4	0.0	0.9	0.5	1.0	0.6	1.1	0.7
64	SPRNGF IL	2.2	2.0	2.5	2.4	2.7	2.5	2.8	2.6
65	CDRRAP IA	0.3	0.0	0.8	0.5	0.9	0.6	0.9	0.6
66	DMOINE IA	0.3	0.0	0.9	0.6	0.9	0.7	1.0	0.7
67	WICHTA KS	0.3	0.0	0.9	0.7	1.0	0.7	1.1	0.8
68	JKSNVL FL	1.1	1.0	1.5	1.4	1.6	1.5	1.7	1.6
69	PADUCA KY	0.1	1.0	0.7	1.6	0.8	1.7	0.9	1.7
70	ROANCK VA	0.2	0.0	0.7	0.5	0.8	0.6	0.9	0.7
71	KNOXVL TN	0.8	1.0	1.4	1.6	1.5	1.7	1.6	1.8
72	FRESNO CA	4.1	5.0	4.5	5.4	4.6	5.6	4.8	5.8
73	RALEIG NC	0.8	1.0	1.4	1.6	1.4	1.7	1.5	1.7
74	JOHNST PA	0.5	1.0	1.0	1.6	1.1	1.6	1.2	1.7
75	PORTLN ME	0.2	0.0	0.8	0.5	0.8	0.6	0.9	0.6
76	SPOKAN WA	0.1	0.0	0.7	0.6	0.7	0.6	0.8	0.7
77	JACKSN MS	0.6	1.0	1.2	1.5	1.2	1.6	1.3	1.7
78	CHATTN TN	0.2	1.0	0.7	1.5	0.8	1.6	0.8	1.6
79	YGSTN OH	3.2	3.0	3.8	3.5	3.9	3.7	4.1	3.9
80	SBEND IN	3.1	3.0	3.7	3.6	3.8	3.8	4.0	3.9
81	ALBUQ NM	0.2	0.0	0.7	0.5	0.8	0.6	0.8	0.6
82	FTWAYN IN	3.2	3.0	3.8	3.6	4.0	3.8	4.2	4.0
83	PEORIA IL	3.2	3.0	3.9	3.7	4.1	3.9	4.3	4.1
84	GRNVLE NC	0.1	0.0	0.7	0.6	0.8	0.7	0.8	0.7
85	SIOUXF SD	-0.1	0.0	0.6	0.6	0.6	0.7	0.7	0.8
86	EVANSV IN	1.7	2.0	2.1	2.4	2.2	2.5	2.3	2.6
87	BATONR LA	0.7	1.0	1.0	1.3	1.1	1.4	1.1	1.5
88	BEAUMT TX	-0.0	0.0	0.4	0.4	0.5	0.5	0.5	0.5
89	DULUTH MN	0.1	0.0	0.5	0.4	0.5	0.5	0.6	0.5
90	WHLING WV	0.3	0.0	0.7	0.5	0.8	0.5	0.8	0.6
91	LINCLN NE	0.1	0.0	0.7	0.6	0.7	0.6	0.8	0.7
92	LANSNG MI	0.6	0.0	1.0	0.4	1.0	0.5	1.1	0.6
93	MADISN WI	1.6	2.0	1.9	2.3	2.0	2.4	2.1	2.5
94	COLUMB GA	0.4	1.0	0.8	1.4	0.9	1.4	1.0	1.5
95	AMARIL TX	0.1	0.0	0.5	0.4	0.6	0.5	0.6	0.5
96	HUNTSV AL	3.0	3.0	3.5	3.6	3.7	3.8	3.9	4.0
97	ROCKFD IL	1.6	2.0	1.9	2.3	2.0	2.4	2.1	2.5
98	FARGO ND	-0.1	0.0	0.6	0.6	0.6	0.7	0.7	0.7
99	MONROE LA	0.1	0.0	0.9	0.8	1.0	0.9	1.1	1.0
100	COLUMB SC	1.4	2.0	1.9	2.5	2.0	2.6	2.1	2.7

Column 1 for each year shows the number of stations actually calculated by our model. In general, it is a fractional number of stations, like 3.4 for New York, which as we mentioned in Section II is not rounded off at this stage. Column 2 shows the adjusted projections also as discussed in Section II. These are based on the assumption that factors we have not taken into account affect the outcome in each market, and that these factors will be fairly stable over time. So if our model overstates the number of UHF stations in New York in 1974 by 1.4 stations, it will tend to overstate by the same amount in future years. To get column 2 from column 1, we subtract or add the "constant adjustment factor" for 1974.*

RESULTS USING FOUR-YEAR EQUATION

A second version of the model was estimated in an attempt to uncover trends in the UHF handicap to use in making projections in Section VII. Since it was estimated using data for the years 1971 through 1974, rather than only 1974, we shall refer to this as our "four-year equation." This equation is also used to make upper-bound projections of the impact of cable television on UHF in Section IV. Table 3 shows projections made using the base-case assumptions and the four-year equation. Columns 1 and 2 have the same meaning as in Table 2. One would hope that the projections would not differ very much between the two different equations. To make this easy to check, column 3 shows the difference between the two. We see that the difference is generally very small (in 1990, for example, 0.1 stations in New York and -0.3 stations in Los Angeles). The only large differences are a few markets such as Wilkes-Barre and Fresno, with relatively many UHF stations.

RESULTS USING CONSTRAINED EQUATION

Some of the projections below are based on yet a third equation. We refer to it as our "constrained equation," because it was estimated subject to certain constraints that make it possible to project the effect of the complete disappearance of the UHF handicap (Section VII). We also use this equation to project the effects of VHF drop-ins in Section V. Table 4 shows projections using the constrained equation together with base

*Because the results are rounded to the nearest 0.1 of a station, there are some apparent small discrepancies in the tables. For example, in New York the 1.4 constant adjustment factor shows up as 1.3 for 1985.

Table 3

BASE CASE PROJECTIONS USING FOUR-YEAR EQUATION

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1 NY	NY	3.2	2.0	-0.2	5.7	4.4	0.3	5.9	4.6	0.2	6.1	4.8	0.1
2 LA	CA	4.5	6.0	-0.3	6.4	7.9	-0.1	6.7	8.2	-0.2	7.0	8.5	-0.3
3 CHCAGO	IL	1.7	3.0	0.0	2.2	3.5	0.0	2.2	3.5	0.0	2.3	3.6	-0.0
4 PHIL	PA	1.7	3.0	-0.0	2.1	3.4	-0.1	2.1	3.4	-0.1	2.2	3.5	-0.2
5 DTROIT	MI	1.2	2.0	0.1	1.6	2.4	0.1	1.7	2.4	0.1	1.7	2.5	0.1
6 BOSTON	MA	1.3	2.0	-0.1	1.9	2.6	-0.0	2.0	2.6	-0.1	2.0	2.7	-0.1
7 SF	CA	1.0	3.0	-0.0	1.6	3.6	0.1	1.7	3.7	0.0	1.7	3.8	0.0
8 CLVLND	OH	1.3	2.0	0.1	1.7	2.4	0.0	1.8	2.4	-0.0	1.8	2.4	-0.1
9 WASH	DC	1.0	1.0	0.1	1.5	1.4	0.1	1.6	1.5	0.1	1.7	1.6	0.1
10 PITT	PA	0.7	0.0	-0.1	1.5	0.8	0.0	1.5	0.8	-0.0	1.5	0.8	-0.1
11 STLOUS	MO	0.7	1.0	0.0	1.3	1.6	0.1	1.3	1.6	0.1	1.3	1.6	0.0
12 DALLAS	TX	0.8	1.0	0.1	1.4	1.5	0.1	1.4	1.6	0.1	1.5	1.6	0.1
13 MINN	MN	0.3	0.0	-0.1	1.2	0.9	0.1	1.3	1.0	0.1	1.3	1.0	0.0
14 BALT	MD	0.9	1.0	0.1	1.4	1.5	0.1	1.4	1.5	0.1	1.4	1.5	0.1
15 HOUSTN	TX	1.2	2.0	0.1	1.6	2.4	0.1	1.6	2.4	0.0	1.7	2.5	0.0
16 INDPLS	IN	0.5	1.0	0.0	1.1	1.6	0.1	1.1	1.6	0.1	1.2	1.7	0.1
17 CINCI	OH	0.9	1.0	0.1	1.3	1.4	0.1	1.4	1.5	0.1	1.4	1.5	0.0
18 ATLANT	GA	1.0	2.0	-0.0	1.5	2.5	0.1	1.6	2.6	0.0	1.6	2.7	0.C
19 HARTFD	CN	1.5	2.0	0.0	1.9	2.5	0.0	1.9	2.5	-0.0	2.0	2.5	-0.1
20 SEATLE	WA	0.2	0.0	-0.0	0.9	0.7	0.1	1.0	0.7	0.0	1.0	0.8	-0.0
21 MIAMI	FL	0.7	1.0	0.0	1.3	1.6	0.2	1.4	1.7	0.2	1.5	1.8	0.2
22 KANCTY	MO	0.8	1.0	0.1	1.3	1.5	0.1	1.3	1.5	0.1	1.4	1.6	0.1
23 MILWAU	WI	1.0	1.0	0.1	1.3	1.3	0.1	1.4	1.3	0.1	1.4	1.4	0.0
25 SACRA	CA	0.8	1.0	0.0	1.2	1.5	0.1	1.3	1.5	0.0	1.3	1.6	0.0
26 MEMPH	TN	0.3	0.0	-0.1	1.2	0.9	0.1	1.2	0.9	0.1	1.3	1.0	0.1
27 COLUMB	OH	0.7	0.0	0.1	1.2	0.5	0.2	1.2	0.5	0.2	1.3	0.6	0.1
28 TAMPA	FL	1.0	1.0	0.0	1.5	1.5	0.1	1.6	1.6	0.1	1.7	1.6	0.0
29 PORTLN	OR	0.3	0.0	0.0	1.0	0.6	0.1	1.0	0.7	0.1	1.0	0.7	0.1
30 NASHVL	TN	0.3	0.0	-0.1	1.3	1.0	0.1	1.3	1.0	0.1	1.4	1.1	0.1
31 NEWORL	LA	0.8	1.0	0.1	1.2	1.4	0.1	1.2	1.4	0.1	1.2	1.4	0.1
32 DENVER	CO	0.3	0.0	-0.0	1.0	0.7	0.2	1.1	0.7	0.1	1.1	0.8	0.1
33 PROVID	RI	0.8	0.0	0.1	1.3	0.5	0.2	1.3	0.5	0.2	1.3	0.6	0.1
34 ALBANY	NY	0.5	0.0	0.0	1.1	0.6	0.1	1.1	0.6	0.1	1.2	0.6	0.0
35 SYRACU	NY	0.5	0.0	0.1	0.9	0.4	0.1	0.9	0.4	0.1	1.0	0.5	0.C
36 CHARLS	WV	0.4	0.0	-0.0	1.0	0.6	0.1	1.0	0.6	0.0	1.0	0.7	-0.0
37 GRNDRP	MI	0.5	0.0	-0.0	1.1	0.7	0.1	1.2	0.7	0.1	1.2	0.7	0.0
38 LOUSVL	KY	1.3	2.0	0.1	1.8	2.5	0.1	1.8	2.5	0.0	1.9	2.6	-0.0
39 OKCITY	OK	0.4	0.0	-0.0	1.2	0.8	0.2	1.2	0.8	0.1	1.2	0.8	0.1
40 BIRM	AL	1.1	1.0	0.0	1.6	1.5	0.1	1.7	1.6	0.1	1.7	1.6	-0.0
41 DAYTON	OH	1.2	1.0	0.0	1.7	1.5	0.1	1.7	1.5	0.0	1.7	1.5	-0.0
42 CHARLT	NC	1.2	2.0	0.0	1.8	2.6	0.1	1.8	2.6	0.0	1.9	2.7	-0.0
43 PHOENX	AZ	0.5	1.0	0.0	1.0	1.5	0.1	1.0	1.6	0.1	1.1	1.6	0.1
44 NORFLK	VA	0.7	1.0	0.1	1.1	1.4	0.1	1.1	1.5	0.1	1.2	1.5	0.1
45 SANANT	TX	0.5	1.0	0.0	1.1	1.5	0.1	1.1	1.6	0.1	1.1	1.6	0.0
46 GRNVLE	SC	0.3	1.0	-0.0	1.2	1.9	0.2	1.2	1.9	0.2	1.2	1.9	0.1
47 GRNBRO	NC	0.3	0.0	0.0	1.1	0.8	0.2	1.1	0.8	0.2	1.2	[illegible]	0.2
48 SALTLK	UT	0.3	0.0	-0.0	1.1	0.8	0.1	1.1	0.8	0.1	1.1	0.9	0.1
49 WLKSBR	PA	3.3	3.0	-0.9	3.7	[illegible]	-1.1	3.8	3.5	-1.3	3.9	3.6	-1.5
50 LITLRK	AR	0.2	0.0	0.0	1.1	0.8	0.2	1.1	0.8	0.2	1.1	0.9	0.1

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from Table 2 projection.

Table 3 (contd.)

MARKET	1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH	1.1	1.0	0.0	1.5	1.4	-0.0	1.6	1.4	-0.0	1.6	1.5	-0.1
53 OMAHA NE	0.3	0.0	0.1	0.9	0.7	0.2	1.0	0.7	0.2	1.0	0.7	0.1
54 TULSA OK	0.3	0.0	0.0	1.0	0.8	0.2	1.1	0.8	0.1	1.1	0.8	0.1
55 ORLAN FL	0.5	0.0	-0.0	1.1	0.6	0.1	1.2	0.6	0.0	1.2	0.7	0.0
56 ROCHES NY	0.6	0.0	0.1	1.0	0.5	0.2	1.1	0.5	0.2	1.1	0.6	0.1
57 HARISB PA	2.0	2.0	-0.3	2.4	2.4	-0.4	2.4	2.4	-0.5	2.5	2.5	-0.5
58 SHRVPT LA	0.2	0.0	-0.0	1.0	0.8	0.2	1.0	0.8	0.1	1.1	0.9	0.1
59 MOBILE AL	0.1	0.0	-0.0	0.9	0.8	0.1	1.0	0.8	0.1	1.0	0.9	0.1
60 DAVENP IA	0.4	0.0	0.1	0.9	0.5	0.1	1.0	0.5	0.1	1.0	0.5	0.1
61 FLINT MI	1.2	1.0	0.0	1.6	1.4	0.0	1.6	1.4	-0.0	1.6	1.4	-0.1
62 GRNBAY WI	0.3	0.0	0.0	0.9	0.5	0.2	1.0	0.6	0.1	1.0	0.6	0.1
63 RICHMN VA	0.4	0.0	-0.0	1.1	0.7	0.1	1.1	0.7	0.1	1.1	0.8	0.1
64 SPRNGF IL	2.0	2.0	-0.1	2.3	2.3	-0.2	2.4	2.3	-0.3	2.4	2.4	-0.4
65 CDRRAP IA	0.3	0.0	0.0	0.9	0.6	0.1	1.0	0.7	0.1	1.0	0.7	0.1
66 DMOINE IA	0.3	0.0	0.0	1.0	0.8	0.2	1.0	0.8	0.1	1.1	0.8	0.1
67 WICHTA KS	0.2	0.0	-0.1	1.0	0.8	0.0	1.0	0.8	0.0	1.0	0.8	-0.0
68 JKSNVL FL	1.1	1.0	-0.0	1.6	1.5	0.0	1.6	1.5	-0.0	1.6	1.5	-0.1
69 PADUCA KY	0.1	1.0	-0.0	0.9	1.9	0.2	0.9	1.8	0.1	1.0	1.9	0.1
70 ROANOK VA	0.2	0.0	0.0	0.9	0.7	0.2	1.0	0.8	0.2	1.0	0.8	0.2
71 KNOXVL TN	0.8	1.0	-0.0	1.6	1.8	0.1	1.6	1.8	0.1	1.6	1.8	0.0
72 FRESNO CA	3.4	5.0	-0.7	3.5	5.1	-0.9	3.6	5.2	-1.1	3.6	5.2	-1.2
73 RALEIG NC	0.8	1.0	0.0	1.5	1.7	0.1	1.5	1.7	0.1	1.6	1.3	0.1
74 JOHNST PA	0.4	1.0	-0.1	1.1	1.7	0.0	1.1	1.7	0.0	1.1	1.7	-0.0
75 PORTLN ME	0.2	0.0	0.0	0.8	0.6	0.1	0.9	0.6	0.1	0.9	0.6	0.0
76 SPOKAN WA	0.1	0.0	-0.0	0.8	0.7	0.1	0.8	0.7	0.1	0.8	0.7	0.0
77 JACKSN MS	0.7	1.0	0.1	1.3	1.7	0.2	1.4	1.7	0.1	1.4	1.8	0.1
78 CHATTN TN	0.3	1.0	0.0	0.9	1.7	0.2	1.0	1.7	0.2	1.0	1.7	0.2
79 YGSTN OH	2.9	3.0	-0.3	3.3	3.4	-0.5	3.4	3.5	-0.6	3.4	3.5	-0.7
80 SBEND IN	2.7	3.0	-0.3	3.2	3.5	-0.5	3.3	3.5	-0.6	3.3	3.6	-0.7
81 ALBUQ NM	0.2	0.0	0.0	0.8	0.6	0.1	0.9	0.7	0.1	0.9	0.7	0.1
82 FTWAYN IN	2.8	3.0	-0.3	3.3	3.4	-0.5	3.4	3.5	-0.6	3.5	3.6	-0.7
83 PEORIA IL	2.7	3.0	-0.5	3.3	3.6	-0.6	3.4	3.6	-0.7	3.5	3.7	-0.9
84 GRNVLE NC	0.1	0.0	-0.0	0.9	0.8	0.2	0.9	0.9	0.1	1.0	0.9	0.1
85 SIOUXF SD	-0.1	0.0	-0.0	0.7	0.8	0.2	0.8	0.9	0.1	0.8	0.9	0.1
86 EVANSV IN	1.7	2.0	0.1	2.1	2.4	0.0	2.1	2.4	-0.0	2.2	2.4	-0.1
87 BATONR LA	0.3	1.0	0.2	1.2	1.4	0.2	1.2	1.4	0.2	1.3	1.4	0.1
88 BEAUMT TX	0.0	0.0	0.1	0.6	0.6	0.2	0.6	0.6	0.2	0.7	0.6	0.1
89 DULUTH MN	[illegible]	0.0	0.1	0.7	0.5	0.2	0.7	0.5	0.1	0.7	0.6	0.1
90 WHLING WV	0.3	0.0	0.1	0.9	0.6	0.2	0.9	0.6	0.1	0.9	0.6	0.1
91 LINCLN NE	0.1	0.0	0.0	0.8	0.7	0.1	0.8	0.7	0.1	0.8	0.7	0.1
92 LANSNG MI	0.7	0.0	0.1	1.2	0.5	0.2	1.2	0.5	0.1	1.2	0.6	0.1
93 MADISN WI	1.7	2.0	0.1	1.9	2.2	0.0	2.0	2.3	-0.0	2.1	2.3	-0.1
94 COLUMB GA	0.6	1.0	0.1	1.0	1.4	0.2	1.0	1.5	0.2	1.1	1.5	0.1
95 AMARIL TX	0.1	0.0	-0.0	0.6	0.5	0.0	0.6	0.5	-0.0	0.6	0.5	-0.1
96 HUNTSV AL	2.5	3.0	-0.5	2.9	3.4	-0.6	3.0	3.5	-0.7	3.1	3.6	-0.8
97 ROCKFD IL	1.7	2.0	0.1	1.9	2.2	0.0	1.9	2.2	-0.0	2.0	2.3	-0.1
98 FARGO ND	-0.1	0.0	-0.0	0.7	0.8	0.1	0.7	0.8	0.1	0.7	0.8	0.1
99 MONROE LA	0.1	0.0	-0.1	1.1	1.1	0.2	1.1	1.1	0.1	1.2	1.1	0.1
100 COLUMB SC	1.4	2.0	0.0	1.9	2.5	0.0	2.0	2.6	-0.0	2.1	2.6	-0.1

Table 4

BASE CASE PROJECTIONS USING
CONSTRAINED EQUATION

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	2.4	2.0	-1.0	10.5	10.1	5.1	11.0	10.6	5.3	11.5	11.1	5.5
2	LA	CA	2.3	6.0	-2.5	4.5	8.2	-2.0	4.8	8.5	-2.1	5.2	8.9	-2.2
3	CHCAGO	IL	3.7	3.0	2.0	5.2	4.6	3.1	5.4	4.8	3.2	5.6	5.0	3.3
4	PHIL	PA	3.6	3.0	1.9	4.9	4.2	2.7	5.0	4.5	2.7	5.1	4.4	2.7
5	DTROIT	MI	1.9	2.0	0.8	2.8	2.9	1.3	2.9	3.0	1.3	3.0	3.1	1.4
6	BOSTCN	MA	2.1	2.0	0.8	3.8	3.6	1.8	3.9	3.7	1.8	4.0	3.9	1.9
7	SF	CA	1.3	3.0	0.3	3.0	4.6	1.4	3.1	4.8	1.5	3.3	5.0	1.6
8	CLVLND	CH	2.2	2.0	0.9	3.0	2.8	1.3	3.0	2.8	1.2	3.0	2.8	1.1
9	WASH	CC	1.4	1.0	0.5	2.4	2.0	1.1	2.8	2.3	1.3	3.2	2.7	1.6
10	PITT	PA	0.8	0.0	0.0	2.4	1.6	1.0	2.4	1.6	0.8	2.4	1.5	0.7
11	STLOUS	MO	0.7	1.0	0.1	1.5	1.8	0.4	1.5	1.8	0.3	1.5	1.8	0.2
12	DALLAS	TX	1.0	1.0	0.2	1.8	1.8	0.6	2.0	2.0	0.6	2.1	2.2	0.7
13	MINN	MN	0.1	0.0	-0.3	1.4	1.3	0.3	1.5	1.4	0.3	1.6	1.5	0.3
14	BALT	MD	1.2	1.0	0.3	1.9	1.8	0.7	1.9	1.8	0.6	2.0	1.8	0.6
15	HCUSTN	TX	1.6	2.0	0.4	2.3	2.7	0.8	2.4	2.8	0.8	2.6	3.0	0.9
16	INDPLS	IN	0.5	1.0	-0.0	1.2	1.7	0.2	1.3	1.8	0.2	1.4	1.9	0.2
17	CINCI	CH	1.1	1.0	0.3	1.7	1.7	0.5	1.8	1.7	0.5	1.8	1.7	0.4
18	ATLANT	GA	1.1	2.0	0.2	2.2	3.0	0.7	2.3	3.2	0.8	2.5	3.3	0.9
19	HARTFD	CN	1.8	2.0	0.4	2.6	2.7	0.7	2.6	2.8	0.6	2.6	2.8	0.6
20	SEATLE	WA	0.1	0.0	-0.2	0.3	0.3	-0.5	0.4	0.3	-0.5	0.5	0.4	-0.6
21	MIAMI	FL	0.7	1.0	-0.0	1.7	2.1	0.6	2.0	2.3	0.8	2.5	2.7	1.0
22	KANCTY	MO	0.9	1.0	0.2	1.7	1.8	0.6	1.8	1.8	0.5	1.8	1.8	0.5
23	MILWAU	WI	1.2	1.0	0.3	1.7	1.4	0.4	1.6	1.4	0.3	1.6	1.4	0.3
25	SACRA	CA	0.9	1.0	0.1	1.6	1.7	0.4	1.6	1.8	0.4	1.7	1.8	0.4
26	MEMPH	TN	0.1	0.0	-0.2	1.5	1.4	0.4	1.5	1.4	0.3	1.5	1.4	0.3
27	CCLUMB	CH	0.8	0.0	0.2	1.6	0.8	0.6	1.6	0.8	0.6	1.7	0.9	0.6
28	TAMPA	FL	1.2	1.0	0.2	2.3	2.1	0.9	2.5	2.2	0.9	2.7	2.4	1.0
29	PORTLN	CR	0.2	0.0	-0.1	0.9	0.7	0.1	1.0	0.7	0.1	1.0	0.8	0.0
30	NASHVL	TN	0.1	0.0	-0.3	1.6	1.5	0.5	1.7	1.6	0.5	1.7	1.6	0.4
31	NEWORL	LA	0.9	1.0	0.2	1.4	1.4	0.3	1.4	1.5	0.3	1.4	1.5	0.2
32	DENVER	CO	0.2	0.0	-0.1	1.0	0.8	0.1	1.1	0.8	0.1	1.1	0.9	0.1
33	PRCVID	RI	0.9	0.0	0.3	1.7	0.8	0.6	1.7	0.8	0.6	1.8	0.8	0.5
34	ALBANY	NY	0.5	0.0	0.0	1.3	0.8	0.3	1.3	0.8	0.2	1.3	0.8	0.1
35	SYRACU	NY	0.6	0.0	0.2	1.1	0.5	0.3	1.1	0.5	0.2	1.1	0.5	0.1
36	CHARLS	WV	0.4	0.0	-0.0	1.2	0.9	0.3	1.2	0.8	0.2	1.1	0.8	0.1
37	GRNDRP	MI	0.4	0.0	-0.0	1.3	0.8	0.2	1.3	0.8	0.2	1.3	0.8	0.1
38	LOUSVL	KY	1.5	2.0	0.3	2.2	2.7	0.5	2.3	2.7	0.5	2.3	2.8	0.4
39	OKCITY	CK	0.3	0.0	-0.1	1.4	1.1	0.4	1.4	1.1	0.4	1.5	1.2	0.3
40	BIRM	AL	1.2	1.0	0.2	2.1	1.8	0.5	2.1	1.8	0.5	2.1	1.8	0.3
41	DAYTCN	CH	1.4	1.0	0.3	2.1	1.7	0.5	2.1	1.7	0.4	2.1	1.7	0.4
42	CHARLT	NC	1.3	2.0	0.1	2.3	3.0	0.6	2.3	3.0	0.5	2.4	3.0	0.5
43	PHOENX	AZ	0.3	1.0	-0.1	0.8	1.5	-0.0	1.0	1.6	0.1	1.1	1.8	0.1
44	NORFLK	VA	0.7	1.0	0.1	1.2	1.5	0.2	1.2	1.5	0.2	1.2	1.5	0.1
45	SANANT	TX	0.5	1.0	0.0	1.2	1.6	0.2	1.2	1.6	0.1	1.2	1.6	0.1
46	GRNVLE	SC	0.2	1.0	-0.1	1.4	2.3	0.5	1.5	2.3	0.5	1.5	2.4	0.4
47	GRNBRO	NC	0.2	0.0	-0.0	1.3	1.1	0.5	1.4	1.1	0.5	1.4	1.2	0.5
48	SALTLK	UT	0.2	0.0	-0.1	1.2	1.0	0.3	1.2	1.0	0.2	1.3	1.1	0.2
49	WLKSBR	PA	3.0	3.0	-1.2	3.4	3.4	-1.4	3.4	3.4	-1.7	3.4	3.4	-2.0
50	LITLRK	AR	0.2	0.0	-0.1	1.2	1.1	0.4	1.2	1.1	0.3	1.3	1.1	0.3

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from Table 2 projection.

Table 4 (contd.)

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH	1.3	1.0	0.2	1.9	1.6	0.4	[illegible]	1.6	0.3	1.9	1.6	0.3
53	OMAHA	NE	0.3	0.0	0.1	1.1	0.8	0.3	1.1	0.8	0.3	1.1	0.8	0.2
54	TULSA	OK	0.2	0.0	-0.1	1.2	1.0	0.3	1.2	1.0	0.3	1.2	1.0	0.2
55	ORLAN	FL	0.5	0.0	-0.1	1.3	0.8	0.3	1.4	0.9	0.2	1.5	1.0	0.2
56	ROCHES	NY	0.6	0.0	0.2	1.2	0.5	0.3	1.2	0.6	0.3	1.3	0.6	0.3
57	HARISB	PA	2.2	2.0	-0.1	2.6	2.5	-0.1	2.6	2.5	-0.2	2.6	2.5	-0.4
58	SHRVPT	LA	0.1	0.0	-0.1	1.1	1.0	0.2	1.1	1.0	0.2	1.1	1.0	0.1
59	MOBILE	AL	0.4	0.0	-0.1	1.0	1.0	0.2	1.1	1.0	0.2	1.1	1.0	0.1
60	DAVENP	IA	[illegible]	0.0	0.1	1.0	0.5	0.2	1.0	0.5	0.1	1.0	0.5	0.1
61	FLINT	MI	[illegible]	1.0	0.3	1.9	1.5	0.4	1.9	1.5	0.3	1.9	1.5	0.2
62	GRNBAY	WI	[illegible]	0.0	0.1	1.0	0.7	0.2	1.0	0.7	0.2	1.0	0.7	0.1
63	RICHMN	VA	0.3	0.0	-0.1	1.2	0.9	0.3	1.2	0.9	0.2	1.3	0.9	0.2
64	SPRNGF	IL	2.2	2.0	0.0	2.5	2.3	-0.0	2.5	2.3	-0.1	2.5	2.3	-0.3
65	CDRRAP	IA	0.3	0.0	0.0	1.0	0.7	0.2	1.0	0.7	0.1	1.0	0.7	0.1
66	DMOINE	IA	0.2	0.0	-0.1	1.1	0.9	0.2	1.1	0.9	0.2	1.1	0.9	0.1
67	WICHTA	KS	0.1	0.0	-0.2	1.0	0.9	0.1	1.0	0.9	-0.0	0.9	0.8	-0.1
68	JKSNVL	FL	1.2	1.0	0.1	1.8	1.6	0.3	1.8	1.7	0.2	1.9	1.7	0.2
69	PADUCA	KY	0.1	1.0	-0.1	1.0	2.0	0.3	1.0	2.0	0.2	1.0	2.0	0.2
70	ROANOK	VA	0.2	0.0	0.0	1.1	0.9	0.4	1.1	0.9	0.3	1.2	0.9	0.3
71	KNOXVL	TN	0.7	1.0	-0.1	1.9	2.2	0.5	1.9	2.2	0.4	1.9	2.2	0.3
72	FRESNO	CA	3.1	5.0	-0.9	3.1	5.0	-1.4	3.0	4.9	-1.6	4.9	4.8	-1.9
73	RALEIG	NC	0.8	1.0	0.0	1.9	2.1	0.6	1.9	2.1	0.5	1.9	2.1	0.4
74	JOHNST	PA	0.5	1.0	-0.0	1.7	2.3	0.7	1.7	2.3	0.6	1.7	2.3	0.5
75	PORTLN	ME	0.2	0.0	0.0	0.9	0.7	0.1	0.9	0.6	0.1	0.9	0.6	-0.0
76	SPOKAN	WA	0.1	0.0	-0.0	0.9	0.8	0.2	0.9	0.8	0.2	0.9	0.8	0.1
77	JACKSN	MS	0.7	1.0	0.1	1.7	2.1	0.6	1.7	2.1	0.5	1.7	2.1	0.4
78	CHATTN	TN	0.3	1.0	0.1	1.0	1.8	0.5	1.1	1.8	0.3	1.1	1.8	0.3
79	YGSTN	OH	2.9	3.0	-0.3	3.3	3.4	-0.5	3.3	3.4	-0.6	3.2	3.3	-0.9
80	SBEND	IN	2.7	3.0	-0.3	3.2	3.5	-0.4	3.2	3.5	-0.6	3.2	3.4	-0.8
81	ALBUQ	NM	0.2	0.0	0.0	0.9	0.7	0.2	0.9	0.7	0.1	0.9	0.7	0.1
82	FTWAYN	IN	2.8	3.0	-0.4	3.3	3.4	-0.5	3.2	3.4	-0.7	3.2	3.4	-0.9
83	PEORIA	IL	2.5	3.0	-0.7	3.2	3.7	-0.8	3.1	3.6	-1.0	3.1	3.6	[illegible]
84	GRNVLE	NC	0.0	0.0	-0.1	1.0	0.9	0.2	1.0	1.0	0.2	1.0	1.0	0.2
85	SIOUXF	SD	-0.1	0.0	-0.1	0.8	0.9	0.2	0.8	0.9	0.2	0.8	0.9	0.1
86	EVANSV	IN	2.0	2.0	0.4	2.5	2.4	0.4	2.5	2.4	0.3	2.4	2.4	0.2
87	BATONR	LA	1.1	1.0	0.5	1.6	1.5	0.6	1.6	1.5	0.5	1.6	1.5	0.4
88	BEAUMT	TX	0.2	0.0	0.2	0.7	0.6	0.3	0.8	0.6	0.3	0.8	0.6	0.2
89	DULUTH	MN	0.2	0.0	0.2	0.7	0.5	0.3	0.7	0.5	0.2	0.7	0.5	0.1
90	WHLING	WV	0.5	0.0	0.3	1.5	1.0	0.8	1.5	1.0	0.7	1.5	1.0	0.7
91	LINCLN	NE	0.1	0.0	0.0	0.9	0.8	0.2	0.9	0.8	0.2	0.9	0.8	0.1
92	LANSNG	MI	0.9	0.0	0.3	1.6	0.8	0.7	1.7	0.8	0.6	1.7	0.8	0.5
93	MADISN	WI	2.2	2.0	0.6	2.4	2.2	0.5	2.4	2.2	0.4	2.4	2.2	0.3
94	COLUMB	GA	0.8	1.0	0.4	1.5	1.7	0.7	1.5	1.7	0.6	1.5	1.7	0.5
95	AMARIL	TX	0.1	0.0	0.0	0.6	0.5	0.1	0.6	0.5	0.0	0.6	0.4	-0.1
96	HUNTSV	AL	2.6	3.0	-0.4	3.0	3.4	-0.5	3.0	3.4	-0.7	3.0	3.4	-0.9
97	ROCKFD	IL	2.2	2.0	0.6	2.3	2.1	0.5	2.3	2.1	0.3	2.3	2.1	0.2
98	FARGO	ND	-0.1	0.0	-0.1	0.8	0.9	0.2	0.7	0.9	0.1	0.7	0.8	0.0
99	MONROE	LA	-0.3	0.0	-0.4	1.5	1.9	0.6	1.5	1.8	0.5	1.5	1.8	0.4
100	COLUMB	SC	1.6	2.0	0.2	2.4	2.8	0.5	2.4	2.7	0.4	2.4	2.7	0.2

case assumptions. Column 3 again shows the difference between these projections and those based on our basic quadratic equation. The differences in this case are larger, with the constrained equation projecting more UHF stations than does the preferred equation in most markets. The differences are largest in the top 10 markets; in smaller markets, the difference is generally only a fraction of a station.

SUMMARY OF BASE CASE PROJECTIONS

Table 5 summarizes the base-case projections. The basic quadratic equation, the four-year equation, and the constrained equation all project the number of stations in what we call our "narrow count." This excludes certain stations that provide less than a full alternative signal in their markets--mostly satellite stations in the same market as their parents, duplicate network affiliates, and outlying stations that do not serve the main metropolitan area of the market. We take account of these excluded stations in two ways in the summary table. The first line shows the narrow count projections; these are simply the sums of column 2 in the market-by-market tables. The second line adds the excluded stations, on the assumption that their number will not increase in the future. The fourth line adds the growth in excluded stations, on the assumption that they will increase in proportion to the included stations. Although both are extreme assumptions, we shall use the former. If the reader prefers another assumption, he can easily produce projections based on that assumption using our computer model.

Several notable features emerge from Table 5. First, in 1990 there is a difference of only two stations between using the single base year 1974 (167 stations) and the four-year base period 1971-1974 (165 stations). The constrained equation yields a somewhat higher projection (192 stations). We will continue to use the 1974 base period and the basic quadratic equation throughout the following analysis except where exceptions are explicitly noted.

Table 5

SUMMARY OF BASE CASE PROJECTIONS
COMMERCIAL UHF STATIONS, TOP 100 MARKETS

Projection	1974	1980	1985	1990
Narrow count, Table 2	97	149	158	167
Excluded stations, flat	27	27	27	27
Total	124	176	185	194
Excluded stations, proportional	0	14	17	19
Total	124	190	202	213
Narrow Count, Table 3	97	156	161	165
Excluded stations, flat	27	27	27	27
Total	124	183	188	192
Excluded stations, proportional	0	16	18	19
Total	124	199	206	211
Narrow count, Table 4	97	185	189	192
Excluded stations, flat	27	27	27	27
Total	124	212	216	219
Excluded stations, proportional	0	24	26	26
Total	124	236	242	245

Second, the projected growth of UHF stations is fairly substantial even in the case where we assume that the number of "excluded" stations remains flat at 27. For the 1974 base year analysis the total rises from 124 in 1974 to 194 stations in 1990--a percentage increase of about 55 percent. Again this increase must be considered in terms of the relatively neutral assumptions that have gone into our base case projection. We assume that the UHF tuning and reception handicap does not change, although almost surely between now and 1990 the handicap will fall or even disappear, further stimulating the growth of UHF stations, as treated in Section VII. On the other hand, we assume that developments such as pay television and videodiscs make no inroads on the audience for conventional commercial programs, which is likely not to be the case, so on this count the growth rate shown in Table 5 is likely to be an overestimate. The projected growth in UHF stations is largely a consequence of 100 percent UHF set penetration assumed by 1980. It is because of these conflicting pressures that we interpret the base case being more or less neutral, as a convenient point of comparison in examining the range of assumptions in the subsequent sections.

IV. EFFECTS OF CABLE TELEVISION

We mentioned in Section II that cable television apparently has very little effect on the number of UHF stations, one way or the other. In all variants of the model that we estimated, its effect was insignificant in a statistical sense; in most, it was negative, though small; in one or two variants it was very small and positive. Beyond suggesting that cable will not reduce UHF growth to any great extent, this does not give us much to go on in estimating the effect of continued cable growth.

We shall handle the uncertainty by making two sets of projections of the effects of cable. In the first (Table 6), we use our basic quadratic equation and moderately high values for cable penetration. This results in a very small reduction in the projected number of viable UHF stations relative to our base case. In the second (Table 7), we pick from among all of the variants of our model estimated in Appendix A, the one in which the negative effect of cable on UHF is estimated to be the largest; it is the four-year equation that we used for the projections in Table 3. In conjunction with this equation, we use very high values for cable penetration. Both the choice of equation and the high penetration values exaggerate the effect of cable. Thus we can be reasonably sure that the actual effect of cable will be less severe than shown in our second set of projections. That is, we expect that the reduction in the number of viable UHF stations due to continued cable growth will actually be less than that shown in Table 7.

The moderately high cable penetration used for our first set of projections is at the upper end of the range suggested by the most widely accepted study of the matter. Park (1971)* summarizes his findings as follows: "Generally, expected penetration at the center of the market ranges from about 20 to 35 percent; at the edges of the 35-mile zone, it ranges from about 30 to 60 percent." These estimates are for cable systems

*Rolla Edward Park, *Prospects for Cable in the 100 Largest Television Markets*, R-875-MF, October 1971. Also appears in *Bell Journal of Economics and Management Science*, Spring 1972.

Table 6

ESTIMATED EFFECTS OF CABLE

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	3.3	1.9	-0.1	5.2	3.8	-0.2	5.5	4.1	-0.2	5.8	4.4	-0.2
2	LA	CA	4.6	5.8	-0.2	6.3	7.5	-0.2	6.7	7.9	-0.2	7.1	8.4	-0.2
3	CHCAGO	IL	1.6	2.9	-0.1	2.0	3.4	-0.1	2.1	3.5	-0.1	2.2	3.6	-0.1
4	PHIL	PA	1.7	2.9	-0.1	2.1	3.3	-0.1	2.2	3.4	-0.1	2.3	3.5	-0.1
5	DTROIT	MI	1.1	1.9	-0.1	1.4	2.3	-0.1	1.5	2.4	-0.1	1.6	2.5	-0.1
6	BOSTON	MA	1.3	1.9	-0.1	1.9	2.5	-0.1	2.0	2.6	-0.1	2.1	2.7	-0.1
7	SF	CA	0.9	2.9	-0.1	1.5	3.5	-0.1	1.5	3.6	-0.1	1.6	3.6	-0.1
8	CLVLND	OH	1.2	1.9	-0.1	1.6	2.3	-0.1	1.7	2.4	-0.1	1.8	2.5	-0.1
9	WASH	DC	0.9	0.9	-0.1	1.3	1.3	-0.1	1.4	1.4	-0.1	1.5	1.5	-0.1
10	PITT	PA	0.7	-0.1	-0.1	1.4	0.6	-0.1	1.5	0.7	-0.1	1.5	0.7	-0.1
11	STLOUS	MO	0.6	1.0	-0.0	1.1	1.4	-0.1	1.2	1.5	-0.1	1.2	1.6	-0.1
12	DALLAS	TX	0.7	0.9	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1	1.4	1.6	-0.1
13	MINN	MN	0.3	-0.0	-0.0	1.1	0.7	-0.1	1.1	0.8	-0.1	1.2	0.8	-0.1
14	BALT	MD	0.8	0.9	-0.1	1.2	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
15	HOUSTN	TX	1.1	1.9	-0.1	1.4	2.3	-0.1	1.5	2.4	-0.1	1.6	2.4	-0.1
16	INDPLS	IN	0.5	1.0	-0.0	0.9	1.4	-0.1	1.0	1.5	-0.1	1.1	1.6	-0.1
17	CINCI	OH	0.8	0.9	-0.1	1.2	1.3	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
18	ATLANT	GA	0.9	1.9	-0.1	1.4	2.4	-0.1	1.5	2.5	-0.1	1.6	2.6	-0.1
19	HARTFD	CN	1.3	1.9	-0.1	1.8	2.4	-0.1	1.9	2.5	-0.1	2.0	2.6	-0.1
20	SEATLE	WA	0.2	-0.0	-0.0	0.8	0.5	-0.1	0.9	0.6	-0.1	1.0	0.7	-0.1
21	MIAMI	FL	0.6	1.0	-0.0	1.1	1.4	-0.1	1.1	[illegible]	-0.1	1.2	1.6	-0.1
22	KANCTY	MO	0.7	1.0	-0.0	1.1	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
23	MILWAU	WI	0.9	0.9	-0.1	1.2	1.3	-0.1	1.3	1.3	-0.1	1.3	1.4	-0.1
25	SACRA	CA	0.7	1.0	-0.0	1.1	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
26	MEMPH	TN	0.3	-0.0	-0.0	1.0	0.7	-0.1	1.1	0.7	-0.1	1.2	0.8	-0.1
27	COLUMB	OH	0.6	-0.0	-0.0	1.0	0.4	-0.1	1.0	0.4	-0.1	1.1	0.5	-0.1
28	TAMPA	FL	1.0	0.9	-0.1	1.4	1.4	-0.1	1.5	1.4	-0.1	1.6	1.5	-0.1
29	PORTLN	OR	0.3	-0.0	-0.0	0.8	0.5	-0.1	0.9	0.5	-0.1	0.9	0.6	-0.1
30	NASHVL	TN	0.3	-0.0	-0.0	1.1	0.7	-0.1	1.1	0.8	-0.1	1.2	0.9	-0.1
31	NEWORL	LA	0.6	1.0	-0.0	1.0	1.3	-0.1	1.1	1.4	-0.1	1.1	1.4	-0.1
32	DENVER	CO	0.3	-0.0	-0.0	0.8	0.5	-0.1	0.9	0.5	-0.1	1.0	0.6	-0.1
33	PROVID	RI	0.6	-0.0	-0.0	1.0	0.4	-0.1	1.1	0.4	-0.1	1.2	0.5	-0.1
34	ALBANY	NY	0.5	-0.0	-0.0	0.9	0.4	-0.1	1.0	0.5	-0.1	1.1	0.6	-0.1
35	SYRACU	NY	0.4	-0.0	-0.0	0.9	0.3	-0.1	0.8	0.4	-0.1	0.9	0.4	-0.1
36	CHARLS	WV	0.3	-0.0	-0.0	0.9	0.5	-0.1	0.9	0.5	-0.1	1.0	0.6	-0.1
37	GRNDRP	MI	0.4	-0.0	-0.0	1.0	0.5	-0.1	1.1	0.6	-0.1	1.1	0.6	-0.1
38	LOUSVL	KY	1.2	1.9	-0.1	1.6	2.4	-0.1	1.7	2.5	-0.1	1.8	2.5	-0.1
39	OKCITY	OK	0.4	-0.0	-0.0	0.9	[illegible]	-0.1	1.0	0.6	-0.1	1.1	0.7	-0.1
40	BIRM	AL	1.0	0.9	-0.1	1.5	1.4	-0.1	1.5	1.5	-0.1	1.6	1.6	-0.1
41	DAYTON	OH	1.1	0.9	-0.1	1.5	1.4	-0.1	1.6	1.5	-0.1	1.7	1.5	-0.1
42	CHARLT	NC	1.1	1.9	-0.1	1.6	[illegible]	-0.1	1.7	2.5	-0.1	1.8	2.6	-0.1
43	PHOENX	AZ	0.4	1.0	-0.0	0.8	[illegible]	-0.1	0.9	1.4	-0.1	0.9	1.5	-0.1
44	NORFLK	VA	0.5	1.0	-0.0	0.9	[illegible]	-0.1	1.0	1.4	-0.1	1.0	1.5	-0.1
45	SANANT	TX	0.5	1.0	-0.0	0.9	1.4	-0.1	1.0	1.5	-0.1	1.0	1.5	-0.1
46	GRNVLE	SC	0.3	1.0	-0.0	0.9	1.6	-0.1	1.0	1.7	-0.1	1.0	1.7	-0.1
47	GRNBRO	NC	0.2	-0.0	-0.0	0.8	0.5	[illegible]	0.9	0.6	-0.1	0.9	0.6	-0.1
48	SALTLK	UT	0.3	-0.0	-0.0	0.9	[illegible]	[illegible]	0.9	0.6	-0.1	1.0	0.7	-0.1
49	WLKSBR	PA	4.0	2.9	-0.1	4.7	[illegible]	[illegible]	5.0	3.8	-0.2	5.2	4.0	-0.2
50	LITLRK	AR	0.2	-0.0	-0.0	0.8	[illegible]	[illegible]	0.9	0.6	-0.1	0.9	0.7	-0.1

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 6 (contd.)

	MARKET		1974 PROJ (1) (2) (3)	1980 PROJ (1) (2) (3)	1985 PROJ (1) (2) (3)	1990 PROJ (1) (2) (3)
52	TOLEDO	OH	1.1 0.9-0.1	1.5 1.3-0.1	1.5 1.4-0.1	1.6 1.5-0.1
53	OMAHA	NE	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.5-0.1	0.8 0.6-0.1
54	TULSA	OK	0.2-0.0-0.0	0.8 0.5-0.1	0.9 0.6-0.1	0.9 0.7-0.1
55	ORLAN	FL	0.5-0.0-0.0	1.0 0.4-0.1	1.1 0.5-0.1	1.2 0.6-0.1
56	ROCHES	NY	0.4-0.0-0.0	0.8 0.3-0.1	0.8 0.4-0.1	0.9 0.5-0.1
57	HARISB	PA	2.2 1.9-0.1	2.6 2.4-0.1	2.8 2.5-0.1	2.9 2.6-0.1
58	SHRVPT	LA	0.2-0.0-0.0	0.8 0.6-0.1	0.9 0.6-0.1	0.9 0.7-0.1
59	MOBILE	AL	0.1-0.0-0.0	0.8 0.6-0.1	0.8 0.7-0.1	0.9 0.7-0.1
60	DAVENP	IA	0.3-0.0-0.0	0.7 0.4-0.1	0.8 0.4-0.1	0.9 0.5-0.1
61	FLINT	MI	1.1 0.9-0.1	1.5 1.3-0.1	1.5 1.4-0.1	1.6 1.5-0.1
62	GRNBAY	WI	0.3-0.0-0.0	0.7 0.4-0.1	0.8 0.5-0.1	0.9 0.6-0.1
63	RICHMN	VA	0.4-0.0-0.0	0.9 0.5-0.1	0.9 0.5-0.1	1.0 0.6-0.1
64	SPRNGF	IL	2.1 1.9-0.1	2.4 2.3-0.1	2.6 2.4-0.1	2.7 2.5-0.1
65	CDRRAP	IA	0.3-0.0-0.0	0.8 0.5-0.1	0.8 0.5-0.1	0.9 0.6-0.1
66	DMOINE	IA	0.2-0.0-0.0	0.8 0.5-0.1	0.9 0.6-0.1	0.9 0.7-0.1
67	WICHTA	KS	0.2-0.0-0.0	0.9 0.6-0.1	0.9 0.7-0.1	1.0 0.7-0.1
68	JKSNVL	FL	1.1 0.9-0.1	1.5 1.4-0.1	1.5 1.4-0.1	1.[illegible] 1.5-0.1
69	PADUCA	KY	0.1 1.0-0.0	0.7 1.5-0.0	0.7 1.6-0.1	0.[illegible] 1.7-0.1
70	ROANOK	VA	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.6-0.1	0.8 0.6-0.1
71	KNOXVL	TN	0.8 0.9-0.1	1.4 1.6-0.1	1.5 1.6-0.1	1.6 1.7-0.1
72	FRESNO	CA	3.9 4.9-0.1	4.3 5.2-0.2	4.5 5.4-0.2	4.7 5.6-0.2
73	RALEIG	NC	0.7 1.0-0.0	1.3 1.5-0.1	1.4 1.6-0.1	1.4 1.7-0.1
74	JOHNST	PA	0.4 1.0-0.0	1.0 1.5-0.1	1.0 1.6-0.1	1.1 1.6-0.1
75	PORTLN	ME	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.5-0.1	0.8 0.6-0.1
76	SPOKAN	WA	0.1-0.0-0.0	0.6 0.5-0.0	0.7 0.6-0.0	0.7 0.6-0.0
77	JACKSN	MS	0.6 1.0-0.0	1.1 1.5-0.1	1.2 1.6-0.1	1.2 1.6-0.1
78	CHATTN	TN	0.2 1.0-0.0	0.7 1.4-0.0	0.7 1.5-0.0	0.8 1.6-0.1
79	YGSTN	OH	3.1 2.9-0.1	3.6 3.4-0.1	3.8 3.6-0.1	4.0 3.7-0.1
80	SBEND	IN	2.9 2.9-0.1	3.5 3.5-0.1	3.7 3.6-0.1	3.8 3.8-0.1
81	ALBUQ	NM	0.2-0.0-0.0	0.6 0.5-0.0	0.7 0.5-0.0	0.8 0.6-0.1
82	FTWAYN	IN	3.1 2.9-0.1	3.7 3.5-0.1	3.9 3.7-0.1	4.0 3.8-0.1
83	PEORIA	IL	3.1 2.9-0.1	3.8 3.6-0.1	4.0 3.7-0.1	4.2 3.9-0.1
84	GRNVLE	NC	0.1-0.0-0.0	0.7 0.6-0.0	0.7 0.6-0.0	0.8 0.7-0.1
85	SIOUXF	SD	-0.1-0.0-0.0	0.5 0.6-0.0	0.6 0.7-0.0	0.7 0.7-0.0
86	EVANSV	IN	1.6 1.9-0.1	2.0 2.3-0.1	2.1 2.4-0.1	2.2 2.5-0.1
87	BATONR	LA	0.6 1.0-0.0	0.9 1.3-0.1	1.0 1.4-0.1	1.1 1.4-0.1
88	BEAUMT	TX	-0.0-0.0-0.0	0.4 0.4-0.0	0.4 0.4-0.0	0.5 0.5-0.0
89	DULUTH	MN	0.0-0.0-0.0	0.4 0.4-0.0	0.5 0.4-0.0	0.5 0.5-0.0
90	WHLING	WV	0.2-0.0-0.0	0.7 0.4-0.0	0.7 0.5-0.0	0.8 0.5-0.1
91	LINCLN	NE	0.1-0.0-0.0	0.6 0.5-0.0	0.7 0.6-0.0	0.7 0.6-0.0
92	LANSNG	MI	0.5-0.0-0.0	0.9 0.4-0.1	1.0 0.4-0.1	1.1 0.5-0.1
93	MADISN	WI	1.5 1.9-0.1	1.8 2.2-0.1	1.9 2.3-0.1	2.0 2.4-0.1
94	COLUMB	GA	0.4 1.0-0.0	0.8 1.3-0.1	0.8 1.4-0.1	0.9 1.5-0.1
95	AMARIL	TX	0.1-0.0-0.0	0.5 0.4-0.0	0.6 0.4-0.0	0.6 0.5-0.0
96	HUNTSV	AL	2.8 2.9-0.1	3.4 3.4-0.1	3.6 3.6-0.1	3.8 3.8-0.1
97	ROCKFD	IL	1.5 1.9-0.1	1.8 2.2-0.1	1.9 2.3-0.1	2.0 2.4-0.1
98	FARGO	ND	-0.1-0.0-0.0	0.5 0.6-0.0	0.6 0.6-0.0	0.6 0.7-0.0
99	MONROE	LA	0.1-0.0-0.0	0.9 0.8-0.1	1.0 0.8-0.1	1.0 0.9-0.1
100	COLUMB	SC	1.4 1.9-0.1	1.8 2.4-0.1	1.9 2.5-0.1	2.0 2.6-0.1

Table 7

EFFECTS OF CABLE TELEVISION:
FOUR-YEAR EQUATION, VERY HIGH CABLE PENETRATION

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1 NY	NY	2.7	1.5	-0.5	4.8	3.6	-0.8	5.0	3.8	-0.9	5.2	3.9	-0.9
2 LA	CA	3.8	5.3	-0.7	5.4	6.9	-0.9	5.7	7.2	-1.0	6.0	7.5	-1.0
3 CHCAGO	IL	1.4	2.7	-0.3	1.8	3.1	-0.4	1.8	3.1	-0.4	1.9	3.2	-0.4
4 PHI[illegible]	PA	1.4	2.7	-0.3	1.7	3.0	-0.4	1.7	3.0	-0.4	1.8	3.1	-0.4
5 DTROIT	MI	1.0	1.7	-0.3	1.3	2.1	-0.3	1.3	2.1	-0.3	1.4	2.1	-0.3
6 BOSTON	MA	1.0	1.7	-0.3	1.6	2.2	-0.4	1.6	2.3	-0.4	1.6	2.3	-0.4
7 SF	CA	0.7	2.8	-0.2	1.3	3.3	-0.3	1.3	3.4	-0.3	1.4	3.4	-0.3
8 CLVLND	OH	1.0	1.7	-0.3	1.4	2.0	-0.3	1.4	2.1	-0.3	1.4	2.1	-0.4
9 WASH	DC	0.8	0.7	-0.3	1.2	1.1	-0.3	1.2	1.2	-0.3	1.3	1.3	-0.3
10 PITT	PA	0.5	-0.2	-0.2	1.2	0.4	-0.3	1.2	0.5	-0.3	1.2	0.5	-0.3
11 STLOUS	MO	0.5	0.8	-0.2	1.0	1.3	-0.3	1.0	1.3	-0.3	1.0	1.3	-0.3
12 DALLAS	TX	0.6	0.8	-0.2	1.1	1.2	-0.3	1.1	1.3	-0.3	1.2	1.3	-0.3
13 MINN	MN	0.2	-0.2	-0.2	1.0	0.6	-0.3	1.0	0.7	-0.3	1.0	0.7	-0.3
14 BALT	MD	0.7	0.8	-0.2	1.1	1.2	-0.3	1.1	1.2	-0.3	1.1	1.2	-0.3
15 HOUSTN	TX	0.9	1.7	-0.3	1.3	2.0	-0.3	1.3	2.1	-0.3	1.4	2.1	-0.3
16 INDPLS	IN	0.3	0.8	-0.2	0.8	1.3	-0.3	0.9	1.4	-0.3	0.9	1.4	-0.3
17 CINCI	OH	0.7	0.8	-0.2	1.0	1.1	-0.3	1.1	1.2	-0.3	1.1	1.2	-0.3
18 ATLANT	GA	0.7	1.7	-0.3	1.2	2.2	-0.3	1.3	2.3	-0.3	1.3	2.3	-0.3
19 HARTFD	CN	1.1	1.7	-0.3	1.5	2.1	-0.4	1.6	2.1	-0.4	1.6	2.2	-0.4
20 SEATLE	WA	0.1	-0.2	-0.2	0.7	0.5	-0.2	0.7	0.5	-0.2	0.8	0.5	-0.3
21 MIAMI	FL	0.5	0.8	-0.2	1.0	1.3	-0.3	1.1	1.4	-0.3	1.2	1.5	-0.3
22 KANCTY	MO	0.6	0.8	-0.2	1.0	1.2	-0.3	1.0	1.2	-0.3	1.1	1.3	-0.3
23 MILWAU	WI	0.8	0.7	-0.3	1.1	1.0	-0.3	1.1	1.0	-0.3	1.1	1.1	-0.3
25 SACRA	CA	0.5	0.8	-0.2	1.0	1.2	-0.3	1.0	1.2	-0.3	1.0	1.3	-0.3
26 MEMPH	TN	0.1	-0.2	-0.2	0.9	0.6	-0.3	1.0	0.6	-0.3	1.0	0.7	-0.3
27 COLUMB	OH	0.5	-0.2	-0.2	0.9	0.2	-0.3	1.0	0.3	-0.3	1.0	0.3	-0.3
28 TAMPA	FL	0.8	0.7	-0.3	1.2	1.2	-0.3	1.3	1.2	-0.3	1.3	1.3	-0.3
29 PORTLN	OR	0.2	-0.2	-0.2	0.7	0.4	-0.2	0.8	0.4	-0.3	0.8	0.5	-0.3
30 NASHVL	TN	0.1	-0.2	-0.2	1.0	0.7	-0.3	1.0	0.7	-0.3	1.1	0.8	-0.3
31 NEWORL	LA	0.6	0.8	-0.2	0.9	1.1	-0.3	0.9	1.1	-0.3	1.0	1.1	-0.3
32 DENVER	CO	0.2	-0.2	-0.2	0.8	0.4	-0.3	0.8	0.5	-0.3	0.9	0.5	-0.3
33 PROVID	RI	0.5	-0.2	-0.2	1.0	0.2	-0.3	1.0	0.2	-0.3	1.0	0.3	-0.3
34 ALBANY	NY	0.3	-0.2	-0.2	0.8	0.3	-0.3	0.9	0.3	-0.3	0.9	0.4	-0.3
35 SYRACU	NY	0.3	-0.2	-0.2	0.7	0.2	-0.2	0.7	0.2	-0.2	0.7	0.2	-0.2
36 CHARLS	WV	0.2	-0.2	-0.2	0.8	0.4	-0.3	0.8	0.4	-0.3	0.8	0.4	-0.3
37 GRNDRP	MI	0.3	-0.2	-0.2	0.9	0.4	-0.3	0.9	0.4	-0.3	0.9	0.4	-0.3
38 LOUSVL	KY	1.0	1.7	-0.3	1.4	2.1	-0.4	1.5	2.1	-0.4	1.5	2.2	-0.4
39 OKCITY	OK	0.2	-0.2	-0.2	0.9	0.5	-0.3	0.9	0.5	-0.3	1.0	0.6	-0.3
40 BIRM	AL	0.8	0.7	-0.3	1.3	1.2	-0.3	1.3	1.2	-0.3	1.4	1.3	-0.3
41 DAYTON	OH	0.9	0.7	-0.3	1.3	1.1	-0.3	1.4	1.2	-0.3	1.4	1.2	-0.3
42 CHARLT	NC	0.9	1.7	-0.3	1.4	2.2	-0.4	1.5	2.3	-0.4	1.5	2.3	-0.4
43 PHOENX	AZ	0.3	0.8	-0.2	0.7	1.3	-0.3	0.8	1.3	-0.3	0.8	1.4	-0.3
44 NORFLK	VA	0.5	0.8	-0.2	0.8	1.2	-0.3	0.9	1.2	-0.3	0.9	1.2	-0.3
45 SANANT	TX	0.3	0.8	-0.2	[illegible].8	1.3	-0.3	0.8	1.3	-0.3	0.9	1.3	-0.3
46 GRNVLE	SC	0.1	0.8	-0.2	0.9	1.6	-0.3	0.9	1.6	-0.3	1.0	1.7	-0.3
47 GRNBRO	NC	0.1	-0.2	-0.2	0.8	0.5	-0.3	0.8	0.5	-0.3	0.9	0.6	-0.3
48 SALTLK	UT	0.1	-0.2	-0.2	0.8	0.5	-0.3	0.8	0.5	-0.3	0.9	0.6	-0.3
49 WLKSBR	PA	2.7	2.5	-0.5	3.1	2.8	-0.6	3.2	2.9	-0.6	3.3	3.0	-0.6
50 LITLRK	AR	0.1	-0.2	-0.2	0.8	0.5	-0.3	0.8	0.6	-0.3	0.9	0.6	-0.3

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 7 (contd.)

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH	0.9	0.7	-0.3	1.2	1.1	-0.3	[illegible]	1.1	-0.3	1.3	1.1	-0.3
53	OMAHA	NE	0.1	-0.2	-0.2	0.7	0.4	-0.2	0.7	0.5	-0.3	0.7	0.5	-0.3
54	TULSA	OK	0.1	-0.2	-0.2	0.8	0.5	-0.3	0.8	0.5	-0.3	0.8	0.6	-0.3
55	ORLAN	FL	0.3	-0.2	-0.2	0.9	0.3	-0.3	0.9	0.4	-0.3	0.9	0.4	-0.3
56	ROCHES	NY	0.4	-0.2	-0.2	0.8	0.2	-0.3	0.8	0.2	-0.3	0.8	0.3	-0.3
57	HARISB	PA	1.6	1.6	-0.4	1.9	2.0	-0.4	2.0	2.0	-0.4	2.0	2.0	-0.4
58	SHRVPT	LA	0.1	-0.2	-0.2	0.8	0.6	-0.3	0.8	0.6	-0.3	0.8	0.6	-0.3
59	MOBILE	AL	-0.0	-0.1	-0.1	0.7	0.6	-0.2	0.7	0.6	-0.3	0.8	0.6	-0.3
60	DAVENP	IA	0.3	-0.2	-0.2	0.7	0.3	-0.2	0.7	0.3	-0.2	0.7	0.3	-0.3
61	FLINT	MI	0.9	0.7	-0.3	1.2	1.0	-0.3	1.3	1.1	-0.3	1.3	1.1	-0.3
62	GRNBAY	WI	0.2	-0.2	-0.2	0.7	0.3	-0.2	0.7	0.4	-0.2	0.7	0.4	-0.3
63	RICHMN	VA	0.2	-0.2	-0.2	0.8	0.4	-0.3	0.8	0.4	-0.3	0.9	0.5	-0.3
64	SPRNGF	IL	1.6	1.6	-0.4	1.9	1.9	-0.4	1.9	1.9	-0.4	2.0	2.0	-0.4
65	CDRRAP	IA	0.2	-0.2	-0.2	0.7	0.4	-0.2	0.7	0.4	-0.2	0.7	0.4	-0.3
66	DMOINE	IA	0.1	-0.2	-0.2	0.8	0.5	-0.3	0.8	0.5	-0.3	0.8	0.5	-0.3
67	WICHTA	KS	0.1	-0.2	-0.2	0.7	0.5	-0.3	0.7	0.5	-0.3	0.8	0.5	-0.3
68	JKSNVL	FL	0.8	0.7	-0.3	1.2	1.1	-0.3	1.3	1.2	-0.3	1.3	1.2	-0.3
69	PADUCA	KY	-0.0	0.9	-0.1	0.7	1.6	-0.2	0.7	1.6	-0.2	0.7	1.6	-0.2
70	ROANOK	VA	0.1	-0.2	-0.2	0.7	0.5	-0.2	0.7	0.5	-0.3	0.8	0.5	-0.3
71	KNOXVL	TN	0.6	0.8	-0.2	1.2	1.4	-0.3	1.3	1.5	-0.3	1.3	1.5	-0.3
72	FRESNO	CA	2.8	4.4	-0.6	3.0	4.6	-0.6	3.0	4.6	-0.6	3.0	4.7	-0.6
73	RALEIG	NC	0.6	0.8	-0.2	1.2	1.4	-0.3	1.2	1.4	-0.3	1.2	1.4	-0.3
74	JOHNST	PA	0.2	0.8	-0.2	0.8	1.4	-0.3	0.8	1.4	-0.3	0.9	1.5	-0.3
75	PORTLN	ME	0.1	-0.2	-0.2	0.6	0.4	-0.2	0.6	0.4	-0.2	0.6	0.4	-0.2
76	SPOKAN	WA	-0.1	-0.1	-0.1	0.6	0.5	-0.2	0.6	0.5	-0.2	0.6	0.5	-0.2
77	JACKSN	MS	0.4	0.8	-0.2	1.0	1.4	-0.3	1.1	1.4	-0.3	1.1	1.5	-0.3
78	CHATTN	TN	0.1	0.8	-0.2	0.7	1.4	-0.2	0.7	1.5	-0.2	0.7	1.5	-0.3
79	YGSTN	OH	2.4	2.5	-0.5	2.8	2.9	-0.5	2.8	2.9	-0.6	2.9	3.0	-0.6
80	SBEND	IN	2.3	2.5	-0.5	2.7	2.9	-0.5	2.7	3.0	-0.5	2.8	3.0	-0.5
81	ALBUQ	NM	0.0	-0.2	-0.2	0.6	0.4	-0.2	0.6	0.4	-0.2	0.7	0.5	-0.2
82	FTWAYN	IN	2.4	2.5	-0.5	2.7	2.9	-0.5	2.8	3.0	-0.6	2.9	3.1	-0.6
83	PEORIA	IL	2.3	2.5	-0.5	2.8	3.0	-0.5	2.8	3.1	-0.6	2.9	3.1	-0.6
84	GRNVLE	NC	-0.1	-0.1	-0.1	0.7	0.6	-0.2	0.7	0.6	-0.2	0.7	0.6	-0.2
85	SIOUXF	SD	-0.2	-0.1	-0.1	0.5	0.6	-0.2	0.5	0.6	-0.2	0.6	0.6	-0.2
86	EVANSV	IN	1.4	1.7	-0.3	1.7	2.0	-0.4	1.7	2.0	-0.4	1.8	2.0	-0.4
87	BATONR	LA	0.6	0.8	-0.2	0.9	1.1	-0.3	0.9	1.1	-0.3	1.0	1.1	-0.3
88	BEAUMT	TX	-0.1	-0.1	-0.1	0.4	0.4	-0.2	0.4	0.4	-0.2	0.4	0.4	-0.2
89	DULUTH	MN	-0.0	-0.1	-0.1	0.4	0.3	-0.2	0.5	0.3	-0.2	0.5	0.3	-0.2
90	WHLING	WV	0.1	-0.2	-0.2	0.6	0.3	-0.2	0.7	0.3	-0.2	0.7	0.4	-0.2
91	LINCLN	NE	-0.0	-0.1	-0.1	0.6	0.5	-0.2	0.6	0.5	-0.2	0.6	0.5	-0.2
92	LANSNG	MI	0.4	-0.2	-0.2	0.9	0.2	-0.3	0.9	0.3	-0.3	0.9	0.3	-0.3
93	MADISN	WI	1.4	1.7	-0.3	1.6	1.8	-0.4	1.6	1.9	-0.4	1.7	1.9	-0.4
94	COLUMB	GA	0.4	0.8	-0.2	0.8	1.2	-0.3	0.8	1.2	-0.3	0.8	1.2	-0.3
95	AMARIL	TX	-0.1	-0.1	-0.1	0.4	0.3	-0.2	0.4	0.3	-0.2	0.4	0.3	-0.2
96	HUNTSV	AL	2.1	2.6	-0.4	2.4	2.9	-0.5	2.5	3.0	-0.5	2.6	3.1	-0.5
97	ROCKFD	IL	1.4	1.7	-0.3	1.5	1.8	-0.4	1.6	1.8	-0.4	1.6	1.9	-0.4
98	FARGO	ND	-0.2	-0.1	-0.1	0.5	0.6	-0.2	0.5	0.6	-0.2	0.5	0.6	-0.2
99	MONROE	LA	-0.1	-0.1	-0.1	0.9	0.8	-0.3	0.9	0.8	-0.3	0.9	0.8	-0.3
100	COLUMB	SC	1.1	1.7	-0.3	1.6	2.1	-0.4	1.6	2.2	-0.4	1.7	2.2	-0.4

that provide traditional services only: improved reception plus the distant signals that are allowed by current rules. Actual cable penetration will depend on future regulatory decisions, development and consumer acceptance of new cable communications services, and other factors that are now impossible to predict with any precision. Our moderately high cable penetration assumption is intended to include some allowance for the effect of a possible relaxation of distant signal restrictions and/or new services.

For our first set of projections we assume a *minimum* penetration of 30 percent. Specifically, we assume that whatever the fraction of homes in a market that did *not* subscribe to cable in 1974, only seven-tenths of that fraction will not subscribe in the future. So in a market with no cable subscribers at all in 1974, we use 30 percent penetration for our cable projections. With 40 percent in 1974, we use 58 percent for the projections, and so on. The maximal penetration in any market would increase from a current value of 69 up to an assumed value of 78.

We also maintain the assumptions of the base case, that is, that market size and wealth grow in pace with BEA projections, and UHF set penetration reaches 100 percent in 1980. Our higher assumed cable penetration is used in all years, even 1974. This way we can see what its effect would be in the absence of the assumed base-case developments. The results of using these assumptions in our preferred equation are shown in Table 6 in comparison with the preceding results of the base case in Table 2. Table 6, column 1, shows the predicted number of UHF stations with cable. Column 2 is the adjusted number of stations taking into account the constant adjustment factor described previously, and column 3 shows the difference in the predicted number of stations between the base case and the situation where we take explicitly into account the effect of cable. Thus, for example, in Table 6 for New York, column 1 shows 3.3 stations and after reducing the number 3.3 by the adjustment factor of 1.4, we have 1.9 stations, in comparison with 2 stations in Table 2. The difference of -0.1 station shows the effect of cable, that is, a reduction in number of UHF stations by 0.1. By examining all markets together for the 1990 projection, we see in column 3 that in only three cases does the effect of cable cause a reduction of as much as -0.2 of a station. In virtually all markets the reduction is -0.1 station, and in some it is 0.

Table 7 shows our upper limit projections for the impact of cable. We use our four-year equation together with assumed levels of cable penetration ranging from 50 to 85 percent. Specifically, we assume that the percentage of households *not* subscribing to cable in 1974 is reduced by a factor of one-half in each market. We consider these figures to be optimistic upper bounds on the cable penetration that can reasonably be expected in the foreseeable future. As in Table 5, column 3 in Table 7 shows changes relative to the base case for the four-year equation, Table 3. Thus, for the 1990 projection in the New York market, column 2 in Table 7 shows 3.9 stations in comparison with 4.8 stations in column 2 of Table 3 base case projections, or a difference of -0.9 stations (shown in column 3). That is, the effect of cable in this case would be to reduce the number of UHF stations projected in 1990 by 0.9 for New York.

Table 8 summarizes the cable projections and includes as column 2 the difference that cable makes in comparison with the summary in Table 5. Thus, in Table 8 the narrow count for Table 6 for 1974 in column 1 shows 92 stations, in comparison with 97 stations for 1974 in Table 5, or a net loss of UHF stations of -5. As another example, Table 8 with the addition of 27 excluded stations shows a total of 160 stations for 1990 in column 1, in comparison with 192 stations in Table 4, for a net decrease of 32 stations. Table 6, which includes the relatively small effects of cable on the growth of UHF, shows only a modest decrease in the total number of stations, with the maximum of 10 shown in column 1 for 1990. When we increase the penetration of cable in our assumptions described for Table 8, and use the four-year 1971-1974 equation for our projections indicating the maximum effects of cable, we see a reduction of 41 stations for 1990, in comparison with the base case in Table 5.

Table 8

SUMMARY OF CABLE PROJECTIONS

Projection	1974 (1)	1974 (2)	1980 (1)	1980 (2)	1985 (1)	1985 (2)	1990 (1)	1990 (2)
Narrow count, Table 6	92		142		151		159	
Excluded stations, flat	27		27		27		27	
Total	119	-5	169	-7	178	-7	186	-8
Excluded stations, proportional	-1		13		15		17	
Total	118	-6	182	-8	193	-9	203	-10
Narrow count, Table 7	73		125		129		133	
Excluded stations, flat	27		27		27		27	
Total	100	-24	152	-31	156	-32	160	-32
Excluded stations, proportional	-7		8		9		10	
Total	93	-31	160	-39	165	-41	170	-41

Column (1): Projected stations.
Column (2): Difference from base-case totals.

Perhaps one of the most interesting aspects of Table 8 is that even assuming the *maximum* impact of cable shown in Table 7, the number of UHF stations would continue to grow beyond that operating in 1974. The 124 stations shown for 1974 in Table 5 would grow to 152 by 1980 under the assumption that excluded stations are included at the flat total of 27; and would continue to grow to 156 by 1985 and to 160 by 1990--for a net gain of 36 stations over the 15-year period. Thus, under our most extreme assumptions about the effect of cable on UHF, the number of UHF stations would not decline over the 15-year period but would continue to exhibit at least some modest growth.

V. EFFECTS OF VHF DROP-INS

The Office of Telecommunications Policy* has proposed the possibility of "dropping in" up to 83 VHF stations in the top 100 markets. This would require reduction of minimal adjacent channel separation by 15 percent, reduction of minimal co-channel separation by 17.65 percent, plus an additional reduction of as much as five miles if necessary to permit a drop-in, and the reassignment of some presently unused channels.

BASIC QUADRATIC EQUATION

Including additional VHF stations is easy in our model because we already have as one of the variables the number of VHF stations that operate in each of the 197 markets and the effect that their presence has on the number of UHF stations. Thus, we can use the base case assumptions in Table 2 with our basic quadratic equation and add the number of VHF stations specified by OTP under its most liberal assumptions in whichever markets they would operate. Table 9 shows the 100 top markets again but under the assumption that 83 additional VHF stations are distributed among the markets indicated by asterisks after the market name.**

Especially important, *the basic quadratic equation provides no basis for judgment as to either the technical feasibility or the economic viability of the drop-ins themselves.* The projections in Table 9 simply assume that all proposed drop-ins are on the air. However, the alternative projections based on our constrained equation below do take economic viability into account.

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*"Further evaluation of additional VHF-TV channels that could be assigned in the top 100 markets," attachment to letter from Clay T. Whitehead, OTP, to Richard E. Wiley, FCC, May 14, 1974.

**Plus four other markets that are among the top 100 in the ranking used by OTP but below that in our ranking. Our ranking is the same as the list in the 1972 cable television regulations; OTP uses a different, and unidentified, list. Seven of the 83 stations would be assigned to these four other markets, leaving 76 drop-ins for markets on our list of the top 100.

Table 9

83 VHF DROP-INS IN THE BASIC QUADRATIC EQUATION

	MARKET			1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY		3.4	2.0	0.0	5.4	4.0	0.0	5.6	4.3	0.0	6.0	4.6	0.0
2	LA	CA		4.8	6.0	0.0	6.5	7.7	0.0	6.9	8.2	0.0	7.4	8.6	0.0
3	CHCAGO	IL	*	1.8	3.2	0.2	2.3	3.7	0.2	2.5	3.8	0.2	2.6	3.9	0.3
4	PHIL	PA		1.7	3.0	0.0	2.2	3.4	0.0	2.3	3.5	0.0	2.4	3.6	0.0
5	DTROIT	MI		1.1	2.0	0.0	1.5	2.4	0.0	1.6	2.5	0.0	1.7	2.5	0.0
6	BOSTON	MA		1.4	2.0	0.0	2.0	2.6	0.0	2.0	2.7	0.0	2.1	2.8	0.0
7	SF	CA		1.0	3.0	0.0	1.6	3.6	0.1	1.7	3.7	0.1	1.8	3.8	0.1
8	CLVLND	OH	*	1.0	1.7	-0.3	1.3	2.0	-0.4	1.4	2.1	-0.4	1.5	2.2	-0.4
9	WASH	DC		1.0	1.0	0.0	1.3	1.4	0.0	1.4	1.5	0.0	1.5	1.6	0.0
10	PITT	PA	*	0.5	-0.3	-0.3	1.1	0.3	-0.4	1.2	0.4	-0.4	1.2	0.4	-0.4
11	STLOUS	MO		0.7	1.0	0.0	1.1	1.5	0.0	1.2	1.6	0.0	1.3	1.6	0.0
12	DALLAS	TX	*	0.9	1.1	0.1	1.5	1.7	0.2	1.6	1.8	0.3	1.7	1.9	0.3
13	MINN	MN		0.4	0.0	0.0	1.1	0.7	0.0	1.2	0.8	0.0	1.3	0.9	0.0
14	BALT	MD		0.8	1.0	0.0	1.2	1.4	0.0	1.3	1.5	0.0	1.4	1.6	0.0
15	HOUSTN	TX	*	0.8	1.7	-0.3	1.1	2.0	-0.4	1.2	2.1	-0.4	1.3	2.1	-0.4
16	INDPLS	IN	*	0.4	0.9	-0.1	0.9	1.4	-0.1	1.0	1.5	-0.1	1.0	1.5	-0.1
17	CINCI	OH		0.8	1.0	0.0	1.2	1.4	0.0	1.3	1.5	0.0	1.4	1.6	0.0
18	ATLANT	GA	*	0.7	1.7	-0.3	1.1	2.1	-0.4	1.2	2.2	-0.4	1.3	2.3	-0.4
19	HARTFD	CN		1.4	2.0	0.0	1.9	2.5	0.0	2.0	2.6	0.0	2.1	2.6	0.0
20	SEATLE	WA	*	0.6	0.3	0.3	1.3	1.1	0.5	1.5	1.2	0.5	1.6	1.3	0.6
21	MIAMI	FL		0.7	1.0	0.0	1.3	1.6	0.2	1.4	1.8	0.2	1.6	1.9	0.3
22	KANCTY	MO	*	0.3	0.6	-0.4	0.7	0.9	-0.5	0.8	1.0	-0.5	0.8	1.1	-0.5
23	MILWAU	WI	*	0.6	0.7	-0.3	0.9	1.0	-0.4	0.9	1.0	-0.4	1.0	1.1	-0.4
25	SACRA	CA		0.7	1.0	0.0	1.2	1.4	0.0	1.2	1.5	0.0	1.3	1.6	0.0
26	MEMPH	TN	*	0.1	-0.2	-0.2	0.7	0.4	-0.[illegible]	0.8	0.4	-0.4	0.9	0.5	-0.4
27	CCLUMB	OH		0.6	0.0	0.0	1.0	0.4	0.0	1.1	0.5	0.0	1.1	0.6	0.0
28	TAMPA	FL		1.0	1.0	0.0	1.4	1.4	0.0	1.5	1.5	0.0	1.6	1.6	0.0
29	PORTLN	OR	*	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1	0.8	0.5	-0.1
30	NASHVL	TN	*	0.1	-0.2	-0.2	0.8	0.4	-0.4	0.8	0.5	-0.4	0.9	0.5	-0.4
31	NEWORL	LA		0.7	1.0	0.0	1.0	1.3	0.0	1.1	1.4	0.0	1.2	1.5	0.0
32	DENVER	CO	*	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1	0.9	0.5	-0.1
33	PROVID	RI		0.7	0.0	0.0	1.1	0.4	0.0	1.2	0.5	0.0	1.2	0.6	0.0
34	ALBANY	NY	*	0.2	-0.3	-0.3	0.6	0.1	-0.4	0.7	0.2	-0.4	0.8	0.2	-0.4
35	SYRACU	NY		0.4	0.0	0.0	0.8	0.4	0.0	0.9	0.4	0.0	0.9	0.5	0.0
36	CHARLS	WV	*	0.0	-0.4	-0.4	0.4	-0.0	-0.5	0.4	0.0	-0.5	0.5	0.1	-0.6
37	GRNDRP	MI	*	0.2	-0.3	-0.3	0.7	0.2	-0.4	0.7	0.2	-0.4	0.8	0.3	-0.4
38	LOUSVL	KY	*	0.4	1.1	-0.9	0.7	1.4	-1.0	0.7	1.5	-1.1	0.8	1.5	-1.1
39	OKCITY	OK		0.4	0.0	0.0	1.0	0.6	0.0	1.1	0.7	0.0	1.2	0.7	0.0
40	BIRM	AL	*	0.5	0.5	-0.5	0.9	0.8	-0.6	1.0	0.9	-0.7	1.0	1.0	-0.7
41	DAYTCN	OH		0.6	0.5	-0.5	1.0	0.8	-0.7	1.0	0.9	-0.7	1.1	0.9	-0.7
42	CHARLT	NC		1.2	2.0	0.0	1.7	2.5	0.0	1.8	2.6	0.0	1.9	2.7	0.0
43	PHOENX	AZ	*	0.3	0.9	-0.1	0.7	1.3	-0.1	0.8	1.3	-0.1	0.9	1.4	-0.1
44	NORFLK	VA	*	0.3	0.7	-0.3	0.6	1.0	-0.4	0.6	1.1	-0.4	0.7	1.1	-0.4
45	SANANT	TX		0.5	1.0	0.0	1.0	1.5	0.0	1.0	1.5	0.0	1.1	1.6	0.0
46	GRNVLE	SC	*	0.1	0.8	-0.2	0.6	1.3	-0.3	0.7	1.4	-0.4	0.7	1.4	-0.4
47	GRNBRO	NC		0.3	0.0	0.0	0.9	0.6	0.0	0.9	0.6	0.0	1.0	0.7	0.0
48	SALTLK	UT		0.3	-0.0	-0.0	1.0	0.7	0.1	1.2	0.9	0.2	1.4	1.1	0.3
49	WLKSBR	PA		4.2	3.0	0.0	4.9	3.7	0.0	5.1	4.0	0.0	5.4	4.2	0.0
50	LITLRK	AR	*	-0.1	-0.4	-0.4	0.3	0.1	-0.5	0.4	0.2	-0.5	0.5	0.3	-0.5

* Indicates market with one or more VHF drop-in stations.
Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 9 (contd.)

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH		1.1	1.0	0.0	1.5	1.4	0.0	1.6	1.5	0.0	1.7	1.6	0.0
53 OMAHA NE		0.2	0.0	0.0	0.8	0.5	0.0	0.8	0.6	0.0	0.9	0.6	0.0
54 TULSA OK		0.3	0.0	0.0	0.8	0.6	0.0	0.9	0.7	0.0	1.0	0.7	[illegible]
55 ORLAN FL		0.6	0.0	0.0	1.1	0.5	0.0	1.1	0.6	0.0	1.2	0.6	0.0
56 ROCHES NY		[illegible]	0.0	0.0	0.8	0.4	0.0	0.9	0.4	0.0	1.0	0.5	0.0
57 HARISB PA		2.3	2.0	0.0	2.7	2.5	0.0	2.9	2.6	0.0	3.0	2.7	0.0
58 SHRVPT LA	*	-0.1	-0.4	-0.4	0.3	0.1	-0.6	0.4	0.1	-0.6	0.4	0.2	-0.6
59 MOBILE AL	*	-0.1	-0.2	-0.2	0.4	0.3	-0.4	0.5	0.3	-0.4	0.6	0.4	-0.4
60 DAVENP IA	*	-0.1	-0.4	-0.4	0.2	-0.1	-0.6	0.3	-0.1	-0.6	0.3	-0.1	-0.6
61 FLINT MI		1.2	1.0	0.0	1.5	1.4	0.0	1.6	1.5	0.0	1.7	1.5	0.0
62 GRNBAY WI		0.3	0.0	0.0	0.8	0.5	0.0	0.8	0.5	0.0	0.9	0.6	0.0
[illegible] RICHMN VA		0.4	0.0	0.0	0.9	0.5	[illegible]	1.0	0.6	0.0	1.1	0.7	0.0
64 SPRNGF IL	*	0.6	0.5	-1.5	0.8	0.6	-1.7	0.9	0.7	-1.8	0.9	0.8	-1.8
65 CDRRAP IA		0.3	0.0	0.0	0.8	0.5	0.0	0.9	0.6	0.0	0.9	0.6	0.0
66 DMOINE IA		0.3	0.0	0.0	0.9	0.6	0.0	0.9	0.7	0.0	1.0	0.7	0.0
67 WICHTA KS	*	0.0	-0.2	-0.2	0.6	0.3	-0.4	0.6	0.3	-0.4	0.7	0.4	-0.4
68 JKSNVL FL		1.1	1.0	0.0	1.5	1.4	0.0	1.6	1.5	0.0	1.7	1.6	0.0
69 PADUCA KY	*	-0.1	0.8	-0.2	0.4	1.2	-0.3	0.4	1.3	-0.4	0.5	1.4	-0.4
70 ROANOK VA		0.2	0.0	0.0	0.7	0.5	0.0	0.8	0.6	0.0	0.9	0.7	0.0
71 KNOXVL TN		0.8	1.0	0.0	1.4	1.6	0.0	1.5	1.7	0.0	1.6	1.8	0.0
72 FRESNO CA	*	0.0	1.0	-4.0	0.1	1.0	-4.4	0.1	1.1	-4.5	0.2	1.1	-4.6
73 RALEIG NC		0.8	1.0	0.0	1.4	1.6	0.0	1.4	1.7	0.0	1.5	1.7	0.0
74 JOHNST PA	*	-0.1	0.4	-0.6	0.2	0.7	-0.8	0.2	0.8	-0.8	0.3	0.8	-0.9
75 PORTLN ME	*	-0.0	-0.3	-0.3	0.4	0.2	-0.4	0.4	0.2	-0.4	0.5	0.2	-0.4
76 SPOKAN WA		0.1	0.0	0.0	0.7	0.6	0.0	0.7	0.6	0.0	0.8	0.7	0.0
77 JACKSN MS	*	-0.2	0.2	-0.8	0.1	0.5	-1.1	0.1	0.5	-1.1	0.2	0.6	-1.1
78 CHATTN TN	*	-0.0	0.7	-0.3	0.4	1.2	-0.3	0.4	1.2	-0.3	0.5	1.3	-0.4
79 YGSTN OH		3.2	3.0	0.0	3.8	3.5	0.0	3.9	3.7	0.0	4.1	3.9	0.0
80 SBEND IN	*	0.9	0.8	-2.2	1.1	1.1	-2.5	1.2	1.1	-2.6	1.3	1.2	-2.7
81 ALBUQ NM	*	-0.3	-0.5	-0.5	0.0	-0.2	-0.7	0.1	-0.1	-0.7	0.1	-0.1	-0.7
82 FTWAYN IN		3.2	3.0	0.0	3.8	3.6	0.0	4.0	3.8	0.0	4.2	4.0	0.0
83 PEORIA IL		3.2	3.0	0.0	3.9	3.7	0.0	4.1	3.9	0.0	4.3	4.1	0.0
84 GRNVLE NC		0.1	0.0	0.0	0.7	0.6	0.0	0.8	0.7	0.0	0.8	0.7	0.0
85 SIOUXF SD	*	-0.5	-0.4	-0.4	[illegible]	-0.1	-0.8	-0.1	-0.1	-0.8	-0.1	-0.0	-0.8
86 EVANSV IN	*	0.4	0.7	-1.3	0.6	0.9	-1.5	0.6	1.0	-1.5	0.7	1.0	-1.6
87 BATONR LA		0.7	1.0	0.0	1.0	1.3	0.0	1.1	1.4	0.0	1.1	1.5	0.0
88 BEAUMT TX		-0.0	0.0	0.0	0.4	0.4	0.0	0.5	0.5	0.0	0.5	0.5	0.0
89 DULUTH MN		0.1	0.0	0.0	0.5	0.4	0.0	0.5	0.5	0.0	0.6	0.5	0.0
90 WHLING WV		0.3	0.0	0.0	0.7	0.5	0.0	0.8	0.5	0.0	0.8	0.6	0.0
91 LINCLN NE		0.1	0.0	0.0	0.7	0.6	0.0	0.7	0.6	0.0	0.8	0.7	0.0
92 LANSNG MI		0.6	0.0	0.0	1.0	0.4	0.0	1.0	0.5	0.0	1.1	0.6	0.0
93 MADISN WI		1.6	2.0	0.0	1.9	2.3	0.0	2.0	2.4	0.0	2.1	2.5	0.0
94 COLUMB GA		0.4	1.0	0.0	0.8	1.4	0.0	0.9	1.4	0.0	1.0	1.5	0.0
95 AMARIL TX		0.1	0.0	0.0	0.5	0.4	0.0	0.6	0.5	0.0	0.6	0.5	0.0
96 HUNTSV AL		3.0	3.0	0.0	3.5	3.6	0.0	3.7	3.8	0.0	3.9	4.0	0.0
97 ROCKFD IL		1.6	2.0	0.0	1.9	2.3	0.0	2.0	2.4	0.0	2.1	2.5	0.0
98 FARGO ND		-0.1	0.0	0.0	0.6	0.6	0.0	0.6	0.7	0.0	0.7	0.7	0.0
99 MONROE LA	*	-0.2	-0.3	-0.3	0.4	0.3	-0.5	0.5	0.4	-0.5	0.5	0.4	[illegible]
100 COLUMB SC	*	0.7	1.3	-0.7	1.0	1.6	-0.9	1.1	1.7	-0.9	1.2	1.8	-0.9

To interpret Table 9, let us take the case of Fresno, California (market no. 72). There the effect of VHF drop-ins is especially great, since 5 UHF stations now operate in the Fresno market (one of the few deintermixed* markets in the United States) and since in the OTP list as many as 5 VHF drop-ins could be included in the Fresno market. For 1974, Table 9, column 1 indicates that if 5 VHF stations were operating in the Fresno market in 1974, there would be 0.0 UHF stations in the Fresno market. Adjusting this upward by 0.9 constant adjustment factor, taken from Table 2, we compute a figure of 1.0 UHF station in column 2.** Column 3 in the 1974 projection shows -4.0 stations, which is the difference between the 5 stations that actually operated in Fresno (Table 2, column 2, 1974 projection) and the one station predicted with VHF drop-ins.

Similarly, in 1980 our Fresno base case projects 5.4 UHF stations while in column 2 in Table 9, we project only 1.0 for a net loss of 4.4 stations as shown in column 3. By 1990 the net loss is 4.6 stations, shown by the difference between the projection of 1.1 stations with VHF drop-ins for 1990 and 5.8 stations in the base case. Rounding the 4.6 upwards as a rough approximation, we conclude from our analysis that the inclusion of 5 VHF stations in Fresno would cause the loss of 5 UHF stations in Fresno, so that in effect the UHF stations would be converted to VHF.

We must note one peculiarity in our results: We would expect that in all cases the insertion of a VHF in a given market would reduce the number of UHF stations in that market, or at the limit have no effect, as shown by the minus figures or the zeros in column 3 of the projections in Table 9. However, in a few large markets--Chicago, San Francisco, Dallas, Seattle, and Miami--we see positive figures suggesting that the number of UHF stations would *rise* rather than decline (though by small amounts) as a result of VHF drop-ins. This counterintuitive result is probably a consequence of quirks in our data resulting from large variations in the character of the market listed in our tables.

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*An *intermixed* market has both VHF and UHF channel assignments; a *deintermixed* market, in contrast, has only one kind or the other.

**Here again, an apparent discrepancy of 0.1 occurs, as described in the footnote on p. 25.

For example, New York has almost twice as many television households as Los Angeles, and one fewer VHF station, and yet it has only 2 UHF stations compared to Los Angeles' 6. The viability of additional UHF stations in the Los Angeles market probably reflects the fact that it covers a far larger geographical area containing a number of separate communities (such as San Bernadino and Fontana). Because our equation tries to fit this and other anomalies as well as possible, the estimated equation says that in some very large markets more VHF stations result in more UHF stations. But again the amounts are small; only in the case of Seattle would the number of additional UHF stations round out to a whole station. In the others they would all round down to 0.

CONSTRAINED EQUATION

An alternative approach that avoids this counterintuitive result and in addition provides a basis for judging the economic viability (though still not the technical feasibility) of the drop-ins themselves is based on our constrained equation.* This equation implies an "unlimited-VHF" relationship that projects the number of VHF stations a market could economically support if there were *no* limits on availability of VHF spectrum. We use that relationship to calculate the numbers in column 1 of Table 10. For example, we calculate that New York could support 18.2 stations in 1974 if all could operate on VHF. The second column of Table 10 shows the number of existing stations in each market. Column 3 shows our projection of VHF stations assuming all 83 proposed drop-ins were allocated. In some cases this number is limited by allocations and in some cases by economics. For example, New York now has 6 commercial VHF stations and would continue to be limited to 6 because it does not get any drop-ins under the O proposal. Chicago could support 10.1 VHFs, according to our projections, but it is now limited to 4. The one drop-in proposed by OTP would be viable, so column 3 shows 5 stations. In contrast, the 2 drop-ins proposed for Seattle would probably lie fallow. Seattle already has 5 VHFs.

*We constructed this version of the viable stations model primarily to estimate the effect of the disappearance of the UHF handicap. See Appendix A, Section A.4 for details.

Table 10

VIABLE VHF STATIONS WITH DROP-INS, CONSTRAINED EQUATION

	MARKET			1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY		18.2	6.0	6.0	19.3	6.0	6.0	20.0	6.0	6.0	20.8	6.0	6.0
2	LA	CA		11.8	7.0	7.0	12.8	7.0	7.0	13.3	7.0	7.0	13.8	7.0	7.0
3	CHCAGO	IL	*	10.1	4.0	5.0	10.7	4.0	5.0	11.0	4.0	5.0	11.3	4.0	5.0
4	PHIL	PA		8.9	3.0	3.0	9.3	3.0	3.0	9.5	3.0	3.0	9.8	3.0	3.0
5	DTROIT	MI		7.2	4.0	4.0	7.5	4.0	4.0	7.7	4.0	4.0	7.9	4.0	4.0
6	BOSTON	MA		7.5	3.0	3.0	7.9	3.0	3.0	8.1	3.0	3.0	8.3	3.0	3.0
7	SF	CA		7.4	4.0	5.0	7.9	4.0	5.0	8.1	4.0	5.0	8.4	4.0	5.0
8	CLVLND	OH	*	6.6	3.0	4.0	6.8	3.0	4.0	6.9	3.0	4.0	7.0	3.0	4.0
9	WASH	DC		6.6	4.0	4.0	7.1	4.0	4.0	7.5	4.0	4.0	8.0	4.0	4.0
10	PITT	PA	*	6.1	3.0	4.0	6.2	3.0	4.0	6.2	3.0	4.0	6.2	3.0	4.0
11	STLOUS	MO		5.8	4.0	4.0	5.9	4.0	4.0	6.0	4.0	4.0	6.0	4.0	4.0
12	DALLAS	TX	*	6.0	4.0	6.0	6.3	4.0	6.0	6.5	4.0	6.0	6.8	4.0	6.0
13	MINN	MN		5.6	4.0	4.0	5.8	4.0	4.0	6.0	4.0	4.0	6.1	4.0	4.0
14	BALT	MD		5.3	3.0	3.0	5.4	3.0	3.0	5.5	3.0	3.0	5.5	3.0	3.0
15	HOUSTN	TX	*	5.6	3.0	4.0	5.9	3.0	4.0	6.1	3.0	4.0	6.3	3.0	4.0
16	INDPLS	IN	*	5.3	4.0	5.0	5.5	4.0	5.0	5.7	4.0	5.0	5.8	4.0	5.0
17	CINCI	OH		5.1	3.0	3.0	5.2	3.0	3.0	5.3	3.0	3.0	5.3	3.0	3.0
18	ATLANT	GA	*	5.5	3.0	4.0	5.8	3.0	4.0	6.0	3.0	4.0	6.2	3.0	4.0
19	HARTFD	CN		5.1	2.0	2.0	5.2	2.0	2.0	5.3	2.0	2.0	5.4	2.0	2.0
20	SEATLE	WA	*	5.4	5.0	5.4	5.4	5.0	5.4	5.5	5.0	5.5	5.6	5.0	5.6
21	MIAMI	FL		5.5	4.0	5.5	6.2	4.0	6.0	6.5	4.0	6.0	6.9	4.0	6.0
22	KANCTY	MO	*	5.1	3.0	5.0	5.2	3.0	5.0	5.3	3.0	5.0	5.3	3.0	5.0
23	MILWAU	WI	*	5.0	3.0	4.0	5.1	3.0	4.0	5.1	3.0	4.0	5.2	3.0	4.0
25	SACRA	CA		5.0	3.0	3.0	5.1	3.0	3.0	5.2	3.0	3.0	5.3	3.0	3.0
26	MEMPH	TN	*	4.8	3.0	4.0	4.9	3.0	4.0	4.9	3.0	4.0	5.0	3.0	4.0
27	COLUMB	OH		4.8	3.0	3.0	5.0	3.0	3.0	5.1	3.0	3.0	5.2	3.0	3.0
28	TAMPA	FL		5.4	3.0	3.0	5.9	3.0	3.0	6.2	3.0	3.0	6.4	3.0	3.0
29	PORTLN	OR	*	5.0	4.0	5.0	5.2	4.0	5.0	5.2	4.0	5.0	5.3	4.0	5.0
30	NASHVL	TN	*	4.8	3.0	4.0	5.0	3.0	4.0	5.1	3.0	4.0	5.2	3.0	4.0
31	NEWORL	LA		4.7	3.0	3.0	4.8	3.0	3.0	4.8	3.0	3.0	4.8	3.0	3.0
32	DENVER	CO	*	5.0	4.0	5.0	5.2	4.0	5.0	5.4	4.0	5.0	5.5	4.0	5.0
33	PROVID	RI		5.0	3.0	3.0	5.1	3.0	3.0	5.2	3.0	3.0	5.2	3.0	3.0
34	ALBANY	NY	*	4.6	3.0	4.0	4.7	3.0	4.0	4.7	3.0	4.0	4.7	3.0	4.0
35	SYRACU	NY		4.4	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0
36	CHARLS	WV	*	4.6	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.6	4.6	3.0	4.6
37	GRNDRP	MI	*	4.6	3.0	4.0	4.7	3.0	4.0	4.7	3.0	4.0	4.7	3.0	4.0
38	LOUSVL	KY	*	4.7	2.0	4.0	4.8	2.0	4.0	4.9	2.0	4.0	5.0	2.0	4.0
39	OKCITY	OK		4.7	3.0	3.0	4.8	3.0	3.0	4.8	3.0	3.0	4.9	3.0	3.0
40	BIRM	AL	*	4.5	2.0	3.0	4.6	2.0	3.0	4.7	2.0	3.0	4.7	2.0	3.0
41	DAYTON	OH	*	4.6	2.0	3.0	4.7	2.0	3.0	4.7	2.0	3.0	4.8	2.0	3.0
42	CHARLT	NC		4.8	2.0	2.0	4.9	2.0	2.0	5.0	2.0	2.0	5.1	2.0	2.0
43	PHOENX	AZ	*	4.8	4.0	4.8	5.1	4.0	5.0	5.2	4.0	5.0	5.4	4.0	5.0
44	NORFLK	VA	*	4.5	3.0	4.0	4.5	3.0	4.0	4.5	3.0	4.0	4.6	3.0	4.0
45	SANANT	TX		4.5	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.6	3.0	3.0
46	GRNVLE	SC	*	4.6	3.0	4.0	4.8	3.0	4.0	4.9	3.0	4.0	5.0	3.0	4.0
47	GRNBRO	NC		4.5	3.0	3.0	4.7	3.0	3.0	4.7	3.0	3.0	4.8	3.0	3.0
48	SALTLK	UT		4.5	3.0	4.5	4.5	3.0	4.5	4.6	3.0	4.6	4.7	3.0	4.7
49	WLKSBR	PA		4.5	0.0	0.0	4.7	0.0	0.0	4.7	0.0	0.0	4.8	0.0	0.0
50	LITLRK	AR	*	4.4	3.0	4.4	4.5	3.0	4.5	4.6	3.0	4.6	4.6	3.0	4.6

* Indicates market with one or more VHF drop-in stations.

Column (1): Raw projection.

Column (2): Existing stations.

Column (3): Projected VHF stations as limited by allocations including any viable drop-ins.

Table 10 (contd.)

	MARKET			1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH		4.5	2.0	2.0	4.6	2.0	2.0	4.6	2.0	2.0	4.7	2.0	2.0
53	OMAHA	NE		4.3	3.0	3.0	4.3	3.0	3.0	4.4	3.0	3.0	4.4	3.0	3.0
54	TULSA	OK		4.4	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.6	3.0	3.0
55	ORLAN	FL		4.5	3.0	3.0	4.8	3.0	3.0	4.9	3.0	3.0	5.0	3.0	3.0
56	ROCHES	NY		4.3	3.0	3.0	4.5	3.0	3.0	4.5	3.0	3.0	4.6	3.0	3.0
57	HARISB	PA		4.5	1.0	1.0	4.6	1.0	1.0	4.7	1.0	1.0	4.7	1.0	1.0
58	SHRVPT	LA	*	4.4	3.0	4.4	4.4	3.0	4.4	4.4	3.0	4.4	4.5	3.0	4.5
59	MOBILE	AL	*	4.3	3.0	4.0	4.3	3.0	4.0	4.4	3.0	4.0	4.4	3.0	4.0
60	DAVENP	IA	*	4.3	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.3
61	FLINT	MI		4.4	2.0	2.0	4.5	2.0	2.0	4.5	2.0	2.0	4.6	2.0	2.0
62	GRNBAY	WI		4.3	3.0	3.0	4.3	3.0	3.0	4.3	3.0	3.0	4.4	3.0	3.0
63	RICHMN	VA		4.4	3.0	3.0	4.5	3.0	3.0	4.6	3.0	3.0	4.7	3.0	3.0
64	SPRNGF	IL	*	4.2	1.0	3.0	4.3	1.0	3.0	4.4	1.0	3.0	4.4	1.0	3.0
65	CDRRAP	IA		4.3	3.0	3.0	4.3	3.0	3.0	4.3	3.0	3.0	4.4	3.0	3.0
66	DMOINE	IA		4.3	3.0	3.0	4.4	3.0	3.0	4.4	3.0	3.0	4.4	3.0	3.0
67	WICHTA	KS	*	4.5	3.0	4.0	4.3	3.0	4.0	4.3	3.0	4.0	4.3	3.0	4.0
68	JKSNVL	FL		4.3	2.0	2.0	4.4	2.0	2.0	4.5	2.0	2.0	4.5	2.0	2.0
69	PADUCA	KY	*	4.2	3.0	4.0	4.3	3.0	4.0	4.3	3.0	4.0	4.3	3.0	4.0
70	ROANOK	VA		4.3	3.0	3.0	4.4	3.0	3.0	4.4	3.0	3.0	4.5	3.0	3.0
71	KNOXVL	TN		4.4	2.0	2.0	4.4	2.0	2.0	4.5	2.0	2.0	4.5	2.0	2.0
72	FRESNO	CA	*	4.2	0.0	4.2	4.2	0.0	4.2	4.2	0.0	4.2	4.2	0.0	4.2
73	RALEIG	NC		4.3	2.0	2.0	4.4	2.0	2.0	4.5	2.0	2.0	4.5	2.0	2.0
74	JOHNST	PA	*	4.2	2.0	4.0	4.3	2.0	4.0	4.3	2.0	4.0	4.4	2.0	4.0
75	PORTLN	ME	*	4.2	3.0	4.0	4.2	3.0	4.0	4.2	3.0	4.0	4.2	3.0	4.0
76	SPOKAN	WA		4.2	3.0	3.0	4.2	3.0	3.0	4.2	3.0	3.0	4.2	3.0	3.0
77	JACKSN	MS	*	4.1	2.0	4.1	4.2	2.0	4.2	4.2	2.0	4.2	4.2	2.0	4.2
78	CHATTN	TN	*	4.2	3.0	4.0	4.3	3.0	4.0	4.3	3.0	4.0	4.4	3.0	4.0
79	YGSTN	OH		4.1	0.0	0.0	4.1	0.0	0.0	4.2	0.0	0.0	4.2	0.0	0.0
80	SBEND	IN	*	4.1	0.0	2.0	4.1	0.0	2.0	4.1	0.0	2.0	4.1	0.0	2.0
81	ALBUQ	NM	*	4.1	3.0	4.1	4.2	3.0	4.2	4.2	3.0	4.2	4.2	3.0	4.2
82	FTWAYN	IN		4.1	0.0	0.0	4.1	0.0	0.0	4.1	0.0	0.0	4.2	0.0	0.0
83	PEORIA	IL		4.1	0.0	0.0	4.1	0.0	0.0	4.1	0.0	0.0	4.2	0.0	0.0
84	GRNVLE	NC		4.2	3.0	3.0	4.2	3.0	3.0	4.2	3.0	3.0	4.3	3.0	3.0
85	SIOUXF	SD	*	4.1	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1
86	EVANSV	IN	*	4.1	1.0	3.0	4.1	1.0	3.0	4.2	1.0	3.0	4.2	1.0	3.0
87	BATONR	LA		4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0
88	BEAUMT	TX		3.9	3.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0
89	DULUTH	MN		4.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.9	3.0	3.0
90	WHLING	WV		4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0
91	LINCLN	NE		4.1	3.0	3.0	4.2	3.0	3.0	4.2	3.0	3.0	4.2	3.0	3.0
92	LANSNG	MI		4.0	2.0	2.0	4.1	2.0	2.0	4.1	2.0	2.0	4.2	2.0	2.0
93	MADISN	WI		4.0	1.0	1.0	4.0	1.0	1.0	4.1	1.0	1.0	4.1	1.0	1.0
94	COLUMB	GA		4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0	4.0	2.0	2.0
95	AMARIL	TX		4.0	3.0	3.0	3.9	3.0	3.0	3.9	3.0	3.0	3.9	3.0	3.0
96	HUNTSV	AL		4.0	0.0	0.0	4.1	0.0	0.0	4.1	0.0	0.0	4.2	0.0	0.0
97	ROCKFD	IL		4.0	1.0	1.0	4.0	1.0	1.0	4.0	1.0	1.0	4.0	1.0	1.0
98	FARGO	ND		4.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0
99	MONROE	LA	*	4.0	2.0	3.0	4.0	2.0	3.0	4.0	2.0	3.0	4.0	2.0	3.0
100	COLUMB	SC	*	4.0	1.0	2.0	4.0	1.0	2.0	4.1	1.0	2.0	4.1	1.0	2.0

and we project 5.4 as the number it could support with unlimited VHF allocations.

We use the number of VHF stations from Table 10, column 3, and our constrained equation to project UHF stations in Table 11. Column 1 is the number of UHF stations calculated directly from the constrained equation. To get column 2 from column 1, we apply the constant adjustment factor from Table 4.* Column 3 is the difference between these projections and the base case projections using the constrained equation in Table 4. That is, column 3 shows what difference VHF drop-ins make in the number of viable UHF stations.

Table 12 shows the summary of projected stations with VHF drop-ins. The minus figures show the reductions below the base case in Tables 2 and 4. The plus figures are drop-ins projected to be viable. Three features are particularly notable. First, our projections indicate that a maximum of 57 VHF drop-in stations would be viable out of a total of 76 proposed by OTP for the markets on our list of the top 100.** Second, the inclusion of as many as 83 VHF drop-ins would reduce the number of UHF stations largely as a consequence of UHF stations converting over to the new VHF assignments. Third, even with this reduction of UHF stations, there would continue to be some growth in UHF, partly as a consequence of many markets lying outside of those affected by drop-ins. Thus, with the inclusion of the flat total of 27 "excluded" stations, the projected number of UHF stations in 1990 would run to 168 using the basic quadratic equation or 174 using the constrained equation, in comparison with the 124 in the 1974 base cases shown in Table 5.***

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*Except for cases like Seattle, where we project unused VHF allocations. In those cases, we apply no adjustment factor, leaving projected UHF stations equal to zero.

**This estimate of 57 stations is an upper bound, since some VHF drop-ins would probably be limited to a smaller geographical coverage than that of "regular" VHF stations in our data base. This restriction in coverage may be required to reduce problems of interference with other stations.

***The reader should bear in mind that the projections in this section maintain all of the base case assumptions (listed on p. 22) except no. 5 relating to VHF allocations. It is also of interest to change several assumptions at a time. We report three such "combination" cases in Section VIII, and others are easy to calculate using our computer model.

Table 11

VIABLE UHF STATIONS WITH DROP-INS,
CONSTRAINED EQUATION

	MARKET			1974 PROJ (1)	1974 PROJ (2)	1974 PROJ (3)	1980 PROJ (1)	1980 PROJ (2)	1980 PROJ (3)	1985 PROJ (1)	1985 PROJ (2)	1985 PROJ (3)	1990 PROJ (1)	1990 PROJ (2)	1990 PROJ (3)
1	NY	NY		2.4	2.0	0.0	10.5	10.1	0.0	11.0	10.6	0.0	11.5	11.1	0.0
2	LA	CA		2.3	6.0	0.0	4.5	8.2	0.0	4.8	8.5	0.0	5.2	8.9	0.0
3	CHCAGO	IL	*	3.1	2.4	-0.6	4.5	3.8	-0.8	4.7	4.0	-0.8	4.8	4.2	-0.8
4	PHIL	PA		3.6	3.0	0.0	4.9	4.2	0.0	5.0	4.3	0.0	5.1	4.4	0.0
5	DTROIT	MI		1.9	2.0	0.0	2.8	2.9	0.0	2.9	3.0	0.0	3.0	3.1	0.0
6	BOSTON	MA		2.1	2.0	0.0	3.8	3.6	0.0	3.9	3.7	0.0	4.0	3.9	0.0
7	SF	CA		0.9	2.6	-0.4	2.2	3.8	-0.8	2.4	4.0	-0.8	2.6	4.3	-0.8
8	CLVLND	OH	*	1.6	1.4	-0.6	2.2	2.0	-0.8	2.2	2.1	-0.8	2.3	2.1	-0.8
9	WASH	DC		1.4	1.0	0.0	2.4	2.0	0.0	2.8	2.3	0.0	3.2	2.7	0.0
10	PITT	PA	*	0.6	-0.3	-0.3	1.7	0.8	-0.8	1.6	0.8	-0.7	1.6	0.8	-0.7
11	STLOUS	MO		0.7	1.0	0.0	1.5	1.8	0.0	1.5	1.8	0.0	1.5	1.8	0.0
12	DALLAS	TX	*	0.0	0.0	-1.0	0.3	0.3	-1.6	0.4	0.4	-1.5	0.6	0.6	-1.5
13	MINN	MN		0.1	0.0	0.0	1.4	1.3	0.0	1.5	1.4	0.0	1.6	1.5	0.0
14	BALT	MD		1.2	1.0	0.0	1.9	1.6	0.0	1.9	1.8	0.0	2.0	1.8	0.0
15	HOUSTN	TX	*	1.0	1.4	-0.6	1.5	1.9	-0.8	1.7	2.1	-0.8	1.8	2.2	-0.8
16	INDPLS	IN	*	0.1	0.6	-0.4	0.4	1.0	-0.8	0.5	1.0	-0.8	0.6	1.1	-0.8
17	CINCI	OH		1.1	1.0	0.0	1.7	1.7	0.0	1.8	1.7	[illegible]	1.8	1.7	0.0
18	ATLANT	GA	*	0.7	1.5	-0.5	1.4	2.2	-0.8	1.5	2.4	-0.8	1.7	2.6	-0.8
19	HARTFD	CN		1.8	2.0	0.0	2.6	2.7	0.0	2.6	2.8	0.0	2.6	2.8	0.0
20	SEATLE	WA	*	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	-0.3	0.0	0.0	-0.4
21	MIAMI	FL		0.0	0.0	-1.0	0.1	0.5	-1.6	0.4	0.7	-1.6	0.7	1.1	-1.6
22	KANCTY	MO	*	0.0	0.1	-0.9	0.2	0.2	-1.6	0.2	0.3	-1.6	0.3	0.3	-1.5
23	MILWAU	WI	*	0.6	0.4	-0.6	0.9	0.6	-0.8	0.9	0.6	-0.8	0.9	0.6	-0.8
25	SACRA	CA		0.9	1.0	0.0	1.6	1.7	0.0	1.6	1.8	0.0	1.7	1.8	0.0
26	MEMPH	TN	*	0.1	-0.1	-0.1	0.7	0.6	-0.8	0.7	0.6	-0.8	0.8	0.6	-0.8
27	COLUMB	OH		0.8	0.0	0.0	1.6	0.8	0.0	1.6	0.8	0.0	1.7	0.9	0.0
28	TAMPA	FL		1.2	1.0	0.0	2.3	2.1	0.0	2.5	2.2	0.0	2.7	2.4	0.0
29	PORTLN	OR	*	0.0	-0.2	-0.2	0.1	-0.1	-0.6	0.2	-0.1	-0.8	0.3	0.0	-0.8
30	NASHVL	TN	*	0.0	-0.0	-0.0	0.8	0.7	-0.6	0.9	0.8	-0.8	1.0	0.9	-0.8
31	NEWORL	LA		0.9	1.0	0.0	1.4	1.4	0.0	1.4	1.5	0.0	1.4	1.5	0.0
32	DENVER	CO	*	0.0	0.0	0.0	0.2	-0.0	-0.8	0.3	0.0	-0.8	0.4	0.1	-0.8
33	PROVID	RI		0.9	0.8	0.0	1.7	0.8	0.0	1.7	0.8	0.0	1.8	0.8	0.0
34	ALBANY	NY	*	0.2	-0.3	-0.3	0.5	-0.0	-0.8	0.5	0.0	-0.8	0.5	0.0	-0.7
35	SYRACU	NY		0.6	0.0	0.0	1.1	0.5	0.0	1.1	0.5	0.0	1.1	0.5	0.0
36	CHARLS	WV	*	0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	-0.9	0.0	0.0	-0.8
37	GRNDRP	MI	*	0.2	-0.3	-0.3	0.5	0.1	-0.8	0.5	0.1	-0.8	0.5	0.1	-0.7
38	LOUSVL	KY	*	0.4	0.8	-1.2	0.6	1.1	-1.6	0.7	1.2	-1.6	0.8	1.2	-1.6
39	OKCITY	OK		0.3	0.0	0.0	1.4	1.1	0.0	1.4	1.1	0.0	1.5	1.2	0.0
40	BIRM	AL	*	0.7	0.5	-0.5	1.3	1.1	-0.8	1.3	1.1	-0.8	1.3	1.1	-0.8
41	DAYTON	OH	*	0.9	0.5	-0.5	1.3	0.9	-0.8	1.3	0.9	-0.8	1.4	1.0	-0.8
42	CHARLT	NC		1.3	2.0	0.0	2.3	3.0	0.0	2.3	3.0	0.0	2.4	3.0	0.0
43	PHOENX	AZ	*	0.0	0.0	-1.0	0.0	0.7	-0.8	0.2	0.8	-0.8	0.3	1.0	-0.8
44	NORFLK	VA	*	0.2	0.5	-0.5	0.4	0.7	-0.8	0.4	0.7	-0.8	0.4	0.7	-0.8
45	SANANT	TX		0.5	1.0	0.0	1.2	1.6	0.0	1.2	1.6	0.0	1.2	1.6	0.0
46	GRNVLE	SC	*	0.1	0.9	-0.1	0.6	1.5	-0.8	0.7	1.5	-0.8	0.8	1.6	-0.8
47	GRNBRO	NC		0.2	0.0	0.0	1.3	1.1	0.0	1.4	1.1	0.0	1.4	1.2	0.0
48	SALTLK	UT		0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	-1.0	0.0	0.0	-1.1
49	WLKSBR	PA		3.0	3.0	0.0	3.4	3.4	0.0	3.4	3.4	0.0	3.4	3.4	0.0
50	LITLRK	AR	*	0.0	0.0	0.0	0.0	0.0	-1.1	0.0	0.0	-1.1	0.0	0.0	-1.1

* Indicates market with one or more VHF drop-in stations.

Column (1): Raw projection.

Column (2): Adjusted projection.

Column (3): Difference from base case projection.

Table 11 (contd.)

	MARKET			1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH		1.3	1.0	0.0	1.9	1.6	0.0	1.9	1.6	0.0	1.9	1.6	0.0
53	OMAHA	NE		0.3	0.0	0.0	1.1	0.8	0.0	1.1	0.8	0.0	1.1	0.8	0.0
54	TULSA	OK		0.2	0.0	0.0	1.2	1.0	0.0	1.2	1.0	0.0	1.2	1.0	0.0
55	ORLAN	FL		0.5	0.0	0.0	1.3	0.8	0.0	1.4	0.9	0.0	1.5	1.0	0.0
56	ROCHES	NY		0.6	0.0	0.0	1.2	0.5	0.0	1.2	0.6	0.0	1.3	0.6	0.0
57	HARISB	PA		2.2	2.0	0.0	2.6	2.5	0.0	2.6	2.5	0.0	2.6	2.5	0.0
58	SHRVPT	LA	*	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	0.0	-1.0	0.0	0.0	-1.0
59	MOBILE	AL	*	0.0	-0.0	-0.0	0.3	0.2	-0.8	0.3	0.2	-0.8	0.3	0.3	-0.8
60	DAVENP	IA	*	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	-0.5	0.0	0.0	-0.5
61	FLINT	MI		1.4	1.0	0.0	1.9	1.5	0.0	1.9	1.5	0.0	1.9	1.5	0.0
62	GRNBAY	WI		0.4	0.0	0.0	1.0	0.7	0.0	1.0	0.7	0.0	1.0	0.7	0.0
63	RICHMN	VA		0.3	0.0	0.0	1.2	0.9	0.0	1.2	0.9	0.0	1.3	0.9	0.0
64	SPRNGF	IL	*	0.8	0.6	-1.4	1.0	0.8	-1.5	1.0	0.8	-1.5	1.0	0.8	-1.5
65	CDRRAP	IA		0.3	0.0	0.0	1.0	0.7	0.0	1.0	0.7	0.0	1.0	0.7	0.0
66	DMOINE	IA		0.2	0.0	0.0	1.1	0.9	0.0	1.1	0.9	0.0	1.1	0.9	0.0
67	WICHTA	KS	*	0.0	-0.1	-0.1	0.3	0.2	-0.7	0.2	0.2	-0.7	0.2	0.2	-0.7
68	JKSNVL	FL		1.2	1.0	0.0	1.8	1.6	0.0	1.8	1.7	0.0	1.9	1.7	0.0
69	PADUCA	KY	*	0.0	1.0	-0.0	0.2	1.2	-0.8	0.2	1.2	-0.8	0.3	1.2	-0.8
70	ROANOK	VA		0.2	0.0	0.0	1.1	0.9	0.0	1.1	0.9	0.0	1.2	0.9	0.0
71	KNOXVL	TN		0.7	1.0	0.0	1.9	2.2	0.0	1.9	2.2	0.0	1.9	2.2	0.0
72	FRESNO	CA	*	0.0	0.0	-5.0	0.0	0.0	-5.0	0.0	0.0	-4.9	0.0	0.0	-4.8
73	RALEIG	NC		0.8	1.0	0.0	1.9	2.1	0.0	1.9	2.1	0.0	1.9	2.1	0.0
74	JOHNSC	PA	*	0.0	0.6	-0.4	0.2	0.8	-1.5	0.2	0.8	-1.5	0.3	0.8	-1.4
75	PORTLN	ME	*	0.0	-0.2	-0.2	0.1	-0.1	-0.7	0.2	-0.1	-0.7	0.2	-0.1	-0.7
76	SPOKAN	WA		0.1	0.0	0.0	0.9	0.8	0.0	0.9	0.8	0.0	0.9	0.8	0.0
77	JACKSN	MS	*	0.0	0.0	-1.0	0.0	0.0	-2.1	0.0	0.0	-2.1	0.0	0.0	-2.1
78	CHATTN	TN	*	0.0	0.8	-0.2	0.2	1.0	-0.8	0.3	1.0	-0.8	0.3	1.0	-0.8
79	YGSTN	OH		2.9	3.0	0.0	3.3	3.4	0.0	3.3	3.4	0.0	3.2	3.3	0.0
80	SBEND	IN	*	1.4	1.7	-1.3	1.7	1.9	-1.6	1.7	1.9	-1.6	1.6	1.9	-1.5
81	ALBUQ	NM	*	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.0	-0.7	0.0	0.0	-0.7
82	FTWAYN	IN		2.8	3.0	0.0	3.3	3.4	0.0	3.2	3.4	0.0	3.2	3.4	0.0
83	PEORIA	IL		2.5	3.0	0.0	3.2	3.7	0.0	3.1	3.6	0.0	3.1	3.6	0.0
84	GRNVLE	NC		0.0	0.0	0.0	1.0	0.9	0.0	1.0	1.0	0.0	1.0	1.0	0.0
85	SIOUXF	SD	*	-0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	-0.9	0.0	0.0	-0.9
86	EVANSV	IN	*	0.7	0.7	-1.3	0.9	0.9	-1.6	0.9	0.9	-1.6	0.9	0.9	-1.5
87	BATONR	LA		1.1	1.0	0.0	1.6	1.5	0.0	1.6	1.5	0.0	1.6	1.5	0.0
88	BEAUMT	TX		0.2	0.0	0.0	0.7	0.6	0.0	0.8	0.6	0.0	0.8	0.6	0.0
89	DULUTH	MN		0.2	0.0	0.0	0.7	0.5	0.0	0.7	0.5	0.0	0.7	0.5	0.0
90	WHLING	WV		0.5	0.0	0.0	1.5	1.0	0.0	1.5	1.0	0.0	1.5	1.0	0.0
91	LINCLN	NE		0.1	0.0	0.0	0.9	0.8	0.0	0.9	0.8	0.0	0.9	0.8	0.0
92	LANSNG	MI		0.9	0.0	0.0	1.6	0.8	0.0	1.7	0.8	0.0	1.7	0.8	0.0
93	MADISN	WI		2.2	2.0	0.0	2.4	2.2	0.0	2.4	2.2	0.0	2.4	2.2	0.0
94	COLUMB	GA		0.8	1.0	0.0	1.5	1.7	0.0	1.5	1.7	0.0	1.5	1.7	0.0
95	AMARIL	TX		0.1	0.0	0.0	0.6	0.5	0.0	0.6	0.5	0.0	0.6	0.4	0.0
96	HUNTSV	AL		2.6	3.0	0.0	3.0	3.4	0.0	3.0	3.4	0.0	3.0	3.4	0.0
97	ROCKFD	IL		2.2	2.0	0.0	2.3	2.1	0.0	2.3	2.1	0.0	2.3	2.1	0.0
98	FARGO	ND		-0.1	0.0	0.0	0.8	0.9	0.0	0.7	0.9	0.0	0.7	0.8	0.0
99	MONROE	LA	*	-0.2	0.2	0.2	0.8	1.1	-0.8	0.8	1.1	-0.8	0.7	1.1	-0.7
100	COLUMB	SC	*	1.1	1.5	-0.5	1.6	2.0	-0.8	1.6	2.0	-0.8	1.6	2.0	-0.8

Table 12

SUMMARY OF PROJECTED UHF STATIONS WITH VHF DROP-INS

Projection	1974		1980		1985		1990	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Narrow count, Table 9	77		124		133		141	
Excluded stations, flat	27		27		27		27	
Total	104	-20	151	-25	160	-25	168	-26
Excluded stations, proportional	-6		8		10		12	
Total	98	-26	159	-31	170	-32	180	-33
VHF stations, Table 10	322	+57	323	+58	324	+59	324	+59
Narrow count, Table 11	74		139		143		147	
Excluded stations, flat	27		27		27		27	
Total	101	-23	166	-46	170	-46	174	-45
Excluded stations, proportional	-6		12		13		14	
Total	95	-29	178	-58	183	-57	188	-57

Column (1): Projected stations.
Column (2): Difference from base-case totals.

VI. EFFECTS OF COMPETITION FROM NEW SERVICES AND TECHNOLOGIES

So far we have examined the effects of growth of conventional cable television and the possibility of VHF drop-ins on the future growth of UHF broadcasting. Another question, of course, relates to the extent through which new technologies and services may also affect the future of UHF. The most immediate possibilities are

1. The growth of pay television both by cable and by conventional broadcasting stations through scrambled signals
2. The continued development of videodisc and videocassette technology
3. The further development and commercialization of fiber optics, and
4. The use of direct broadcast space satellites.

PAY TELEVISION

Probably the most important development in television in recent years is the emergence of pay television through the use of cable channels. In nearly all cases special programming is offered over a special channel. In addition to the basic monthly cable subscription fee, the subscriber pays an amount for which he receives a series of programs otherwise unavailable on television. (The system of per-channel charge stands in contrast to payment on a strictly program-by-program basis, which, because of technical difficulties encountered thus far, is offered on very few cable systems.) To this time, the basic content of pay television has consisted almost entirely of movies newer than those shown on conventional television and sports that otherwise would not be available.

We have been witnessing a rapid growth in pay television using cable channels. For example, the cable industry now has about 200,000 pay subscribers, about double the number estimated a year or so ago.

TelePrompTer, the nation's largest cable operator, has over 33,000 pay cable subscribers, who reportedly will contribute about $3 million in revenues in 1975. In four TelePrompTer systems where pay television has recently been offered, 42 percent of the cable subscribers took the new service.*

In addition, plans have recently been announced to use satellites and terrestrial microwave to link cable systems together for lower cost use of pay television channels. Home Box Office, one of the leading firms in offering pay television packages to cable operators, announced in April 1975 that it had contracted with RCA to buy $7.5 million worth of satellite transponder time over five years. A spokesman for Home Box Office foresees as many as one million pay cable subscribers within five years. UA-Columbia Cablevision plans to join in the Home Box Office network with [illegible]5,000 of its subscribers from Florida through the Midwest. American Television Corporation has also announced plans to build earth stations to feed Home Box Office programs to nine of its systems with a potential of 250,000 subscribers. TelePrompTer has announced an agreement with Home Box Office in plans that would offer pay TV service to as many as 170,000 TelePrompTer subscribers. At this writing Home Box Office has about 115,000 customers, so that these new hookups may enable its pay TV network to offer service to as many as a million customers when the Home Box Office and earth stations are in place by the end of 1976.** Optical Systems, another pay television service, plans to begin operation of a microwave network in the West Texas area, in addition to its networks already operating in the Northern and Southern California markets.***

The overall effect of these pay television networks will be to reduce the cost of the service by providing live interconnection as a

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*_Television Digest_, May 19, 1975, p. 5.

**_Television Digest_, April 21, 1975, p. 2; _The Videocassette and CATV Newsletter_, May 1975, p. 16.

***Ibid., p. 10.

substitute for the bicycling of videotapes and film. With programming being fed from a central location, cable system operators will not need to make major outlays for origination equipment, enabling even small cable operators to offer pay service.

Some forecasts have been made of the growth of pay television, although at this point data are still too sparse to permit projections with much confidence. Were pay television a service that had operated for many years, as, for example, VHF broadcasting stations are, then its presence could be quantified and included in our equations along with the other variables drawn from the cross-section of 197 markets in 1974. But lacking this body of experience, we have no good way to project the path of pay television over the next fifteen years. A recent study conducted by Cox Broadcasting estimates that by 1980 4.8 percent of U.S. homes will subscribe to pay cable, and that 10 percent will subscribe by 1985.* Stanford Research Institute is preparing a study on the future growth of pay television for the Office of Telecommunications Policy, but the report has not yet been released.

In contrast to the rapid growth of pay television via cable, the use of scrambled signals transmitted by broadcasting stations and descrambled at the home television set with a special terminal has had rough sledding. Technical problems and high costs have continued to plague attempts to provide pay television over the air. Several plans have been announced to use UHF stations for pay service in a few major markets, such as Chicago and Los Angeles; but at this writing there is not yet a single over-the-air broadcasting station transmitting special pay programming.

With respect to the impact of pay television on the broadcasting industry, two effects should be considered: (a) the effect on audience and (b) the effect on programming availability and programming costs.

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*This study used the Delphi approach encompassing a series of questionnaires to five groups, supervised by James Landon (*Television Digest*, February 24, 1975, p. 4).

With respect to the first, a major concern of the broadcasting industry has been that those who watch pay television will do so at the expense of watching conventional television (under the assumption that the total viewing time of the individual will not rise as a consequence of new offerings), so that the audience for conventional television will fall. The analysis in Appendix B below indicates that not much new audience will be attracted to more of the same kind of programming. That is, the assumption is probably correct that total viewing will not rise if the kinds of new offerings run much along the lines of what is already available. Thus, the increase in offerings of newer movies where there is already a rich fare of older movies will probably not increase total viewing time. If so, the concern that pay television will take away audience for this kind of fare is well founded.

However, another recent Rand report, dealing with viewing patterns during the Watergate hearings, suggests that sufficiently dissimilar programming *will* attract new audience as well as siphoning off some of the existing audience.* Thus, if pay television offers substantially new kinds of programming, going beyond simply offering newer movies than otherwise would be shown, then perhaps total audience will rise. But at best this would occur only when the pay television industry becomes a major factor in the programming market so that new kinds of programming, perhaps in the educational and cultural fields, emerge to increase total viewing time.**

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*Stanley Besen and Bridger Mitchell, *Watergate and Television: An Economic Analysis*, The Rand Corporation, R-1712-MF, May 1975.

**On the basis of experience to date, new motion pictures will be the basic item for the foreseeable future with educational and cultural items playing a minor role. However, motion pictures currently produced for most theatrical exhibitions are generally superior to the average movie shown on television. This, combined with the absence of commercials, may well warrant their classification as "new" programming, attracting an audience substantially different from the 60-65 percent that receives prime-time television. The exact mix of audience diversion from television and the growth of "new" audience is, of course, uncertain. Shedding light on these questions, a recent study of future demand for pay television by various classes of programming has been completed under contract with the Office of Telecommunications Policy by R. R. Panko et al., *Analysis of Consumer Demand for Pay Television*, Stanford Research Institute, May 1975.

With respect to the second point above--the impact on television programming--concern has been widely expressed that pay television entrepreneurs will bid away programs from broadcasters dependent upon commercial advertising. The FCC, keenly aware of this potential problem, has established a set of rules designed to prevent the siphoning of programs from conventional television by restricting the nature of programs (for example, relatively new movies not typically shown on conventional television) that can be made available to pay television.

Moreover, there is one counter force at work: if pay television develops and provides an important source of funding for programming, then perhaps, in the longer term, programs produced for pay television may eventually be shown on conventional television (on a delayed basis) to increase rather than decrease the total amount of programming available to conventional television. In other words, in the same way that the existence of movie theaters, competing with conventional television, provides a funding source for programs (new movies) that might not otherwise be produced, they provide a source of programming (these same movies with a time delay) to conventional television. With this factor operating more powerfully as pay television grows, and with the continued operation of the FCC antisiphoning rules that prevent or at least reduce direct competition for programs between pay television and conventional broadcast, we shall assume in this section that the effect of pay television on programming sources and volume will remain on balance neutral. Its main detrimental effect on conventional broadcasting, if any, will arise from siphoning off audience.

Finally, if pay television through use of broadcasting stations ever does become significant, it could stimulate the growth of UHF broadcasting, since UHF stations are the ones most likely to be used for pay operation. In this case, some existing UHF stations might switch a portion of programming to pay television, and perhaps new stations would emerge. But there have been too many setbacks in the over-the-air pay television field to predict with confidence that this factor will ever be an important consideration in the future demand for radio spectrum.

VIDEODISC TECHNOLOGY

Videodisc technology has been under development for years. After a number of delays, two systems appear to be close to entering the market. RCA has developed one using a "capacitance" pickup; optical playback seems to be the closest competitor. According to one source, the price of this player is expected to be around $400--a fairly high price for the home, but one low enough to offer possibilities of institutional use. The second system is one developed by MCA-Phillips, a unit using optical playback and involving a price of about $500.

Although videocassette players have an advantage over videodisc of being able to record, they suffer the disadvantage of higher cost. For example, RCA has also developed its Selectavision Magna Tape Player-Recorder, but its cost is likely to run $800 to $1,000.* As another example, the SONY Corporation has announced that it will begin marketing a 1/2-inch videocassette system for the home. The unit reportedly will be priced in Japan at $788, in comparison with a price of $1,297 for SONY's standard 3/4-inch hardware and in contrast to the substantially lower prices of the videodisc units noted above.**

Of course, it is impossible to predict at this point how far videodisc and cassette technology will develop over the next 15 years in terms of quality, reliability, and cost. In any event, whatever effect it has on over-the-air broadcasting will, as in the case of pay television, likely take the form of siphoning audience away from conventional over-the-air broadcasts; that is, unless video disc services provide quite different programming from that available over-the-air

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*_The Videocassette and CATV Newsletter_, April 1975, pp. 1-5.

**Ibid., p. 6.

(and therefore increase total viewing time as described above) then growth of videodisc audiences would be at the expense of both conventional over-the-air broadcast and cable.*

FIBER OPTICS

The use of glass fiber as a communications channel has excited the imagination of many because it offers a tremendous capacity, going far beyond that available even over cable television. If remaining technological difficulties can be resolved, fiber optics might find their first use in the trunking of circuits by telephone companies on high-density routes and perhaps as a substitute for conventional cable television into homes. The last-named application is of interest here. If development of fiber optics reaches the point of application in the television field, we would visualize it as providing a means of simply reducing the costs of cable television to the home--that is, a straightforward substitution of fiber optics for copper that might both increase capacity and reduce costs of installing and operating cable plant. Thus, its main effect would be to increase the penetration of cable along the lines of the assumptions we have made about high levels of cable penetration in Section IV above. Thus, *by itself*, fiber optics would take away neither programming nor audience from conventional broadcasting. But by serving as a lower-cost substitute for conventional cable television construction, it might widen the market for cable and in that manner serve to siphon additional audience from over-the-air broadcast.**

BROADCAST SATELLITES

Finally, a question arises about the prospects of broadcast satellites that would transmit signals directly to the home as a substitute for broadcasting from conventional broadcast stations. Although an analysis of broadcast satellite technology and its prospects lies

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*Videodisc services face the problem of programming. Some observers question whether motion picture discs will sell in sufficient quantity as prices contemplated, since the number of times a motion picture can be enjoyably viewed is limited. Perhaps rental libraries will play an important role, although this prospect is hard to assess today.

**A recent technical discussion of fiber optics is contained in beyond the scope of this study, we must say that despite all the excitement that has been generated by satellite technology in the past, the future of direct satellite broadcasting to the home does not appear bright. In all cases of satellite plans we have seen, an additional cost would be imposed for the ground installation of a rooftop antenna and converter to provide access directly into the television set. This antenna and converter equipment would probably cost several hundred dollars. Were this level of expenditure the *only* way that the home viewer could obtain television, then direct satellite broadcasting might be viable within the foreseeable future. But with the existing well developed broadcasting system in the U.S., it is difficult to imagine the typical home viewer paying for a special rooftop antenna and other equipment just to receive one or a few additional channels. And of course, in addition to expenditures for home equipment, the cost of developing, manufacturing, launching, and operating direct broadcast satellites would in one way or another have to be covered.

As satellite technology advances, we would expect satellites to become progressively more attractive to link relatively small stations for both cable and broadcast station networks, and directly to serve institutions such as hospitals and schools with special rooftop antenna installations. But these applications are quite different from satellite-to-home *direct* broadcasting.

THE RANGE OF OUR PROJECTIONS

Since we assume that any effect of the preceding technologies and services on over-the-air broadcasting is through siphoning of audience and since it is so difficult, indeed, impossible to determine how these technological advances and services will develop in the future, we shall make three projections based on alternative assumptions about the extent

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"Optic Fiber Communications Systems," *Conference Record*, Volume II, International Conference on Communication, San Francisco, June 16-18, 1975. Recent popular accounts of fiber optic developments are contained in *Access* magazine, March 24 and April 21, 1975.

of audience siphoning--10 percent, 20 percent, and 30 percent.*

Our results are shown in Tables 13 through 16. In Table 13, for example, we show the effect of a 10 percent audience loss compared to the base case shown in Table 2. To consider one example, in the New York market for 1990, we project 5.6 stations in Table 13, column 1, and adjust it downward to 4.2 by the 1.4 "constant adjustment factor" described previously for the New York market. The base-case projection of 4.6 for New York in Table 2 is subtracted from the projection of 4.2 to obtain the -0.4 stations shown in column 3 of Table 13. Similarly, Table 14 shows the results of a 20 percent loss of audience, and Table 15 the results of a 30 percent loss of audience.

Running down the list of figures for individual markets in column 3 of Table 15, we find that even with the severest audience losses, here 30 percent, the impact in individual markets is typically small, running on the order of -0.2 stations. The impact is heaviest in places such as New York, Los Angeles, Fresno, and Fort Wayne, which already contain two or more UHF stations.

The summary Table 16 shows the net differences from the base-case analysis of Table 2. As expected, with increasing audience siphoning shown in Tables 13-15, the impact on UHF development becomes increasingly more severe. If we include here the "excluded" stations at the flat 27 used in other summary tables, we find that in 1990 9 fewer stations are projected with a 10 percent audience siphoning; 18 fewer stations with 20 percent audience siphoning; and 27 fewer stations with 30 percent siphoning. But the pattern here is much as shown in other summary tables: despite the possible impact of new services on UHF, including even the relatively severe case of 30 percent audience

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*We do this by reducing by 10, 20 or 30 percent the number of television households (TVH) used in making the projections. That is, we treat the assumed reduction in *actual* audience as equivalent to the same proportional reduction in *potential* audience. An alternative approach would be to treat new services as the equivalent of new broadcast competition in the market, and make the projections by assuming some increase in the number of VHF stations. This, and other variations on the assumptions we have chosen, can be easily used to generate alternative projections using our computer model.

Table 13

TEN-PERCENT LOSS OF AUDIENCE TO NEW VIDEO SERVICES

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	3.2	1.8	-0.2	5.0	3.6	-0.4	5.3	3.9	-0.4	5.6	4.2	-0.4
2	LA	CA	4.3	5.6	-0.4	5.9	7.2	-0.6	6.3	7.6	-0.6	6.8	8.0	-0.6
3	CHCAGO	IL	1.6	2.9	-0.1	2.0	3.4	-0.1	2.1	3.5	-0.1	2.2	3.6	-0.1
4	PHIL	PA	1.7	2.9	-0.1	2.1	3.3	-0.1	2.2	3.4	-0.1	2.3	3.5	-0.1
5	DTROIT	MI	1.1	1.9	-0.1	1.4	2.3	-0.1	1.5	2.4	-0.1	1.6	2.5	-0.1
6	BOSTON	MA	1.3	1.9	-0.1	1.9	2.5	-0.1	2.0	2.6	-0.1	2.1	2.7	-0.1
7	SF	CA	0.9	2.9	-0.1	1.5	3.5	-0.1	1.5	3.5	-0.1	1.6	3.6	-0.1
8	CLVLND	OH	1.2	1.9	-0.1	1.6	2.3	-0.1	1.7	2.4	-0.1	1.8	2.5	-0.1
9	WASH	DC	0.9	0.9	-0.1	1.3	1.3	-0.1	1.4	1.4	-0.1	1.4	1.5	-0.1
10	PITT	PA	0.8	-0.1	-0.1	1.4	0.6	-0.1	1.5	0.7	-0.1	1.5	0.7	-0.1
11	STLOUS	MO	0.6	0.9	-0.1	1.1	1.4	-0.1	1.1	1.5	-0.1	1.2	1.6	-0.1
12	DALLAS	TX	0.7	0.9	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1	1.3	1.6	-0.1
13	MINN	MN	0.3	-0.0	-0.0	1.1	0.7	-0.1	1.1	0.8	-0.1	1.2	0.8	-0.1
14	BALT	MD	0.8	0.9	-0.1	1.2	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
15	HOUSTN	TX	1.1	1.9	-0.1	1.4	2.3	-0.1	1.5	2.4	-0.1	1.6	2.4	-0.1
16	INDPLS	IN	0.5	0.9	-0.1	0.9	1.4	-0.1	1.0	1.5	-0.1	1.1	1.5	-0.1
17	CINCI	OH	0.8	0.9	-0.1	1.2	1.3	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
18	ATLANT	GA	0.9	1.9	-0.1	1.4	2.4	-0.1	1.5	2.5	-0.1	1.6	2.6	-0.1
19	HARTFD	CN	1.4	1.9	-0.1	1.8	2.4	-0.1	1.9	2.5	-0.1	2.0	2.6	-0.1
20	SEATLE	WA	0.2	-0.1	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1	0.9	0.7	-0.1
21	MIAMI	FL	0.6	0.9	-0.1	1.1	1.4	-0.1	1.1	1.5	-0.1	1.2	1.5	-0.1
22	KANCTY	MO	0.7	1.0	-0.0	1.1	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
23	MILWAU	WI	0.9	0.9	-0.1	1.2	1.3	-0.1	1.3	1.3	-0.1	1.3	1.4	-0.1
25	SACRA	CA	0.7	1.0	-0.0	1.1	1.4	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1
26	MEMPH	TN	0.3	-0.0	-0.0	1.0	0.7	-0.1	1.1	0.7	-0.1	1.2	0.8	-0.1
27	COLUMB	OH	0.6	-0.0	-0.0	1.0	0.4	-0.1	1.0	0.4	-0.1	1.1	0.5	-0.1
28	TAMPA	FL	1.0	0.9	-0.1	1.4	1.4	-0.1	1.5	1.4	-0.1	1.6	1.5	-0.1
29	PORTLN	OR	0.3	-0.0	-0.0	0.8	0.5	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1
30	NASHVL	TN	0.3	-0.0	-0.0	1.1	0.7	-0.1	1.1	0.8	-0.1	1.2	0.9	-0.1
31	NEWORL	LA	0.6	1.0	-0.0	1.0	1.3	-0.1	1.1	1.4	-0.1	1.1	1.4	-0.1
32	DENVER	CO	0.3	-0.0	-0.0	0.8	0.5	-0.1	0.9	0.5	-0.1	0.9	0.6	-0.1
33	PROVID	RI	0.6	-0.0	-0.0	1.0	0.4	-0.1	1.1	0.4	-0.1	1.2	0.5	-0.1
34	ALBANY	NY	0.5	-0.0	-0.0	0.9	0.4	-0.1	1.0	0.5	-0.1	1.1	0.6	-0.1
35	SYRACU	NY	0.4	-0.0	-0.0	0.8	0.3	-0.1	0.8	0.4	-0.1	0.9	0.4	-0.1
36	CHARLS	WV	0.3	-0.0	-0.0	0.9	0.5	-0.1	0.9	0.5	-0.1	1.0	0.6	-0.1
37	GRNDRP	MI	0.4	-0.0	-0.0	1.0	0.5	-0.1	1.1	0.6	-0.1	1.1	0.6	-0.1
38	LOUSVL	KY	1.2	1.9	-0.1	1.6	2.4	-0.1	1.7	2.5	-0.1	1.8	2.6	-0.1
39	OKCITY	OK	0.4	-0.0	-0.0	0.9	0.5	-0.1	1.0	0.6	-0.1	1.1	0.7	-0.1
40	BIRM	AL	1.0	0.9	-0.1	1.5	1.4	-0.1	1.5	1.5	-0.1	1.6	1.6	-0.1
41	DAYTON	OH	1.1	0.9	-0.1	1.5	1.4	-0.1	1.6	1.5	-0.1	1.7	1.5	-0.1
42	CHARLT	NC	1.1	1.9	-0.1	1.7	2.4	-0.1	1.7	2.5	-0.1	1.8	2.6	-0.1
43	PHOENX	AZ	0.4	1.0	-0.0	0.8	1.3	-0.1	0.8	1.4	-0.1	0.9	1.5	-0.1
44	NORFLK	VA	0.5	1.0	-0.0	0.9	1.3	-0.1	1.0	1.4	-0.1	1.0	1.5	-0.1
45	SANANT	TX	0.5	1.0	-0.0	0.9	1.4	-0.1	1.0	1.5	-0.1	1.0	1.5	-0.1
46	GRNVLE	SC	0.3	1.0	-0.0	0.9	1.6	-0.1	1.0	1.7	-0.1	1.0	1.7	-0.1
47	GRNBRO	NC	0.2	-0.0	-0.0	0.8	0.5	-0.1	0.9	0.6	-0.1	0.9	0.6	-0.1
48	SALTLK	UT	0.3	-0.0	-0.0	0.9	0.6	-0.1	1.0	0.6	-0.1	1.0	0.7	-0.1
49	WLKSBR	PA	4.0	2.8	-0.2	4.7	3.5	-0.2	4.9	3.7	-0.2	5.1	4.0	-0.2
50	LITLRK	AR	0.2	-0.0	-0.0	0.8	0.6	-0.1	0.9	0.6	-0.1	0.9	0.7	-0.1

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 13 (contd.)

	MARKET		1974 PROJ (1) (2) (3)	1980 PROJ (1) (2) (3)	1985 PROJ (1) (2) (3)	1990 PROJ (1) (2) (3)
52	TOLEDO	OH	1.1 0.9-0.1	1.5 1.3-0.1	1.5 1.4-0.1	1.6 1.5-0.1
53	OMAHA	NE	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.5-0.1	0.8 0.6-0.1
54	TULSA	OK	0.2-0.0-0.0	0.8 0.5-0.1	0.9 0.6-0.1	0.9 0.7-0.1
55	ORLAN	FL	0.5-0.0-0.0	1.0 0.4-0.1	1.1 0.5-0.1	1.2 0.6-0.1
56	ROCHES	NY	0.4-0.0-0.0	0.8 0.3-0.1	0.8 0.4-0.1	0.9 0.5-0.1
57	HARISB	PA	2.2 1.9-0.1	2.6 2.4-0.1	2.8 2.5-0.1	2.9 2.6-0.1
58	SHRVPT	LA	[illegible]-0.0-0.0	0.8 0.6-0.1	0.9 0.6-0.1	0.9 0.7-0.1
59	MOBILE	AL	0.[illegible]-0.0-0.0	0.8 0.6-0.1	0.8 0.7-0.1	0.9 0.7-0.1
60	DAVENP	IA	0.3-0.0-0.0	0.7 0.4-0.1	0.8 0.4-0.1	0.9 0.5-0.1
61	FLINT	MI	1.1 0.9-0.1	1.5 1.3-0.1	1.6 1.4-0.1	1.6 1.5-0.1
62	GRNBAY	WI	0.3-0.0-0.0	0.7 0.4-0.1	0.8 0.5-0.1	0.9 0.6-0.1
63	RICHMN	VA	0.4-0.0-0.0	0.9 0.5-0.1	0.9 0.5-0.1	1.0 0.6-0.1
64	SPRNGF	IL	2.1 1.9-0.1	2.4 2.3-0.1	2.5 2.4-0.1	2.7 2.5-0.1
65	CORRAP	IA	0.3-0.0-0.0	0.8 0.5-0.1	0.8 0.5-0.1	0.9 0.6-0.1
66	DMOINE	IA	0.2-0.0-0.0	0.8 0.5-0.1	0.9 0.6-0.1	0.9 0.7-0.1
67	WICHTA	KS	0.2-0.0-0.0	0.9 0.6-0.1	0.9 0.7-0.1	1.0 0.7-0.1
68	JKSNVL	FL	1.1 0.9-0.1	1.5 1.4-0.1	1.5 1.4-0.1	1.6 1.5-0.1
69	PADUCA	KY	0.1 1.0-0.0	0.7 1.5-0.0	0.7 1.6-0.1	0.8 1.7-0.1
70	ROANOK	VA	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.6-0.1	0.8 0.6-0.1
71	KNOXVL	TN	0.8 1.0-0.0	1.4 1.6-0.1	1.5 1.6-0.1	1.6 1.7-0.1
72	FRESNO	CA	3.9 4.8-0.2	4.2 5.2-0.2	4.4 5.4-0.2	4.6 5.6-0.2
73	RALEIG	NC	0.7 1.0-0.0	1.3 1.5-0.1	1.4 1.6-0.1	1.4 1.7-0.1
74	JOHNST	PA	0.4 1.0-0.0	1.0 1.5-0.1	1.0 1.6-0.1	1.1 1.6-0.1
75	PORTLN	ME	0.2-0.0-0.0	0.7 0.5-0.0	0.8 0.5-0.1	0.8 0.6-0.1
76	SPOKAN	WA	0.1-0.0-0.0	0.6 0.5-0.0	0.7 0.6-0.0	0.7 0.6-0.0
77	JACKSN	MS	0.6 1.0-0.0	1.1 1.5-0.1	1.2 1.6-0.1	1.3 1.6-0.1
78	CHATTN	TN	0.2 1.0-0.0	0.7 1.4-0.0	0.7 1.5-0.0	0.8 1.6-0.1
79	YGSTN	OH	3.1 2.8-0.2	3.6 3.4-0.2	3.7 3.5-0.2	3.9 3.7-0.2
80	SBEND	IN	2.9 2.8-0.2	3.5 3.4-0.2	3.6 3.6-0.2	3.8 3.7-0.2
81	ALBUQ	NM	0.2-0.0-0.0	0.6 0.5-0.0	0.7 0.5-0.0	0.8 0.6-0.1
82	FTWAYN	IN	3.0 2.8-0.2	3.6 3.4-0.2	3.8 3.6-0.2	4.0 3.8-0.2
83	PEORIA	IL	3.1 2.8-0.2	3.7 3.5-0.2	3.9 3.7-0.2	4.1 3.9-0.2
84	GRNVLE	NC	0.1-0.0-0.0	0.7 0.6-0.0	0.7 0.6-0.0	0.8 0.7-0.1
85	SIOUXF	SD	-0.1-0.0-0.0	0.5 0.6-0.0	0.6 0.7-0.0	0.7 0.7-0.0
86	EVANSV	IN	1.6 1.9-0.1	2.0 2.3-0.1	2.1 2.4-0.1	2.2 2.5-0.1
87	BATONR	LA	0.6 1.0-0.0	0.9 1.3-0.1	1.0 1.4-0.1	1.1 1.4-0.1
88	BEAUMT	TX	-0.0-0.0-0.0	0.4 0.4-0.[illegible]	0.4 0.4-0.0	0.5 0.5-0.0
89	DULUTH	MN	0.0-0.0-0.0	0.4 0.4-0.0	0.5 0.4-0.0	0.5 0.5-0.0
90	WHLING	WV	0.2-0.0-0.0	0.7 0.4-0.0	0.7 0.5-0.0	0.8 0.5-0.0
91	LINCLN	NE	0.1-0.0-0.0	0.6 0.5-0.[illegible]	0.7 0.6-0.0	0.7 0.6-0.0
92	LANSNG	MI	0.5-0.0-0.0	0.9 0.4-0.1	1.0 0.4-0.1	1.1 0.5-0.1
93	MADISN	WI	1.5 1.9-0.1	1.8 2.2-0.1	1.9 2.3-0.1	2.0 2.4-0.1
94	COLUMB	GA	0.4 1.0-0.0	0.8 1.3-0.0	0.8 1.4-0.1	0.9 1.5-0.1
95	AMARIL	TX	0.1-0.0-0.0	0.5 0.4-0.0	0.6 0.4-0.0	0.6 0.5-0.0
96	HUNTSV	AL	2.8 2.9-0.1	3.3 3.4-0.2	3.6 3.6-0.2	3.8 3.8-0.2
97	ROCKFD	IL	1.5 1.9-0.1	1.8 2.2-0.1	1.9 2.3-0.1	2.0 2.4-0.1
98	FARGO	ND	-0.1-0.0-0.0	0.5 0.6-0.0	0.6 0.6-0.0	0.6 0.7-0.0
99	MONROE	LA	0.1-0.0-0.0	0.9 0.8-0.1	1.0 0.8-0.1	1.0 0.9-0.1
100	COLUMB	SC	1.4 1.9-0.1	1.8 2.4-0.1	1.9 2.5-0.1	2.0 2.6-0.1

Table 14

TWENTY PERCENT LOSS OF AUDIENCE TO NEW VIDEO SERVICES

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1 NY	NY	2.9	1.5	-0.5	4.6	3.2	-0.7	4.9	3.5	-0.8	5.2	3.8	-0.8
2 LA	CA	3.9	5.1	-0.9	5.4	6.6	-1.1	5.7	7.0	-1.2	6.1	7.4	-1.3
3 CHCAGO	IL	1.5	2.8	-0.2	[illegible]	3.3	-0.2	2.0	3.3	-0.2	2.1	3.4	-0.2
4 PHIL	PA	1.6	2.8	-0.2	2.0	3.2	-0.2	2.1	3.3	-0.2	2.2	3.4	-0.2
5 DTROIT	MI	1.0	1.9	-0.1	1.3	2.2	-0.2	1.4	2.3	-0.2	1.5	2.4	-0.2
6 BOSTON	MA	1.2	1.9	-0.1	1.8	2.4	-0.2	1.9	2.5	-0.2	2.0	2.6	-0.2
7 SF	CA	0.9	2.9	-0.1	1.4	3.4	-0.2	1.4	3.4	-0.2	1.5	3.5	-0.2
8 CLVLND	OH	1.2	1.9	-0.1	1.5	2.2	-0.2	1.6	2.3	-0.2	1.7	2.4	-0.2
9 WASH	DC	0.8	0.9	-0.1	1.2	1.2	-0.2	1.3	1.3	-0.2	1.4	1.4	-0.2
10 PITT	PA	0.7	-0.1	-0.1	1.3	0.5	-0.1	1.4	0.6	-0.1	1.5	0.7	-0.2
11 STLOUS	MO	0.5	0.9	-0.1	1.0	1.3	-0.1	1.1	1.4	-0.2	1.1	1.5	-0.2
12 DALLAS	TX	0.7	0.9	-0.1	1.1	1.3	-0.2	1.2	1.4	-0.2	1.3	1.5	-0.2
13 MINN	MN	0.3	-0.1	-0.1	1.0	0.6	-0.1	1.1	0.7	-0.2	1.1	0.8	-0.2
14 BALT	MD	0.7	0.9	-0.1	1.1	1.3	-0.1	1.2	1.4	-0.1	1.2	1.4	-0.1
15 HOUSTN	TX	1.0	1.9	-0.1	1.4	2.2	-0.1	1.4	2.3	-0.2	1.5	2.4	-0.2
16 INDPLS	IN	0.4	0.9	-0.1	0.8	1.3	-0.1	0.9	1.4	-0.1	1.0	1.5	-0.1
17 CINCI	OH	0.7	0.9	-0.1	1.1	1.3	-0.1	1.1	1.3	-0.1	1.2	1.4	-0.1
18 ATLANT	GA	0.9	1.9	-0.1	1.3	2.3	-0.1	1.4	2.4	-0.1	1.5	2.5	-0.2
19 HARTFD	CN	1.3	1.9	-0.1	1.7	2.3	-0.2	1.8	2.4	-0.2	1.9	2.5	-0.2
20 SEATLE	WA	0.2	-0.1	-0.1	0.7	0.4	-0.2	0.8	0.5	-0.2	0.8	0.6	-0.2
21 MIAMI	FL	0.6	0.9	-0.1	1.0	1.3	-0.1	1.1	1.4	-0.2	1.1	1.5	-0.2
22 KANCTY	MO	0.6	0.9	-0.1	1.0	1.3	-0.1	1.1	1.4	-0.1	1.2	1.4	-0.1
23 MILWAU	WI	0.8	0.9	-0.1	1.1	1.2	-0.1	1.2	1.3	-0.1	1.2	1.3	-0.1
25 SACRA	CA	0.6	0.9	-0.1	1.0	1.3	-0.1	1.1	1.4	-0.1	1.2	1.4	-0.1
26 MEMPH	TN	0.3	-0.1	-0.1	1.0	0.6	-0.1	1.0	0.7	-0.1	1.1	0.7	-0.1
27 COLUMB	OH	0.5	-0.1	-0.1	0.9	0.3	-0.1	1.0	0.4	-0.1	1.0	0.4	-0.1
28 TAMPA	FL	0.9	0.9	-0.1	1.3	1.3	-0.1	1.4	1.4	-0.1	1.5	1.5	-0.2
29 PORTLN	OR	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1	0.8	0.5	-0.1
30 NASHVL	TN	0.3	-0.1	-0.1	1.0	0.6	-0.1	1.1	0.7	-0.1	1.2	0.8	-0.1
31 NEWORL	LA	0.6	0.9	-0.1	0.9	1.2	-0.1	1.0	1.3	-0.1	1.1	1.4	-0.1
32 DENVER	CO	0.3	-0.1	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1	0.9	0.5	-0.1
33 PROVID	RI	0.6	-0.1	-0.1	1.0	0.3	-0.1	1.0	0.4	-0.1	1.1	0.4	-0.1
34 ALBANY	NY	0.4	-0.1	-0.1	0.9	0.4	-0.1	0.9	0.4	-0.1	1.0	0.5	-0.1
35 SYRACU	NY	0.4	-0.1	-0.1	0.7	0.3	-0.1	0.8	0.3	-0.1	0.8	0.4	-0.1
36 CHARLS	WV	0.3	-0.1	-0.1	0.8	0.4	-0.1	0.9	0.5	-0.1	0.9	0.5	-0.1
37 GRNDRP	MI	0.4	-0.1	-0.1	0.9	0.4	-0.1	1.0	0.5	-0.1	1.1	0.6	-0.1
38 LOUSVL	KY	1.2	1.9	-0.1	1.6	2.3	-0.2	1.7	2.4	-0.2	1.7	2.5	-0.2
39 OKCITY	OK	0.3	-0.1	-0.1	0.9	0.5	-0.1	1.0	0.6	-0.1	1.0	0.6	-0.1
40 BIRM	AL	0.9	0.9	-0.1	1.4	1.3	-0.1	1.5	1.4	-0.1	1.6	1.5	-0.2
41 DAYTON	OH	1.0	0.9	-0.1	1.5	1.3	-0.1	1.5	1.4	-0.2	1.6	1.5	-0.2
42 CHARLT	NC	1.1	1.9	-0.1	1.6	2.4	-0.2	1.6	2.4	-0.2	1.7	2.5	-0.2
43 PHOENX	AZ	0.3	0.9	-0.1	0.7	1.3	-0.1	0.8	1.3	-0.1	0.8	1.4	-0.1
44 NORFLK	VA	0.5	0.9	-0.1	0.8	1.3	-0.1	0.9	1.3	-0.1	1.0	1.4	-0.1
45 SANANT	TX	0.4	0.9	-0.1	0.9	1.3	-0.1	0.9	1.4	-0.1	1.0	1.5	-0.1
46 GRNVLE	SC	0.2	0.9	-0.1	0.8	1.5	-0.1	0.9	1.6	-0.1	1.0	1.7	-0.1
47 GRNBRO	NC	0.2	-0.1	-0.1	0.7	0.5	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1
48 SALTLK	UT	0.2	-0.1	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1	1.0	0.6	-0.1
49 WLKSBR	PA	3.8	2.6	-0.4	4.4	3.2	-0.5	4.7	3.5	-0.5	4.9	3.7	-0.5
50 LITLRK	AR	0.2	-0.1	-0.1	0.7	0.5	-0.1	0.8	0.6	-0.1	0.9	0.6	-0.1

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 14 (contd.)

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH	1.0	0.9	-0.1	1.4	1.3	-0.1	1.5	1.3	-0.1	1.5	1.4	-0.2
53	OMAHA	NE	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.7	0.5	-0.1	0.8	0.5	-0.1
54	TULSA	OK	0.2	-0.1	-0.1	0.7	0.5	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1
55	ORLAN	FL	0.5	-0.1	-0.1	1.0	0.4	-0.1	1.0	0.4	-0.1	1.1	0.5	-0.1
56	ROCHES	NY	0.4	-0.1	-0.1	0.7	0.3	-0.1	0.8	0.3	-0.1	0.9	0.4	-0.1
57	HARISB	PA	2.1	1.8	-0.2	2.5	2.3	-0.2	2.6	2.4	-0.2	2.7	2.5	-0.2
58	SHRVPT	LA	0.2	-0.1	-0.1	0.8	0.5	-0.1	0.8	0.6	-0.1	0.9	0.7	-0.1
59	MOBILE	AL	0.1	-0.1	-0.1	0.7	0.5	-0.1	0.8	0.6	-0.1	0.8	0.7	-0.1
60	DAVENP	IA	0.3	-0.1	-0.1	0.7	0.3	-0.1	0.7	0.4	-0.1	0.8	0.4	-0.1
61	FLINT	MI	1.0	0.9	-0.1	1.4	1.2	-0.1	1.5	1.3	-0.1	1.6	1.4	-0.2
62	GRNBAY	WI	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1
63	RICHMN	VA	0.3	-0.1	-0.1	0.8	0.4	-0.1	0.9	0.5	-0.1	0.9	0.5	-0.1
64	SPRNGF	IL	2.0	1.8	-0.2	2.3	2.1	-0.2	2.4	2.3	-0.2	2.5	2.4	-0.2
65	CDRRAP	IA	0.2	-0.1	-0.1	0.7	0.4	-0.1	0.8	0.5	-0.1	0.8	0.5	-0.1
66	DMOINE	IA	0.2	-0.1	-0.1	0.7	0.5	-0.1	0.8	0.6	-0.1	0.9	0.6	-0.1
67	WICHTA	KS	0.2	-0.1	-0.1	0.8	0.5	-0.1	0.9	0.6	-0.1	0.9	0.7	-0.1
68	JKSNVL	FL	1.0	0.9	-0.1	1.4	1.3	-0.1	1.5	1.4	-0.1	1.6	1.4	-0.2
69	PADUCA	KY	0.1	0.9	-0.1	0.6	1.5	-0.1	0.7	1.6	-0.1	0.8	1.6	-0.1
70	ROANOK	VA	0.1	-0.1	-0.1	0.6	[illegible]	-0.1	0.7	0.5	-0.1	0.8	0.6	-0.1
71	KNOXVL	TN	0.7	0.9	-0.1	1.3	1.5	-0.1	1.4	1.6	-0.1	1.5	1.7	-0.1
72	FRESNO	CA	3.7	4.6	-0.4	4.0	5.0	-0.4	4.2	5.1	-0.4	4.4	5.3	-0.5
73	RALEIG	NC	0.7	0.9	-0.1	1.2	1.4	-0.1	1.3	1.5	-0.1	1.4	1.6	-0.1
74	JOHNST	PA	0.4	0.9	-0.1	0.9	1.5	-0.1	1.0	1.5	-0.1	1.0	1.6	-0.1
75	PORTLN	ME	0.2	-0.1	-0.1	0.6	0.4	-0.1	0.7	0.5	-0.1	0.8	0.5	-0.1
76	SPOKAN	WA	0.0	-0.1	-0.1	0.6	0.5	-0.1	0.6	0.5	-0.1	0.7	0.6	-0.1
77	JACKSN	MS	0.5	0.9	-0.1	1.0	1.4	-0.1	1.1	1.5	-0.1	1.2	1.6	-0.1
78	CHATTN	TN	0.1	0.9	-0.1	0.6	1.4	-0.1	0.7	1.5	-0.1	0.7	1.5	-0.1
79	YGSTN	OH	2.9	2.7	-0.3	3.4	3.2	-0.4	3.5	3.3	-0.4	3.7	3.5	-0.4
80	SBEND	IN	2.7	2.7	-0.3	3.3	3.2	-0.4	3.4	3.4	-0.4	3.6	3.5	-0.4
81	ALBUQ	NM	0.1	-0.1	-0.1	0.6	0.4	-0.1	0.7	0.5	-0.1	0.7	0.5	-0.1
82	FTWAYN	IN	2.9	2.7	-0.3	3.4	3.2	-0.4	3.6	3.4	-0.4	3.8	3.6	-0.4
83	PEORIA	IL	2.9	2.7	-0.3	3.5	3.3	-0.4	3.7	3.5	-0.4	3.9	3.7	-0.4
84	GRNVLE	NC	0.0	-0.1	-0.1	0.6	0.5	-0.1	0.7	0.6	-0.1	0.7	0.6	-0.1
85	SIOUXF	SD	-0.1	-0.1	-0.1	0.5	0.6	-0.1	0.6	0.6	-0.1	0.6	0.7	-0.1
86	EVANSV	IN	1.5	1.8	-0.2	1.9	2.2	-0.2	2.0	2.3	-0.2	2.1	2.4	-0.2
87	BATONR	LA	0.6	0.9	-0.1	0.9	1.2	-0.1	1.0	1.3	-0.1	1.0	1.4	-0.1
88	BEAUMT	TX	-0.1	-0.1	-0.1	0.3	0.3	-0.1	0.4	0.4	-0.1	0.4	0.4	-0.1
89	DULUTH	MN	-0.0	-0.1	-0.1	0.4	0.3	-0.1	0.4	0.4	-0.1	0.5	0.4	-0.1
90	WHLING	WV	0.2	-0.1	-0.1	0.6	0.4	-0.1	0.7	0.4	-0.1	0.7	0.5	-0.1
91	LINCLN	NE	0.0	-0.1	-0.1	0.6	0.5	-0.1	0.6	0.5	-0.1	0.7	0.6	-0.1
92	LANSNG	MI	0.5	-0.1	-0.1	0.9	0.3	-0.1	0.9	0.4	-0.1	1.0	0.4	-0.1
93	MADISN	WI	1.4	1.8	-0.2	1.7	2.1	-0.2	1.8	2.2	-0.2	1.9	2.3	-0.2
94	COLUMB	GA	0.4	0.9	-0.1	0.7	1.3	-0.1	0.8	1.3	-0.1	0.8	1.4	-0.1
95	AMARIL	TX	0.0	-0.1	-0.1	0.5	0.3	-0.1	0.5	0.4	-0.1	0.6	0.4	-0.1
96	HUNTSV	AL	2.6	2.7	-0.3	3.2	3.2	-0.3	3.4	3.4	-0.4	3.6	3.6	-0.4
97	ROCKFD	IL	1.4	1.8	-0.2	1.7	2.1	-0.2	1.8	2.2	-0.2	1.9	2.3	-0.2
98	FARGO	ND	-0.1	-0.1	-0.1	0.5	0.5	-0.1	0.5	0.6	-0.1	0.6	0.6	-0.1
99	MONROE	LA	0.1	-0.1	-0.1	0.8	0.7	-0.1	0.9	0.8	-0.1	1.0	0.8	-0.1
100	COLUMB	SC	1.3	1.8	-0.2	1.7	2.3	-0.2	1.8	2.4	-0.2	1.9	2.5	-0.2

Table 15

THIRTY PERCENT LOSS OF AUDIENCE TO NEW VIDEO SERVICES

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	2.6	1.2	-0.8	4.2	2.8	-1.1	4.5	3.1	-1.2	4.7	3.3	-1.2
2	LA	CA	3.4	4.7	-1.3	4.8	6.0	-1.7	5.1	6.3	-1.8	5.5	6.7	-1.9
3	CHICAGO	IL	1.4	2.7	-0.3	1.8	3.1	-0.3	1.9	3.2	-0.3	2.0	3.3	-0.4
4	PHIL	PA	1.5	2.7	-0.3	1.9	3.1	-0.3	2.0	3.2	-0.3	2.1	3.3	-0.3
5	DTROIT	MI	0.9	1.8	-0.2	1.2	2.1	-0.3	1.3	2.2	-0.3	1.4	2.3	-0.3
6	BOSTON	MA	1.2	1.8	-0.2	1.7	2.3	-0.3	1.8	2.4	-0.3	1.9	2.5	-0.3
7	SF	CA	0.8	2.8	-0.2	1.3	3.3	-0.3	1.3	3.3	-0.3	1.4	3.4	-0.3
8	CLVLND	OH	1.1	1.8	-0.2	1.4	2.2	-0.2	1.5	2.2	-0.3	1.6	2.3	-0.3
9	WASH	DC	0.8	0.8	-0.2	1.1	1.1	-0.3	1.2	1.2	-0.3	1.3	1.3	-0.3
10	PITT	PA	0.6	-0.2	-0.2	1.2	0.4	-0.2	1.3	0.5	-0.2	1.4	0.6	-0.2
11	STLOUS	MO	0.5	0.8	-0.2	0.9	1.3	-0.2	1.0	1.3	-0.2	1.0	1.4	-0.2
12	DALLAS	TX	0.6	0.8	-0.2	1.0	1.2	-0.2	1.1	1.3	-0.3	1.2	1.4	-0.3
13	MINN	MN	0.2	-0.1	-0.1	0.9	0.5	-0.2	1.0	0.6	-0.2	1.0	0.7	-0.2
14	BALT	MD	0.6	0.8	-0.2	1.0	1.2	-0.2	1.1	1.3	-0.2	1.2	1.3	-0.2
15	HOUSTN	TX	1.0	1.8	-0.2	1.3	2.1	-0.2	1.4	2.2	-0.2	1.4	2.3	-0.2
16	INDPLS	IN	0.3	0.8	-0.2	0.8	1.3	-0.2	0.8	1.3	-0.2	0.9	1.4	-0.2
17	CINCI	OH	0.6	0.8	-0.2	1.0	1.2	-0.2	1.1	1.3	-0.2	1.1	1.3	-0.2
18	ATLANT	GA	0.8	1.8	-0.2	1.2	2.2	-0.2	1.3	2.3	-0.2	1.4	2.4	-0.2
19	HRTFD	CN	1.2	1.8	-0.2	1.6	2.2	-0.3	1.7	2.3	-0.3	1.8	2.4	-0.3
20	SEATLE	WA	0.1	-0.2	-0.2	0.6	0.3	-0.3	0.7	0.4	-0.3	0.7	0.5	-0.3
21	MIAMI	FL	0.5	0.8	-0.2	0.9	1.2	-0.2	1.0	1.3	-0.2	1.0	1.4	-0.2
22	KANCTY	MO	0.6	0.8	-0.2	1.0	1.2	-0.2	1.0	1.3	-0.2	1.1	1.4	-0.2
23	MILWAU	WI	0.7	0.8	-0.2	1.0	1.1	-0.2	1.1	1.2	-0.2	1.2	1.3	-0.2
25	SACRA	CA	0.6	0.8	-0.2	1.0	1.2	-0.2	1.0	1.3	-0.2	1.1	1.4	-0.2
26	MEMPH	TN	0.2	-0.1	-0.1	0.9	0.5	-0.2	1.0	0.6	-0.2	1.0	0.7	-0.2
27	COLUMB	OH	0.5	-0.1	-0.1	0.8	0.2	-0.2	0.9	0.3	-0.2	1.0	0.4	-0.2
28	TAMPA	FL	0.8	0.8	-0.2	1.2	1.2	-0.2	1.3	1.3	-0.2	1.4	1.4	-0.2
29	PORTLN	OR	0.2	-0.1	-0.1	0.6	0.3	-0.2	0.7	0.4	-0.2	0.9	0.4	-0.2
30	NASHVL	TN	0.2	-0.1	-0.1	0.9	0.6	-0.2	1.0	0.6	-0.2	1.1	0.7	-0.2
31	NEWORL	LA	0.5	0.8	-0.2	0.9	1.2	-0.2	0.9	1.2	-0.2	1.0	1.3	-0.2
32	DENVER	CO	0.2	-0.1	-0.1	0.7	0.3	-0.2	0.7	0.4	-0.2	0.8	0.4	-0.2
33	PROVID	RI	0.5	-0.2	-0.2	0.9	0.2	-0.2	1.0	0.3	-0.2	1.0	0.4	-0.2
34	ALBANY	NY	0.4	-0.1	-0.1	0.8	0.3	-0.2	0.9	0.4	-0.2	0.9	0.4	-0.2
35	SYRACU	NY	0.3	-0.1	-0.1	0.6	0.2	-0.2	0.7	0.3	-0.2	0.8	0.3	-0.2
36	CHARLS	WV	0.3	-0.1	-0.1	0.7	0.3	-0.2	0.8	0.4	-0.2	0.9	0.5	-0.2
37	GRNDRP	MI	0.3	-0.1	-0.1	0.9	0.4	-0.2	0.9	0.4	-0.2	1.0	0.5	-0.2
38	LOUSVL	KY	1.1	1.8	-0.2	1.5	2.2	-0.2	1.6	2.3	-0.2	1.7	2.4	-0.3
39	OKCITY	OK	0.3	-0.1	-0.1	0.8	0.4	-0.2	0.9	0.5	-0.2	1.0	0.6	-0.2
40	BIRM	AL	0.9	0.8	-0.2	1.3	1.2	-0.2	1.4	1.3	-0.2	1.5	1.4	-0.2
41	DAYTON	OH	1.0	0.8	-0.2	1.4	1.2	-0.2	1.5	1.3	-0.2	1.5	1.4	-0.2
42	CHARLT	NC	1.0	1.8	-0.2	1.5	2.3	-0.2	1.6	2.4	-0.2	1.6	2.4	-0.3
43	PHOENX	AZ	0.3	0.8	-0.2	0.6	1.2	-0.2	0.7	1.3	-0.2	0.8	1.3	-0.2
44	NORFLK	VA	0.4	0.9	-0.1	0.8	1.2	-0.2	0.8	1.3	-0.2	0.9	1.3	-0.2
45	SANANT	TX	0.4	0.9	-0.1	0.8	1.3	-0.2	0.9	1.3	-0.2	0.9	1.4	-0.2
46	GRNVLE	SC	0.2	0.9	-0.1	0.8	1.5	-0.2	0.8	1.5	-0.2	0.9	1.6	-0.2
47	GRNBRO	NC	0.2	-0.1	-0.1	0.7	0.4	-0.2	0.7	0.5	-0.2	0.8	0.5	-0.2
48	SALTLK	UT	0.2	-0.1	-0.1	0.8	0.4	-0.2	0.8	0.5	-0.2	0.9	0.6	-0.2
49	WLKSBR	PA	3.5	2.4	-0.6	4.2	3.0	-0.7	4.4	3.2	-0.7	4.6	3.4	-0.8
50	LITLRK	AR	0.1	-0.1	-0.1	0.7	0.4	-0.2	0.7	0.5	-0.2	0.8	0.6	-0.2

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 15 (contd.)

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH	0.9	0.8	-0.2	1.3	1.2	-0.2	1.4	1.3	-0.2	1.5	1.3	-0.2
53	OMAHA	NE	0.1	-0.1	-0.1	0.6	0.4	-0.2	0.6	0.4	-0.2	0.7	0.5	-0.2
54	TULSA	OK	0.1	-0.1	-0.1	0.7	0.4	-0.2	0.7	0.5	-0.2	0.8	0.5	-0.2
55	ORLAN	FL	0.4	-0.1	-0.1	0.9	0.3	-0.2	0.9	0.4	-0.2	1.0	0.4	-0.2
56	ROCHES	NY	0.3	-0.1	-0.1	0.7	0.2	-0.2	0.7	0.3	-0.2	0.8	0.3	-0.2
57	HARTSB	PA	1.9	1.7	-0.3	2.4	2.1	-0.4	2.5	2.2	-0.4	2.6	2.3	-0.4
58	SHRVPT	LA	0.1	-0.1	-0.1	0.7	0.5	-0.2	0.7	0.5	-0.2	0.8	0.6	-0.2
59	MOBILE	AL	0.1	-0.1	-0.1	0.6	0.5	-0.2	0.7	0.5	-0.2	0.8	0.6	-0.2
60	DAVENP	IA	0.2	-0.1	-0.1	0.6	0.3	-0.2	0.7	0.3	-0.2	0.7	0.4	-0.2
61	FLINT	MI	1.0	0.8	-0.2	1.3	1.1	-0.2	1.4	1.2	-0.2	1.5	1.3	-0.2
62	GRNBAY	WI	0.2	-0.1	-0.1	0.6	0.3	-0.2	0.7	0.4	-0.2	0.7	0.4	-0.2
63	RICHMN	VA	0.3	-0.1	-0.1	0.8	0.4	-0.2	0.8	0.4	-0.2	0.9	0.5	-0.2
64	SPRNGF	IL	1.9	1.7	-0.3	2.2	2.0	-0.3	2.3	2.1	-0.4	2.4	2.2	-0.4
65	CDRRAP	IA	0.2	-0.1	-0.1	0.6	0.3	-0.2	0.7	0.4	-0.2	0.7	0.5	-0.2
66	DMOINE	IA	0.1	-0.1	-0.1	0.7	0.4	-0.2	0.7	0.5	-0.2	0.8	0.5	-0.2
67	WICHTA	KS	0.2	-0.1	-0.1	0.8	0.5	-0.2	0.8	0.5	-0.2	0.9	0.6	-0.2
68	JKSNVL	FL	0.9	0.6	-0.2	1.3	1.2	-0.2	1.4	1.3	-0.2	1.5	1.4	-0.2
69	PADUCA	KY	0.0	0.9	-0.1	0.6	1.4	-0.2	0.6	1.5	-0.2	0.7	1.6	-0.2
70	ROANOK	VA	0.1	-0.1	-0.1	0.6	0.4	-0.2	0.6	0.4	-0.2	0.7	0.5	-0.2
71	KNOXVL	TN	0.7	0.8	-0.2	1.2	1.4	-0.2	1.3	1.5	-0.2	1.4	1.6	-0.2
72	FRESNO	CA	3.4	4.4	-0.6	3.8	4.7	-0.7	4.0	4.9	-0.7	4.1	5.1	-0.7
73	RALEIG	NC	0.6	0.8	-0.2	1.1	1.4	-0.2	1.2	1.4	-0.2	1.3	1.5	-0.2
74	JOHNST	PA	0.3	0.9	-0.1	0.9	1.4	-0.2	0.9	1.4	-0.2	1.0	1.5	-0.2
75	PORTLN	ME	0.1	-0.1	-0.1	0.6	0.4	-0.2	0.6	0.4	-0.2	0.7	0.5	-0.2
76	SPOKAN	WA	0.0	-0.1	-0.1	0.5	0.4	-0.2	0.6	0.5	-0.2	0.6	0.5	-0.2
77	JACKSN	MS	0.5	0.9	-0.1	1.0	1.4	-0.2	1.0	1.4	-0.2	1.1	1.5	-0.2
78	CHATTN	TN	0.1	0.9	-0.1	0.5	1.3	-0.2	0.6	1.4	-0.2	0.7	1.4	-0.2
79	YGSTN	OH	2.7	2.5	-0.5	3.2	3.0	-0.6	3.3	3.1	-0.6	3.5	3.3	-0.6
80	SBEND	IN	2.6	2.5	-0.5	3.1	3.0	-0.6	3.2	3.2	-0.6	3.4	3.3	-0.6
81	ALBUQ	NM	0.1	-0.1	-0.1	0.5	0.4	-0.2	0.6	0.4	-0.2	0.6	0.5	-0.2
82	FTWAYN	IN	2.7	2.5	-0.5	3.2	3.0	-0.6	3.4	3.2	-0.6	3.6	3.4	-0.6
83	PEORIA	IL	2.7	2.5	-0.5	3.3	3.1	-0.6	3.5	3.3	-0.6	3.7	3.4	-0.6
84	GRNVLE	NC	-0.0	-0.1	-0.1	0.6	0.5	-0.2	0.6	0.5	-0.2	0.7	0.6	-0.2
85	SIOUXF	SD	-0.1	-0.1	-0.1	0.4	0.5	-0.1	0.5	0.6	-0.2	0.5	0.6	-0.2
86	EVANSV	IN	1.4	1.7	-0.3	1.8	2.1	-0.3	1.9	2.2	-0.3	2.0	2.3	-0.3
87	BATONR	LA	0.5	0.9	-0.1	0.8	1.2	-0.2	0.9	1.2	-0.2	1.0	1.3	-0.2
88	BEAUMT	TX	-0.1	-0.1	-0.1	0.3	0.3	-0.1	0.3	0.3	-0.1	0.4	0.4	-0.1
89	DULUTH	MN	-0.0	-0.1	-0.1	0.3	0.3	-0.1	0.4	0.3	-0.1	0.4	0.4	-0.1
90	WHLING	WV	0.1	-0.1	-0.1	0.6	0.3	-0.2	0.6	0.4	-0.2	0.7	0.4	-0.2
91	LINCLN	NE	-0.0	-0.1	-0.1	0.5	0.4	-0.2	0.5	0.4	-0.2	0.6	0.5	-0.2
92	LANSNG	MI	0.4	-0.1	-0.1	0.8	0.2	-0.2	0.9	0.3	-0.2	0.9	0.4	-0.2
93	MADISN	WI	1.4	1.7	-0.3	1.6	2.0	-0.3	1.7	2.1	-0.3	1.8	2.2	-0.3
94	COLUMB	GA	0.3	0.9	-0.1	0.7	1.2	-0.2	0.7	1.3	-0.2	0.8	1.3	-0.2
95	AMARIL	TX	0.0	-0.1	-0.1	0.4	0.3	-0.1	0.5	0.3	-0.1	0.5	0.4	-0.2
96	HUNTSV	AL	2.5	2.5	-0.5	3.0	3.0	-0.5	3.2	3.2	-0.6	3.3	3.4	-0.6
97	ROCKFD	IL	1.3	1.7	-0.3	1.6	2.0	-0.3	1.7	2.1	-0.3	1.8	2.2	-0.3
98	FARGO	ND	-0.1	-0.1	-0.1	0.4	0.5	-0.1	0.5	0.5	-0.1	0.5	0.6	-0.2
99	MONROE	LA	0.0	-0.1	-0.1	0.8	0.7	-0.2	0.8	0.7	-0.2	0.9	0.8	-0.2
100	COLUMB	SC	1.2	1.8	-0.2	1.6	2.2	-0.3	1.7	2.3	-0.3	1.8	2.4	-0.3

Table 16

SUMMARY OF EFFECTS OF NEW SERVICES AND TECHNOLOGIES

Projection	1974		1980		1985		1990	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Narrow count, Table 13	91		141		150		158	
Excluded stations, flat	27		27		27		27	
Total	118	-6	168	-8	177	-8	185	-9
Excluded stations, proportional	-2		12		15		17	
Total	116	-8	180	-10	192	-10	202	-11
Narrow count, Table 14	84		133		141		149	
Excluded stations, flat	27		27		27		27	
Total	111	-13	160	-16	168	-17	176	-18
Excluded stations, proportional	-4		10		12		14	
Total	107	-17	170	-20	180	-22	190	-23
Narrow count, Table 15	77		124		132		140	
Excluded stations, flat	27		27		27		27	
Total	104	-20	151	-25	159	-26	167	-27
Excluded stations, proportional	-6		6		10		12	
Total	98	-26	157	-33	169	-33	179	-34

Column (1): Projected stations.
Column (2): Difference from base-case totals.

loss, the number of UHF stations continues to grow. The 167 stations projected for 1990 in Table 16 is still substantially higher than the 124 stations in our 1974 base case.

VII. EFFECTS OF DECREASED UHF HANDICAP AND IMPROVED ECONOMIC CONDITIONS

Even when UHF set penetration reaches 100 percent--as we assume will happen for our projections to 1980 and beyond--UHF stations will continue to be handicapped by reception and tuning deficiencies relative to VHF stations. However, one expects that this so-called UHF handicap will be reduced over time as UHF stations increase their transmitter power, more people install special UHF antennas, and new television sets with better receivers and pushbutton or detent tuners for UHF come into wider use.

Quite a number of quantitative estimates of the handicap are available. Perhaps the first is found in an FCC Research Branch report (1970),* which attempts to measure the handicap in terms of relative audiences attract by VHF and UHF stations. An alternative estimate of the audience handicap is in Park (1970).** Fischman (1971)*** criticizes Park's estimate and provides his own. Besen (1973)† estimates the handicap measured in terms of time rates, that is, the prices at which stations would sell broadcast time. Our own attempts to construct an economic model of station viability produced several estimates of the handicap measured in terms of a variety of financial quantities. These include station shares of market revenue (Appendix D, Tables D.1 and D.3); reported profits, both gross and net of depreciation (Appendix E, Tables E.3 and E.7); the revenue received for any level of audience (Appendix F, equation (F.1')); and the cost of attracting any level of audience (Appendix F, equation (F.2')).

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*Research Branch, Broadcast Bureau, Federal Communications Commission, "The Economics of the TV-CATV Interface," Staff Report, July 15, 1970, pp. 6

**Rolla Edward Park, *Potential Impact of Cable Growth on Television Broadcasting*, The Rand Corporation, R-587-FF, October 1970, pp. 31-33.

***Leonard L. Fischman, "Critique of Study by Rolla Edward Park on Potential Impact of Cable Growth on Television Broadcasting," Economic Research Associates, February 1971, pp. 26-34; Appendix A to Edgar F. Czarra, Jr., and Michael S. Horn, *Joint Comments on Behalf of 21 Broadcast Stations*, Covington and Burling, February 10, 1971, filed in FCC Docket No. 18397-A.

†Stanley M. Besen, *The Value of Television Time and the Prospects for New Stations*, The Rand Corporation, R-1328-MF, October 1973, passim.

These estimates taken together provide strong support for the statement that the UHF handicap is substantial and significant no matter how it is measured. They also provide some indication that the handicap is decreasing over time.* However, none of them is of direct use to us in this section. The reason is that all of the previous estimates are in terms of audience, or revenue share, or reported profits, or some other measure that does not translate into station viability, as discussed in the Introduction. We must develop a method that yields estimates of numbers of viable stations in each market as the handicap declines. We report results of two such methods in this section.

FOUR-YEAR EQUATION

We attempted to estimate the rate of decline in the UHF handicap over the four-year period 1971-74** as a rough guide for projecting declines in the future. To do this, we included separate terms in the viable stations formula to estimate a "year effect" for each of the four years. We expected that the estimated year effect would be larger for 1974 than for 1971--that is to say, even if all the other variables in the equation (including UHF set penetration) kept exactly the same values from 1971 to 1974, the number of UHF stations would still increase, reflecting a decline in the UHF handicap. We were surprised to find, instead, that the year effects *decreased* from 1971 to 1974.*** If the year effects reflected only trends in the UHF handicap, this would mean that the handicap increased over this four-year period. However, we cannot believe that the handicap actually did increase. Rather, we expect that factors that are not included in our model, such as high interest rates and unsettled economic conditions, depressed the number of UHF stations in 1972, 1973, and 1974, relative to 1971. The estimated year effect, then, is a conglomerate measure of the effect of economic conditions, UHF handicap, and all other factors that vary from

*See particularly Fischman (1971) and our Appendix Tables D.1 and D.3 for evidence on this point.

**Unfortunately, complete data for UHF set penetration by market, a critical factor in our model, were not available for years before 1971, so we could not do an estimate over a longer period.

***See Appendix A, Table A-10.

year to year and affect the number of UHF stations but are not included as variables in our model.

Consequently, we are reduced to making essentially arbitrary assumptions about changes in the year effect and checking to see what effect they have on our projections. For the projections in Table 17, we assume that the net effect of decreased handicap and improved economic climate is such that the year effect returns to its 1971 level. We arbitrarily label this as a "moderate" decrease in the handicap and/or improvement in economic conditions. For Table 18 we assume an increase in the year effect that is twice as large as that reflected in Table 17. We call this a "large" decrease in handicap or improvement in the economy.

An important virtue of this method is that it emphasizes the significance of factors that vary from year to year and cannot be captured in an equation based on data from a single year. We have assumed changes in the year effect that are of the same order of magnitude as the change observed between 1971 and 1974, and the resulting changes in our projections are substantial. We see, for example, in summary Table 20, that when the "large" increase in year effect is combined with the 27 "excluded" stations, the number of UHF stations in 1990 increases from 194 in the base case to 290--a difference of 96 stations.*

On the other hand, there are two significant drawbacks to this method. For one thing, the approach simply does not allow one to separate out those effects which may be attributed to (1) changes in the UHF handicap, (2) changes in the state of the economy, or (3) changes in all other factors which vary from year to year and which also influence the financial performance of television stations.

Another drawback is that it does not yield estimates of what would happen should the handicap disappear completely. Even if we were able to isolate a trend in the handicap using this approach, it would show up as an increasing multiplicative term in the equation for number of viable stations, and we would have no way of knowing what value corresponded to the point of zero handicap. In other words, in making projections we would have no way of knowing when we had gone beyond the point of zero handicap and begun to project a UHF advantage.

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*Also, since consideration of general economic conditions and other factors independent of the UHF handicap are important to the future of UHF development, the Commission will likely find these estimates useful in its future deliberations.

Table 17

"MODERATE" DECREASE IN UHF HANDICAP
OR IMPROVEMENT IN ECONOMIC CONDITIONS

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	4.2	2.8	0.8	6.5	5.1	1.1	6.8	5.4	1.1	7.2	5.8	1.2
2	LA	CA	5.8	7.0	1.0	7.8	9.0	1.3	8.3	9.5	1.4	8.8	10.0	1.4
3	CHICAGO	IL	2.1	3.5	0.5	2.7	4.0	0.5	2.8	4.1	0.6	2.9	4.2	0.6
4	PHIL	PA	2.2	3.5	0.5	2.7	4.0	0.5	2.8	4.1	0.6	2.9	4.2	0.6
5	DTROIT	MI	1.5	2.4	0.4	1.9	2.8	0.4	2.0	2.9	0.4	2.1	3.0	0.5
6	BOSTON	MA	1.8	2.4	0.4	2.5	3.1	0.5	2.6	3.2	0.5	2.7	3.3	0.5
7	SF	CA	1.3	3.3	0.3	2.0	4.0	0.4	2.1	4.1	0.5	2.2	4.2	0.5
8	CLVLND	OH	1.7	2.4	0.4	2.2	2.9	0.5	2.3	3.0	0.5	2.4	[illegible]	0.5
9	WASH	DC	1.3	1.3	0.3	1.7	1.8	0.4	1.9	1.9	0.4	2.0	2.0	0.4
10	PITT	PA	1.1	0.3	0.3	1.9	1.1	0.4	2.0	1.2	0.4	2.1	1.3	0.5
11	STLOUS	MO	0.9	1.3	0.3	1.5	1.9	0.4	1.6	1.9	0.4	1.7	2.0	0.4
12	DALLAS	TX	1.1	1.3	0.3	1.6	1.8	0.4	1.7	1.9	0.4	1.8	2.1	0.4
13	MINN	MN	0.6	0.2	0.2	1.5	1.1	0.4	1.6	1.2	0.4	1.7	1.3	0.4
14	BALT	MD	1.1	1.3	0.3	1.6	1.8	0.4	1.7	1.9	0.4	1.8	2.0	0.4
15	HOUSTN	TX	1.5	2.4	0.4	1.9	2.8	0.4	2.0	2.9	0.4	2.1	3.0	0.5
16	INDPLS	IN	0.8	1.3	0.3	1.3	1.8	0.3	1.4	1.9	0.4	1.5	2.0	0.4
17	CINCI	OH	1.1	1.3	0.3	1.6	1.8	0.4	1.7	1.9	0.4	1.8	2.0	0.4
18	ATLANT	GA	1.3	2.3	0.3	1.9	2.9	0.4	2.0	3.0	0.4	2.1	3.1	0.5
19	HARTFD	CN	1.8	2.4	0.4	2.4	3.0	0.5	2.5	3.1	0.5	2.6	3.2	0.5
20	SEATLE	WA	0.5	0.2	0.2	1.2	0.9	0.3	1.3	1.0	0.3	1.4	1.1	0.3
21	MIAMI	FL	1.0	1.3	0.3	1.5	1.8	0.4	1.6	1.9	0.4	1.7	2.0	0.4
22	KANCTY	MO	1.0	1.3	0.3	1.5	1.8	0.4	1.6	1.9	0.4	1.7	2.0	0.4
23	MILWAU	WI	1.2	1.3	0.3	1.6	1.7	0.4	1.7	1.8	0.4	1.8	1.9	0.4
25	SACRA	CA	1.0	1.3	0.3	1.5	1.8	0.4	1.6	1.9	0.4	1.7	2.0	0.4
26	MEMPH	TN	0.6	0.2	0.2	1.4	1.1	0.4	1.5	1.2	0.4	1.6	1.3	0.4
27	COLUMB	OH	0.9	0.3	0.3	1.4	0.8	0.3	1.4	0.8	0.4	1.5	0.9	0.4
28	TAMPA	FL	1.4	1.3	0.3	1.9	1.9	0.4	2.0	2.0	0.4	2.1	2.1	0.5
29	PORTLN	OR	0.5	0.2	0.2	1.2	0.3	0.3	1.2	0.9	0.3	1.3	1.0	0.3
30	NASHVL	TN	0.6	0.2	0.2	1.5	1.1	0.4	1.6	1.2	0.4	1.7	1.3	0.4
31	NEWORL	LA	1.0	1.3	0.3	1.4	1.7	0.4	1.5	1.8	0.4	1.6	1.9	0.4
32	DENVER	CO	0.6	0.2	0.2	1.2	0.3	0.3	1.3	0.9	0.3	1.4	1.0	0.3
33	PROVID	RI	1.0	0.3	0.3	1.5	0.8	0.4	1.5	0.9	0.4	1.6	0.9	0.4
34	ALBANY	NY	0.8	0.3	0.3	1.3	0.3	0.3	1.4	0.9	0.4	1.5	1.0	0.4
35	SYRACU	NY	0.7	0.2	0.2	1.1	0.7	0.3	1.2	0.8	0.3	1.3	0.8	0.3
36	CHARLS	WV	0.6	0.2	0.2	1.2	0.8	0.3	1.3	0.9	0.3	1.4	1.0	0.4
37	GRNDRP	MI	0.7	0.3	0.3	1.4	0.9	0.4	1.5	1.0	0.4	1.6	1.1	0.4
38	LOUSVL	KY	1.7	2.4	0.4	2.2	2.9	0.5	2.3	3.0	0.5	2.4	3.1	0.5
39	OKCITY	OK	0.6	0.2	0.2	1.3	0.9	0.3	1.4	1.0	0.4	1.5	1.1	0.4
40	BIRM	AL	1.4	1.4	0.4	2.0	1.9	0.4	2.1	2.0	0.5	2.2	2.1	0.5
41	DAYTON	OH	1.5	1.4	0.4	2.1	1.9	0.5	2.2	2.0	0.5	2.3	2.1	0.5
42	CHARLT	NC	1.6	2.4	0.4	2.2	3.0	0.5	2.3	3.1	0.5	2.4	3.2	0.5
43	PHOENX	AZ	0.7	1.2	0.2	1.2	1.7	0.3	1.2	1.8	0.3	1.3	1.9	0.3
44	NORFLK	VA	0.8	1.3	0.3	1.3	1.7	0.3	1.4	1.8	0.3	1.4	1.9	0.4
45	SANANT	TX	0.8	1.3	0.3	1.3	1.8	0.3	1.4	1.9	0.4	1.5	2.0	0.4
46	GRNVLE	SC	0.5	1.2	0.2	1.3	2.0	0.3	1.4	2.1	0.3	1.5	2.2	0.4
47	GRNBRO	NC	0.5	0.2	0.2	1.2	0.9	0.3	1.2	1.0	0.3	1.3	1.0	0.3
48	SALTLK	UT	0.5	0.2	0.2	1.3	1.0	0.3	1.4	1.0	0.3	1.4	1.1	0.4
49	WLKSBR	PA	5.1	3.9	0.9	5.9	4.7	1.0	6.2	5.0	1.1	6.5	5.3	1.1
50	LITLRK	AR	0.5	0.2	0.2	1.2	0.9	0.3	1.3	1.0	0.3	1.3	1.1	0.3

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 17 (contd.)

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO	OH	1.5	1.4	0.4	2.0	1.8	0.4	2.1	1.9	0.4	2.2	2.0	0.5
53 OMAHA	NE	0.4	0.2	0.2	1.1	0.8	0.3	1.1	0.9	0.3	1.2	1.0	0.3
54 TULSA	OK	0.5	0.2	0.2	1.2	0.9	0.3	1.2	1.0	0.3	1.3	1.1	0.3
55 ORLAN	FL	0.8	0.3	0.3	1.4	0.9	0.4	1.5	0.9	0.4	1.6	1.0	0.4
56 ROCHES	NY	0.7	0.3	0.3	1.2	0.7	0.3	1.2	0.8	0.3	1.3	0.9	0.3
57 HARISB	PA	2.8	2.6	0.6	3.4	3.1	0.6	3.5	3.3	0.7	3.7	3.4	0.7
58 SHRVPT	LA	0.4	0.2	0.2	1.2	1.0	0.3	1.3	1.0	0.3	1.3	1.1	0.3
59 MOBILE	AL	0.4	0.2	0.2	1.1	1.0	0.3	1.2	1.0	0.3	1.3	1.1	0.3
60 DAVENP	IA	0.6	0.2	0.2	1.1	0.7	0.3	1.2	0.8	0.3	1.2	0.9	0.3
61 FLINT	MI	1.5	1.4	0.4	2.0	1.8	0.4	2.1	1.9	0.5	2.2	2.0	0.5
62 GRNBAY	WI	0.5	0.2	0.2	1.1	0.8	0.3	1.2	0.9	0.3	1.2	0.9	0.3
63 RICHMN	VA	0.6	0.2	0.2	1.3	0.9	0.3	1.3	0.9	0.3	1.4	1.0	0.4
64 SPRNGF	IL	2.7	2.5	0.5	3.1	3.0	0.6	3.3	3.1	0.6	3.4	3.3	0.7
65 CDRRAP	IA	0.5	0.2	0.2	1.1	0.8	0.3	1.2	0.9	0.3	1.3	1.0	0.3
66 DMOINE	IA	0.5	0.2	0.2	1.2	0.9	0.3	1.3	1.0	0.3	1.3	1.1	0.3
67 WICHTA	KS	0.5	0.2	0.2	1.3	1.0	0.3	1.3	1.1	0.3	1.4	1.1	0.4
68 JKSNVL	FL	1.5	1.4	0.4	2.0	1.9	0.4	2.1	2.0	0.5	2.2	2.1	0.5
69 PADUCA	KY	0.3	1.2	0.2	1.0	1.9	0.3	1.1	2.0	0.3	1.2	2.0	0.3
70 ROANOK	VA	0.4	0.2	0.2	1.0	0.8	0.3	1.1	0.9	0.3	1.2	1.0	0.3
71 KNOXVL	TN	1.1	1.3	0.3	1.9	2.0	0.4	2.0	2.1	0.4	2.1	2.3	0.5
72 FRESNO	CA	4.9	5.9	0.9	5.4	6.3	0.9	5.6	6.6	1.0	5.8	6.8	1.0
73 RALEIG	NC	1.1	1.3	0.3	1.8	2.0	0.4	1.8	2.1	0.4	1.9	2.2	0.4
74 JOHNST	PA	0.7	1.3	0.3	1.4	1.9	0.3	1.5	2.0	0.4	1.5	2.1	0.4
75 PORTLN	ME	0.4	0.2	0.2	1.1	0.8	0.3	1.1	0.9	0.3	1.2	1.0	0.3
76 SPOKAN	WA	0.3	0.2	0.2	0.9	0.8	0.3	1.0	0.9	0.3	1.1	1.0	0.3
77 JACKSN	MS	0.9	1.3	0.3	1.5	1.9	0.4	1.6	2.0	0.4	1.7	2.1	0.4
78 CHATTN	TN	0.4	1.2	0.2	1.0	1.8	0.3	1.1	1.9	0.3	1.1	1.9	0.3
79 YGSTN	OH	3.9	3.7	0.7	4.6	4.4	0.8	4.8	4.6	0.8	5.0	4.8	0.9
80 SBEND	IN	3.8	3.7	0.7	4.5	4.4	0.8	4.7	4.6	0.8	4.8	4.8	0.9
81 ALBUQ	NM	0.4	0.2	0.2	1.0	0.8	0.3	1.1	0.9	0.3	1.1	0.9	0.3
82 FTWAYN	IN	3.9	3.7	0.7	4.6	4.4	0.8	4.9	4.7	0.9	5.1	4.9	0.9
83 PEORIA	IL	4.0	3.7	0.7	4.6	4.5	0.8	5.0	4.8	0.9	5.2	5.0	0.9
84 GRNVLE	NC	0.3	0.2	0.2	1.0	0.9	0.3	1.1	1.0	0.3	1.2	1.1	0.3
85 SIOUXF	SD	0.1	0.2	0.2	0.9	0.9	0.3	0.9	1.0	0.3	1.0	1.0	0.3
86 EVANSV	IN	2.1	2.5	0.5	2.6	2.9	0.5	2.7	3.0	0.5	2.8	3.2	0.6
87 BATONR	LA	0.9	1.3	0.3	1.3	1.7	0.3	1.4	1.8	0.4	1.5	1.9	0.4
88 BEAUMT	TX	0.2	0.2	0.2	0.7	0.7	0.2	0.7	0.7	0.3	0.8	0.8	0.3
89 DULUTH	MN	0.2	0.2	0.2	0.7	0.7	0.3	0.8	0.7	0.3	0.8	0.8	0.3
90 WHLING	WV	0.5	0.2	0.2	1.0	0.8	0.3	1.1	0.8	0.3	1.1	0.9	0.3
91 LINCLN	NE	0.3	0.2	0.2	0.9	0.8	0.3	1.0	0.9	0.3	1.1	1.0	0.3
92 LANSNG	MI	0.8	0.3	0.3	1.3	0.8	0.3	1.4	0.8	0.4	1.5	0.9	0.4
93 MADISN	WI	2.1	2.4	0.4	2.4	2.8	0.5	2.5	2.9	0.5	2.6	3.0	0.5
94 COLUMB	GA	0.7	1.2	0.2	1.1	1.7	0.3	1.2	1.8	0.3	1.3	1.9	0.3
95 AMARIL	TX	0.3	0.2	0.2	0.8	0.7	0.3	0.9	0.8	0.3	0.9	0.8	0.3
96 HUNTSV	AL	3.6	3.7	0.7	4.3	4.3	0.8	4.5	4.6	0.8	4.8	4.8	0.9
97 ROCKFD	IL	2.1	2.4	0.4	2.4	2.8	0.5	2.5	2.9	0.5	2.6	3.0	0.5
98 FARGO	ND	0.1	0.2	0.2	0.8	0.9	0.3	0.9	1.0	0.3	1.0	1.0	0.3
99 MONFOR	LA	0.3	0.2	0.2	1.3	1.2	0.3	1.4	1.2	0.3	1.4	1.3	0.4
100 COLUMB	SC	1.8	2.4	0.4	2.4	3.0	0.5	2.5	3.1	0.5	2.7	3.3	0.5

Table 18

"LARGE" DECREASE IN UHF HANDICAP, OR IMPROVEMENT IN ECONOMIC CONDITIONS

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	5.0	3.6	1.6	7.8	6.4	2.4	8.1	6.7	2.5	8.6	7.2	2.6
2	LA	CA	6.9	8.2	2.2	9.3	10.5	2.8	9.9	11.1	3.0	10.5	11.7	3.1
3	CHCAGO	IL	2.6	4.0	1.0	3.3	4.6	1.2	3.4	4.8	1.2	3.6	4.9	1.2
4	PHIL	PA	2.8	4.0	1.0	3.3	4.6	1.2	3.5	4.7	1.2	3.6	4.9	1.3
5	DTROIT	MI	1.9	2.8	0.8	2.5	3.3	0.9	2.6	3.4	1.0	2.7	3.6	1.0
6	BOSTON	MA	2.3	2.9	0.9	3.1	3.7	1.1	3.2	3.8	1.1	3.3	3.9	1.2
7	SF	CA	1.7	3.7	0.7	2.5	4.5	0.9	2.6	4.6	1.0	2.7	4.7	1.0
8	CLVLND	OH	2.1	2.9	0.9	2.7	3.4	1.0	2.8	3.5	1.0	2.9	3.7	1.1
9	WASH	DC	1.7	1.7	0.7	2.2	2.2	0.9	2.4	2.4	0.9	2.5	2.5	0.9
10	PITT	PA	1.5	0.7	0.7	2.4	1.6	0.9	2.5	1.7	1.0	2.6	1.8	1.0
11	STLOUS	MO	1.3	1.6	0.6	2.0	2.3	0.8	2.0	2.4	0.8	2.2	2.5	0.9
12	DALLAS	TX	1.5	1.7	0.7	2.1	2.3	0.8	2.2	2.4	0.9	2.3	2.5	0.9
13	MINN	MN	0.9	0.5	0.5	1.9	1.5	0.8	2.0	1.7	0.8	2.2	1.8	0.9
14	BALT	MD	1.5	1.7	0.7	2.1	2.3	0.8	2.2	2.4	0.9	2.3	2.5	0.9
15	HOUSTN	TX	2.0	2.8	0.8	2.4	3.3	0.9	2.6	3.4	1.0	2.7	3.5	1.0
16	INDPLS	IN	1.1	1.6	0.6	1.7	2.2	0.7	1.8	2.3	0.8	1.9	2.4	0.8
17	CINCI	OH	1.5	1.7	0.7	2.0	2.2	0.8	2.1	2.3	0.9	2.2	2.4	0.9
18	ATLANT	GA	1.7	2.7	0.7	2.4	3.4	0.9	2.5	3.5	1.0	2.6	3.6	1.0
19	HRTFRD	CN	2.3	2.9	0.9	3.0	3.5	1.1	3.1	3.7	1.1	3.2	3.8	1.1
20	SEATLE	WA	0.7	0.5	0.5	1.6	1.3	0.7	1.7	1.4	0.7	1.8	1.5	0.8
21	MIAMI	FL	1.3	1.5	0.6	1.9	2.3	0.8	2.0	2.4	0.8	2.1	2.5	0.9
22	KNSCTY	MO	1.4	1.7	0.7	2.0	2.2	0.8	2.1	2.3	0.8	2.2	2.5	0.9
23	MILWAU	WI	1.6	1.7	0.7	2.1	2.2	0.8	2.2	2.3	0.9	2.3	2.4	0.9
25	SACRA	CA	1.4	1.7	0.7	2.0	2.2	0.8	2.1	2.3	0.8	2.2	2.4	0.9
26	MEMPH	TN	0.9	0.5	0.5	1.9	1.5	0.8	2.0	1.6	0.8	2.1	1.7	0.8
27	COLUMB	OH	1.2	0.6	0.6	1.8	1.2	0.8	1.9	1.3	0.8	2.0	1.4	0.8
28	TAMPA	FL	1.8	1.8	0.8	2.4	2.3	0.9	2.5	2.5	0.9	2.6	2.6	1.0
29	PORTLN	OR	0.8	0.5	0.5	1.5	1.2	0.7	1.6	1.3	0.7	1.7	1.4	0.7
30	NASHVL	TN	0.9	0.5	0.5	1.9	1.5	0.8	2.0	1.7	0.8	2.2	1.8	0.9
31	NEWORL	LA	1.3	1.6	0.6	1.8	2.1	0.8	1.9	2.2	0.8	2.0	2.3	0.8
32	DENVER	CO	0.9	0.5	0.5	1.6	1.2	0.7	1.7	1.3	0.7	1.8	1.4	0.8
33	PROVID	RI	1.3	0.6	0.6	1.9	1.2	0.8	2.0	1.3	0.8	2.1	1.4	0.8
34	ALBANY	NY	1.1	0.6	0.6	1.7	1.2	0.7	1.8	1.3	0.8	1.9	1.4	0.8
35	SYRACU	NY	1.0	0.5	0.5	1.5	1.0	0.7	1.6	1.1	0.7	1.7	1.2	0.7
36	CHRLS	WV	0.9	0.5	0.5	1.6	1.2	0.7	1.7	1.3	0.7	1.8	1.4	0.8
37	GRNDRP	MI	1.0	0.6	0.6	1.8	1.3	0.8	1.9	1.4	0.8	2.0	1.5	0.8
38	LOUSVL	KY	2.1	2.9	0.9	2.7	3.5	1.0	2.9	3.6	1.1	3.0	3.7	1.1
39	OKCITY	OK	0.9	0.5	0.5	1.8	1.3	0.7	1.9	1.5	0.8	2.0	1.6	0.8
40	BIRM	AL	1.8	1.8	0.8	2.5	2.4	0.9	2.6	2.5	1.0	2.7	2.7	1.0
41	DAYTON	OH	2.0	1.8	0.8	2.6	2.4	1.0	2.7	2.6	1.0	2.8	2.7	1.0
42	CHARLT	NC	2.0	2.9	0.8	2.7	3.5	1.0	2.9	3.7	1.1	3.0	3.8	1.1
43	PHOENX	AZ	1.0	1.5	0.5	1.5	2.1	0.7	1.6	2.2	0.7	1.7	2.3	0.7
44	NORFLK	VA	1.2	1.6	0.6	1.7	2.1	0.7	1.8	2.2	0.8	1.9	2.3	0.8
45	SANANT	TX	1.1	1.6	0.6	1.7	2.2	0.7	1.8	2.3	0.8	1.9	2.4	0.8
46	GRNVLE	SC	0.8	1.5	0.5	1.7	2.4	0.7	1.8	2.5	0.8	1.9	2.6	0.8
47	GRNBRO	NC	0.8	0.5	0.5	1.6	1.3	0.7	1.6	1.4	0.7	1.7	1.4	0.7
48	SALTLK	UT	0.8	0.5	0.5	1.7	1.3	0.7	1.6	1.4	0.8	1.9	1.5	0.8
49	WLKSBR	PA	6.1	4.9	1.9	7.1	5.9	2.2	7.4	6.3	2.3	7.8	6.6	2.4
50	LITLRK	AR	0.7	0.5	0.5	1.5	1.3	0.7	1.6	1.4	0.7	1.7	1.5	0.7

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 18 (contd.)

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52	TOLEDO	OH	1.9	1.8	0.8	2.5	2.4	0.9	2.6	2.5	1.0	2.7	2.6	1.0
53	OMAHA	NE	0.7	0.5	0.5	1.4	1.2	0.7	1.5	1.3	0.7	1.6	1.3	0.7
54	TULSA	OK	0.7	0.5	0.5	1.5	1.3	0.7	1.6	1.4	0.7	1.7	1.5	0.7
55	ORLAN	FL	1.2	0.6	0.6	1.8	1.3	0.8	1.9	1.4	0.8	2.0	1.5	0.8
56	ROCHES	NY	1.0	0.5	0.5	1.5	1.1	0.7	1.6	1.2	0.7	1.7	1.3	0.7
57	HARISB	PA	3.5	3.2	1.2	4.1	3.9	1.4	4.3	4.1	1.4	4.5	4.2	1.5
58	SHRVPT	LA	0.7	0.5	0.5	1.6	1.3	0.7	1.6	1.4	0.7	1.7	1.5	0.7
59	MOBILE	AL	0.6	0.4	0.4	1.5	1.3	0.7	1.6	1.4	0.7	1.7	1.5	0.7
60	DAVENP	IA	0.9	0.5	0.5	1.5	1.1	0.7	1.5	1.2	0.7	1.5	1.3	0.7
61	FLINT	MI	2.0	1.8	0.8	2.5	2.3	0.9	2.6	2.4	1.0	2.7	2.6	1.0
62	GRNBAY	WI	0.8	0.5	0.5	1.5	1.2	0.7	1.5	1.2	0.7	1.6	1.3	0.7
63	RICHMN	VA	0.9	0.5	0.5	1.7	1.3	0.7	1.7	1.3	0.7	1.8	1.4	0.8
64	SPRNGF	IL	3.4	3.2	1.2	3.8	3.7	1.3	4.0	3.8	1.4	4.2	4.0	1.4
65	CDRRAP	IA	0.8	0.5	0.5	1.5	1.2	0.7	1.6	1.3	0.7	1.6	1.3	0.7
66	DMOINE	IA	0.7	0.5	0.5	1.5	1.3	0.7	1.6	1.4	0.7	1.7	1.5	0.7
67	WICHTA	KS	0.8	0.5	0.5	1.7	1.4	0.7	1.7	1.5	0.7	1.8	1.5	0.8
68	JKSNVL	FL	1.9	1.8	0.8	2.5	2.4	1.0	2.6	2.5	1.0	2.7	2.6	1.0
69	PADUCA	KY	0.6	1.4	0.4	1.4	2.2	0.6	1.5	2.3	0.7	1.6	2.4	0.7
70	ROANOK	VA	0.6	0.4	0.4	1.4	1.2	0.7	1.5	1.3	0.7	1.6	1.4	0.7
71	KNOXVL	TN	1.5	1.7	0.7	2.4	2.5	0.9	2.5	2.7	0.9	2.6	2.8	1.0
72	FRESNO	CA	5.9	6.9	1.9	6.5	7.4	2.0	6.7	7.7	2.1	7.0	8.0	2.2
73	RALEIG	NC	1.4	1.7	0.7	2.2	2.5	0.9	2.3	2.6	0.9	2.5	2.7	0.9
74	JOHNST	PA	1.0	1.5	0.5	1.8	2.3	0.8	1.9	2.4	0.8	2.0	2.5	0.8
75	PORTLN	ME	0.7	0.5	0.5	1.4	1.2	0.7	1.5	1.2	0.7	1.6	1.3	0.7
76	SPOKAN	WA	0.5	0.4	0.4	1.3	1.2	0.6	1.4	1.3	0.6	1.4	1.3	0.7
77	JACKSN	MS	1.2	1.6	0.6	2.0	2.4	0.8	2.1	2.5	0.8	2.2	2.6	0.9
78	CHATTN	TN	0.7	1.5	0.5	1.3	2.1	0.6	1.4	2.2	0.7	1.5	2.3	0.7
79	YGSTN	OH	4.8	4.6	1.6	5.5	5.3	1.8	5.8	5.5	1.8	[illegible]	5.8	1.9
80	SBEND	IN	4.6	4.5	1.5	5.4	5.4	1.7	5.6	5.6	1.8	5.9	5.8	1.9
81	ALBUQ	NM	0.6	0.4	0.4	1.3	1.1	0.6	1.4	1.2	0.7	1.5	1.3	0.7
82	FTWAYN	IN	4.8	4.6	1.6	5.6	5.4	1.8	5.9	5.7	1.9	6.1	5.9	1.9
83	PEORIA	IL	4.8	4.6	1.6	5.8	5.5	1.8	6.0	5.8	1.9	6.3	6.1	2.0
84	GRNVLE	NC	0.5	0.4	0.4	1.4	1.3	0.6	1.4	1.3	0.7	1.5	1.4	0.7
85	SIOUXF	SD	0.3	0.4	0.4	1.2	1.2	0.6	1.3	1.3	0.6	1.3	1.4	0.6
86	EVANSV	IN	2.7	3.0	1.0	3.2	3.5	1.1	3.3	3.7	1.2	3.5	3.6	1.2
87	BATONR	LA	1.3	1.6	0.6	1.7	2.1	0.7	1.8	2.2	0.8	1.9	2.3	0.8
88	BEAUMT	TX	0.4	0.4	0.4	0.9	1.0	0.5	1.0	1.0	0.5	1.1	1.1	0.6
89	DULUTH	MN	0.5	0.4	0.4	1.0	1.0	0.6	1.1	1.0	0.6	1.2	1.1	0.6
90	WHLING	WV	0.7	0.5	0.5	1.4	1.1	0.6	1.4	1.2	0.7	1.5	1.3	0.7
91	LINCLN	NE	0.5	0.4	0.4	1.3	1.2	0.6	1.3	1.2	0.6	1.4	1.3	0.7
92	LANSNG	MI	1.1	0.6	0.6	1.7	1.2	0.7	1.8	1.2	0.8	1.9	1.3	0.8
93	MADISN	WI	2.6	3.0	1.0	3.0	3.4	1.1	3.1	3.5	1.1	3.3	3.7	1.2
94	COLUMB	GA	1.0	1.5	0.5	1.5	2.1	0.7	1.6	2.1	0.7	1.7	2.3	0.7
95	AMARIL	TX	0.5	0.4	0.4	1.1	1.0	0.6	1.2	1.1	0.6	1.3	1.2	0.6
96	HUNTSV	AL	4.4	4.5	1.5	[illegible]	5.3	1.7	5.5	5.5	1.8	5.8	5.8	1.8
97	ROCKFD	IL	2.6	3.0	1.0	2.9	3.3	1.1	3.1	3.5	1.1	3.2	3.6	1.1
98	FARGO	ND	0.3	0.4	0.4	1.2	1.2	0.6	1.2	1.3	0.6	1.3	1.4	0.6
99	MONROE	LA	0.5	0.4	0.4	1.7	1.6	0.7	1.8	1.6	0.8	1.9	1.7	0.8
100	COLUMB	SC	2.3	2.9	0.9	3.0	3.6	1.1	3.2	3.7	1.1	3.3	3.9	1.2

CONSTRAINED EQUATION*

Consequently, we turn to another version of the viable stations model that does produce projections based on the complete disappearance of the handicap. We call this our constrained equation because it is estimated subject to certain constraints on the coefficients of the variables, the technical details of which are set out in Appendix A.

The basic idea behind the constrained equation is fairly straightforward. The method is based on the following observation: The total number of stations, VHF and UHF, that a market would support if the handicap disappeared is equal to the number of VHF stations it would support were there no limits on VHF spectrum allocations. Thus our task reduces to estimating the latter quantity, or what we call the "unlimited" VHF relationship. Since all VHF allocations are in use in almost all markets, we cannot estimate an unlimited VHF relationship directly. We know that the number of VHF stations is already bumping up against the ceiling of channel assignments, but we do not know how hard it is pushing in different markets. One suspects that VHF allocations are very restrictive in some markets (Philadelphia and Boston, for example) and much less so in others (say Seattle and Denver). If one could somehow separate out markets where there is little or no pressure on VHF allocations, one could use just these markets to estimate an unlimited-VHF relationship.

Our constrained equation does something very much like that. We take the presence of UHF stations to be an indication of pressure on VHF allocations. That is, if a market now supports a UHF station, we are quite sure that it could support another VHF station if allocations permitted. The more UHFs it supports, the greater is the presumed pressure on VHF allocations. To find the unlimited-VHF line, we first estimate the viable stations model (subject to constraints described in Appendix A); this gives us a relationship between the number of UHF stations, number of VHFs, television households, and other variables. We then find points of no pressure on VHF allocations by setting the number of UHF stations equal to zero and solving for the number of VHF stations. These points

*This method is an elaboration of that used by Stanley M. Besen and Paul J. Hanley in "Market Size, VHF Allocations, and the Viability of Television Stations," *Journal of Industrial Economics*, September 1975.

constitute the unlimited-VHF line.

The unlimited-VHF line is used to make the projections in Table 19. The unlimited-VHF line gives directly an estimate of the total number of stations the market would support--VHF stations plus unhandicapped UHF stations. From this number we subtract the number of VHFs to get the projected number of UHFs in Table 19. Column 1 is the straight projection. Column 2 is column 1 plus or minus the constant adjustment factor for the constrained equation. Column 3 shows how much difference disappearance of the handicap makes by comparing these projections with the constrained equation base case projections in Table 4. For example, disappearance of the handicap increases projected UHF stations in New York in 1990 by 3.3. In 1974, the projected difference is larger--9.8 stations--because UHF stations in the base case projections suffer not just from the handicap but from incomplete UHF set penetration as well. The 9.8 station increase reflects removal of both burdens.

As shown in summary Table 20, the total number of UHF stations projected using the constrained equation assuming complete disappearance of the handicap (280) is about the same as the projection using the four-year equation assuming a "large" decrease in the handicap and/or improvement in economic conditions (290).

An apparent weakness of this second method is that it does not provide any estimate of the rate at which the handicap will decrease and when, if ever, it will disappear entirely. However, even if it were possible to isolate past trends in the handicap, its future course would remain highly speculative and heavily dependent on FCC policy changes such as those recently suggested by the Council for UHF Broadcasting and others.*

*In September 1975 the Council for UHF Broadcasting filed a petition fo rulemaking to require that whenever a VHF antenna is affixed to a television receiver by the manufacturer, an effective UHF antenna must be likewise affixed to the receiver, as one way to promote greater parity between UHF and VHF. The speed with which the UHF handicap is reduced will depend upon FCC action regarding this petition, as well as in considering imposition of more stringent UHF tuner specifications and other approaches to reducing the UHF handicap.

Table 19

PROJECTIONS ASSUMING UHF HANDICAP DISAPPEARS, CONSTRAINED EQUATION

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	12.2	11.8	9.8	13.3	12.9	2.8	14.0	13.7	3.0	14.8	14.4	3.3
2	LA	CA	4.8	8.5	2.5	5.8	9.5	1.3	6.3	10.0	1.4	6.8	10.5	1.6
3	CHCAGO	IL	6.1	5.4	2.4	6.7	6.0	1.5	7.0	6.4	1.6	7.3	6.7	1.7
4	PHIL	PA	5.9	5.3	2.3	6.3	5.7	1.4	6.5	5.9	1.6	6.8	6.1	1.7
5	DTROIT	MI	3.2	3.3	1.3	3.5	3.6	0.7	3.7	3.8	0.8	3.9	4.0	0.9
6	BOSTON	MA	4.5	4.4	2.4	4.9	4.7	1.1	5.1	4.9	1.2	5.3	5.1	1.3
7	SF	CA	[illegible]	5.0	2.0	3.9	5.5	0.9	4.1	5.8	1.0	4.4	6.1	1.1
8	CLVLND	OH	3.6	3.5	1.5	3.8	3.7	0.8	3.9	3.7	0.9	4.0	3.8	1.0
9	WASH	DC	2.6	2.1	1.1	3.1	2.7	0.6	3.5	3.1	0.7	4.0	3.6	0.8
10	PITT	PA	3.1	2.3	2.3	3.2	2.4	0.7	3.2	2.4	0.8	3.2	2.4	0.9
11	STLOUS	MO	1.8	2.1	1.1	1.9	2.2	0.4	2.0	2.2	0.4	2.0	2.3	0.5
12	DALLAS	TX	2.0	2.1	1.1	2.3	2.3	0.5	2.5	2.6	0.6	2.8	2.8	0.7
13	MINN	MN	1.6	1.5	1.5	1.8	1.7	0.4	2.0	1.8	0.4	2.1	2.0	0.5
14	BALT	MD	2.3	2.2	1.2	2.4	2.2	0.5	2.5	2.3	0.5	2.5	2.4	0.6
15	HOUSTN	TX	2.5	3.0	1.0	2.9	3.3	0.6	3.1	3.5	0.7	3.3	3.7	0.7
16	INDPLS	IN	1.3	1.9	0.9	1.5	2.1	0.3	1.7	2.2	0.4	1.8	2.3	0.4
17	CINCI	OH	2.1	2.0	1.0	2.2	2.1	0.5	2.3	2.2	0.5	2.3	2.3	0.5
18	ATLANT	GA	2.5	3.3	1.3	2.8	3.6	0.6	3.0	3.9	0.7	3.2	4.1	0.8
19	HARTFD	CN	3.1	3.3	1.3	3.2	3.4	0.7	3.3	3.5	0.7	3.4	3.5	0.7
20	SEATLE	WA	0.4	0.3	0.3	0.4	0.4	0.1	0.5	0.5	0.1	0.6	0.6	0.2
21	MIAMI	FL	1.5	1.8	0.8	2.2	2.5	0.4	2.5	2.8	0.5	2.9	3.2	0.6
22	KANCTY	MO	2.1	2.1	1.1	2.2	2.2	0.5	2.3	2.3	0.5	2.3	2.4	0.5
23	MILWAU	WI	2.0	1.8	0.8	2.1	1.9	0.5	2.1	1.9	0.5	2.2	1.9	0.5
25	SACRA	CA	2.0	2.1	1.1	2.1	2.2	0.5	2.2	2.3	0.5	2.3	2.4	0.6
26	MEMPH	TN	1.3	1.7	1.7	1.9	1.8	0.4	1.9	1.8	0.4	2.0	1.9	0.5
27	COLUMB	OH	1.8	1.0	1.0	2.0	1.1	0.4	2.1	1.2	0.4	2.2	1.3	0.5
28	TAMPA	FL	2.4	2.1	1.1	2.9	2.7	0.6	3.2	2.9	0.7	3.4	3.2	0.8
29	PORTLN	OR	1.0	0.9	0.8	1.2	0.9	0.3	1.2	1.0	0.3	1.3	1.1	0.3
30	NASHVL	TN	1.8	1.8	1.8	2.0	1.9	0.4	2.1	2.0	0.5	2.2	2.1	0.5
31	NEWORL	LA	1.7	1.8	0.8	1.8	1.8	0.4	1.8	1.9	0.4	1.8	1.9	0.4
32	DENVER	CO	1.0	0.7	0.7	1.2	1.0	0.3	1.4	1.1	0.3	1.5	1.2	0.3
33	PROVID	RI	2.0	1.0	1.0	2.1	1.2	0.4	2.2	1.2	0.4	2.2	1.3	0.5
34	ALBANY	NY	1.6	1.1	1.1	1.7	1.1	0.4	1.7	1.2	0.4	1.7	1.2	0.4
35	SYRACU	NY	1.4	0.8	0.8	1.5	0.8	0.4	1.5	0.9	0.4	1.5	0.9	0.4
36	CHARLS	WV	1.6	1.2	1.2	1.6	1.2	0.4	1.6	1.2	0.4	1.6	1.2	0.4
37	GRNDRP	MI	1.6	1.2	1.2	1.7	1.2	0.4	1.7	1.3	0.4	1.7	1.3	0.5
~~38~~	~~LOUSVL~~	~~KY~~	~~2.7~~	~~3.1~~	~~1.1~~	~~2.8~~	~~3.3~~	~~0.6~~	~~2.9~~	~~3.4~~	~~0.6~~	3.0	3.5	0.7
39	OKCITY	OK	1.7	1.3	1.3	1.8	1.4	0.4	1.8	1.5	0.4	1.9	1.6	0.4
40	BIRM	AL	2.5	2.3	1.3	2.6	2.4	0.5	2.7	2.4	0.6	2.7	2.5	0.6
41	DAYTON	OH	2.6	2.2	1.2	2.7	2.3	0.6	2.7	2.3	0.6	2.8	2.4	0.7
42	CHARLT	NC	2.8	3.4	1.4	2.9	3.6	0.6	3.0	3.6	0.6	3.1	3.7	0.7
43	PHOENX	AZ	0.8	1.5	0.5	1.1	1.7	0.2	1.2	1.9	0.3	1.4	2.1	0.3
44	NORFLK	VA	1.5	1.8	0.8	1.5	1.8	0.3	1.5	1.8	0.3	1.6	1.9	0.4
45	SANANT	TX	1.5	2.0	1.0	1.5	2.0	0.3	1.5	2.0	0.4	1.6	2.0	0.4
46	GRNVLE	SC	1.6	2.5	1.5	1.8	2.6	0.4	1.9	2.7	0.4	2.0	2.8	0.4
47	GRNBRO	NC	1.5	1.2	1.2	1.7	1.4	0.3	1.7	1.5	0.3	1.8	1.6	0.4
48	SALTLK	UT	1.5	1.3	1.3	1.5	1.3	0.3	1.6	1.4	0.4	1.7	1.5	0.4
49	WLKSBR	PA	4.5	4.5	1.5	4.7	4.6	1.2	4.7	4.7	1.3	4.8	4.8	1.4
50	LITLRK	AR	1.4	1.3	1.3	1.5	1.3	0.3	1.6	1.4	0.3	1.6	1.4	0.3

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 19 (contd.)

MARKET	1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH	2.5	2.1	1.1	2.6	2.2	0.6	2.6	2.3	0.7	2.7	2.3	0.7
53 OMAHA NE	1.3	1.0	1.0	1.3	1.1	0.3	1.4	1.1	0.3	1.4	1.1	0.3
54 TULSA OK	1.4	1.2	1.2	1.5	1.3	0.3	1.5	1.3	0.3	1.6	1.4	0.4
55 ORLAN FL	1.5	1.0	1.0	1.8	1.3	0.4	1.9	1.4	0.5	2.0	1.5	0.5
56 ROCHES NY	1.3	0.7	0.7	1.5	0.8	0.3	1.5	0.9	0.3	1.6	1.0	0.3
57 HARISB PA	3.5	3.4	1.4	3.6	3.5	1.0	3.7	3.5	1.0	3.7	3.6	1.1
58 SHRVPT LA	1.4	1.3	1.3	1.4	1.3	0.3	1.4	1.3	0.3	1.5	1.3	0.4
59 MOBILE AL	1.3	1.3	1.3	1.3	1.3	0.3	1.4	1.3	0.3	1.4	1.4	0.3
60 DAVENP IA	1.3	0.8	0.8	1.3	0.8	0.3	1.3	0.8	0.3	1.3	0.8	0.3
61 FLINT MI	2.4	2.0	1.0	2.5	2.1	0.6	2.5	2.1	0.6	2.6	2.2	0.7
62 GRNBAY WI	1.3	0.9	0.9	1.3	1.0	0.3	1.3	1.0	0.3	1.4	1.0	0.3
63 RICHMN VA	1.4	1.1	1.1	1.5	1.2	0.3	1.6	1.3	0.4	1.7	1.3	0.4
64 SPRNGF IL	3.2	3.0	1.0	3.3	3.1	0.8	3.4	3.2	0.9	3.4	3.2	0.9
65 CDRRAP IA	1.3	1.0	1.0	1.3	1.0	0.3	1.3	1.0	0.3	1.4	1.0	0.3
66 DMOINE IA	1.3	1.1	1.1	1.4	1.2	0.3	1.4	1.2	0.3	1.4	1.2	0.3
67 WICHTA KS	1.5	1.4	1.4	1.3	1.3	0.4	1.3	1.3	0.4	1.3	1.3	0.4
68 JKSNVL FL	2.3	2.1	1.1	2.4	2.2	0.6	2.5	2.3	0.6	2.5	2.4	0.7
69 PADUCA KY	1.2	2.2	1.2	1.3	2.3	0.3	1.3	2.3	0.3	1.3	2.3	0.3
70 ROANOK VA	1.3	1.1	1.1	1.4	1.2	0.3	1.4	1.2	0.3	1.5	1.3	0.3
71 KNOXVL TN	2.4	2.6	1.6	2.4	2.7	0.5	2.5	2.7	0.5	2.5	2.8	0.6
72 FRESNO CA	4.2	6.0	1.0	4.2	6.0	1.1	4.2	6.0	1.2	4.2	6.1	1.2
73 RALEIG NC	2.3	2.5	1.5	2.4	2.6	0.5	2.5	2.7	0.5	2.5	2.7	0.6
74 JOHNST PA	2.2	2.8	1.8	2.3	2.9	0.6	2.3	2.9	0.6	2.4	2.9	0.7
75 PORTLN ME	1.2	1.0	1.0	1.2	1.0	0.3	1.2	1.0	0.3	1.2	1.0	0.4
76 SPOKAN WA	1.2	1.1	1.1	1.2	1.1	0.3	1.2	1.1	0.3	1.2	1.1	0.3
77 JACKSN MS	2.1	2.5	1.5	2.2	2.5	0.4	2.2	2.5	0.5	2.2	2.6	0.5
78 CHATTN TN	1.2	1.9	0.9	1.3	2.0	0.3	1.3	2.1	0.3	1.4	2.1	0.3
79 YGSTN OH	4.1	4.2	1.2	4.1	4.3	0.8	4.2	4.3	0.9	4.2	4.3	1.0
80 SBEND IN	4.1	4.4	1.4	4.1	4.4	0.9	4.1	4.4	0.9	4.1	4.4	1.0
81 ALBUQ NM	1.1	0.9	0.9	1.2	1.0	0.3	1.2	1.0	0.3	1.2	1.0	0.3
82 FTWAYN IN	4.1	4.2	1.2	4.1	4.3	0.9	4.1	4.3	0.9	4.2	4.4	0.9
83 PEORIA IL	4.1	4.5	1.5	4.1	4.6	0.9	4.1	4.6	1.0	4.2	4.6	1.1
84 GRNVLE NC	1.2	1.1	1.1	1.2	1.2	0.3	1.2	1.2	0.3	1.3	1.3	0.3
85 SIOUXF SD	1.1	1.2	1.2	1.1	1.2	0.2	1.1	1.2	0.3	1.1	1.2	0.3
86 EVANSV IN	3.1	3.0	1.0	3.1	3.1	0.6	3.2	3.1	0.7	3.2	3.1	0.7
87 BATONR LA	2.0	1.9	0.9	2.0	1.9	0.4	2.0	1.9	0.4	2.0	1.9	0.5
88 BEAUMT TX	0.9	0.8	0.8	1.0	0.8	0.2	1.0	0.8	0.2	1.0	0.8	0.2
89 DULUTH MN	1.0	0.8	0.8	1.0	0.7	0.2	1.0	0.7	0.2	0.9	0.7	0.2
90 WHLING WV	2.0	1.5	1.5	2.0	1.5	0.5	2.0	1.5	0.5	2.0	1.5	0.5
91 LINCLN NE	1.1	1.0	1.0	1.2	1.0	0.3	1.2	1.1	0.3	1.2	1.1	0.3
92 LANSNG MI	2.0	1.2	1.2	2.1	1.2	0.4	2.1	1.2	0.5	2.2	1.3	0.5
93 MADISN WI	3.0	2.7	0.7	3.0	2.8	0.6	3.1	2.8	0.7	3.1	2.9	0.7
94 COLUMB GA	2.0	2.1	1.1	2.0	2.1	0.4	2.0	2.1	0.5	2.0	2.1	0.5
95 AMARIL TX	1.0	0.8	0.8	0.9	0.8	0.3	0.9	0.8	0.3	0.9	0.8	0.3
96 HUNTSV AL	4.0	4.4	1.4	4.1	4.5	1.1	4.1	4.5	1.1	4.2	4.6	1.1
97 ROCKFD IL	3.0	2.8	0.8	3.0	2.8	0.7	3.0	2.8	0.7	3.0	2.8	0.8
98 FARGO ND	1.0	1.1	1.1	1.0	1.1	0.2	1.0	1.1	0.3	1.0	1.1	0.3
99 MONROE LA	2.0	2.3	2.3	2.0	2.3	0.4	2.0	2.3	0.5	2.0	2.3	0.5
100 COLUMB SC	3.0	3.4	1.4	3.0	3.4	0.6	3.1	3.4	0.7	3.1	3.5	0.7

Table 20

SUMMARY OF PROJECTIONS FOR DECREASED UHF HANDICAP
OR IMPROVEMENT IN ECONOMIC CONDITIONS

Projection	1974 (1)	1974 (2)	1980 (1)	1980 (2)	1985 (1)	1985 (2)	1990 (1)	1990 (2)
Narrow count, Table 17	130		191		201		211	
Excluded stations, flat	27		27		27		27	
Total	157	+33	218	+42	228	+43	238	+44
Excluded stations, proportional	9		26		29		32	
Total	166	+42	244	+54	257	+55	270	+57
Narrow count, Table 18	168		239		251		263	
Excluded stations, flat	27		27		27		27	
Total	195	+71	266	+90	278	+93	290	+96
Excluded stations, proportional	20		40		43		46	
Total	215	+91	306	+116	321	+119	336	+123
Narrow count, Table 19	224		237		245		253	
Excluded stations, flat	27		27		27		27	
Total	251	+127	264	+52	272	+56	280	+61
Excluded stations, proportional	35		39		41		43	
Total	286	+162	303	+67	313	+73	323	+78

Column (1): Projected stations.
Column (2): Difference from base-case totals.

VIII. RANGE OF THE PROJECTIONS AND IMPLICATIONS FOR SPECTRUM ALLOCATION

THREE MIXED CASES

All of the projections we have presented so far have been pure cases in the sense that we check out only one development at a time (in addition to the base case assumptions). Mixed cases involving combinations of developments may also be of interest and are easy to produce using our computer model. As examples, we present three of them in this subsection.

We saw in the base case that population and income growth and, especially, 100 percent UHF set penetration, are sufficient to cause a large increase in UHF stations. Figures from Table 5 show UHF stations in the top 100 markets (including the stations that are excluded from our narrow count, projected flat) increasing from 124 in 1974 to 176 in 1980 and 194 in 1990.

One might want to know what combination of other developments would be sufficient to offset that growth--that is, developments such that the number of stations in 1990 would be about the same as the 124 stations in our 1974 base case, although there might be some variation within individual markets. The question is easy to answer by trying different combinations of assumptions in our model. Using our basic quadratic equation, we find that it takes the following formidable combination of developments to produce little or no growth to 1990:

- o Cable penetration a minimum of 50 percent and ranging up to 85 percent.*
- o 83 VHF drop-in stations on the air
- o 30 percent of the market siphoned off by new video services.

Table 21 shows the market-by-market projections for this case.

*Precisely, the fraction of homes in the market without cable declines to 50 percent of its 1974 value.

Table 21

"NO GROWTH" PROJECTION

	MARKET		1974 PROJ			1980 PROJ			1985 PROJ			1990 PROJ		
			(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	NY	NY	2.4	1.0	-1.0	4.0	2.6	-1.4	4.2	2.8	-1.5	4.4	3.0	-1.5
2	LA	CA	3.2	4.4	-1.6	4.5	5.7	-2.0	4.8	6.0	-2.1	5.1	6.4	-2.3
3	CHCAGO	IL	1.3	2.6	-0.4	1.7	3.1	-0.4	1.8	3.2	-0.4	1.9	3.3	-0.4
4	PHIL	PA	1.3	2.6	-0.4	1.7	3.0	-0.4	1.8	3.1	-0.5	1.9	3.2	-0.5
5	DTROIT	MI	0.8	1.7	-0.3	1.1	2.0	-0.4	1.2	2.1	-0.4	1.3	2.1	-0.4
6	BOSTON	MA	1.0	1.7	-0.3	1.5	2.2	-0.4	1.6	2.2	-0.4	1.7	2.3	-0.4
7	SF	CA	0.6	2.6	-0.4	1.1	3.1	-0.4	1.2	3.2	-0.4	1.3	3.3	-0.4
8	CLVLND	OH	0.7	1.4	-0.6	1.0	1.7	-0.7	1.0	1.7	-0.7	1.1	1.8	-0.8
9	WASH	DC	0.7	0.7	-0.3	1.0	1.0	-0.4	1.1	1.1	-0.4	1.1	1.2	-0.4
10	PITT	PA	0.3	-0.5	-0.5	0.8	-0.0	-0.7	0.8	0.0	-0.7	0.9	0.1	-0.7
11	STLOUS	MO	0.4	0.7	-0.3	0.8	1.2	-0.3	0.9	1.2	-0.3	0.9	1.3	-0.4
12	DALLAS	TX	0.5	0.7	-0.3	0.9	1.1	-0.3	1.0	1.2	-0.3	1.1	1.3	-0.3
13	MINN	MN	0.2	-0.2	-0.2	0.8	0.4	-0.3	0.9	0.5	-0.3	0.9	0.6	-0.4
14	BALT	MD	0.6	0.7	-0.3	0.9	1.1	-0.3	1.0	1.2	-0.3	1.0	1.2	-0.3
15	HOUSTN	TX	0.5	1.4	-0.6	0.8	1.6	-0.7	0.9	1.7	-0.7	0.9	1.8	-0.7
16	INDPLS	IN	0.2	0.6	-0.4	0.5	1.0	-0.5	0.6	1.1	-0.5	0.7	1.2	-0.5
17	CINCI	OH	0.6	0.7	-0.3	0.9	1.1	-0.3	1.0	1.2	-0.3	1.0	1.2	-0.3
18	ATLANT	GA	0.4	1.4	-0.6	0.8	1.8	-0.7	0.8	1.8	-0.7	0.9	1.9	-0.7
19	HARTFD	CN	1.1	1.7	-0.3	1.5	2.1	-0.4	1.6	2.1	-0.4	1.6	2.2	-0.4
20	SEATLE	WA	0.2	-0.1	-0.1	0.7	0.4	-0.2	0.8	0.5	-0.1	0.9	0.6	-0.1
21	MIAMI	FL	0.3	0.6	-0.4	0.8	1.1	-0.4	0.9	1.2	-0.3	1.0	1.4	-0.3
22	KANCTY	MO	0.1	0.3	-0.7	0.4	0.6	-0.8	0.4	0.7	-0.8	0.5	0.7	-0.8
23	MILWAU	WI	0.3	0.4	-0.6	0.6	0.7	-0.7	0.6	0.7	-0.7	0.7	0.8	-0.7
25	SACRA	CA	0.5	0.8	-0.2	0.9	1.1	-0.3	0.9	1.2	-0.3	1.0	1.2	-0.3
26	MEMPH	TN	-0.1	-0.4	-0.4	0.5	0.1	-0.6	0.5	0.1	-0.7	0.6	0.2	-0.7
27	COLUMB	OH	0.4	-0.2	-0.2	0.7	0.1	-0.3	0.8	0.2	-0.3	0.8	0.2	-0.3
28	TAMPA	FL	0.7	0.7	-0.3	1.1	1.1	-0.3	1.2	1.2	-0.4	1.3	1.2	-0.4
29	PORTLN	OR	-0.0	-0.3	-0.3	0.4	0.1	-0.4	0.5	0.1	-0.5	0.5	0.2	-0.5
30	NASHVL	TN	-0.0	-0.4	-0.4	0.5	0.1	-0.6	0.6	0.2	-0.7	0.6	0.2	-0.7
31	NEWORL	LA	0.5	0.8	-0.2	0.8	1.1	-0.3	0.8	1.1	-0.3	0.9	1.2	-0.3
32	DENVER	CO	0.0	-0.3	-0.3	0.4	-0.1	-0.4	0.5	0.1	-0.5	0.6	0.2	-0.5
33	PROVID	RI	0.4	-0.2	-0.2	0.8	0.1	-0.3	0.9	0.2	-0.3	0.9	0.2	-0.3
34	ALBANY	NY	0.0	-0.5	-0.5	0.4	-0.1	-0.6	0.4	-0.1	-0.6	0.5	-0.0	-0.7
35	SYRACU	NY	0.2	-0.2	-0.2	0.6	0.1	-0.3	0.6	0.2	-0.3	0.7	0.2	-0.3
36	CHARLS	WV	-0.2	-0.6	-0.6	0.1	-0.3	-0.8	0.2	-0.2	-0.8	0.2	-0.2	-0.8
37	GRNDRP	MI	0.0	-0.5	-0.5	0.4	-0.1	-0.6	0.5	-0.0	-0.7	0.5	0.0	-0.7
38	LOUSVL	KY	0.2	0.9	-1.1	0.4	1.1	-1.3	0.5	1.2	-1.3	0.5	1.2	-1.4
39	OKCITY	OK	0.2	-0.2	-0.2	0.7	0.3	-0.3	0.8	0.4	-0.3	0.9	0.4	-0.3
40	BIRM	AL	0.3	0.3	-0.7	0.6	0.6	-0.9	0.7	0.6	-0.9	0.7	0.7	-1.0
41	DAYTON	OH	0.4	0.2	-0.8	0.7	0.5	-0.9	0.7	0.6	-1.0	0.8	0.6	-1.0
42	CHARLT	NC	0.9	1.7	-0.3	1.4	2.1	-0.4	1.4	2.2	-0.4	1.5	2.3	-0.4
43	PHOENX	AZ	0.1	0.6	-0.4	0.4	0.9	-0.5	0.4	1.0	-0.5	0.5	1.1	-0.5
44	NORFLK	VA	0.1	0.5	-0.5	0.3	0.8	-0.6	0.4	0.8	-0.6	0.4	0.9	-0.7
45	SANANT	TX	0.3	0.8	-0.2	0.7	1.2	-0.3	0.8	1.2	-0.3	0.8	1.3	-0.3
46	GRNVLE	SC	-0.1	0.6	-0.4	0.4	1.1	-0.6	0.4	1.1	-0.6	0.5	1.2	-0.6
47	GRNBRO	NC	0.1	-0.2	-0.2	0.6	0.3	-0.3	0.6	0.4	-0.3	0.7	0.4	-0.3
48	SALTLK	UT	-0.2	-0.5	-0.5	0.2	-0.1	-0.7	0.4	0.0	-0.6	0.5	0.2	-0.6
49	WLKSBR	PA	3.3	2.1	-0.9	3.9	2.7	-1.0	4.1	2.9	-1.0	4.3	3.1	-1.1
50	LITLRK	AR	-0.4	-0.6	-0.6	-0.0	-0.3	-0.9	0.0	-0.2	-0.9	0.1	-0.1	-0.9

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 21 (contd.)

MARKET	1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH	0.8	0.7	-0.3	1.2	1.1	-0.3	1.3	1.1	-0.4	1.3	1.2	-0.4
53 OMAHA NE	0.1	-0.2	-0.2	0.5	0.3	-0.2	0.6	0.3	-0.3	0.6	0.4	-0.3
54 TULSA OK	0.1	-0.2	-0.2	0.6	0.3	-0.3	0.6	0.4	-0.3	0.7	0.4	-0.3
55 ORLAN FL	0.4	-0.2	-0.2	0.8	0.2	-0.3	0.8	0.3	-0.3	0.9	0.3	-0.3
56 ROCHES NY	0.3	-0.2	-0.2	0.6	0.1	-0.3	0.6	0.2	-0.3	0.7	0.2	-0.3
57 HARISB PA	1.8	1.5	-0.5	2.2	1.9	-0.5	2.3	2.0	-0.6	2.4	2.2	-0.6
58 SHRVPT LA	-0.3	-0.5	-0.5	0.1	-0.1	-0.8	0.1	-0.1	-0.8	0.2	-0.1	-0.8
59 MOBILE AL	-0.2	-0.4	-0.4	0.2	0.1	-0.6	0.3	0.1	-0.6	0.3	0.2	-0.6
60 DAVENP IA	-0.2	-0.6	-0.6	0.0	-0.4	-0.8	0.0	-0.3	-0.8	0.1	-0.3	-0.8
61 FLINT MI	0.9	0.7	-0.3	1.2	1.0	-0.3	1.3	1.1	-0.4	1.3	1.2	-0.4
62 GRNBAY WI	0.1	-0.2	-0.2	0.5	0.2	-0.3	0.6	0.3	-0.3	0.6	0.3	-0.3
63 RICHMN VA	0.2	-0.2	-0.2	0.7	0.3	-0.3	0.7	0.3	-0.3	0.8	0.4	-0.3
64 SPRNGF IL	0.4	0.2	-1.8	0.6	0.4	-2.0	0.6	0.4	-2.0	0.7	0.5	-2.1
65 CDRRAP IA	0.1	-0.2	-0.2	0.5	0.3	-0.3	0.6	0.3	-0.3	0.7	0.4	-0.3
66 DMOINE IA	0.1	-0.2	-0.2	0.6	0.3	-0.3	0.6	0.4	-0.3	0.7	0.4	-0.3
67 WICHTA KS	-0.1	-0.4	-0.4	0.3	0.0	-0.6	0.4	0.1	-0.6	0.4	0.1	-0.7
68 JKSNVL FL	0.8	0.7	-0.3	1.2	1.1	-0.3	1.3	1.1	-0.4	1.3	1.2	-0.4
69 PADUCA KY	-0.2	0.6	-0.4	0.2	1.0	-0.6	0.2	1.1	-0.6	0.3	1.1	-0.6
70 ROANOK VA	0.0	-0.2	-0.2	0.5	0.3	-0.2	0.6	0.4	-0.3	0.6	0.4	-0.3
71 KNOXVL TN	0.6	0.8	-0.2	1.1	1.3	-0.3	1.2	1.4	-0.3	1.3	1.4	-0.4
72 FRESNO CA	-0.2	0.7	-4.3	-0.1	0.8	-4.6	-0.1	0.8	-4.7	-0.1	0.9	-4.9
73 RALEIG NC	0.5	0.8	-0.2	1.0	1.3	-0.3	1.1	1.3	-0.3	1.2	1.4	-0.3
74 JOHNST PA	-0.3	0.3	-0.7	0.0	0.6	-1.0	0.1	0.6	-1.0	0.1	0.6	-1.1
75 PORTLN ME	-0.2	-0.4	-0.4	0.2	-0.1	-0.6	0.2	-0.0	-0.6	0.3	0.0	-0.6
76 SPOKAN WA	-0.1	-0.2	-0.2	0.4	0.3	-0.2	0.5	0.4	-0.2	0.5	0.4	-0.2
77 JACKSN MS	-0.4	0.0	-1.0	-0.1	0.3	-1.3	-0.1	0.3	-1.3	-0.1	0.3	-1.4
78 CHATTN TN	-0.2	0.6	-0.4	0.2	0.9	-0.6	0.2	1.0	-0.6	0.2	1.0	-0.6
79 YGSTN OH	2.5	2.3	-0.7	3.0	2.7	-0.8	3.1	2.9	-0.8	3.2	3.0	-0.9
80 SBEND IN	0.6	0.6	-2.4	0.8	0.8	-2.8	0.9	0.8	-2.9	1.0	0.9	-3.0
81 ALBUQ NM	-0.5	-0.6	-0.6	-0.2	-0.4	-0.9	-0.2	-0.4	-0.9	-0.1	-0.3	-1.0
82 FTWAYN IN	2.5	2.3	-0.7	3.0	2.8	-0.8	3.2	3.0	-0.8	3.3	3.1	-0.9
83 PEORIA IL	2.5	2.3	-0.7	3.1	2.9	-0.8	3.3	3.0	-0.9	3.4	3.2	-0.9
84 GRNVLE NC	-0.1	-0.2	-0.2	0.5	0.4	-0.2	0.5	0.4	-0.2	0.6	0.5	-0.3
85 SIOUXF SD	-0.6	-0.6	-0.6	-0.4	-0.3	-1.0	-0.4	-0.3	-1.0	-0.3	-0.3	-1.0
86 EVANSV IN	0.2	0.5	-1.5	0.4	0.7	-1.7	0.4	0.7	-1.8	0.5	0.8	-1.8
87 BATONR LA	0.4	0.8	-0.2	0.7	1.1	-0.3	0.8	1.1	-0.3	0.8	1.2	-0.3
88 BEAUMT TX	-0.1	-0.1	-0.1	0.2	0.2	-0.2	0.3	0.3	-0.2	0.3	0.3	-0.2
89 DULUTH MN	-0.1	-0.1	-0.1	0.3	0.2	-0.2	0.3	0.3	-0.2	0.4	0.3	-0.2
90 WHLING WV	0.1	-0.2	-0.2	0.5	0.2	-0.2	0.5	0.3	-0.2	0.6	0.3	-0.3
91 LINCLN NE	-0.1	-0.2	-0.2	0.4	0.3	-0.2	0.5	0.4	-0.2	0.5	0.4	-0.2
92 LANSNG MI	0.3	-0.2	-0.2	0.7	0.2	-0.3	0.8	0.2	-0.3	0.8	0.3	-0.3
93 MADISN WI	1.2	1.6	-0.4	1.5	1.9	-0.4	1.6	2.0	-0.4	1.7	2.0	-0.5
94 COLUMB GA	0.2	0.8	-0.2	0.6	1.1	-0.2	0.6	1.2	-0.3	0.7	1.3	-0.3
95 AMARIL TX	-0.0	-0.2	-0.2	0.3	0.2	-0.2	0.4	0.3	-0.2	0.4	0.3	-0.2
96 HUNTSV AL	[illegible]	2.3	-0.7	2.8	2.8	-0.8	2.9	3.0	-0.8	3.1	3.2	-0.8
97 ROCKFO IL	1.2	1.6	-0.4	1.4	1.8	-0.4	1.5	1.9	-0.4	1.6	2.0	-0.4
98 FARGO ND	0.2	-0.1	-0.1	0.3	0.4	-0.2	0.4	0.5	-0.2	0.4	0.5	-0.2
99 MONROE LA	-0.3	-0.4	-0.4	0.2	0.1	-0.7	0.3	0.2	-0.7	0.3	0.2	-0.8
100 COLUMB SC	0.5	1.0	-1.0	0.8	1.3	-1.1	0.8	1.4	-1.2	0.9	1.5	-1.2

Other, more plausible, combinations are just as easy to construct. A "middle of the road" set of assumptions might be:

- o Cable penetration ranging from 50 to 85 percent.
- o No VHF drop-ins
- o Twenty percent of audience siphoned to new services
- o The "year effect" goes back up to the 1971 level because of improvement in the economy, decrease in the UHF handicap, or for whatever reason.

These assumptions in our basic quadratic equation underlie Table 22

We call the following an "optimistic" set of assumptions because it is relatively favorable to UHF growth.

- o Cable penetration ranges from 30 to 80 percent*
- o No VHF drop-ins
- o Ten percent of audience is siphoned to new services
- o The "year effect" improves still further, so that it is as much better than 1971 as 1971 was better than 1974. This might result from a combination of a favorable economic climate with a substantial decline in the UHF handicap.

Table 23 shows these projections, and Table 24 summarizes the three mixed cases with the differences shown from the base case figures in Table 5.

AN OVERVIEW

In the preceding discussion, including the mixed cases immediately above, we have accumulated quite a few sets of projections. Table 25 draws many of them together in a summary overview, ranked in order of their increasingly *negative* effects on the growth of UHF. Thus the

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*The fraction of homes in the market without cable declines to 70 percent of its 1974 value.

Table 22

"MIDDLE OF THE ROAD" PROJECTION

MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1 NY	NY	3.3	1.9	-0.1	5.3	3.9	-0.1	5.5	4.1	-0.1	5.8	4.4	-0.1
2 LA	CA	4.4	5.7	-0.3	6.1	7.3	-0.4	6.5	7.7	-0.4	6.9	8.1	-0.5
3 CHCAGO	IL	1.7	3.1	0.1	2.2	3.6	0.1	2.3	3.7	0.1	2.4	3.8	0.1
4 PHIL	PA	1.9	3.1	0.1	2.3	3.6	0.1	2.4	3.7	0.1	2.5	3.8	0.1
5 DTROIT	MI	1.2	2.1	0.1	1.6	2.5	0.1	1.7	2.5	0.1	1.8	2.6	0.1
6 BOSTCN	MA	1.5	2.1	0.1	2.1	2.7	0.1	2.2	2.8	0.1	2.3	2.9	0.1
7 SF	CA	1.1	3.1	0.1	1.6	3.6	0.1	1.7	3.7	0.1	1.8	3.8	0.1
8 CLVLND	OH	1.4	2.1	0.1	1.8	2.5	0.1	1.9	2.6	0.1	2.0	2.7	0.1
9 WASH	DC	1.0	1.1	0.1	1.4	1.4	0.1	1.5	1.6	0.1	1.6	1.6	0.1
10 PITT	PA	0.9	0.1	0.1	1.6	0.8	0.1	1.7	0.9	0.1	1.7	[illegible]	0.1
11 STLOUS	MO	0.7	1.1	0.1	1.2	1.6	0.1	1.3	1.6	0.1	1.4	1.7	0.1
12 DALLAS	TX	0.9	1.1	0.1	1.3	1.5	0.1	1.4	1.6	0.1	1.5	1.7	0.1
13 MINN	MN	0.4	0.0	0.0	1.2	0.8	0.1	1.3	0.9	0.1	1.4	1.0	0.1
14 BALT	MD	0.9	1.1	0.1	1.3	1.5	0.1	1.4	1.6	0.1	1.5	1.7	0.1
15 HOUSTN	TX	1.3	2.1	0.1	1.6	2.4	0.1	1.7	2.5	0.1	1.8	2.6	0.1
16 INDPLS	IN	0.6	1.0	0.0	1.1	1.5	0.1	1.1	1.6	0.1	1.2	1.7	0.1
17 CINCI	OH	0.9	1.1	0.1	1.3	1.5	0.1	1.4	1.6	0.1	1.5	1.7	0.1
18 ATLANT	GA	1.1	2.1	0.1	1.6	2.6	0.1	1.7	2.7	0.1	1.8	2.8	0.1
19 HARTFD	CN	1.5	2.1	0.1	2.0	2.6	0.1	2.1	2.7	0.1	2.2	2.8	0.1
20 SEATLE	WA	0.3	0.0	0.0	0.9	0.6	0.0	1.0	0.7	0.0	1.0	0.8	0.0
21 MIAMI	FL	0.7	1.1	0.1	1.2	1.5	0.1	1.3	1.6	0.1	1.4	1.7	0.1
22 KANCTY	MO	0.8	1.1	0.1	1.3	1.5	0.1	1.4	1.6	0.1	1.4	1.7	0.1
23 MILWAU	WI	1.0	1.1	0.1	1.3	1.4	0.1	1.4	1.5	0.1	1.5	1.6	0.1
25 SACRA	CA	0.8	1.1	0.1	1.3	1.5	0.1	1.3	1.6	0.1	1.4	1.7	0.1
26 MEMPH	TN	0.4	0.1	0.1	1.2	0.8	0.1	1.3	0.9	0.1	1.3	1.0	0.1
27 COLUMB	OH	0.7	0.1	0.1	1.1	0.5	0.1	1.2	0.6	0.1	1.2	0.6	0.1
28 TAMPA	FL	1.1	1.1	0.1	1.6	1.5	0.1	1.6	1.6	0.1	1.7	1.7	0.1
29 PORTLN	OR	0.4	0.0	0.0	0.9	0.6	0.1	1.0	0.6	0.1	1.0	0.7	0.1
30 NASHVL	TN	0.4	0.1	0.1	1.2	0.8	0.1	1.3	0.9	0.1	1.4	1.0	0.1
31 NEWORL	LA	0.8	1.1	0.1	1.1	1.4	0.1	1.2	1.5	0.1	1.3	1.6	0.1
32 DENVER	CO	0.4	0.0	0.0	0.9	0.6	0.1	1.0	0.7	0.1	1.1	0.7	0.1
33 PROVID	RI	0.7	0.1	0.1	1.2	0.5	0.1	1.3	0.6	0.1	1.3	0.7	0.1
34 ALBANY	NY	0.6	0.1	0.1	1.1	0.6	0.1	1.2	0.6	0.1	1.2	0.7	0.1
35 SYRACU	NY	0.5	0.1	0.1	0.9	0.4	0.1	1.0	0.5	0.1	1.0	0.6	0.1
36 CHARLS	WV	0.4	0.1	0.1	1.0	0.6	0.1	1.1	0.7	0.1	1.1	0.8	0.1
37 GRNDRP	MI	0.5	0.1	0.1	1.1	0.7	0.1	1.2	0.7	0.1	1.3	0.8	0.1
38 LOUSVL	KY	1.4	2.1	0.1	1.8	2.6	0.1	2.0	2.7	0.1	2.0	2.8	0.1
39 OKCITY	OK	0.5	0.1	0.1	1.1	0.7	0.1	1.2	0.8	0.1	1.3	0.8	0.1
40 BIRM	AL	1.2	1.1	0.1	1.7	1.6	0.1	1.7	1.7	0.1	1.8	1.8	0.1
41 DAYTCN	OH	1.3	1.1	[illegible]	1.7	1.6	0.1	1.8	1.7	0.1	1.9	1.8	0.1
42 CHARLT	NC	1.3	2.1	0.1	1.9	2.6	0.1	1.9	2.7	0.1	2.0	2.8	0.1
43 PHOENX	AZ	0.5	1.0	0.0	0.9	1.5	0.1	1.0	1.5	0.1	1.0	1.6	0.1
44 NORFLK	VA	0.6	1.1	0.1	1.0	1.5	0.1	1.1	1.5	0.1	1.2	1.6	0.1
45 SANANT	TX	0.6	1.1	0.1	1.1	1.5	0.1	1.1	1.6	0.1	1.2	1.7	0.1
46 GRNVLE	SC	0.4	1.1	0.1	1.1	1.7	0.1	1.1	1.8	0.1	1.2	1.9	0.1
47 GRNBRO	NC	0.3	0.1	0.1	0.9	0.7	0.1	1.0	0.7	0.1	1.1	0.8	0.1
48 SALTLK	UT	0.4	0.1	0.1	1.0	0.7	0.1	1.1	0.8	0.1	1.2	0.9	0.1
49 WLKSBR	PA	4.3	3.1	0.1	5.0	3.8	0.1	5.3	4.1	0.1	5.5	4.4	0.1
50 LITLRK	AR	0.3	0.1	0.1	0.9	0.7	0.1	1.0	0.8	0.1	1.1	0.8	0.1

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 22 (contd.)

MARKET	1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH	1.2	1.1	0.1	1.7	1.5	0.1	1.7	1.6	0.1	1.8	1.7	0.1
53 OMAHA NE	0.3	0.1	0.1	0.8	0.6	0.1	0.9	0.7	0.1	1.0	0.7	0.1
54 TULSA OK	0.3	0.1	0.1	0.9	0.7	0.1	1.0	0.7	0.1	1.1	0.8	0.1
55 ORLAN FL	0.6	0.1	0.1	1.2	0.6	0.1	1.2	0.7	0.1	1.3	0.7	0.1
56 ROCHES NY	0.5	0.1	0.1	0.9	0.5	0.1	1.0	0.5	0.1	1.1	0.6	0.1
57 HARISB PA	2.4	2.1	0.1	2.9	2.6	0.1	3.0	2.8	0.2	3.2	2.9	0.2
58 SHRVPT LA	0.3	0.1	0.1	0.9	0.7	0.1	1.0	0.8	0.1	1.1	0.9	0.1
59 MOBILE AL	0.2	0.1	0.1	0.9	0.7	0.1	0.9	0.8	0.1	1.0	0.9	0.1
60 DAVENP IA	0.4	0.1	0.1	0.9	0.5	0.1	0.9	0.6	0.1	1.0	0.6	0.1
61 FLINT MI	1.3	1.1	0.1	1.7	1.5	0.1	1.7	1.6	0.1	1.8	1.7	0.1
62 GRNBAY WI	0.4	0.1	0.1	0.9	0.6	0.1	0.9	0.6	0.1	1.0	0.7	0.1
63 RICHMN VA	0.5	0.1	0.1	1.0	0.6	0.1	1.1	0.7	0.1	1.2	0.8	0.1
64 SPRNGF IL	2.3	2.1	0.1	2.7	2.5	0.1	2.8	2.6	0.1	2.9	2.8	0.2
65 CORRAP IA	0.4	0.1	0.1	0.9	0.6	0.1	0.9	0.7	0.1	1.0	0.7	0.1
66 DMOINE IA	0.3	0.1	0.1	0.9	0.7	0.1	1.0	0.7	0.1	1.1	0.8	0.1
67 WICHTA KS	0.3	0.1	0.1	1.0	0.7	0.1	1.1	0.8	0.1	1.2	0.9	0.1
68 JKSNVL FL	1.2	1.1	0.1	1.7	1.5	0.1	1.7	1.6	0.1	1.8	1.7	0.1
69 PADUCA KY	0.2	1.1	0.1	0.8	1.7	0.1	0.9	1.7	0.1	0.9	1.8	0.1
70 ROANOK VA	0.3	0.1	0.1	0.8	0.6	0.1	0.9	0.7	0.1	0.9	0.7	0.1
71 KNOXVL TN	0.9	1.1	0.1	1.6	1.7	0.1	1.6	1.8	0.1	1.7	1.9	0.1
72 FRESNO CA	4.2	5.1	0.1	4.6	5.5	0.1	4.8	5.7	0.1	5.0	5.9	0.1
73 RALFIG NC	0.9	1.1	0.1	1.5	1.7	0.1	1.5	1.8	0.1	1.6	1.9	0.1
74 JOHNST PA	0.5	1.1	0.1	1.1	1.7	0.1	1.2	1.7	0.1	1.3	1.8	0.1
75 PORTLN ME	0.3	0.1	0.1	0.8	0.6	0.1	0.9	0.7	0.1	1.0	0.7	0.1
76 SPOKAN WA	0.2	0.0	0.0	0.7	0.6	0.1	0.8	0.7	[illegible]	0.9	0.7	0.1
77 JACKSN MS	0.7	1.1	0.1	1.3	1.7	0.1	1.3	1.7	0.1	1.4	1.8	0.1
78 CHATTN TN	0.3	1.1	0.1	0.8	1.6	0.1	0.8	1.6	0.1	0.9	1.7	0.1
79 YGSTN OH	3.3	3.1	0.1	3.9	3.7	0.1	4.0	3.8	0.1	4.2	4.0	0.1
80 SBEND IN	3.2	3.1	0.1	3.8	3.7	0.1	3.9	3.9	0.1	4.1	4.0	0.1
81 ALBUQ NM	0.2	0.1	0.1	0.8	0.6	0.1	0.8	0.7	0.1	0.9	0.7	0.1
82 FTWAYN IN	3.3	3.1	0.1	3.9	3.7	0.1	4.1	3.9	0.1	4.3	4.1	0.1
83 PEORIA IL	3.3	3.1	0.1	4.0	3.8	0.1	4.2	4.0	0.1	4.4	4.2	0.1
84 GRNVLE NC	0.1	0.0	0.0	0.8	0.7	0.1	0.9	0.8	0.1	0.9	0.8	0.1
85 SIOUXF SD	-0.0	0.0	0.0	0.7	0.7	0.1	0.7	0.8	0.1	0.8	0.8	0.1
86 EVANSV IN	1.8	2.1	0.1	2.2	2.5	0.1	2.3	2.6	0.1	2.4	2.7	0.1
87 BATONR LA	0.7	1.1	0.1	1.1	1.4	0.1	1.2	1.5	0.1	1.2	1.6	0.1
88 BEAUMT TX	0.0	0.0	0.0	0.5	0.5	0.1	0.5	0.5	0.1	0.6	0.6	0.1
89 DULUTH MN	0.1	0.0	0.0	0.5	0.5	0.1	0.6	0.5	0.1	0.6	0.6	0.1
90 WHLING WV	0.3	0.1	0.1	0.8	0.5	0.1	0.9	0.6	0.1	0.9	0.7	0.1
91 LINCLN NE	0.1	0.0	0.0	0.7	0.6	0.1	0.8	0.7	0.1	0.8	0.7	0.1
92 LANSNG MI	0.6	0.1	0.1	1.1	0.5	0.1	1.1	0.6	0.1	1.2	0.7	0.1
93 MADISN WI	1.7	2.1	0.1	2.0	2.4	0.1	2.1	2.5	0.1	2.2	2.6	0.1
94 COLUMB GA	0.5	1.1	0.1	0.9	1.5	0.1	1.0	1.5	0.1	1.0	1.6	0.1
95 AMARIL TX	0.2	0.0	0.0	0.6	0.5	0.1	0.7	0.6	0.1	0.7	0.6	0.1
96 HUNTSV AL	3.0	3.1	0.1	3.6	3.7	0.1	3.8	3.9	0.1	4.1	4.1	0.1
97 ROCKFD IL	1.7	2.1	0.1	2.0	2.4	0.1	2.1	2.5	0.1	2.2	2.6	0.1
98 FARGO ND	-0.0	0.0	0.0	0.6	0.7	0.1	0.7	0.8	0.1	0.7	0.8	0.1
99 MONROE LA	0.2	0.1	0.1	1.0	0.9	0.1	1.1	1.0	0.1	1.2	1.1	0.1
100 COLUMB SC	1.5	2.1	0.1	2.0	2.6	0.1	2.1	2.7	0.1	2.3	2.8	0.1

Table 23

"OPTIMISTIC" PROJECTION

	MARKET		1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
1	NY	NY	4.5	3.1	1.1	7.0	5.6	1.7	7.4	6.0	1.7	7.8	6.4	1.8
2	LA	CA	6.1	7.4	1.4	8.3	9.5	1.8	8.8	10.0	1.9	9.4	10.6	2.0
3	CHCAGO	IL	2.4	3.8	0.8	3.0	4.4	0.9	3.2	4.5	0.9	3.3	4.6	1.0
4	PHIL	PA	2.5	3.8	0.8	3.1	4.4	0.9	3.2	4.5	1.0	3.4	4.6	1.0
5	DTROIT	MI	1.8	2.6	0.6	2.2	3.1	0.7	2.4	3.2	0.8	2.5	3.3	0.8
6	BOSTCN	MA	2.1	2.7	0.7	2.8	3.5	0.9	3.0	3.6	0.9	3.1	3.7	0.9
7	SF	CA	1.6	3.6	0.6	2.3	4.3	0.7	2.4	4.4	0.8	2.5	4.5	0.8
8	CLVLND	OH	2.0	2.7	0.7	2.5	3.2	0.8	2.6	3.3	0.8	2.7	3.4	0.9
9	WASH	DC	1.5	1.6	0.6	2.0	2.1	0.7	2.2	2.2	0.7	2.3	2.3	0.7
10	PITT	PA	1.3	0.5	0.5	2.2	1.4	0.7	2.3	1.5	0.8	2.4	1.6	0.8
11	STLOUS	MO	1.1	1.5	0.5	1.8	2.1	0.6	1.9	2.2	0.6	2.0	2.3	0.7
12	DALLAS	TX	1.3	1.5	0.5	1.9	2.1	0.7	2.0	2.2	0.7	2.1	2.3	0.7
13	MINN	MN	0.8	0.4	0.4	1.8	1.4	0.6	1.9	1.5	0.6	2.0	1.6	0.7
14	BALT	MD	1.4	1.5	0.5	1.9	2.1	0.7	2.0	2.2	0.7	2.1	2.3	0.7
15	HOUSTN	TX	1.8	2.6	0.6	2.3	3.1	0.7	2.4	3.2	0.8	2.5	3.3	0.8
16	INDPLS	IN	1.0	1.4	0.4	1.6	2.1	0.6	1.7	2.2	0.6	1.8	2.2	0.6
17	CINCI	OH	1.3	1.5	0.5	1.9	2.1	0.7	2.0	2.2	0.7	2.1	2.3	0.7
18	ATLANT	GA	1.6	2.6	0.6	2.2	3.2	0.7	2.3	3.3	0.8	2.4	3.4	0.8
19	HARTFO	CN	2.1	2.7	0.7	2.7	3.3	0.9	2.9	3.4	0.9	3.0	3.6	0.9
20	SEATLE	WA	0.6	0.4	0.4	1.4	1.1	0.5	1.5	1.2	0.5	1.6	1.3	0.6
21	MIAMI	FL	1.2	1.5	0.5	1.7	2.1	0.6	1.9	2.2	0.6	2.0	2.3	0.7
22	KANCTY	MO	1.3	1.5	0.5	1.8	2.1	0.6	1.9	2.2	0.7	2.0	2.3	0.7
23	MILWAU	WI	1.5	1.6	0.6	1.9	2.0	0.7	2.0	2.1	0.7	2.1	2.2	0.7
25	SACRA	CA	1.3	1.5	0.5	1.8	2.1	0.6	1.9	2.2	0.7	2.0	2.3	0.7
26	MEMPH	TN	0.8	0.4	0.4	1.7	1.3	0.6	1.8	1.4	0.6	1.9	1.5	0.7
27	COLUMB	OH	1.1	0.5	0.5	1.6	1.0	0.6	1.7	1.1	0.6	1.8	1.2	0.6
28	TAMPA	FL	1.6	1.6	0.6	2.2	2.2	0.7	2.3	2.3	0.8	2.4	2.4	0.8
29	PORTLN	OR	0.7	0.4	0.4	1.4	1.0	0.5	1.5	1.1	0.6	1.5	1.2	0.6
30	NASHVL	TN	0.8	0.4	0.4	1.8	1.4	0.6	1.9	1.5	0.7	2.0	1.6	0.7
31	NEWORL	LA	1.2	1.5	0.5	1.7	2.0	0.6	1.7	2.1	0.6	1.8	2.2	0.7
32	DENVER	CO	0.7	0.4	0.4	1.4	1.1	0.5	1.5	1.2	0.6	1.6	1.2	0.6
33	PROVID	RI	1.2	0.5	0.5	1.7	1.1	0.6	1.8	1.1	0.6	1.9	1.2	0.7
34	ALBANY	NY	1.0	0.5	0.5	1.6	1.1	0.6	1.7	1.2	0.6	1.8	1.3	0.6
35	SYRACU	NY	0.9	0.4	0.4	1.4	0.9	0.5	1.4	1.0	0.6	1.5	1.1	0.6
36	CHARLS	WV	0.8	0.4	0.4	1.5	1.1	0.6	1.6	1.2	0.6	1.7	1.3	0.6
37	GRNDRP	MI	0.9	0.4	0.4	1.7	1.2	0.6	1.7	1.3	0.6	1.8	1.3	0.7
38	LOUSVL	KY	2.0	2.7	0.7	2.5	3.3	0.8	2.7	3.4	0.8	2.8	3.5	0.9
39	OKCITY	OK	0.8	0.4	0.4	1.6	1.2	0.6	1.7	1.3	0.6	1.8	1.4	0.6
40	BIRM	AL	1.7	1.6	0.6	2.3	2.2	0.8	2.4	2.3	0.8	2.5	2.5	0.8
41	DAYTON	OH	1.8	1.6	0.6	2.4	2.2	0.8	2.5	2.4	0.8	2.6	2.5	0.8
42	CHARLT	NC	1.9	2.7	0.7	2.5	3.3	0.8	2.6	3.4	0.8	2.8	3.6	0.9
43	PHOENX	AZ	0.9	1.4	0.4	1.4	1.9	0.5	1.5	2.0	0.6	1.6	2.1	0.6
44	NORFLK	VA	1.0	1.5	0.5	1.5	2.0	0.6	1.6	2.1	0.6	1.7	2.1	0.6
45	SANANT	TX	1.0	1.5	0.5	1.6	2.0	0.6	1.6	2.1	0.6	1.7	2.2	0.6
46	GRNVLE	SC	0.7	1.4	0.4	1.5	2.2	0.6	1.6	2.3	0.6	1.7	2.4	0.6
47	GRNBRO	NC	0.7	0.4	0.4	1.4	1.1	0.6	1.5	1.2	0.6	1.6	1.3	0.6
48	SALTLK	UT	0.7	0.4	0.4	1.5	1.2	0.6	1.6	1.3	0.6	1.7	1.4	0.6
49	WLKSBR	PA	5.6	4.5	1.5	6.5	5.4	1.7	6.9	5.7	1.8	7.2	6.0	1.8
50	LITLRK	AR	0.6	0.4	0.4	1.4	1.2	0.6	1.5	1.2	0.6	1.6	1.3	0.6

Column (1): Raw projection.
Column (2): Adjusted projection.
Column (3): Difference from base case projection.

Table 23 (contd.)

MARKET	1974 PROJ (1)	(2)	(3)	1980 PROJ (1)	(2)	(3)	1985 PROJ (1)	(2)	(3)	1990 PROJ (1)	(2)	(3)
52 TOLEDO OH	1.8	[illegible]	0.6	2.3	2.2	0.8	2.4	2.3	0.8	2.5	2.4	0.8
53 OMAHA NE	0.6	0.4	0.4	1.3	1.1	0.5	1.4	1.1	0.5	1.4	1.2	0.6
54 TULSA OK	0.6	0.4	0.4	1.4	1.1	0.5	1.5	1.2	0.6	1.6	1.3	0.6
55 ORLAN FL	1.0	0.5	0.5	1.7	1.1	0.6	1.8	1.2	0.6	1.9	1.3	0.7
56 ROCHES NY	0.9	0.4	0.4	1.4	0.9	0.5	1.5	1.0	0.6	1.6	1.1	0.6
57 HARISB PA	3.2	3.0	1.0	3.9	3.6	1.1	4.0	3.8	1.1	4.2	3.9	1.2
58 SHRVPT LA	0.6	0.4	0.4	1.4	1.2	0.6	1.5	1.3	0.6	1.6	1.4	0.6
59 MOBILE AL	0.5	0.3	0.3	1.3	1.2	0.5	1.4	1.3	0.6	1.5	1.3	0.6
60 DAVENP IA	0.8	0.4	0.4	1.3	1.0	0.5	1.4	1.0	0.6	1.5	1.1	0.6
61 FLINT MI	1.8	1.7	0.7	2.3	2.1	0.8	2.4	2.2	0.8	2.5	2.4	0.8
62 GRNBAY WI	0.7	0.4	0.4	1.3	1.0	0.5	1.4	1.1	0.6	1.5	1.2	0.6
63 RICHMN VA	0.8	0.4	0.4	1.5	1.1	0.6	1.6	1.2	0.6	1.7	1.3	0.6
64 SPRNGF IL	3.1	2.9	0.9	3.6	3.4	1.0	3.7	3.6	1.1	3.9	3.7	1.1
65 CDRRAP IA	0.7	0.4	0.4	1.3	1.0	0.5	1.4	1.1	0.6	1.5	1.2	0.6
66 DMOINE IA	0.6	0.4	0.4	1.4	1.2	0.6	1.5	1.2	0.6	1.6	1.3	0.6
67 WICHTA KS	0.7	0.4	0.4	1.5	1.2	0.6	1.6	1.3	0.6	1.7	1.4	0.6
68 JKSNVL FL	1.8	1.6	0.6	2.3	2.2	0.8	2.4	2.3	0.8	2.5	2.4	0.8
69 PADUCA KY	0.5	1.3	0.3	1.2	2.1	0.5	1.3	2.2	0.5	1.4	2.3	0.6
70 ROANOK VA	0.6	0.4	0.4	1.3	1.1	0.5	1.3	1.1	0.5	1.4	1.2	0.6
71 KNOXVL TN	1.4	1.5	0.5	2.2	2.4	0.7	2.3	2.5	0.8	2.4	2.6	0.8
72 FRESNO CA	5.5	6.4	1.4	6.0	7.0	1.6	6.2	7.2	1.6	6.5	7.4	1.7
73 RALEIG NC	1.3	1.5	0.5	2.1	2.3	0.7	2.2	2.4	0.7	2.3	2.5	0.8
74 JOHNST PA	0.9	1.4	0.4	1.6	2.2	0.6	1.7	2.3	0.6	1.8	2.3	0.6
75 PORTLN ME	0.6	0.4	0.4	1.3	1.0	0.5	1.3	1.1	0.5	1.4	1.2	0.6
76 SPOKAN WA	0.4	0.3	0.3	1.2	1.1	0.5	1.2	1.1	0.5	1.3	1.2	0.5
77 JACKSN MS	1.1	1.5	0.5	1.8	2.2	0.6	1.9	2.3	0.7	2.0	2.4	0.7
78 CHATTN TN	0.6	1.4	0.4	1.2	2.0	0.5	1.3	2.1	0.5	1.4	2.2	0.5
79 YGSTN OH	4.4	4.2	1.2	5.1	4.9	1.4	5.3	5.1	1.4	5.6	5.3	1.5
80 SBEND IN	4.2	4.2	1.2	5.0	4.9	1.3	5.2	5.1	1.4	5.4	5.4	1.4
81 ALBUQ NM	0.5	0.4	0.4	1.2	1.0	0.5	1.3	1.1	0.5	1.4	1.2	0.5
82 FTWAYN IN	4.4	4.2	1.2	5.2	5.0	1.4	5.4	5.2	1.4	5.7	5.5	1.5
83 PEORIA IL	4.4	4.2	1.2	5.3	5.1	1.4	5.6	5.3	1.5	5.8	5.6	1.5
84 GRNVLE NC	0.4	0.3	0.3	1.2	1.1	0.5	1.3	1.2	0.5	1.4	1.3	0.5
85 SIOUXF SD	0.2	0.3	0.3	1.1	1.1	0.5	1.1	1.2	0.5	1.2	1.3	0.5
86 EVANSV IN	2.5	2.8	0.8	3.0	3.3	0.9	3.1	3.4	0.9	3.3	3.6	1.0
87 BATONR LA	1.2	1.5	0.5	1.6	1.9	0.6	1.7	2.0	0.6	1.8	2.1	0.6
88 BEAUMT TX	0.3	0.3	0.3	0.8	0.8	0.4	0.9	0.9	0.4	1.0	1.0	0.5
89 DULUTH MN	0.4	0.3	0.3	0.9	0.9	0.4	1.0	0.9	0.5	1.0	1.0	0.5
90 WHLING WV	0.6	0.4	0.4	1.2	1.0	0.5	1.3	1.0	0.5	1.4	1.1	0.5
91 LINCLN NE	0.4	0.3	0.3	1.2	1.1	0.5	1.2	1.1	0.5	1.3	1.2	0.5
92 LANSNG MI	1.0	0.5	0.5	1.6	1.0	0.6	1.7	1.1	0.6	1.7	1.2	0.6
93 MADISN WI	2.4	2.8	0.8	2.7	3.1	0.9	2.9	3.3	0.9	3.0	3.4	0.9
94 COLUMB GA	0.9	1.4	0.4	1.4	1.9	0.5	1.4	2.0	0.6	1.5	2.1	0.6
95 AMARIL TX	0.4	0.3	0.3	1.0	0.9	0.5	1.1	1.0	0.5	1.1	1.0	0.5
96 HUNTSV AL	4.1	4.1	1.1	4.8	4.9	1.3	5.1	5.1	1.4	5.3	5.4	1.4
97 ROCKFD IL	2.4	2.8	0.8	2.7	3.1	0.8	2.8	3.2	0.9	3.0	3.4	0.9
98 FARGO ND	0.2	0.3	0.3	1.0	1.1	0.5	1.1	1.2	0.5	1.2	1.2	0.5
99 MONROE LA	0.5	0.3	0.3	1.5	1.4	0.6	1.6	1.5	0.6	1.7	1.6	0.6
100 COLUMB SC	2.1	2.7	0.7	2.8	3.3	0.9	2.9	3.5	0.9	3.1	3.6	0.9

Table 24

SUMMARY OF PROJECTIONS FOR COMBINED ASSUMPTIONS

Projection	1974 (1)	1974 (2)	1980 (1)	1980 (2)	1985 (1)	1985 (2)	1990 (1)	1990 (2)
Narrow count, Table 21 (no growth assumptions)	49		87		95		103	
Excluded stations, flat	27		27		27		27	
Total	76	-48	144	-62	122	-63	130	-64
Excluded stations, proportional	-13		-3		-1		2	
Total	63	-61	141	-79	121	-81	132	-81
Narrow count, Table 22 (middle of the road assumptions)	104		158		167		176	
Excluded stations, flat	27		27		27		27	
Total	131	+7	185	+9	194	+9	203	+9
Excluded stations, proportional	2		17		19		22	
Total	133	+9	202	+12	213	+11	225	+12
Narrow count, Table 23 (optimistic assumptions)	152		220		231		242	
Excluded stations, flat	27		27		27		27	
Total	179	+55	247	+64	258	+70	269	+77
Excluded stations, proportional	15		34		37		40	
Total	194	+70	281	+82	295	+89	309	+98

Column (1): Projected stations.
Column (2): Difference from base-case totals.

SUMMARY RANKING OF THE VARIOUS CASES
IN ACCORDANCE WITH EFFECT ON UHF GROWTH

Table	Case	Projected UHF Stations in Top-100 Markets 1974	1980	1985	1990
18	Large improvement in economy and/or decrease in UHF handicap	195	266	278	290
19	Disappearance of the UHF handicap with no change in economic conditions	251	264	272	280
23	Optimistic combination of assumptions	179	247	258	269
17	Moderate improvement in economy and/or decrease in UHF handicap	157	218	228	238
22	"Middle of the road" combination of assumptions	131	185	194	203
2	Base case	124	176	185	194
6	Estimated effects of cable	119	169	178	186
13	Ten percent audience siphoning	118	168	177	185
14	Twenty percent audience siphoning	111	160	168	176
11	Eighty-three VHF drop-in stations (constrained equation)	101	166	170	174
9	Eighty-three VHF drop-in stations (basic quadratic equation)	104	151	160	168
15	Thirty percent audience siphoning	104	151	159	167
7	Fifty to 85 percent cable penetration in four-year equation	100	152	156	160
21	No growth combination of assumptions	76	114	122	130

first entry from Table 18 shows that the greatest positive effect on the growth of UHF, with 290 stations projected for the year 1990, would come from a large improvement of economic conditions and/or a large decrease in the UHF handicap. At the other extreme in Table 21, our no-growth combination of assumptions shows only 130 stations projected for 1990. The numbers of UHF stations in Table 25 are taken from the middle line for each case in the individual section summary tables above. That is, they include the projected number of stations in our narrow count, plus 27 stations that were excluded from that count projected with no growth.

The most important features of Table 25 are the following:

- In all cases, there is a substantial increase in projected stations between 1974 and 1980, reflecting primarily the achievement of 100 percent UHF set penetration.
- Slower growth is projected after 1980.
- Cable will probably have only a slight negative impact on the number of UHF stations. Even on extreme assumptions, the reduction due to cable in 1990 is less than 18 percent below our base case.
- Loss of audience to new video services such as pay television and videodiscs also has a relatively small impact on projected stations. Even a 30 percent audience loss reduces the 1990 projections by only 14 percent.
- The projected impact of VHF drop-in stations is also only moderate: about a 14 percent reduction in UHF stations in 1990.
- The negative impacts of developments mentioned above may be easily offset by improvements in the economic climate or reductions in UHF's reception and tuning handicaps.

COMPARISONS WITH CURRENT SPECTRUM ASSIGNMENTS IN EACH MARKET

Finally, and most important of all, is the question of how these projections of stations compare with current channel assignments in the separate markets. Column 1 in Table 26 shows the number of currently

PROJECTED USES VS. CHANNEL ASSIGNMENTS

Using Assumptions from Table:[a]

Market	(1)	18 (2)	18 (3)	19 (2)	19 (3)	23 (2)	23 (3)	17 (2)	17 (3)	22 (2)	22 (3)	2 (2)	2 (3)	6 (2)	6 (3)	13 (2)	13 (3)	14 (2)	14 (3)	11 (2)	11 (3)	9 (2)	9 (3)	15 (2)	15 (3)	7 (2)	7 (3)	21 (2)	21 (3)
1 NY NY	9	7	2	14	-5	6	3	6	3	4	5	5	4	4	5	4	5	4	5	11	-2	5	4	3	6	4	5	3	6
2 LA CA	10	12	-2	11	-1	11	-1	10	[illegible]	8	2	9	1	8	2	8	2	7	3	9	1	9	1	7	3	8	2	6	4
3 CHCAGO IL	9	5	4	7	2	5	4	4	5	4	5	4	5	4	5	4	5	3	6	4	5	4	5	3	6	3	6	3	6
4 PHIL PA	11	6	5	7	4	6	5	5	6	5	6	5	6	5	6	5	6	4	7	5	6	5	6	4	7	4	7	4	7
5 DETROIT MI	6	4	2	4	2	3	3	3	3	3	3	3	3	3	3	3	3	2	4	3	3	3	3	2	4	2	4	2	4
6 BOSTON MA	9	5	4	6	3	5	4	4	5	4	5	4	5	4	5	4	5	4	5	5	4	4	5	4	5	3	6	3	6
7 SF CA	10	5	5	6	4	5	5	4	6	4	6	4	6	4	6	4	6	4	6	4	6	4	6	3	7	3	7	3	7
8 CLVLND OH	7	6	1	6	1	5	2	5	2	5	2	5	2	5	2	5	2	4	3	4	3	4	3	4	3	4	3	4	3
9 WASH DC	7	4	3	5	2	3	4	3	4	3	4	3	4	3	4	3	4	2	5	4	3	3	4	2	5	2	5	2	5
10 PITT PA	3	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	2	1	2	0	3
11 STLOUS MO	2	3	1	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	1	1	1	1	1	1
12 DALLAS TX	6	3	3	3	3	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	5	2	4	1	5	1	5	1	5
13 MINS MN	4	2	2	2	2	2	2	1	3	1	3	1	3	1	3	1	3	1	3	2	2	1	3	1	3	1	3	1	3
14 BALT MD	3	3	0	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	1	1	2	1	2	1	2
15 HOUSTN TX	5	4	1	4	1	3	2	3	2	3	2	3	2	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3
16 INDPLS IN	4	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	2	2	3	1	2	2	2	2	2	2
17 CINCI OH	2	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	1	1	2	0	2	0	1	1	1	1	1	1
18 ATLANT GA	4	4	0	4	0	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	2	2	2	2	2	2	2	2
19 HRTFD CN	5	5	0	5	0	5	0	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	3	2	3	2	3	2
20 SEATLE WA	3	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	2	1	2	1	2	1	2
21 MIAMI FL	7	3	4	3	4	2	5	2	5	2	5	2	5	2	5	2	5	2	5	1	6	2	5	1	6	2	5	1	6
22 KNSCTY MO	3	3	0	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	0	3	1	2	1	2	1	2	1	2
23 MILWAU WI	4	2	2	2	2	2	2	2	2	2	2	2	2	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3
25 SACRA CA	5	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	2	2	3	2	3	2	3
26 MEMPH TN	2	2	0	2	0	2	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	2
27 COLUMB OH	4	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4	1	3	1	3	0	4	0	4	0	4
28 TAMPA FL	6	3	3	3	3	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	5	1	5	1	5
29 PORTLN OR	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	[illegible]	0	3	1	2	0	3
30 NSHVL TN	5	2	3	2	3	2	3	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5
31 NEWORL LA	3	2	1	2	1	2	1	2	1	2	1	2	4	1	2	1	2	1	2	2	1	2	1	1	2	1	2	1	2
32 DENVER CO	4	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4	1	3	0	4	1	3	0	4
33 PRVDNC RI	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	2	1	2	0	3	0	3	0	3
34 ALBANY NY	5	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	1	4	1	4	1	4	1	4	1	4
35 SYRACU NY	2	1	1	1	1	1	1	1	1	1	1	1	1	0	2	0	2	0	2	1	1	1	1	0	2	0	2	0	2
36 CHARLS WV	9	2	7	2	7	2	7	2	7	2	7	2	7	2	7	2	7	2	7	1	8	1	8	2	7	1	8	1	8
37 GRNDRP MI	3	3	0	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	2	1	1	2	1	2
38 LOUSVL KY	3	4	-1	4	-1	4	-1	3	0	3	0	3	0	3	0	3	0	3	0	1	2	2	1	2	1	1	2	0	3
39 OKCITY OK	5	2	3	2	3	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5
40 BIRM AL	8	5	3	5	3	5	3	4	4	4	4	4	4	4	4	4	4	4	4	3	5	3	5	3	5	3	5	3	5
41 DAYTON OH	3	3	0	2	1	3	0	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2
42 CHARLT NC	7	5	2	5	2	5	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	3	4	3	4	3	4
43 PHOENX AZ	3	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1	2
44 NORFLK VA	3	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1	2
45 SANANT TX	2	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	1	1	1	1	1	1
46 GRNVLE SC	7	5	2	5	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	3	4
47 GNSBRO NC	4	1	3	2	2	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4
48 SALTLK UT	5	2	3	2	3	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5	1	4	1	4	1	4	0	5
49 ALLNTN PA	6	7	-1	5	1	6	0	5	1	4	2	4	2	4	2	4	2	4	2	3	3	4	2	3	3	3	3	3	3
50 LITLRK AR	4	2	2	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4	0	4	1	3	1	3	0	4

[a]See Table 25 for brief descriptions of the assumptions used for each table.

Table 26 (contd.)

PROJECTED USES VS. CHANNEL ASSIGNMENTS

Using Assumptions from Table:[a]

Market	(1)	18 (2)	18 (3)	19 (2)	19 (3)	23 (2)	23 (3)	17 (2)	17 (3)	22 (2)	22 (3)	2 (2)	2 (3)	6 (2)	6 (3)	13 (2)	13 (3)	14 (2)	14 (3)	11 (2)	11 (3)	9 (2)	9 (3)	15 (2)	15 (3)	7 (2)	7 (3)	21 (2)	21 (3)
52 TOLEDO OH	5	3	2	2	3	2	3	2	3	2	3	2	3	2	3	2	3	1	4	2	3	2	3	1	4	1	4	1	4
53 OMAHA NE	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	2
54 TULSA OK	6	3	3	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	5
55 ORLAND FL	6	2	4	2	4	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	0	6	0	6	0	6
56 [illegible] NY	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	0	1	0	0	1	0	1	0	1
57 HARRSB PA	6	6	0	6	0	6	0	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	4	2	4	2	4	2
58 [illegible] IA	5	2	3	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5	0	5	1	4	1	4	0	5
59 [illegible] FL	4	2	2	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4	0	4	1	3	1	3	0	4
60 DVNPRT IA	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	0	3	0	3	0	3	0	3	0	3
61 FLINT MI	4	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3	2	2	2	2	1	3	1	3	1	3
62 GRNBAY WI	5	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5	0	5	0	5
63 [illegible] VA	4	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	0	4
64 [illegible] IL	9	5	4	4	5	5	4	4	5	4	5	4	5	4	5	4	5	3	6	2	7	2	7	3	6	3	6	2	7
65 CDRAPD IA	5	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	1	4	1	4
66 [illegible] IA	5	3	2	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	1	4
67 WICHTA KS	6	2	4	1	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5	0	6	0	6	1	5	1	5	0	6
68 NASHVL [illegible]	4	4	0	3	1	3	1	3	1	3	1	3	1	3	1	3	1	2	2	3	1	3	1	2	2	2	2	2	2
69 [illegible]	3	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	2	1	2	1	3	0	3	0	2	1
70 ROANOK VA	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3
71 KNOXVL TN	3	3	0	3	0	3	0	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	2
72 [illegible] GA	7	8	-1	6	2	7	0	7	0	6	1	6	1	6	1	6	1	5	2	0	8	1	6	5	2	5	2	1	6
73 [illegible] MO	4	3	1	3	1	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3	1	3
74 JOHNST PA	4	3	1	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3	1	3	2	2	2	2	1	3
75 [illegible] NE	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	3	4	3	2	2	1	3	1	3
76 SPOKAN WA	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3
77 [illegible] MS	5	3	2	3	2	2	3	2	3	2	3	2	3	2	3	2	3	2	3	0	5	1	4	2	3	2	3	0	5
78 [illegible] TX	1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	1	0	1	0	1	0	2	-1	1	0
79 YNGSTN OH	3	6	-3	4	-1	5	-2	5	-2	4	-1	4	-1	4	-1	4	-1	4	-1	3	0	4	-1	3	0	3	0	3	0
80 [illegible] IN	4	6	-2	4	0	5	-1	5	-1	4	0	4	0	4	0	4	0	4	0	2	2	1	3	3	1	3	1	1	3
81 [illegible] MI	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	0	3	1	2	1	2	0	3
82 [illegible] IN	3	6	-3	4	-1	6	-3	5	-2	4	-1	4	-1	4	-1	4	-1	4	-1	3	0	4	-1	3	0	3	0	3	0
83 PEORIA IL	5	6	-1	5	0	6	-1	5	0	4	1	4	1	4	1	4	1	4	1	4	1	4	1	3	2	3	2	3	2
84 [illegible] SC	5	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
85 SIOUXF SD	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	2	0	2	1	1	1	1	0	2
86 [illegible] IN	5	4	1	3	2	4	1	3	2	3	2	3	2	3	2	3	2	2	3	1	4	1	4	2	3	2	3	1	4
87 [illegible] LA	1	2	-1	2	-1	2	-1	2	-1	2	-1	2	-1	1	0	1	0	1	0	2	-1	2	-1	1	0	1	0	1	0
88 [illegible] TX	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	0	1	0	0	1	0	1	0	1
89 [illegible] PA	5	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	0	5	1	4	1	4	0	5	0	5	0	5
90 WHLING WV	0	1	-1	2	-2	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1	0	0	0	0	0	0
91 LINCLN NE	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3
92 LANSNG MI	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	2	1	2	0	3	0	3	0	3
93 MADISN WI	3	4	-1	3	0	3	0	3	0	3	0	3	0	2	1	2	1	2	1	2	1	3	0	2	1	2	1	2	1
94 COLMBS GA	2	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	1	1	2	0	2	0	1	1	1	1	1	1
95 [illegible] TX	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	1	1	0	0	1	0	1	0	1
96 HUNTSV AL	7	7	0	6	1	6	1	6	1	5	2	5	2	5	2	5	2	5	2	4	3	5	2	4	3	4	3	4	3
97 ROCKFD IL	4	4	0	3	1	3	1	3	1	3	1	3	1	2	2	2	2	2	2	2	2	3	1	2	2	2	2	2	2
98 [illegible] MD	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
99 MONROE LA	3	2	1	2	1	2	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	0	3	1	2	1	2	0	3
100 COLUMA SC	3	4	-1	4	-1	4	-1	3	0	3	0	3	0	3	0	3	0	3	0	2	1	2	1	2	1	2	1	2	1

allocated commercial UHF channels in each market. Then, in successive pairs of columns we show our projected number of stations for 1990* in column 2 and the excess, or shortfall, of allocations relative to projected numbers of stations in column 3. Thus the figures in column 3 show the differences between the values in columns 1 and 2 for each of the projections. The columns arranged in the same order as in Table 26 show progressively fewer UHF stations as one moves toward the right. The most striking aspect of Table 26 is that an excess of allocations exists in most markets, even for the most optimistic projections of UHF growth. The projections from Table 18 show that shortfalls of one or two channels arise for only four markets in the top 50. In the largest 10 markets, except for Los Angeles, as many as four or five channels are projected to remain unused. The largest shortfalls from Table 18 columns are in the smaller of the 100 top markets, such as Youngstown, Ohio (-3) and South Bend, Indiana (-2). Taking one other case from Table 22--the middle of the road combination of assumptions--we observe an excess of channels in all of the top 50 markets, or at a minimum, a zero shortfall; with a few one-channel shortfalls in five of the smallest of the top 100 markets.**

PROSPECTS FOR A FOURTH NETWORK

Park (1973)*** examines the prospects for different kinds of new commercial television networks, and concludes that overall the prospects are not very bright. However, he concludes that a fourth network using existing independent stations plus new UHF stations might well be viable if (a) it could affiliate with enough stations to that it could

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*The projected number of stations is the one that is corrected for the constant adjustment factor (column 2 in the detailed projection tables), rounded to the nearest whole number, plus the number of UHF stations in that market that were excluded from our narrow count.

**Also, since many ADIs cover large geographical areas, some of the channels activated in accordance with our projections would provide the basis for new ADIs as defined and measured by the audience rating services.

***Rolla Edward Park, *New Television Networks*, The Rand Corporation, R-1408-MF, December 1973; abridged version appears in *Bell Journal of Economics*, Autumn 1975.

reach nearly all U.S. television households, and (b) the UHF handicap were to drop substantially. (In his calculations, he assumes a decline to the point where a UHF station would attract about 90 percent as much audience as would a VHF station broadcasting the same programs.)

As noted above in Section VII, we have no new evidence on (b), the decline of the UHF handicap. It is, however, interesting to examine our projections in terms of (a), that is, to see how much the projected growth in UHF stations would increase the coverage of a fourth network. In 1974, the potential coverage of a fourth network using existing independent stations would be much less than complete, even in the top 100 markets. There are 57 million television households in the top 100 markets.* Of these, only 22 million are in markets with at least one VHF independent. Another 16 million are in markets with a UHF independent (but no VHF independents). A fourth network made up of existing independent stations would, then, have affiliates (either VHF or UHF) in markets with 38 million households, but it would not serve the remaining 19 million households.

This situation would change dramatically, given the growth of UHF stations projected in this report. Take our "middle of the road" projection for 1990, for example.** On this projection there would be UHF independents available for affiliation with a fourth network in almost all of the top 100 markets. In addition to the 22 million households with VHF fourth network coverage, 34.5 million could then be reached on UHF, leaving only .5 million uncovered. Depending to some extent on what happens in the markets below the top 100,*** and to a greater extent on future declines in the UHF handicap, this increase in coverage could give prospects for a fourth network a substantial boost.

It is worth noting that all three developments are mutually reinforcing. The existence of a large number of UHF stations, particularly

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*Excluding two border markets, Buffalo and San Diego, which we exclude from our analysis. The 57 million, and all of the coverage figures in this subsection, are calculated using Tables A.2 and A.3 in Appendix A.

**Here we are using the rounded projections in column 18 (2), Table 22.

***Containing an additional 9 million television households in 1974.

if they are affiliated with a fourth network, would promote the development and spread of technology to reduce the UHF handicap. The more UHF stations there are and the lower the handicap, the better the prospects for a fourth network. The possibility of affiliating with a fourth network and a decline in the handicap would both stimulate the growth of UHF stations. This beneficial feedback process appears to be our best hope for the emergence of a full scale fourth commercial network.

REMAINING UNCERTAINTIES

Of course, for all the reasons mentioned in Section II about what models can and cannot do in projecting accurately into the future, these estimates are subject to uncertainty. We have given our best estimates of the numbers of stations to be expected in each market under a variety of assumed conditions. Each of these numbers should be thought of as surrounded by a *range* within which the real value is likely to fall. Unfortunately, the complexity of our estimation process makes it impossible to calculate the shape and size of these bands of uncertainty. In particular, our use of a constant adjustment factor for each market should improve the accuracy of the projections, but it makes standard measures of uncertainty inapplicable.

Nevertheless, it is worth noting that the average error* with which our equation predicts the number of UHF stations in 1974 (that is, *within* the sample used to estimate it) is about one half of a station. We conjecture that the average error for our projections is somewhat smaller than this for small projected values and larger for larger values. *All* of the projections are conditional on the assumptions that go into them, and it is for this reason that we have made a large number of projections based on a variety of assumptions.

But perhaps the most salient characteristic in all the patterns we have uncovered is that, despite the uncertainties, it seems reasonably

*Precisely, the root mean-squared error; that is, the square root of the average value of the square of the prediction error.

clear that there will be no strong pressure, at least in most markets, against existing spectrum assignments; that is, existing assignments will be at least enough to provide substantial growth in the numbers of UHF broadcasting stations, even taking into account the recent reallocation of 14 channels of spectrum space from UHF to land mobile radio, as mentioned in the Introduction. Thus, at a minimum, it appears that existing assignments will be sufficient to accommodate whatever growth in UHF can reasonably be projected at this time. Going beyond that, it may be possible to both shuffle allocations by reassigning channels to particular markets based on the continuing empty channel slots shown in Table 24 and to use some of the spectrum space on both a shared and exclusive basis for other competing services. Again, much depends upon the assumptions one is willing to accept. If one is satisfied with the "middle of the road combination" of assumptions (from Table 22), then substantial reallocations can be made in the top 10 or so markets where in all cases two or more channels would remain unused by 1990. On the other hand, if one judges that pay cable and videodisc services will have a substantially greater impact on UHF than we project--moving the conclusions toward the no-growth end of the range of projections--then even more spectrum space in virtually all the top 100 markets could be made available for other uses.

Finally, we again emphasize that yet many other assumptions, and combinations of assumptions, can be explored with our model. And it is for that reason that the model itself, to be turned over to the FCC for its own use, is an important part of this study.

SPECTRUM REQUIREMENTS FOR PUBLIC TELEVISION

Our projections are limited to commercial stations and commercial station spectrum allocations. We exclude public television requirements because the determinants of the growth of public television are far different from those of commercial television. The future willingness of Congress to appropriate funds for public broadcasting, in terms both of funding levels and length of multiyear commitments, will depend on a host of complex political and other factors, including the general tightness of the federal budget, that we cannot hope to capture in our models. Growth will also depend upon the extent of viewers' voluntary contributions, the extent to which schools use public television for classroom instruction with appropriate compensation paid to stations, and the extent to which support is provided by local and state governments, colleges, and private foundations. The future roles of these factors would take us afield into broad questions of television for use in formal education, state and local expenditure policies, the future of private foundations, and other considerations lying outside the major determinants of commercial viability.

The best that can be said here is that many past studies have focused on the financial needs and public benefits of public broadcasting. It was the 1967 Carnegie Commission report, *Public Television--A Program for Action*, that led to establishment of the Corporation for Public Broadcasting. An excellent recent survey of the prospects and the needs of public broadcasting is contained in *Report of the Task Force on the Long-Range Financing of Public Broadcasting*, Corporation for Public Broadcasting, Washington, D.C., September 1973.

IX. PROBLEMS OF USING INDIVIDUAL STATION FINANCIAL DATA

As discussed in Section X below, and in the appendices, we spent a good deal of time exploring three alternative ways of projecting the number of viable stations based upon the financial data supplied by individual stations to the FCC. None of these approaches generated useful results, for two reasons: (a) the questionable reliability of the data supplied to the FCC, and (b) differences in station operating modes and other factors that may not lend themselves to econometric modeling. Each will be discussed here in turn.

QUESTIONABLE RELIABILITY OF THE DATA

To identify potential problem areas that arise in current methods for obtaining station financial data, let us consider Schedules 1, 2, and 3 reproduced below from the 1974 "Annual Financial Report of Networks and Licensees of Broadcast Stations," Form 324, that the FCC annually sends to broadcast stations for their submission.

On a priori grounds one would expect the computations of broadcast revenues to be straightforward, with little variation among stations rising as a consequence of differences in their accounting techniques.* One area, probably of minor importance, is the amount reported on line 20 because of differences in valuing merchandise and services that are not actually purchased and sold in the marketplace. The FCC recognizes this problem for it specifies in its "General Instructions for Broadcast Stations" in completing Form 324 that "spots exchanged for merchandise...for advertisements in other media...for services...are more difficult to value, but must be estimated for purposes of the financial report." The FCC states that "the amount of cash the station would have paid for the merchandise provides a reasonable basis for estimating the value." But one could expect widely varying estimates among stations for this value in the same way that the price of a particular piece of merchandise can vary substantially among retail stores.

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*However, the allocation among revenue categories, particularly between national-regional spot and local spot, may be somewhat arbitrary.

1974 CALL LETTERS ....

SCHEDULE 1. BROADCAST REVENUES

LINE NO.	CLASS OF BROADCAST REVENUES (a)	MAKE ENTRIES IN THIS COLUMN FIRST (omit cents) (b)	USE THIS COLUMN FOR YOUR TOTALING ONLY (omit cents) (c)
		$	$
1	A. REVENUES FROM THE SALE OF STATION TIME:		
2	(1) Network		
3	Sale of station time to networks:		
4	Sale of station time to major networks, ABC, CBS, MBS, NBC (before line or service charges) .... (17-24)		
5	Sale of station time to other networks (before line or service charges) .... (25-32)		
6	Total (lines 4 + 5)	....	
7	(2) Non-network (after trade and special discounts but before cash discounts to advertisers and sponsors, and before commissions to agencies, representatives and brokers).		
8	Sale of station time to national and regional advertisers or sponsors .... (33-40)		
9	Sale of station time to local advertisers or sponsors (41-48)		
10	Total (lines 8 + 9)	....	
11	Total sale of station time (lines 6 + 10)	....	
12	B. BROADCAST REVENUES OTHER THAN FROM SALE OF STATION TIME (after deduction for trade discounts but before cash discounts and before commissions): (1) Revenues from separate charges made for programs, materials, facilities, and services supplied to advertisers or sponsors in connection with sale of station time:		
13	(a) to national and regional advertisers or sponsors .. (49-56)		
14	(b) to local advertisers or sponsors .... (57-64)		
15	(2) Other broadcast revenues .... (65-72)		
16	Total broadcast revenues, other than from time sales (lines 13 + 14 + 15)	....	
17	C. TOTAL BROADCAST REVENUES (lines 11 + 16)	....	
18	(1) Less commission to agencies, representatives, and brokers (but not to staff salesmen or employees) and less cash discounts .... (73-80)		
19	D. NET BROADCAST REVENUES (lines 17 minus line 18)	....	
20	Report here the total value of trade outs and barter transactions. This value must also be included as sales in the appropriate lines above ..		
21	If this is a report for a joint AM-FM operation, indicate below the amount, if any, of total broadcast revenues in line 19 which is applicable separately to the FM station:		
22	FM revenues from sale of station time (after discounts, commissions, etc.) .... (17-24)		
23	FM revenues from providing functional music or other special services .... (25-32)		
24	Other FM revenues .... (33-40)		
25	Total (lines 22 + 23 + 24)	....	

Fig. 3—Form for reporting broadcast revenues to FCC, 1974 (slightly reduced).

1974 CALL LETTERS . . . .

SCHEDULE 2. BROADCAST EXPENSES

LINE NO.	CLASS OF BROADCAST EXPENSES (a)	MAKE ENTRIES IN THIS COLUMN FIRST (omit cents) (b)	USE THIS COLUMN FOR YOUR TOTALING ONLY (omit cents) (c)
1	TECHNICAL EXPENSES:	$	$
2	Technical payroll* . . . . . (41-48)		
3	All other technical expenses . . . . . (49-56)		
4	Total technical expenses		
5	PROGRAM EXPENSES:		
6	Payroll* for employees considered "talent" . . . . . (57-64)		
7	Payroll* for all other program employees . . . . . (65-72)		
8	Rental and amortization of film and tape . . . . . (73-80)		
9	Records and transcriptions . . . . . (17-24)		
10	Cost of outside news services . . . . . (25-32)		
11	Payments to talent other than reported in line (6) . . . . . (33-40)		
12	Music license fees . . . . . (41-48)		
13	Other performance and program rights . . . . . (49-56)		
14	All other program expenses . . . . . (57-64)		
15	Total program expenses		
16	SELLING EXPENSES:		
17	Selling payroll* . . . . . (65-72)		
18	All other selling expenses . . . . . (73-80)		
19	Total selling expenses		
20	GENERAL AND ADMINISTRATIVE EXPENSES:		
21	General and administrative payroll* . . . . . (17-24)		
22	Depreciation and amortization . . . . . (25-32)		
22a	Interest		
22b	Allocated costs of management from home office or affiliate(s)		
23	Other general and administrative expenses . . . . . (33-40)		
24	Total general and administrative expenses		
25	TOTAL BROADCAST EXPENSES (lines 4 + 15 + 19 + 24		

**Payroll includes salaries, wages, bonuses and commissions.*

SCHEDULE 3. BROADCAST INCOME

LINE NO.		AMOUNT (omit cents)
		$
1	Broadcast revenues (from Schedule 1, line 19) . . . . . (41-48)	
2	Broadcast expenses (from Schedule 2, line 25) . . . . . (49-56)	
3	Broadcast operating income or (loss) (line 1 minus line 2)	
4	Total of any amounts included in line 2 above which represent payments (salaries, commissions, management fees, rents, etc.) for services or materials supplied by the owners or stockholders, or any close relative of such persons or any affiliated company under common control (see page 3 of instructions) . . . . . (57-64)	
5	Note: If no such payments were made, check here . . . . . ☐	

Fig. 4—Form for reporting broadcast expenses to FCC, 1974 (slightly reduced)

It is in Schedule 2--Broadcast Expenses--that the most serious problems of reliability of financial data are likely to arise, in "general and administrative expenses" (line 20). "General and administrative payroll" (line 21) can be overstated by excessive payments made to owner-principals. "Depreciation and amortization" (line 22) can vary widely depending upon the depreciation method being used (straight-line or other), and the basis upon which depreciation is calculated.

For example, when a station is purchased, an excessive original cost assigned to the intangible property could be used as the basis for depreciation calculations. These calculations critically depend on the way that the selling price of the station in excess of its value of plant and equipment (with the differences between the two reflecting goodwill and the value of scarce radio spectrum space) is depreciated. "Interest" (line 22a) can vary widely among stations depending upon requirements to repay funds borrowed to purchase the station. "Allocated costs of management from home office or affiliate" (line 22b) can obviously vary a good deal depending upon the techniques that the firm uses in making these allocations. This figure can easily be exaggerated by excessive payments to affiliated units of the same enterprise, computer billing and management services, and other items.

To obtain a rough idea of how sensitive operating income or loss may be to variations in these figures, let us consider the figures for an average broadcasting station.* Its broadcast revenues were $2.77 million; broadcast expenses were $2.12 million; broadcast operating income was, therefore, $0.64 million. Its general and administrative expenses from line 20 above were $0.66 million or about the same as its operating income. Thus, an increase of 50 percent in its general administrative expenses would have reduced operating income by 50 percent; a doubling of these expenses would have wiped out profits altogether.

*These figures are calculated by dividing the totals for all reporting stations shown on p. 225 of FCC, *39th Annual Report, Fiscal Year 1973*, by 690, the number of reporting stations.

Broadcast stations have wide leeway in reporting their financial situations--particularly in general and administrative expenses--and the FCC has at this time no technique for independent verification. It does not audit any of the reports it receives on Form 324, nor is it able to cross-check figures against income tax returns. Thus, we have no way of determining the extent to which variations in accounting practices among firms do arise to cause distortions in financial data and to compromise their usefulness for analytic purposes. For these reasons, the FCC appears to be moving constructively in explicitly recognizing the potential unreliability of the financial data and in authorizing in December 1975 a separate 13-month study focused specifically upon this problem.*

DIFFERENCES IN STATION OPERATING MODES AND OTHER FACTORS

Other difficulties may arise not from faults in the data but because of the way stations are owned and operated. While network stations have essentially the same program formats, independent stations--particularly UHF--show wide variations. Well-financed UHFs purchase top syndicated product with strong audience appeal and sometimes commit themselves to the purchase of expensive sports programming rights. Weakly financed UHFs operate at lower costs with the hope of garnering sufficient revenues to make a modest profit. In some cases they are held in the hope of eventually being sold for a capital gain when their financial prospects improve.

A station with a larger local news and public affairs staff may show higher expenses and less profit than its counterparts; or a station with a stricter limitation on commercial interruptions may have lower time sales. Data are available on the number of minutes of news programming, size of staff, and program expenses for local programming. In principle, one might be able to construct a model that, taking these data into account, could distinguish among a few operating modes. The major problem is in determining the operating modes of *new* stations coming on the air between now and 1990 and *changes* in operating modes of existing stations

*The FCC authorization of the study is reported in *Television Digest*, December 8, 1975, and is described in an FCC Request for Proposals, RFP 76-12, January 23, 1976.

as a consequence; here there is simply no basis for judgment.

Other factors include differences in management skills among firms. We frequently observe, for example, that two gasoline stations across the street from each other, although apparently equally situated perform quite differently. While one thrives and prospers, perhaps eventually to form a chain, the other loses money and eventually may go out of business. These differences are hard to explain other than in terms of skills in management practices and perhaps sheer luck. The same is probably true in the broadcast business where these factors create static to reduce the explanatory power of our econometric techniques based on station financial data.

Among network stations, *which* network (ABC, CBS, NBC) is involved could certainly be used to explain some of the variation in financial performance. However, we are primarily interested in projecting new stations for the top-100 markets where no new affiliations are available; a more precise explanation of network station profitability would not help us in this task.

Another possibility is that reception quality varies enough among VHF stations or among UHF stations so that stations with lower channel numbers do better than those with higher numbers, even within the same frequency band. (That is, channel 2 is better than channel 13; channel 14 is better than channel 70.) Perhaps audience loyalty builds up over long periods, so that older stations are generally more profitable than newer stations. Perhaps there is some sort of specialization, with each station going after a different category of audience, some more profitable than others. This is clearly the case with foreign language stations, and there may be some more subtle form of specialization by other stations. More generally, the literature on audience preferences and station programing behavior* suggests that there should be a regular *distribution* of audience shares, and hence profits, among equally situated stations.

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*Peter Steiner, "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting," *Quarterly Journal of Economics*, May 1952; Bruce M. Owen, Jack H. Beebe and Willard H. Manning, Jr., *Television Economics*, Lexington, MA., 1974; Stanley M. Besen and Bridger M. Mitchell, *Watergate and Television: An Economic Analysis*, The Rand Corporation, R-1712-MF, May 1975.

We investigated each of these possibilities in enough detail to convince ourselves that none of them would improve our financial predictions for independent UHF stations sufficiently to make them useful for projecting the number of new stations. Further research into these matters might well be useful for other purposes, however, and would almost certainly advance understanding of the television industry.

X. UNSUCCESSFUL ATTEMPTS TO CONSTRUCT MODELS USING TELEVISION STATION FINANCIAL DATA

The projections discussed in earlier sections are all based on our viable stations model,* which predicts the number of stations directly. We also put extensive effort into three models that would predict number of stations indirectly. Elements of these models are described in detail in Appendixes B through F. They are all based on financial data reported to the FCC by individual television stations. All would yield estimates of station profits, and our intention was to use these as indicators of viability. However, for reasons noted in Section IX, none of the three methods did a very good job of predicting profits, particularly for stations handicapped by UHF transmission or lack of network affiliation--precisely those stations in which we are most interested. Consequently, we did not use any of these three methods in making our projections. However, they are of interest in their own right and carry some important lessons that are summarized in this section.

METHOD I

Our first method of predicting station profits was based on suggestions made in the work statement that accompanied the FCC's request for proposals. It comprises several interlocking steps. First, one estimates the total television audience for each market (Appendix B) and the "price" of audience** in each market (Appendix C). Multiplying these two quantities gives an estimate of the total revenue for each market. Then one estimates the fraction of market revenue that goes to each station in the market (Appendix D). Multiplying this fraction by the estimated market revenue yields an estimate of each station's revenue. Finally, one estimates each station's expense and deducts

*As described in general terms in Section II and in detail in Appendix A.

**More precisely, the ratio of total revenue to total audience for each market.

this from estimated revenue to arrive at the station's estimated profit. We discuss briefly in turn what we learned from each of these steps; details are included in the appendixes.

Television Market Audience

In estimating television market audience, we are particularly interested in whether or not additional stations increase total audience, and if so, how much. One can find support for both positions in previous research results. Noll, Peck, and McGowan (1973)* present regression results that

> imply that a single affiliate will attract between 42 and 45 percent of the potential viewers in its market. In a market with two stations, the total audience would be between 55 and 65 percent of the potential, depending upon the affiliation status of the stations. Finally, in a market with an affiliate of each network, the total audience is 60 percent of potential.

In a similar vein, Besen and Mitchell (1975)** conclude from an analysis of television audiences during the Watergate hearings that additional program choices can substantially increase total audience, at least if the new programming is sufficiently different from standard fare. On the other hand, it has been frequently assumed (e.g., Park, 1973),*** or asserted based on rather casual evidence (e.g., Owen, Beebe and Manning, 1974; FCC, 1970),**** that total audience does not depend on the choice

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*Roger G. Noll, Merton J. Peck, and John J. McGowan, *Economic Aspects of Television Regulation*, Brookings Institution, Washington, D.C., 1973, p.

**Stanley M. Besen and Bridger M. Mitchell, *Watergate and Television: An Economic Analysis*, The Rand Corporation, R-1712-MF, May 1975.

***Rolla Edward Park, *New Television Networks*, The Rand Corporation, R-1408-MF, December 1973; abridged version appears in *Bell Journal of Economics*, Autumn, 1975.

****Bruce M. Owen, Jack H. Beebe, and Willard G. Manning, Jr., *Television Economics*, D. C. Heath, Lexington, Ma., 1974; Federal Communications Commission, "The Economics of the TV-CATV Interface," prepared by the Research Branch, Broadcast Bureau, Washington, D.C., July 15, 1970.

of signals.

Our own analysis has two parts, corresponding to the two strands in previous research, and leads to a reconciliation of the apparently conflicting results. The first part of our analysis uses market level data. We add up the audience for all stations in the market to get total audience. We measure the level of television service by the number of networks in the market, whether they broadcast on VHF or UHF, and whether there is VHF or UHF independent service in the market. By this definition, the worst-served market has only one network UHF station, and the best-served receives all three networks plus at least one independent, all on VHF. We find that total audience (as a fraction of potential audience) is generally about twice as great in the best-served markets as it is in the worst-served markets. This is consistent with Noll, Peck, and McGowan's results.

In the second part of our analysis, we use data on audience in over 3000 individual counties. Here we find that the range of signal choice has very little effect on audience size. There are very few counties where only one network signal is received--fewer than 50 on most counts*--and in these counties prime-time audience averaged 54 percent of potential audience. In the counties with two network signals, audience averaged 56 percent. In those with three, it was 58 percent, and in those with three networks plus at least one independent, it was 59 percent. Overall, there is not much difference between the size of the audience in the worst-served and the best-served counties.

How do we reconcile these seemingly conflicting results? In a sense both are correct, but they are conclusions about different effects. Consider the following example, which is consistent with both sets of results. Market A is a three-network market surrounded by other three-network markets. Within A's ADI, 58 percent of households watch television during prime time. Both county-level and market-level data show total

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*We counted signals received in several different ways; see Appendix B for details.

ratings of 58. Market B is a two-network market surrounded by three-network markets. Within B's ADI, total viewing is the same as in A's: 58 percent. But a substantial share of this total is watching the third network signal from adjacent markets. Thus the total rating for Market B's two stations is substantially less than 58 percent.

The county-level results are correct in showing that total viewing in any given geographical area is only slightly affected by the number of signals received there. The market-level results are correct in showing how that total is shared among adjacent markets with different numbers of local stations.

Television Market Revenue

It would be convenient if audience were worth the same amount of money to advertisers in all markets. Then one could simply multiply the market audience estimates from Appendix B by some constant "price" of audience to get market revenue estimates. A look at the data, however, shows considerable market-to-market variation in the "price" of audience. In 1972, for example, the ratio of market revenue to average daily audience averaged $80 per household, with a range of $42 to $199. We attempted to explain this variance in three different ways.

First, we used regression analysis to check for relationships between "price" of audience and things that might be expected to influence it -- the wealth of the market, market size, and a measure of competition among stations in the market. We did find significant relationships that went in the expected directions -- for example, the "price" of audience tended to be higher in richer markets. However, the relationships were not strong enough to explain more than 20 percent of the market-to-market variance in "price" of audience.

Second, we attempted to discover additional factors that might account for the unexplained variance, by interviewing people who might know -- station officials, advertising representatives, and advertising agency executives. FCC staff members conducted interviews in New York, and we interviewed people in Los Angeles. The results were not very helpful. Some explanations were simply appeals to tradition: "San Francisco has always been a good market."* Others relied on idiosyncratic and unpredictable factors: "One of the Las Vegas station managers is really on the ball." Some explanations were used interchangeably to explain both good and bad markets: "A dominant station in one three-station market keeps prices up; two weak stations in another three-station market drive prices down."

The idea behind our third approach is that there are a whole host of factors that affect "price" of audience in a particular market: the age, occupation, education, race, and income distribution of its population; its climate; its industrial, commercial and financial make-up; activities, tastes and opportunities of its population; competition from other media--anything that affects the advertising buyer's image of the market. There are far too many potentially important factors to include them all in a regression equation, even if they were all measurable. But if they are relatively stable over time, we can estimate their net effect on "price" of audience in the various markets using a statistical technique called analysis of covariance. Applying this technique to data for 1963-1972, we find that we can explain 75 percent of the variance in "price" of audience, strongly confirming the importance of persistent market effects. In fact, it turns out that "price" of audience is sufficiently stable from year to year that one can do a pretty good job of predicting it by simply assuming that it is constant in each market over time.

Individual Station Shares of Revenue

Thus far, we have a way of estimating audience size and the "price" of audience in each market. Multiplying the two gives an

*Although incomes in San Francisco have been substantially above average ever since the California gold rush, our analysis shows that television costs per thousand are even greater than could be expected on the basis of this level of higher income. Moreover, there are test markets like Phoenix which attract unusually high advertising revenues. But the problem here is predicting where test markets will be in the future, again an area about which there is no good basis for judgment. However, the existence of scattered abnormally performing test markets would have little effect on our overall projections, which encompass such a large data base.

estimate of market revenue. The next step in Method I is to estimate what fraction of market revenue goes to each station in the market. We investigate two different ways of doing this in Appendix D. Both assume that station shares depend on the type of station (network affiliated or independent, VHF or UHF) and on the amount and type of its competition. One formula assumes that a new station reduces all existing stations' shares in the same proportion. That is, it makes no allowance for the possibility that, for example, a new independent station might have more impact on other independents than on network affiliates. The other formula allows for a different impact of each category of station on stations in each category. Both formulas explain about two-thirds of the variance in station revenue shares.

Individual Station Expense

To complete Method I of estimating television station profits, we planned to estimate an equation that would relate station expense to its characteristics and the characteristics of its competition and its market. We would then deduct estimated station expense given by this equation from the revenue figure obtained as described above, and use the result as estimated station profit. However, profit prediction comparisons described below led us to abandon this approach in favor of our viable stations model before we went on to estimate an expense equation.

METHOD II

The second method of predicting profits was suggested in our proposal to the FCC as a way of cutting through the complexities of Method I. Instead of calculating profits as the difference between two estimated quantities, one of which is itself calculated as the product of three other estimated quantities, Method II estimates profit directly.

We use the same equation that Besen (1973)* used to estimate station time rates. This equation relates time rates, or in our case station profits, to the size of the market the station operates in; whether it is handicapped by lack of network affiliation, UHF transmission, both, or neither; the number of competing stations and the extent to which they are handicapped. Superficially, the estimated equation looks remarkably good. All of the coefficients have the expected signs and are highly significant, and the equation explains about 80 percent of the variance in station profits. However, the profit prediction comparisons below show that even Method II has serious shortcomings.

METHOD III

Method III was originated at Rand after the contract work was under way. Its main purpose was to test a profit maximization model of television station behavior, but the model may also be used as a third method of estimating station profits.

We think of a television station as a firm that is in the business of "producing" audience and selling it to advertisers. The more audience it has to sell, the higher its revenues. But additional audience can be produced only at increased cost -- for better programs, stronger promotion, upgraded technical facilities, etc. For a typical station, the relationships between revenue and audience, and between cost and audience may be as shown in Fig. 5. Different stations will have different revenue and cost curves, depending on their own characteristics, their competition, and the market they operate in. We hypothesize that the station will choose to produce the amount of audience (A^*) that maximizes the difference between its revenue and its cost. We estimate equations that represent the revenue and cost curves of Fig. 5. This is a fairly complex process, for reasons discussed in Appendix F.

By usual statistical standards, our estimates of the cost and revenue curves are quite good; their explanatory power and the significance of their coefficients are all high. But this method, too,

*Stanley M. Besen, *The Value of Television Time and the Prospects for New Stations*, The Rand Corporation, R-1328-MF, October 1973.

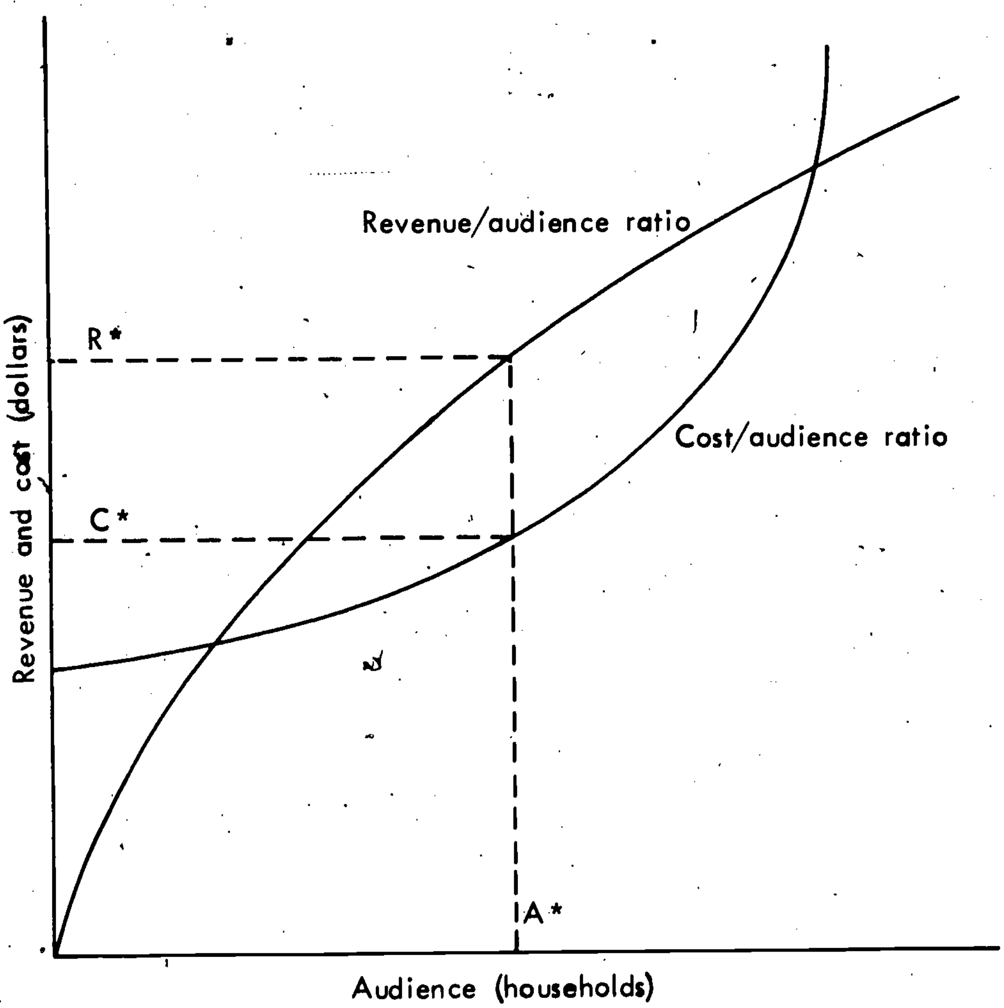

Fig. 5—Revenue and cost curves for a typical television station (conceptual).

fails to do an adequate job of predicting profits, as discussed below.

PROFIT PREDICTION COMPARISONS

Table 27 compares the performance of the three methods of predicting profits. We did the calculations to establish a probable upper bound on the performance of the three methods. Thus, in many places we used actual values of variables that would have to be predicted in full-blown applications of the models to make projections to 1980 and beyond. Without this help, they would almost certainly perform even less well.

In a full-blown application of Method I for making projections, we would first need to predict market audience using Appendix B. Then we would predict market revenue/audience ratios using Appendix C, and multiply the two figures to get estimated market revenue. Then we would use Appendix D to predict individual station shares of market revenue. Finally we would estimate station expenses using an equation similar to the expense equation in Appendix F, and deduct them from estimated station revenues to get estimated profits. The method actually used in Table 27 is much less complicated and represents a probable upper bound on the performance of this method. We applied station revenue shares predicted by Appendix D to *actual* market revenues and subtracted *actual* station expenses to estimate profits. Even with this advantage, this method performs generally less well than does Method II.

Method II also got a little help from the use of actual values. In making the calculations for Table 27, we substituted actual numbers of UHF stations into the profit equation. These numbers would have to be estimated in a full-scale application of the model.

Method III used for the table is also much simpler than a full-scale application of the model would be, and represents an upper bound on the performance of this approach. A full-scale application

Table 27

PROFIT PREDICTION COMPARISONS

Station Class	R-squared			RMSE[a]			RMSE/$\bar{X}$ [b]		
	I	II	III	I	II	III	I	II	III
All stations	.717	.787	.196	906	782	1521	1.14	.98	1.91
Network VHF	.843	.810	.271	747	815	1596	.68	.75	1.47
Network UHF	-3.61	-.213	-.249	424	218	221	1.67	.86	.87
Independent VHF	-3.43	-.151	-.411	2719	1385	1534	3.22	1.64	1.82
Independent UHF	-2.24	-.535	-11.6	1109	763	2189	3.53	2.46	7.06

[a]Root mean squared error in $1000; $\sqrt{SSE/n}$, where SSE is the sum of squared errors and n is the number of observations.

[b]RMSE as a fraction of mean profit.

would be a complicated iterative process in which trial values of station expenditure would be assumed, profit-maximizing expenditures for each station would be calculated assuming other stations' expenditures were equal to the trial values, calculated expenditures would be substituted for the trial values, and the process continued until estimated expenditures for each station converged to a stable value. Estimated profits would be calculated as the difference between estimated revenues and estimated expenses at that point. For our upper bound calculations, we substitute *actual* values for other stations' expenditures in equation (F.3'), Appendix F, to calculate estimated audience, then substitute these estimates in equations (F.1') and (F.2') to predict revenues, expenses, and hence profits.

In Table 27 we show three measures of predictive merit for each method. R-squared is the fraction of variance in profits explained by the method. An R-squared of 1 is 100 percent perfect prediction. A negative R-squared means that the method predicts less well than one would do if one used the observed mean value of profit for all stations in a particular class (for example, independent UHF stations) as the predictor for all stations in that class. Root mean squared error (RMSE) is a sort of average amount by which the predicted value misses the actual value; the smaller it is, the better the prediction. But the absolute size of the error is perhaps less important than its size relative to the size of the quantity being predicted. Thus we also show RMSE/$\bar{X}$, the root mean squared error divided by the mean value of profits.

Methods I and II both do a respectable job of predicting profits for all stations taken together and for network VHF stations as a separate class. But none of the three methods does at all well at predicting for any of the handicapped classes of stations--network UHF, independent VHF, and independent UHF. For independent UHF stations, for example, R-squared shows *minus* values, indicating that the method predicts less well than one could do simply by using the observed mean value of profit for all UHF independents. Moreover, the root mean squared error (RMSE) as a ratio to the mean profit ($\bar{X}$) for independent UHF stations (3.53, 2.46, 7.06 in the lower right hand corner of the table) shows that the average errors are far in excess of the mean values of the variables being estimated. Since we are primarily interested in the potential for new UHF stations, we cannot rely on any of the three profit prediction methods. It is for this reason that we developed the viable stations model and relied on it for the projections in this report.

Proprietary plots of individual station profits against market size* illustrate the problems of predicting profits for handicapped stations. We see, for example, that independent UHF stations located in the same market, and hence facing exactly the same competitive situations, report greatly different profit figures. Since all of our models treat equally situated stations the same, there is no way that they can explain these differences in performance.

SUMMARY LISTING OF LESSONS LEARNED

In summary, we believe that the most important lessons to be learned from our attempts to build models using station financial data are the following:

- Financial data in the *aggregate* are useful as *overall* measures of industry performance over time. Although varying from station to station, accounting practices for individual stations are maintained more or less consistently from year to year; moreover, whatever anomalies appear in individual station accounts are likely to be offset or tempered by anomalies in others. Thus, overall figures are useful in showing *changes* in the financial position of the industry. For example, an increase in profits of, say, 25 or 50 percent in a single year for the industry could surely not be attributable to changes in accounting practices alone, but to rapidly increased revenues relative to industry costs. Aggregate data are also useful in monitoring changes in the *composition* of revenues and expenses, as, for example, in shifts between national advertising and local spot advertising and in costs and expenditures for local public affairs and news programming.

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*These are reproduced in Appendix G, which is separately bound and available only to the FCC because of the proprietary nature of the data displayed.

- However, the large variation observed in the profits of equally situated stations suggests that financial data filed by *individual* stations have little usefulness for policymaking purposes. Comparisons of individual station performance are questionable because of problems with reliability of data and because of differences in station operating modes and other factors that cannot be systematically taken into account. This large non-systematic variation makes it impossible to predict with any precision the smaller, systematic effects of policy changes on station profits.

- Even if it were possible to predict profits, this would not provide a good indication of viability since many stations report losses year after year and continue in business.

- Total audience increases very little as viewing options increase.

- The problem of the UHF handicap shows up consistently whenever we deal with individual station data, whether it is in terms of revenue shares, profits, or a revenue and expense model.

- Perhaps most importantly, the large variation in profits of equally situated stations indicates that there is a good deal of flexibility in the system; there seems to be room for different modes of station operation, all viable. Certainly stations will react to competition from new technologies by adjusting their operations in ways that soften the impact on profits. Indeed, the relationship between competitive factors and profits is so tenuous that any impact of new technologies on profits may get lost in the static.

XI. FURTHER WORK THAT WOULD BE USEFUL IN MAKING SPECTRUM ALLOCATION DECISIONS

MORE EFFICIENT USE OF SPECTRUM SPACE

Based on this work, if the FCC were to deem it desirable to shift some additional UHF space to competing uses on a shared or exclusive basis, then the next step would be to determine which particular channel numbers assigned in particular markets can be reshuffled (in light of all the UHF "taboos") in order to clear on a regionwide or nationwide basis several specific UHF channels that can then be reallocated to other uses. Again, how much spectrum could be released by reallocations depends on which assumptions one chooses to accept among the wide range we have explored in this study. As illustrated in Table 25 the number of channels that might be reassigned in New York could vary all the way from 6 to -5 depending on the range of assumptions, and in Los Angeles from 4 to -2. (Under the most optimistic assumptions about UHF growth, there would be a shortfall in these markets.*)

As a parallel effort to this study, it is important that the FCC reconsider the problem of UHF taboos. In contrast to VHF, which has only two constraints (co-channel and adjacent channel restrictions), UHF has many more, including IF beat, intermodulation, oscillator, and sound image. Because of these taboos, fewer channels can be assigned out of a given total MHz allocation than is true in VHF. However, if UHF receivers were redesigned to higher standards to get around some of these taboos, many more stations could be put into each market. Thus, the question arises of whether new UHF tuner and receiver standards should be imposed in order (a) to permit more UHF channels to be assigned out of the existing total spectrum space allocated to UHF, and (b) given our projections of channel use to 1990, to permit an even larger reallocation of spectrum space to other uses in 10 or 15 years, when improved receivers and tuners might be widely distributed in the market. Fortunately, the FCC has already launched such an inquiry.

*Since many ADIs cover a substantial geographical area, it is important to note the distinction between core city UHF allocations and allocations toward the fringes of the ADI. In many cases, the allocations that would remain unused in our projections would be those in the fringe areas. For example, if all three Washington, D.C., UHF allocations were to be activated, the only additional allocations which could be assigned to other spectrum uses would be those in the outlying areas of Hagerstown, Md. Cumberland, Md., and Fredericksburg, Va., rather than in the metropolitan area where spectrum scarcity is likely to be most serious. But the critical

Another parallel effort involves projections of demand for mobile radio and for other services that by their nature could use spectrum space now allocated to television. Several studies have been completed in this area and their projections, like ours, will need to be revised as new data and information become available.*

In addition, it is important to examine the actual channel loadings employed in mobile radio uses in representative metropolitan environments. Some assignments may be lightly used or may be used during the time of day that could be meshed with communications activities using other frequencies.

THE SOCIAL VALUE OF SPECTRUM SPACE

Of course, another question that arises, as mentioned in the Introduction, is the value to society of whatever stations we do project to come onto the market between now and 1990. Just because a station may be economically viable does not necessarily mean that its operation is in the public interest in view of the fact that the spectrum space it uses is made available without charge. Unfortunately, there is no way within the scope of our study to determine the social value of these projected stations (or of existing stations, for that matter) because any realistic calculation would have to quantify the value of spectrum space in alternative uses. Were spectrum space bought and sold like other resources such as land, then we would have some measure of the social value of spectrum. But since spectrum is allocated by administrative decision, no such measure exists. All that can be said here is that certain attempts in the past to measure spectrum value, involving adding up the value of equipment that makes use of spectrum space, are wholly *invalid* measures of spectrum values. For example, we have seen many computations made of the millions of dollars invested in communications

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factor is that so long as those allocations are maintained in the outlying areas, spectrum interference, were the allocations ever to be activated. Or, to express it differently, a station operating on a given UHF frequency in Fredericksburg, Va., would preclude the use of the same spectrum space for other uses in Washington some 50 miles away.

*A comprehensive report prepared for the Office of Telecommunications Policy is George P. Mandanis, et al., *Land Mobile Communications and Public Policy*, Systems Applications, Inc., National Technical Information Service, No. PB-231524, August 1972. See also President's Task Force on Communications Policy, "Public Safety Radio Spectrum Requirements," Appendix F, Staff Paper 4, National Technical Information Service, PB-184422, June 1969.

gear dependent upon the use of spectrum space with the implication drawn that the total value of communications equipment is somehow a measure of the value of the spectrum space.* This is analogous to estimating the value of, say, copper by adding together the value of all of the copper-using commodities, including automobiles, telephone plant, and the host of other items in which copper is employed. The astronomical figure that one would derive in the case of copper would surely not reflect its value, since other metals could, at some price, be substituted for it to some degree.

Similarly, with spectrum space. It is only one of many inputs that goes into communications systems. It can substitute for and be substituted against in the design and use of communications systems. In mobile communication, substitution is most constrained, but even there adjustments are possible between equipment design and spectrum use. Were the explicit price of spectrum very high, for example, this would serve as further inducement for the development of cable television systems with program origination to reduce the demand for over-the-air broadcasting. Were its price very low, perhaps as a consequence of technological breakthroughs permitting greater sharing between terrestrial and space uses, then the use of over-the-air communications might be substituted (to a degree) for the eventual use of fiber optics, millimeter wave guides, and other confined communications links.

In a similar vein, we cannot estimate the social value of competing uses of spectrum space. The best that can be done here is to project demand by competitors for use of UHF spectrum--an effort that falls outside the scope of the present study, but one that is the focus of other studies either underway or completed, as mentioned above.

FURTHER USE OF VIABLE STATIONS MODEL

Finally, further work using our model itself will be useful over the years as new data become available regarding such things as the popularity of pay television and videodiscs, the inclusion of unexpected new developments, and, especially, the rate at which the UHG handicap declines. As mentioned above, our time series 1971 to 1974 is too

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*One such estimate, running to $17 billion in 1962, was based on the total value of (a) all spectrum-using equipment sold in that year, (b) the short, and intermingled with macroeconomic effects such as high interest rates and general recessionary tendencies, to show UHF handicap has declined over the four-year period. As a longer time series becomes available, perhaps extending through 1980, it may be possible to estimate the decline in the UHF handicap from 1971 through 1980 and use that estimate as a key element in projecting the further decline in the handicap through 1990.

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annual repair and maintenance bill on the total stock of spectrum-using equipment, and (c) research and development expenditures in spectrum-related activities. See Telecommunications Science Panel of the Department of Commerce Technical Advisory Board, *Electromagnetic Spectrum Utilization: The Silent Crisis*, October 1966, p. 8.

APPENDICES

GUIDE TO THE APPENDICES

Appendix A describes the model that we use to make the projections discussed in the main body of this report. This model yields direct projections of the number of viable commercial UHF stations in each market. However, when we began work late in 1973, we expected to use more roundabout ways of projecting viable stations. All would yield projections of stations' profits, and profitability would be used as an indicator of economic viability.

As described in more detail in Section IX, we tried three different ways to predict television station profits. The first method was inspired by the FCC's draft work statement in its RFP, which suggests a procedure with several steps including the estimation of television market revenues, partitioning these among stations in the market, and deduction of estimated expenses to arrive at profit predictions. Elements of this method are reported in Appendices B, C and D.

A second method was suggested in our proposal that the FCC funded as a way of cutting through some of the complexities of the first approach: Estimate profits directly, rather than as the difference between estimated revenues and estimated costs. This method is discussed in Appendix E.

A third method was originated at Rand after the project was underway, to focus more explicitly on television station behavior. As described in Appendix F, we view the station as a firm that chooses its expenditure level to maximize profits subject to competitive pressure, public service obligations, and other aspects of its environment. We estimated cost and revenue curves that model this process; these curves can be used as a third way to estimate profits.

As it turned out, *none* of the three methods of predicting station profits did a very good job, particularly for stations handicapped by UHF transmission or lack of network affiliation. Furthermore, even good profit projections would have been dubious indicators of viability, since many stations report losses year after year and still remain on the air. So we rely on the more direct method of Appendix A for all of our projections.

In this sense, then, the work reported in Appendices B through F is a dead end, since it did not lead to a useful way of projecting viable stations. However, much of it is interesting in its own right, as discussed in Section X above, and it is included here for that reason.

These appendices were prepared at intervals over a year-long period as interim reports on work in process. It is not too surprising, then, that there are some inconsistencies among them--for example, use of data for different years, or reporting of different summary statistics. To iron out all of these differences would be a costly job for small benefits, and so we have not tried to do it. We have, though, made some changes. These are most extensive in Appendices A and E, each of which is based on two interim reports.

Appendix A

A MODEL OF THE DETERMINATION OF THE NUMBER OF VIABLE UHF TELEVISION STATIONS

A.1. INTRODUCTION

Our analysis of the profits reported by television stations to the FCC* convinced us of two things. First, reported profits are very difficult to predict with any precision. Equally situated stations--for example, independent UHF stations all located in the same market--which, objectively, ought to be equally profitable, report widely different profits. Second, reported profits are only very tenuously related to station viability. Many stations report large losses year after year, yet still remain in business. We can't predict profits very well, and even if we could, they wouldn't help us very much to predict numbers of viable stations.

Consequently, we turned our attention to the construction of a model that predicts directly the number of viable stations in each television market. That model is the subject of this appendix. In Section A.2, we take a close look at the data that we are trying to explain--the number of UHF stations in each market. In Section A.3, we describe the model and estimate it. In Section A.4, we attempt to separate out the effects of the UHF handicap, using a four-year data base and a constrained version of the viable stations model.

*See especially Appendix E.

A.2. DATA DESCRIPTION

In this section, we *describe* relationships between the number of commercial UHF stations in a market (NUHF), the number of commercial VHF stations (NVHF), and the size of the market for the year 1974. This is not yet meant to be a model of the determination of the number of viable UHF stations, for clearly there are other factors that can affect that number (for example, the level of UHF set penetration). It is simply meant to point out certain regularities in the data. We use these observed regularities when we specify the model in Section A.3.

Our unit of observation is an American Research Bureau (ARB) television market area of dominant influence (ADI). An ADI is a set of counties, within which a given market's television stations attract a plurality of all viewers. The set of all ADIs is an exhaustive and mutually exclusive partitioning of U.S. counties. We confine our attention to ADIs within the 48 contiguous states, and we exclude six "border" markets,* whose stations attract a substantial share of their audience from Canada or Mexico.

We are interested in the number of UHF stations in each ADI. The starting point for counting numbers of stations is the market-by-market list in *Television Factbook* services volume.** But a number of adjustments are necessary or desirable, as summarized in Table A.1. The first three

*Buffalo, NY (market 24); San Diego, CA (51); Burlington, VT (117); Bellingham, WA (167); Watertown, NY (178); Pembina, ND (215). San Diego was excluded in part because one of its network affiliates was licensed in Mexico. All the other excluded cities are relatively small compared to their neighboring Canadian cities: Detroit, for example, was *not excluded* because it is much bigger than Windsor, Ontario.

**Number of stations for 1974, for example, come from the list on pp. 43-46 of the 1974-75 edition.

Table A.1

ADJUSTMENTS TO COUNT OF UHF STATIONS, 1974

Item	NUHF
In *Factbook* list	169
Not on the air	- 1
In border markets	- 3
In non-ADI markets omitted from *Factbook* list	+12
Satellites in same market as parents	- 8
In our broad count	169
Outlying stations in non-ADI markets	-16
(Other) duplicate affiliates	-10
In our narrow count	143

listed adjustments are straightforward. We omit one station that is included in the *Factbook* list even though it was not on the air, drop three stations in border markets which we exclude from our analysis, and add 12 stations in markets that are not included in the list. These 12 stations are all in markets that do not have ADIs. That is, they do not attract a plurality of viewing even in their home counties. They are physically located in the ADI of a nearby larger market. Examples are the Akron and Canton stations in the Cleveland ADI. We count them in the ADI in which they are physically located.

In the fourth adjustment, we subtract eight satellite stations located in the same market as their parents. The rationale is that these are not separate stations in any real sense; they add little or nothing to programming choice, and not much to the parent stations' costs. Functionally, they are just the equivalent of more powerful transmitters for the parent stations.

The net effect of the first four adjustments is to leave us with 169 UHF stations in what we call our broad count. Other adjustments, which reduce the number of UHF stations to ~~143 in our~~ narrow count, can be argued both ways. We might want to exclude outlying stations (such as the Akron and Canton stations) because they are not really a factor in the main market. These stations, for example, provide very little competition for Cleveland stations, and thus have little effect on the number of stations metropolitan Cleveland can support. Also, we might want to exclude duplicate network affiliates, for much the same reason that we excluded satellites. To the extent that these stations' schedules are dominated by network programming, a duplicate affiliate does not increase the competition facing the other stations in the market. On the other hand, both outlying stations and duplicate affiliates are some additional competition, and it would be desirable to work with the most inclusive reasonable data base. Because there is no compelling reason to choose either the broad or the narrow count of stations, we initially use both in one analysis in Section A.3.

Similar adjustments are made to the counts of VHF stations in the *Factbook* list. Table A.2 shows the station counts for each market used in the analysis. The first two columns show VHF and UHF allocations to communities located within the market's ADI. The next two columns show the number of operating television stations within each ADI in 1974.* Our broad count and narrow count, excluding some stations for the reasons discussed above, are also shown.

Table A.3 presents the rest of the 1974 data that we use to estimate our model in the next section.** Table A.4 gives data summary statistics.

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*The total number of operating stations included on our list is smaller than the total stations on the air as reported by *Television Factbook*. The major reason is that we have excluded stations in border markets and in markets outside the 48 contiguous states which presumably are included in the *Factbook* totals. A detailed reconciliation is not possible, since we do not have a list of stations included in the *Factbook* totals.

**There is one minor difference between the data shown in Table A.3 and those used in our estimates: For the estimates, cable penetration was inadvertently set equal to zero for three markets (Jackson, TN (market 175); Elmira, NY (182); and Palm Springs, CA (212). Also, there is a possible problem apparent in Table A.3 that *should*, perhaps, have changed the data used in our estimates. SALES seems unreasonably high for El Centro, CA (207) and Laredo, TX (217), so maybe these markets should be omitted from the data base. These problems were discovered after all our estimates and projections had been made. We reestimated our preferred equation with correct cable penetration in Jackson, Elmira and Palm Springs and omitting El Centro and Laredo, with results shown in Table A.9 below. In our judgment, the changes are too small to justify rerunning all of the estimates and projections.

Table A.2

ALLOCATIONS AND STATION COUNTS BY MARKET AREA OF DOMINANT INFLUENCE

MARKET			ALLOCATIONS VHF	ALLOCATIONS UHF	ON AIR 1974 VHF	ON AIR 1974 UHF	BROAD COUNT VHF	BROAD COUNT UHF	NARROW COUNT VHF	NARROW COUNT UHF
1	NY	NY	6	9	6	2	6	2	6	2
2	LA	CA	7	10	7	6	7	6	7	6
3	CHCAGO	IL	4	9	4	3	4	3	4	3
4	PHIL	PA	3	11	3	4	3	4	3	3
5	DTROIT	MI	3	6	4[a]	2	4	2	4	2
6	BOSTON	MA	4	9	4	3	4	3	3	2
7	SF	CA	5	10	5	3	5	3	4	3
8	CLVLND	OH	3	7	3	4	3	4	3	2
9	WASH	DC	4	7	4	2	4	2	4	1
10	PITT	PA	3	3	3	0	3	0	3	0
11	STLOUS	MO	4	2	4	1	4	1	4	1
12	DALLAS	TX	4	6	4	1	4	1	4	1
13	MINN	MN	4	4	4	0	4	0	4	0
14	BALT	MD	3	3	3	1	3	1	3	1
15	HOUSTN	TX	3	5	3	2	3	2	3	2
16	INDPLS	IN	4	4	4	2	4	2	4	1
17	CINCI	OH	3	2	3	1	3	1	3	1
18	ATLANT	GA	3	4	3	2	3	2	3	2
19	HARTFD	CN	2	5	2	3	2	3	2	2
20	SEATLE	WA	5	3	5	0	5	0	5	0
21	MIAMI	FL	4	7	4	1	4	1	4	1
22	KANCTY	MO	3	3	3	1	3	1	3	1
23	MILWAU	WI	3	4	3	1	3	1	3	1
25	SACRA	CA	3	5	3	2	3	2	3	1
26	MEMPH	TN	3	2	3	0	3	0	3	0
27	COLUMB	OH	3	4	3	0	3	0	3	0
28	TAMPA	FL	3	6	3	1	3	1	3	1
29	PORTLN	OR	6	3	6	0	6	0	4	0
30	NASHVL	TN	4	5	4	0	4	0	3	0
31	NEWORL	LA	4	3	4	1	4	1	3	1
32	DENVER	CO	5	4	4	0	4	0	4	0
33	PROVID	RI	3	3	3	0	3	0	3	0
34	ALBANY	NY	3	5	3	1	3	0	3	0
35	SYRACU	NY	3	2	3	0	3	0	3	0
36	CHAPLS	WV	3	9	3	1	3	1	3	0
37	GRNDRP	MI	3	3	3	1	3	1	3	0
38	LOUSVL	KY	2	3	2	2	2	2	2	2
39	OKCITY	OK	4	5	4	0	4	0	3	0
40	BIRM	AL	2	8	2	3	2	3	2	1
41	DAYTON	OH	2	3	2	1	2	1	2	1
42	CHARLT	NC	2	7	2	3	2	3	2	2
43	PHOENX	AZ	8	3	5	1	5	1	4	1
44	NORFLK	VA	3	3	3	1	3	1	3	1
45	SANANT	TX	5	2	3	1	3	1	3	1
46	GRNVLE	SC	3	7	3	3	3	3	3	1
47	GRNBRO	NC	3	4	3	0	3	0	3	0
48	SALTLK	UT	13	5	3	0	3	0	3	0
49	WLKSBR	PA	0	6	0	3	0	3	0	3
50	LITLRK	AR	3	4	3	0	3	0	3	0

[a]Includes one VHF operating in Windsor, Ont.

Table A.2 (contd.)

MARKET	ALLOCATIONS VHF	ALLOCATIONS UHF	ON AIR 1974 VHF	ON AIR 1974 UHF	BROAD COUNT VHF	BROAD COUNT UHF	NARROW COUNT VHF	NARROW COUNT UHF
52 TOLEDO OH	2	5	2	1	2	1	2	1
53 OMAHA NE	3	2	3	0	3	0	3	0
54 TULSA OK	3	6	3	1	3	1	3	0
55 ORLAN FL	3	6	3	0	3	0	3	0
56 ROCHES NY	3	1	3	0	3	0	3	0
57 HARISB PA	1	6	1	4	1	4	1	2
58 SHRVPT LA	3	5	3	0	3	0	3	0
59 MOBILE AL	3	4	3	0	3	0	3	0
60 DAVENP IA	3	3	3	0	3	0	3	0
61 FLINT MI	3	4	2	1	2	1	2	1
62 GRNBAY WI	4	5	4	0	3	0	3	0
63 RICHMN VA	3	4	3	0	3	0	3	0
64 SPRNGF IL	1	9	1	3	1	2	1	2
65 CDRRAP IA	3	5	3	1	3	1	3	0
66 DMOINE IA	3	5	3	1	3	1	3	0
67 WICHTA KS	11	6	10	0	3	0	3	0
68 JKSNVL FL	2	4	2	2	2	2	2	1
69 PADUCA KY	3	3	3	2	3	1	3	1
70 ROANOK VA	3	4	3	1	3	1	3	0
71 KNOXVL TN	2	3	2	1	2	1	2	1
72 FRESNO CA	0	7	0	5	0	5	0	5
73 RALEIG NC	2	4	2	1	2	1	2	1
74 JOHNST PA	2	4	2	1	2	1	2	1
75 PORTLN ME	3	4	3	1	3	1	3	0
76 SPOKAN WA	3	3	3	0	3	0	3	0
77 JACKSN MS	2	5	2	1	2	1	2	1
78 CHATTN TN	3	1	3	1	3	1	3	1
79 YGSTN OH	0	3	0	3	0	3	0	3
80 SBEND IN	0	4	0	3	0	3	0	3
81 ALBUQ NM	9	3	3	0	3	0	3	0
82 FTWAYN IN	0	3	0	3	0	3	0	3
83 PEORIA IL	0	5	0	3	0	3	0	3
84 GRNVLE NC	3	5	3	0	3	0	3	0
85 SIOUXF SD	8	2	6	0	3	0	3	0
86 EVANSV IN	1	5	1	2	1	2	1	2
87 BATONR LA	2	1	2	1	2	1	2	1
88 BEAUMT TX	3	1	3	0	3	0	3	0
89 DULUTH MN	5	5	4	0	3	0	3	0
90 WHLING WV	2	0	2	0	2	0	2	0
91 LINCLN NE	7	3	7	0	3	0	3	0
92 LANSNG MI	2	3	2	0	2	0	2	0
93 MADISN WI	1	3	1	2	1	2	1	2
94 COLUMB GA	2	2	2	1	2	1	2	1
95 AMARIL TX	4	1	4	0	3	0	3	0
96 HUNTSV AL	0	7	0	4	0	4	0	3
97 ROCKFD IL	1	4	1	2	1	2	1	2
98 FARGO ND	6	3	4	0	3	0	3	0
99 MONROE LA	2	3	2	0	2	0	2	0
100 COLUMB SC	1	3	1	2	1	2	1	2

Table A.2 (contd.)

MARKET	ALLOCATIONS VHF	ALLOCATIONS UHF	ON AIR 1974 VHF	ON AIR 1974 UHF	BROAD COUNT VHF	BROAD COUNT UHF	NARROW COUNT VHF	NARROW COUNT UHF
101 SALNAS CA	2	2	2	1	1	1	1	1
103 WPALMB FL	2	4	2	1	2	1	2	0
104 SPRNGF MA	0	3	0	3	0	2	0	2
105 BINGHM NY	1	2	1	2	1	2	1	2
106 WILMNG NC	2	1	2	0	2	0	2	0
108 AUGUST GA	2	2	2	0	2	0	2	0
109 BRSTOL VA	2	3	2	2	2	2	2	1
110 LAFAYT LA	2	3	2	1	2	1	2	1
111 TRREHT IN	2	1	2	1	2	1	2	1
112 MONTGM AL	2	4	1	2	1	2	1	2
114 LUBBCK TX	2	2	2	1	2	1	2	1
115 ALBANY GA	1	2	1	0	1	0	1	0
116 SIOUXC IA	2	1	2	1	2	1	2	1
118 CHARLS SC	3	0	3	0	3	0	3	0
119 ERIE PA	1	3	1	2	1	2	1	2
120 TALLAH FL	1	3	1	0	1	0	1	0
121 WACO TX	3	2	3	0	2	0	2	0
122 JOPLIN MO	2	1	2	1	2	1	2	1
123 SPRNGF MO	2	2	2	1	2	1	2	1
124 LXNGTN KY	0	4	0	3	0	3	0	3
125 FLORNC SC	1	2	1	0	1	0	1	0
126 AUSTIN TX	1	3	1	2	1	2	1	2
127 TOPEKA KS	1	3	1	1	1	1	1	1
128 ROCHES MN	3	1	3	0	3	0	3	0
129 DOTHAN AL	1	2	1	1	1	1	1	1
130 STJO MO	1	2	1	0	1	0	1	0
131 WICHFL TX	3	2	3	0	3	0	3	0
132 TRAVRS MI	5	1	4	1	2	1	2	1
133 LACROS WI	2	4	2	1	2	1	2	1
134 UTICA NY	1	2	1	1	1	1	1	1
135 ALEXND LA	1	2	1	0	1	0	1	0
136 TUCSON AZ	5	2	4	0	4	0	4	0
137 YAKIMA WA	1	7	1	6	0	3	0	3
138 CORPUS TX	3	4	3	1	3	0	3	0
139 BAKERS CA	0	3	0	3	0	3	0	3
140 SNBARB CA	2	0	2	0	2	0	2	0
141 MACON GA	1	2	1	1	1	1	1	1
142 CHICO CA	3	1	2	0	2	0	2	0
143 QUINCY IL	2	1	2	0	2	0	2	0
144 ELPASO TX	6	3	4	0	3	0	3	0
145 COLSPR CO	4	3	3	0	3	0	3	0
146 EUGENE OR	4	1	4	0	2	0	2	0
147 BLUFLD WV	2	1	2	0	2	0	2	0
148 COLUMB MO	3	2	3	1	2	1	2	1
149 BILOXI MS	1	1	1	0	1	0	1	0
150 SAVANA GA	2	1	2	1	2	1	2	1

Table A.2 (contd.)

MARKET		ALLOCATIONS VHF	ALLOCATIONS UHF	ON AIR 1974 VHF	ON AIR 1974 UHF	BROAD COUNT VHF	BROAD COUNT UHF	NARROW COUNT VHF	NARROW COUNT UHF
151 TYLER	TX	2	1	2	0	1	0	1	0
152 ALEXND	MN	2	1	2	0	1	0	1	0
153 BANGOR	ME	3	0	3	0	3	0	3	0
154 WAUSAU	WI	3	1	3	0	3	0	3	0
155 GRNWD	MS	1	0	1	0	1	0	1	0
156 PANAMA	FL	2	1	2	0	2	0	2	0
157 MINOT	ND	8	4	7	0	3	0	2	0
158 ODESSA	TX	9	3	4	1	3	1	3	1
159 MERID	MS	1	2	1	1	1	1	1	1
160 BOISE	ID	6	1	3	0	2	0	2	0
161 LVEGAS	NV	4	1	4	0	4	0	4	0
162 ABILEN	TX	3	2	2	0	2	0	2	0
163 OTUMWA	IA	1	0	1	0	1	0	1	0
164 FTSMTH	AR	1	2	1	1	1	1	1	1
165 COLUMB	MS	1	2	1	0	1	0	1	0
166 CLRKBG	WV	2	2	2	0	2	0	2	0
168 MNKATO	MN	1	1	1	0	1	0	1	0
169 CHEYEN	WY	3	2	3	0	1	0	1	0
170 MCALLN	TX	2	3	2	0	2	0	2	0
171 LAUREL	MS	1	2	1	0	1	0	1	0
172 MEDFRD	OR	3	0	2	0	2	0	2	0
173 RENO	NV	7	2	4	0	3	0	3	0
174 HARRSN	VA	1	0	1	0	1	0	1	0
175 JACKSN	TN	1	1	1	0	1	0	1	0
176 LKCHAR	LA	1	1	1	0	1	0	1	0
177 LIMA	OH	0	2	0	1	0	1	0	1
179 RPDCTY	SD	5	2	5	0	2	0	2	0
180 ARDMOR	OK	2	1	2	0	2	0	2	0
181 MARQTE	MI	3	1	1	0	1	0	1	0
182 ELMIRA	NY	0	3	0	2	0	2	0	2
183 BUTTE	MT	3	2	2	0	2	0	2	0
184 JONESB	AR	1	0	1	0	1	0	1	0
185 MSOULA	MT	3	1	3	0	2	0	2	0
186 IDFALS	ID	3	3	2	0	2	0	2	0
187 BLLNGS	MT	6	2	2	0	2	0	2	0
188 FTMYER	FL	1	2	1	1	1	1	1	1
190 ROSWEL	NM	3	4	3	0	3	0	3	0
191 GREATF	MT	4	2	2	0	2	0	2	0
192 SALISB	MD	0	1	0	1	0	1	0	1
193 TUPELO	MS	1	0	1	0	1	0	1	0
195 CASPER	WY	3	2	2	0	2	0	2	0
197 EUREKA	CA	2	0	2	0	2	0	2	0
199 ZANESV	OH	0	1	0	1	0	1	0	1
200 GRANDJ	CO	4	0	1	0	1	0	1	0

Table A.2 (contd.)

MARKET	ALLOCATIONS VHF	ALLOCATIONS UHF	ON AIR 1974 VHF	ON AIR 1974 UHF	BROAD COUNT VHF	BROAD COUNT UHF	NARROW COUNT VHF	NARROW COUNT UHF
203 TWNFLS ID	1	0	1	0	1	0	1	0
206 SANANG TX	3	0	2	0	2	0	2	0
207 ELCFNT CA	5	0	2	0	2	0	2	0
211 PRESQU ME	1	0	1	0	1	0	1	0
212 PLMSPR CA	0	2	0	2	0	2	0	2
214 NPLAT NE	1	0	1	0	1	0	1	0
217 LAREDO TX	3	1	2	0	2	0	2	0
219 HELENA MT	2	0	1	0	1	0	1	0
222 GLNDIV MT	2	0	2	0	2	0	1	0
Total--Top 100 markets	319	434	291	124	273	121	265	97
Total--197 markets	543	602	474	177	432	169	422	143

NOTE: The top 100 market rankings are assigned according to the list in the FCC cable television regulations. The rest of the rankings are assigned in order of 1972 ARB prime-time television households. Border markets, markets outside the contiguous states, markets with no area of dominant influence, and markets that have been absorbed by adjacent markets since 1972 are not included in this listing, but the original rank numbers have been preserved.

Table A.3

OTHER VARIABLES IN REGRESSION ANALYSIS
1974 DATA

	MARKET		UHFPEN	CABLE	TVH	SALES	OVERLAP	ETVUHF
1	NY	NY	.79	.04	6167.	6.163	0.960	0.
2	LA	CA	.89	.09	3481.	6.556	0.979	1.
3	CHCAGO	IL	.93	.02	2744.	6.813	0.939	0.
4	PHIL	PA	.94	.14	2230.	6.359	1.003	1.
5	DTROIT	MI	.93	.01	1513.	6.533	1.066	1.
6	BOSTON	MA	.89	.06	1646.	6.974	1.134	0.
7	SF	CA	.87	.20	1593.	6.572	0.990	0.
8	CLVLND	OH	.93	.11	1280.	6.043	1.029	1.
9	WASH	DC	.92	.07	1249.	6.924	1.196	1.
10	PITT	PA	.82	.22	1072.	5.640	1.141	0.
11	STLOUS	MO	.86	.01	918.	6.299	0.985	0.
12	DALLAS	TX	.89	.06	1029.	6.629	1.029	0.
13	MINN	MN	.75	.03	860.	6.629	1.026	0.
14	BALT	MD	.89	.01	724.	6.227	1.398	1.
15	HOUSTN	TX	.94	.03	829.	7.017	0.958	0.
16	INDPLS	IN	.85	.12	726.	6.715	1.051	1.
17	CINCI	OH	.90	.02	616.	6.571	1.265	1.
18	ATLANT	GA	.89	.07	783.	7.408	1.081	1.
19	HARTFD	CN	.92	.01	628.	6.541	1.553	1.
20	SEATLE	WA	.78	.18	759.	5.996	0.990	0.
21	MIAMI	FL	.88	.02	798.	7.481	1.094	0.
22	KANCTY	MO	.88	.07	619.	6.270	1.195	1.
23	MILWAU	WI	.93	.01	607.	6.460	1.057	0.
25	SACRA	CA	.88	.16	594.	6.803	1.211	0.
26	MEMPH	TN	.75	.09	498.	6.133	1.087	0.
27	COLUMB	OH	.88	.07	500.	5.773	1.301	1.
28	TAMPA	FL	.91	.09	746.	7.083	0.996	0.
29	PORTLN	OR	.81	.11	592.	6.257	1.016	0.
30	NASHVL	TN	.74	.06	524.	6.085	1.039	0.
31	NEWORL	LA	.91	.03	461.	6.224	1.128	0.
32	DENVER	CO	.81	.04	573.	7.115	1.050	0.
33	PROVID	RI	.88	.01	570.	5.952	1.369	1.
34	ALBANY	NY	.84	.10	417.	6.735	1.154	1.
35	SYRACU	NY	.88	.22	341.	6.562	1.410	1.
36	CHARLS	WV	.81	.26	423.	5.557	1.041	0.
37	GRNDRP	MI	.82	.08	426.	6.708	1.140	1.
38	LOUSVL	KY	.92	.06	450.	6.122	1.091	1.
39	OKCITY	OK	.79	.09	441.	5.904	1.023	0.
40	BIRM	AL	.89	.12	391.	5.809	1.153	0.
41	DAYTON	OH	.91	.09	422.	6.534	1.441	1.
42	CHARLT	NC	.89	.07	486.	6.259	1.253	1.
43	PHOENX	AZ	.87	.07	505.	6.594	0.784	0.
44	NORFLK	VA	.88	.01	383.	6.113	1.028	1.
45	SANANT	TX	.85	.08	381.	6.510	1.045	0.
46	GRNVLE	SC	.76	.05	440.	5.964	1.263	1.
47	GRNBRO	NC	.78	.06	370.	6.189	1.406	1.
48	SALTLK	UT	.77	.08	374.	6.385	1.126	0.
49	WLKSBR	PA	.97	.41	391.	6.080	1.189	1.
50	LITLRK	AR	.76	.05	343.	5.552	1.008	0.

Table A.3 (contd.)

	MARKET		UHFPEN	CABLE	TVH	SALES	OVERLAP	ETVUHF
52	TOLEDO	OH	.92	.19	363.	7.501	1.580	1.
53	OMAHA	NE	.79	.02	299.	5.587	1.262	1.
54	TULSA	OK	.77	.09	349.	5.540	1.093	0.
55	ORLAN	FL	.85	.19	397.	7.966	1.090	1.
56	ROCHES	NY	.88	.02	306.	6.205	1.141	1.
57	HARISB	PA	.95	.34	393.	6.915	1.325	1.
58	SHRVPT	LA	.75	.06	334.	5.844	1.056	0.
59	MOBILE	AL	.74	.11	298.	6.008	1.113	1.
60	DAVENP	IA	.85	.08	284.	6.245	1.090	0.
61	FLINT	MI	.93	.12	356.	7.291	1.445	1.
62	GRNBAY	WI	.82	.07	285.	6.411	1.222	1.
63	RICHMN	VA	.81	.08	346.	6.881	1.069	1.
64	SPRNGF	IL	.97	.18	264.	7.390	1.067	0.
65	CDRRAP	IA	.81	.09	276.	6.323	1.060	0.
66	DMOINE	IA	.77	.02	305.	5.971	0.964	0.
67	WICHTA	KS	.75	.13	357.	6.504	0.968	0.
68	JKSNVL	FL	.91	.15	291.	7.622	[illegible]	0.
69	PADUCA	KY	.74	.11	269.	5.899	1.034	0.
70	ROANOK	VA	.78	.10	288.	5.710	1.194	1.
71	KNOXVL	TN	.83	.11	319.	5.733	1.042	0.
72	FRESNO	CA	.99	.06	232.	8.269	0.967	0.
73	RALEIG	NC	.84	.09	312.	6.210	1.537	0.
74	JOHNST	PA	.81	.50	270.	5.848	2.244	0.
75	PORTLN	ME	.80	.15	251.	6.949	1.242	0.
76	SPOKAN	WA	.75	.22	238.	6.348	1.184	0.
77	JACKSN	MS	.83	.09	219.	5.640	1.263	1.
78	CHATTN	TN	.80	.05	246.	5.873	1.087	1.
79	YGSTN	OH	.96	.03	211.	6.314	1.352	1.
80	SBEND	IN	.95	.05	201.	6.445	1.470	1.
81	ALBUQ	NM	.79	.11	217.	6.541	1.050	0.
82	FTWAYN	IN	.96	.03	191.	6.652	1.203	0.
83	PEORIA	IL	.94	.04	194.	7.411	1.152	1.
84	GRNVLE	NC	.73	.04	235.	6.505	1.133	1.
85	SIOUXF	SD	.69	.08	192.	6.407	1.290	0.
86	EVANSV	IN	.95	.07	199.	6.182	1.342	0.
87	BATCNR	LA	.91	.03	165.	6.273	1.609	0.
88	BEAUMT	TX	.79	.14	136.	6.126	1.344	0.
89	DULUTH	MN	.80	.12	151.	5.641	1.018	0.
90	WHLING	WV	.82	.40	168.	5.415	3.024	0.
91	LINCLN	NE	.76	.15	224.	5.847	1.110	0.
92	LANSNG	MI	.87	.11	184.	7.146	2.507	1.
93	MADISN	WI	.98	.03	152.	7.423	1.692	1.
94	COLUMB	GA	.87	.20	148.	5.520	1.806	1.
95	AMARIL	TX	.80	.32	148.	8.064	1.093	0.
96	HUNTSV	AL	.96	.32	173.	6.705	1.150	1.
97	ROCKFD	IL	.98	.15	160.	6.399	1.365	0.
98	FARGO	ND	.69	.12	171.	6.219	0.973	0.
99	MONROE	LA	.67	.16	158.	5.717	1.440	0.
100	COLUMB	SC	.91	.05	167.	7.146	1.693	1.

Table A.3 (contd.)

	MARKET		UHFPEN	CABLE	TVH	SALES	OVERLAP	ETVUHF
101	SALNAS	CA	.87	.53	166.	6.687	2.192	0.
103	WPALMB	FL	.85	.24	199.	7.896	1.543	0.
104	SPRNGF	MA	.96	.10	216.	5.945	1.281	1.
105	BINGHM	NY	.93	.46	146.	6.203	1.608	1.
106	WILMNG	NC	.63	.12	109.	6.887	2.301	1.
108	AUGUST	GA	.75	.08	155.	6.070	1.342	1.
109	BRSTCL	VA	.81	.29	201.	5.045	1.215	0.
110	LAFAYT	LA	.82	.09	141.	6.138	1.580	0.
111	TPREHT	IN	.81	.19	152.	6.603	1.433	0.
112	MONTGM	AL	.84	.09	145.	6.221	1.395	1.
114	LUBUCK	TX	.92	.19	114.	7.416	1.444	0.
115	ALBANY	GA	.70	.18	101.	7.409	2.338	1.
116	SIOUXC	IA	.87	.05	145.	6.612	1.285	0.
118	CHARLS	SC	.77	.01	131.	6.017	1.370	0.
119	ERIE	PA	.95	.13	114.	5.776	1.635	1.
120	TALLAH	FL	.69	.27	101.	6.305	1.625	0.
121	WACO	TX	.79	.29	154.	6.695	1.241	1.
122	JOPLIN	MO	.81	.20	145.	5.101	1.302	0.
123	SPRNGF	MO	.82	.10	199.	5.523	1.079	0.
124	LXNGTN	KY	.91	.15	166.	5.665	1.175	1.
125	FLORNC	SC	.73	.18	74.	6.342	2.412	1.
126	AUSTIN	TX	.94	.20	153.	6.469	1.332	0.
127	TOPEKA	KS	.85	.22	129.	5.618	1.361	0.
128	RCCHES	MN	.77	.14	129.	6.423	1.273	1.
129	DOTHAN	AL	.82	.18	86.	5.658	2.122	0.
130	STJO	MO	.73	.25	50.	5.456	3.277	0.
131	WICHFL	TX	.80	.25	145.	6.184	1.029	1.
132	TRAVRS	MI	.80	.28	123.	7.119	1.409	0.
133	LACROS	WI	.82	.29	131.	6.633	1.286	1.
134	UTICA	NY	.85	.43	95.	5.731	1.432	0.
135	ALEXND	LA	.72	.28	61.	5.265	2.561	0.
136	TUCSON	AZ	.79	.08	170.	6.282	0.996	0.
137	YAKIMA	WA	.96	.32	125.	6.553	1.140	1.
138	CORPUS	TX	.86	.19	131.	6.314	1.145	1.
139	BAKERS	CA	.96	.55	92.	6.747	1.492	0.
140	SNBARB	CA	.78	.69	89.	6.526	1.523	0.
141	MACON	GA	.88	.32	117.	6.468	1.240	1.
142	CHICO	CA	.82	.34	88.	6.669	1.405	0.
143	QUINCY	IL	.78	.22	109.	6.368	1.087	0.
144	ELPASO	TX	.77	.15	152.	7.132	0.957	0.
145	COLSPR	CO	.80	.22	163.	6.051	0.916	0.
146	EUGENE	OR	.79	.42	120.	6.253	1.170	0.
147	BLUFLD	WV	.70	.39	111.	5.257	1.196	0.
148	COLUMB	MO	.80	.19	131.	6.612	1.119	0.
149	BILOXI	MS	.83	.31	44.	6.566	2.857	1.
150	SAVANA	GA	.90	.13	120.	6.921	1.073	0.

Table A.3 (contd.)

	MARKET		UHFPEN	CABLE	TVH	SALES	OVERLAP	ETVUHF
151	TYLER	TX	.78	.40	75.	5.903	1.765	0.
152	ALEXND	MN	.70	.21	80.	6.203	1.568	0.
153	BANGOR	ME	.73	.10	98.	6.493	1.267	0.
154	WAUSAU	WI	.74	.10	119.	6.750	1.161	0.
155	GRNWD	MS	.72	.34	38.	5.526	2.453	1.
156	PANAMA	FL	.76	.30	37.	6.690	3.453	0.
157	MINOT	ND	.67	.05	113.	6.001	1.038	0.
158	ODESSA	TX	.80	.42	101.	7.294	0.936	0.
159	MERID	MS	.78	.23	66.	4.704	1.517	1.
160	BOISE	ID	.76	.02	101.	6.243	1.141	0.
161	LVEGAS	NV	.90	.0	104.	8.888	1.000	0.
162	ABILEN	TX	.77	.41	98.	6.646	1.204	0.
163	OTUMWA	IA	.68	.27	30.	4.522	3.230	0.
164	FTSMTH	AR	.84	.25	77.	4.581	1.947	0.
165	COLUMB	MS	.66	.25	66.	5.096	1.751	0.
166	CLRKBG	WV	.75	.48	80.	5.917	0.825	0.
168	MNKATO	MN	.79	.30	43.	7.677	1.998	0.
169	CHEYEN	WY	.82	.36	54.	7.270	1.427	0.
170	MCALLN	TX	.70	.21	95.	7.725	0.971	0.
171	LAUREL	MS	.66	.18	65.	5.670	1.728	0.
172	MEDFRD	OR	.76	.28	77.	6.896	1.789	0.
173	RENO	NV	.85	.35	85.	8.595	0.958	0.
174	HARRSN	VA	.74	.27	30.	5.669	2.923	1.
175	JACKSN	TN	.58	.29	38.	6.095	5.314	0.
176	LKCHAR	LA	.77	.12	48.	5.385	1.519	0.
177	LIMA	OH	.96	.53	35.	7.713	2.091	1.
179	RPDCTY	SD	.78	.27	60.	6.145	1.400	0.
180	ARDMOR	OK	.75	.24	51.	5.023	1.685	0.
181	MARQTE	MI	.75	.49	47.	5.161	1.557	0.
182	ELMIRA	NY	.98	.66	74.	5.910	1.910	0.
183	BUTTE	MT	.68	.34	36.	5.944	1.750	0.
184	JONESB	AR	.68	.20	39.	4.803	2.423	0.
185	MSOULA	MT	.78	.37	80.	6.441	1.700	0.
186	IDFALS	ID	.77	.28	62.	6.869	1.083	0.
187	BLLNGS	MT	.78	.28	62.	6.464	0.978	0.
188	FTMYER	FL	.97	.47	62.	9.199	1.490	0.
190	ROSWEL	NM	.74	.45	36.	7.617	1.578	0.
191	GREATF	MT	.80	.35	52.	7.117	1.142	0.
192	SALISB	MD	.93	.56	61.	6.833	0.992	1.
193	TUPELO	MS	.76	.36	35.	7.143	2.382	0.
195	CASPER	WY	.68	.43	42.	7.216	1.335	0.
197	EUREKA	CA	.76	.22	42.	6.451	1.046	0.
199	ZANESV	OH	.95	.51	26.	7.035	1.636	1.
200	GRANDJ	CO	.73	.34	33.	5.587	1.174	0.

Table A.3 (contd.)

MARKET	UHFPEN	CABLE	TVH	SALES	OVERLAP	ETVUHF
203 TWNFLS ID	.79	.34	38.	6.783	0.988	0.
206 SANANG TX	.74	.51	25.	7.465	1.144	0.
207 ELCENT CA	.75	.51	22.	16.271	1.195	0.
211 PRESCU ME	.74	.37	27.	6.359	0.923	0.
212 PLMSPR CA	.90	.67	35.	6.337	0.610	0.
214 NPLAT NE	.82	.22	15.	5.993	1.638	0.
217 LAREDO TX	.66	.61	21.	10.905	1.056	0.
219 HELENA MT	.85	.37	13.	7.245	0.873	0.
222 GLNDIV MT	.74	.35	8.	6.317	1.600	0.

Table A.4

REGRESSION VARIABLES
1974 DATA SUMMARY

Item	Top-100 Markets		All Markets	
	Mean	Std. Dev.	Mean	Std. Dev.
NVHF, broad count	2.79	1.27	2.19	1.24
NUHF, broad count	1.23	1.32	.86	1.14
NVHF, narrow count	2.70	1.18	2.14	1.18
NUHF, narrow count	.99	1.17	.73	1.02
UHFPEN	.852	.075	.823	.085
CABLE	.106	.091	.198	.155
TVH	582.	770.	334.	597.
SALES	6.43	.59	6.48	1.06
OVERLAP	1.22	.31	1.38	.55
ETVUHF	.449	.497	.340	.474

A.3. ALTERNATIVE MODEL SPECIFICATION AND ESTIMATION

A DESCRIPTIVE MODEL

One expects the number of UHF stations (NUHF) to be negatively related to the number of VHF stations (NVHF) and positively related to market size, other things being equal. As our measure of market size, we use the number of homes with at least one television set located within the ADI. Television homes (TVH) is interpolated from ARB estimates as described in Appendix C and is measured in 1000s of households. Ancillary to our work on profits (Appendix E), we estimated an equation of the form

$$NUHF = \alpha_0 + \alpha_1 NVHF + \alpha_2 TVH. \qquad (A.1)$$

Besen and Hanley (1975) have estimated a similar equation.* We shall argue here that equation (A.1) is unnecessarily and unrealistically restrictive, and that a less restrictive relationship does a significantly better job of describing the data.**

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*Stanley M. Besen and Paul J. Hanley, "Market Size, VHF Allocations, and the Viability of Television Stations," *Journal of Industrial Economics*, September 1975. The Besen-Hanley equation differs from (A.1) in four respects: (1) their independent variable is the number of stations on the air and not the number of UHF stations; (2) their observations are only for markets with at least three stations on the air; (3) their "preferred" equation is logarithmic; and (4) their "preferred" equation is estimated using the limited dependent variable technique.

**Equation (A.1) and all of the more complex specifications to follow treat NUHF as though it were a continuous variable. In fact, of course, it can assume only integer values. Thus the error variance in our equations is necessarily heteroscedastic, and our least squares estimates are inefficient. We attempted to take account of the integer restrictions on NUHF by using discriminant analysis and maximum likelihood estimation of a polycotomous logistic function to sort markets into NUHF categories, but were unable to obtain satisfactory results. Another way to take account of the integer restriction would be to fit a step function to NUHF, as suggested by the comments of one knowledgeable FCC staff member. Both approaches probably warrent further investigation, were time and resources available.

To examine the restrictions imposed by (A.1) and their effect on its ability to describe the data, we first reestimate (A.1) using all 197 markets in our sample. (For the remainder of this section, we present results using our narrow count of stations. Results for the broad count are substantially the same, but somewhat less precise.) The resulting equation is shown on the top line of Table A.5, and the estimated relationship is plotted in Figure A.1. The relationship is statistically highly significant, with NUHF positively related to TVH and negatively to NVHF as expected. However, it accounts for only 40 percent of the variance of NUHF. Figure A.1 shows the restrictiveness of equation (A.1). The relationship consists of a set of equally spaced parallel lines relating NUHF to TVH for different values of NVHF. Equation (A.1) constrains the slopes of the lines to be the same; that is, it constrains number of TVH associated with an additional UHF station to be the same no matter how many VHF stations there are in the market. And it constrains the intercepts to decrease an equal amount with each added VHF station; that is, each VHF station is associated with an equal decrease in the number of UHF stations regardless of market size.

Removing these restrictions, we estimate separate linear relationships between NUHF and TVH for each NVHF value: 0, 1, 2, 3, 4, and 5 or more. The regressions results are shown in Table A.5 and plotted in Figs. A.2 through A.7, together with the data points.

The data plots themselves are quite encouraging. They exhibit a substantial degree of regularity, at least in comparison with our analysis of profit data described in the subsequent appendices. This is particularly true

Table A.5

REGRESSION RELATIONSHIPS FOR NUMBER OF UHF STATIONS, 1974

Sample	Observations	Constant	TVH	NVHF	R^2	SSE[a]
All	197	1.41 (11.5)	.0013 (11.0)	-.516 (-8.8)	.40	122.9
NVHF0	16	1.52 (3.9)	.0069 (3.1)		.41	9.38
NVHF1	43	-.18 (-1.4)	.0092 (8.2)		.62	11.30
NVHF2	56	-.08 (-1.0)	.0036 (9.2)		.61	7.82
NVHF3	65	-.22 (-2.7)	.0014 (9.6)		.59	11.84
NVHF4	14	-.27 (-1.1)	.0013 (6.0)		.75	3.49
NVHF5+	3	1.37 (0.3)	.0004 (0.4)		.11	16.6
All separate equations	197				.70	60.43

[a]Sum of squared errors.

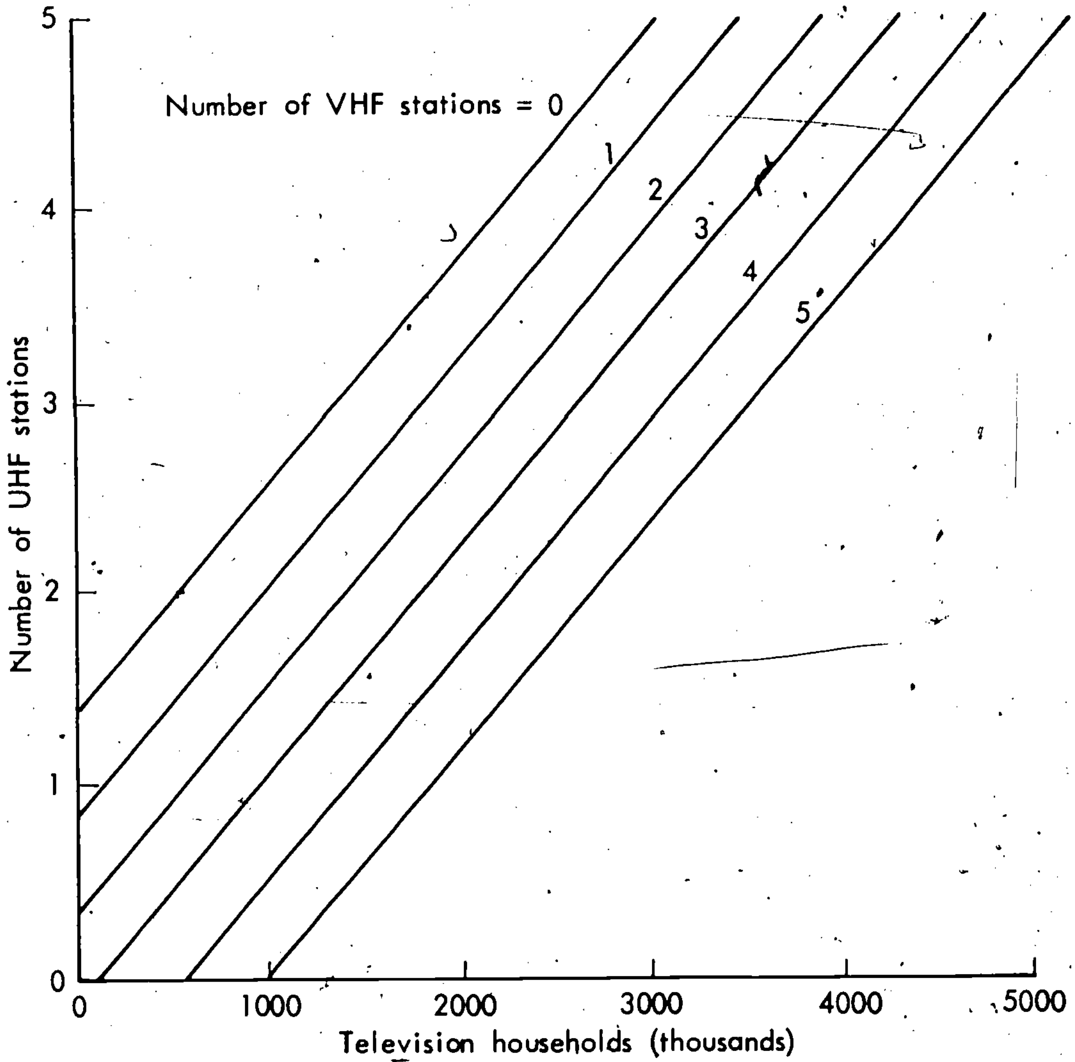

Fig. A.1—Regression relationships using Equation (A.1)

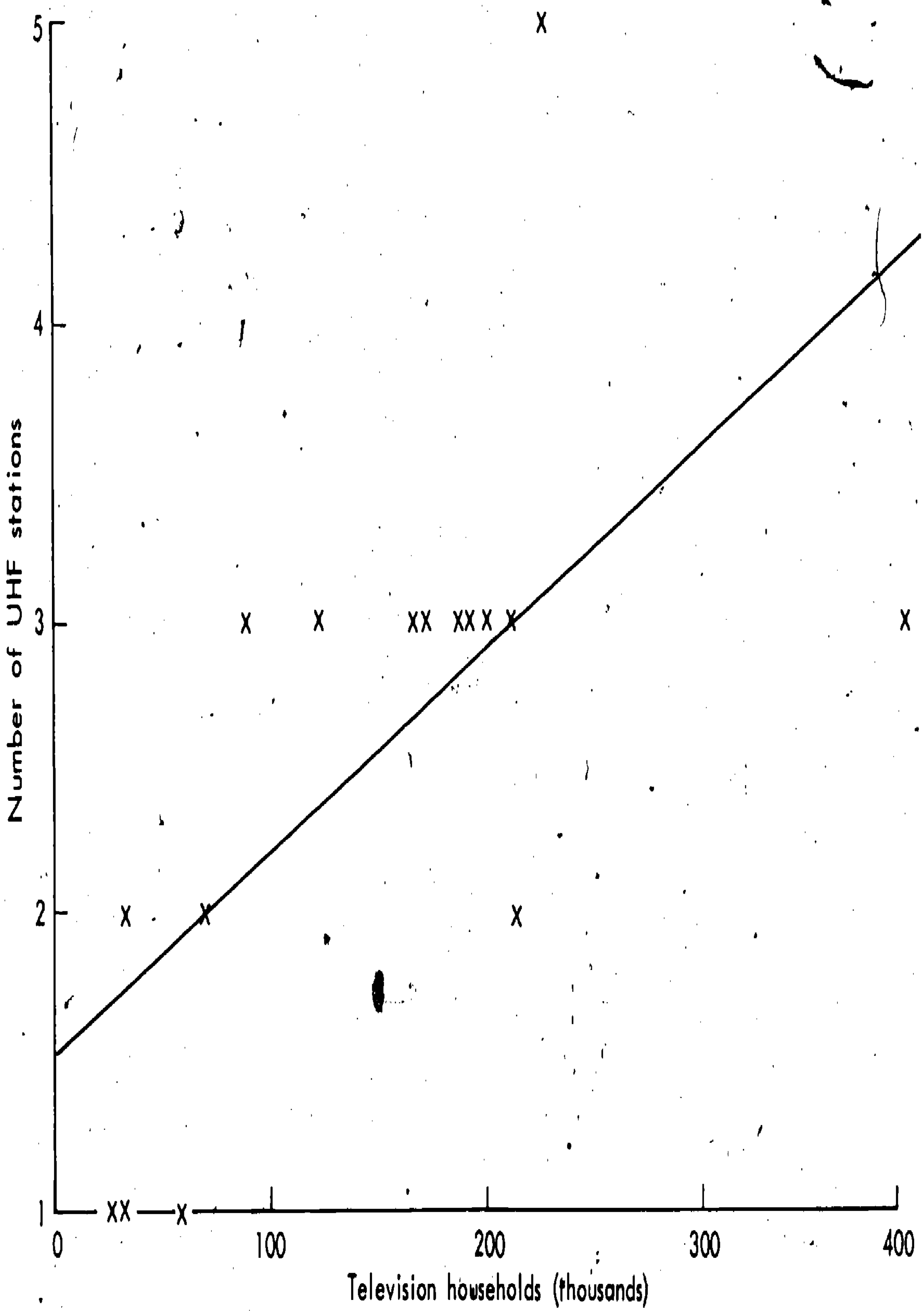

Fig. A.2—Relationship of UHF stations to television households for markets with no VHF station

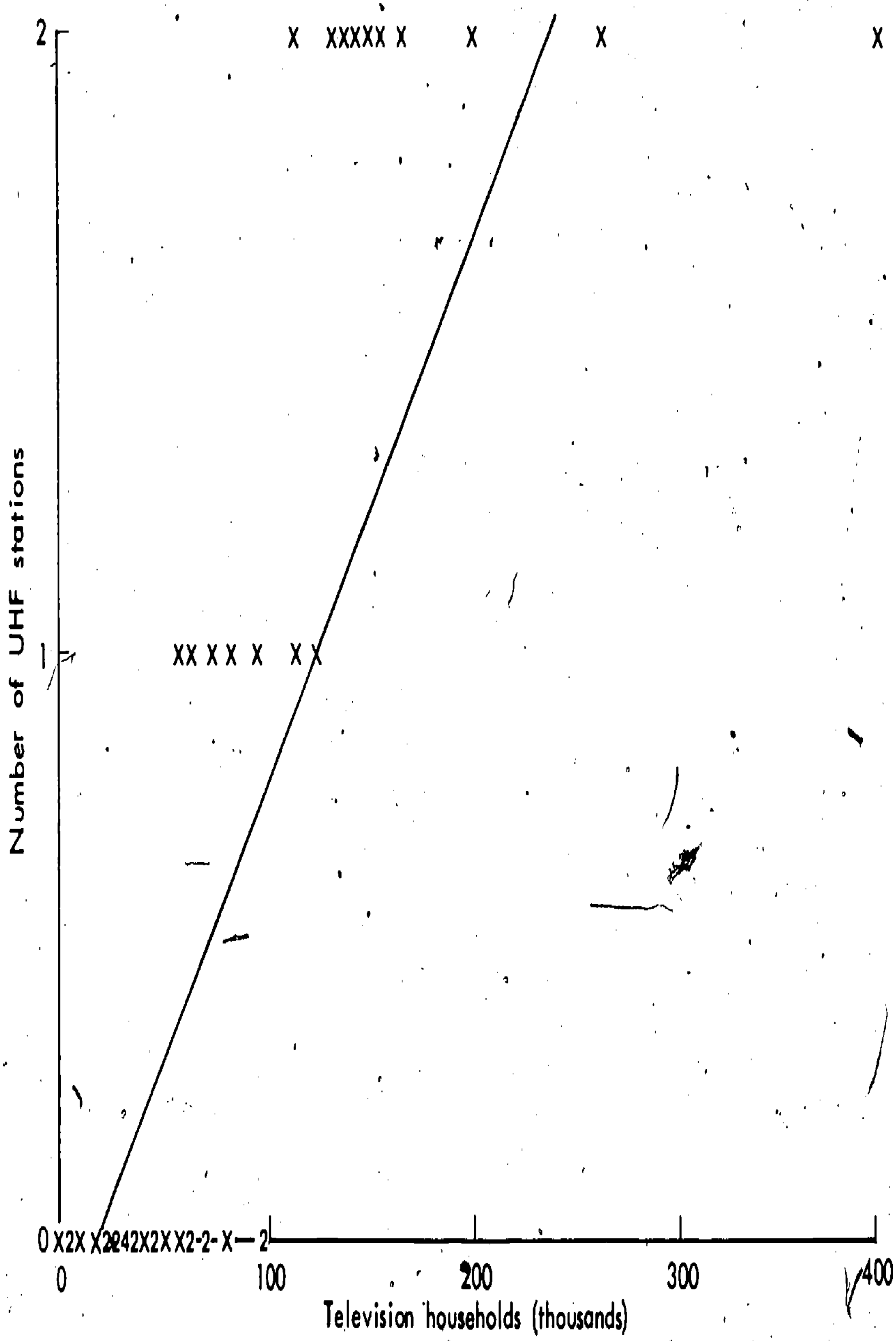

Fig. A.3—Relationship of UHF stations to television households for markets with one VHF station (single X indicates one observation; larger numbers are indicated numerically).

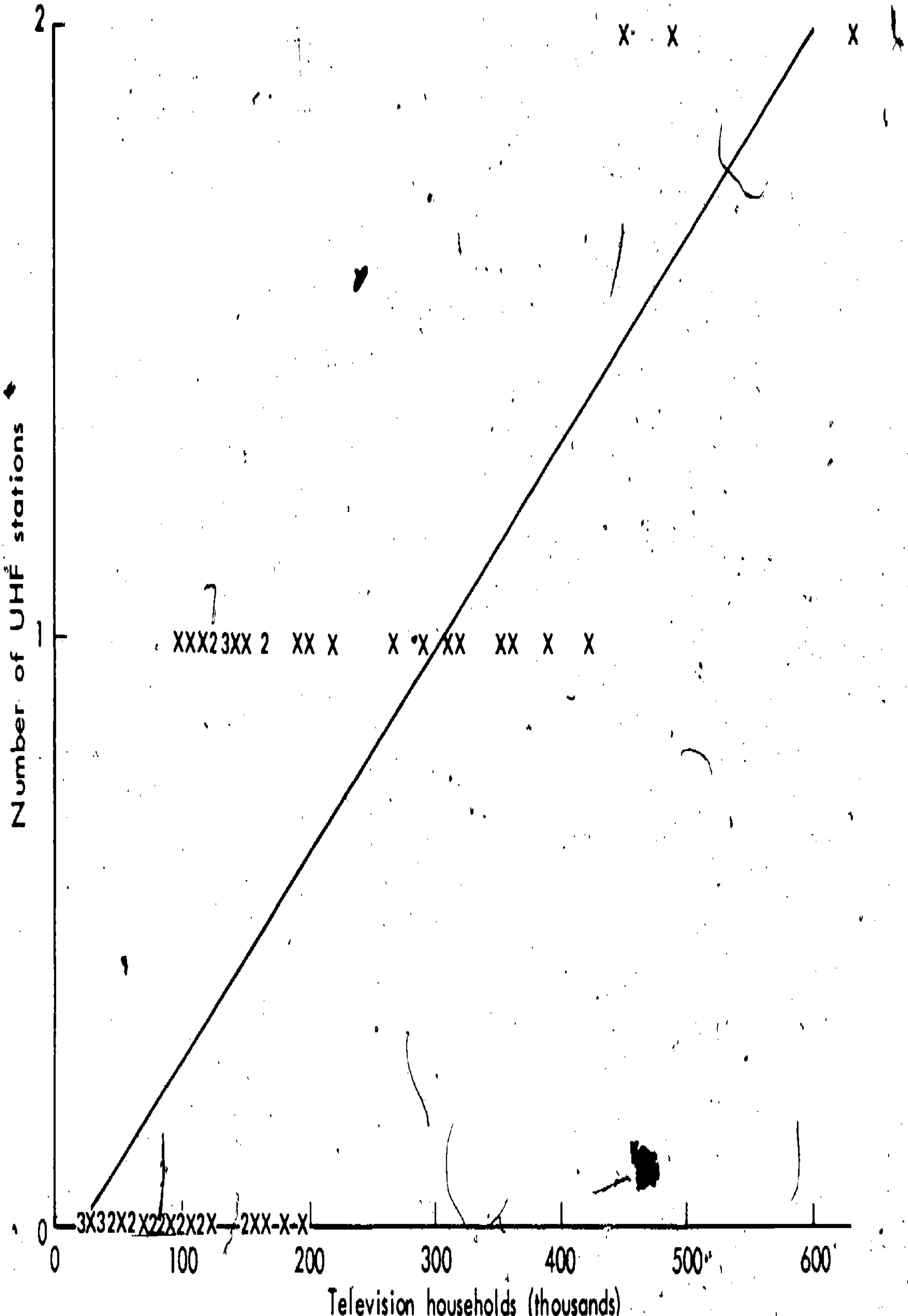

Fig. A.4—Relationship of UHF stations to television households for markets with two VHF stations (single X indicates one observation; larger numbers are indicated numerically)

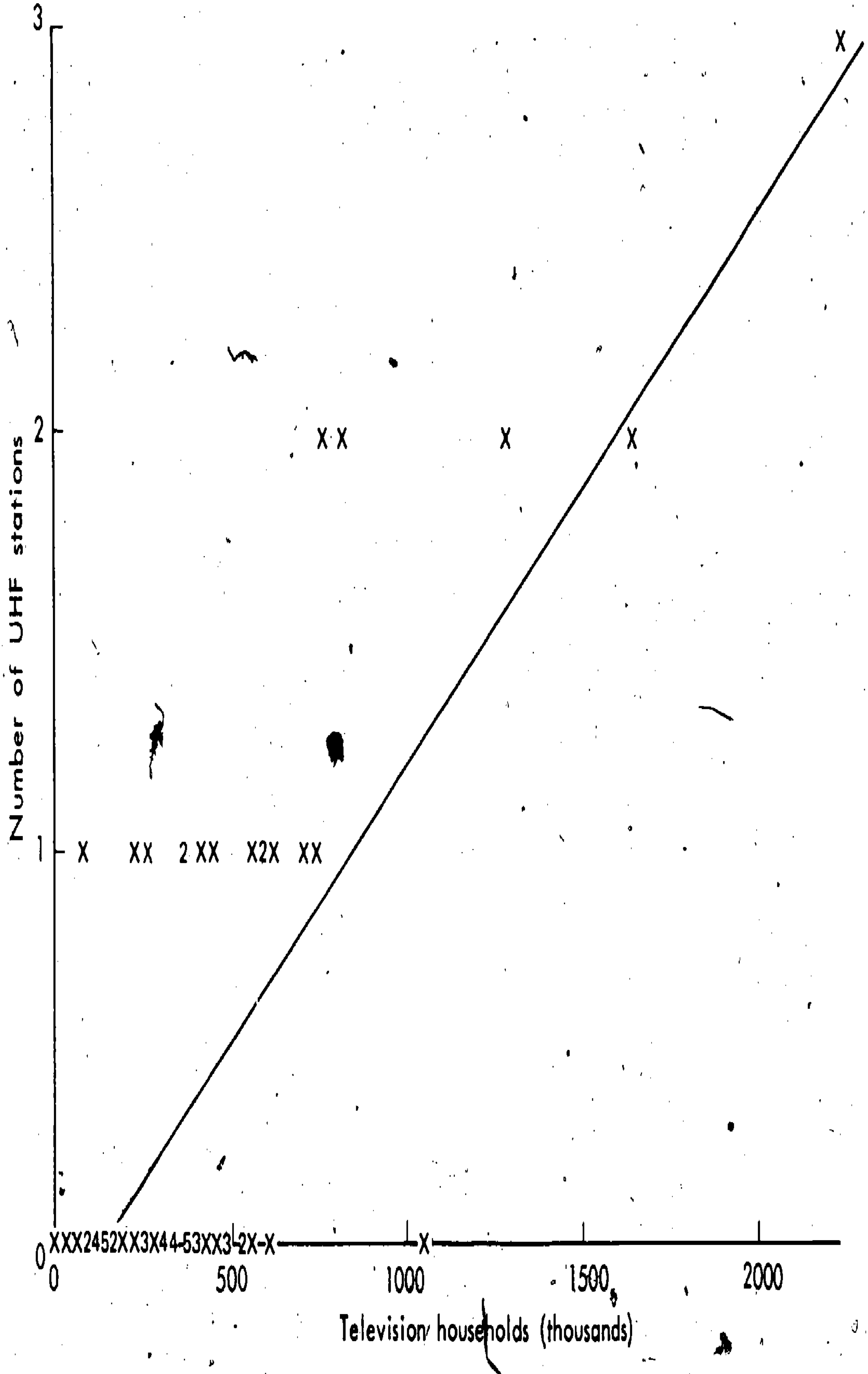

Fig. A.5—Relationship of UHF stations to television households for markets with three VHF stations (single X indicates one observation; larger numbers are indicated numerically)

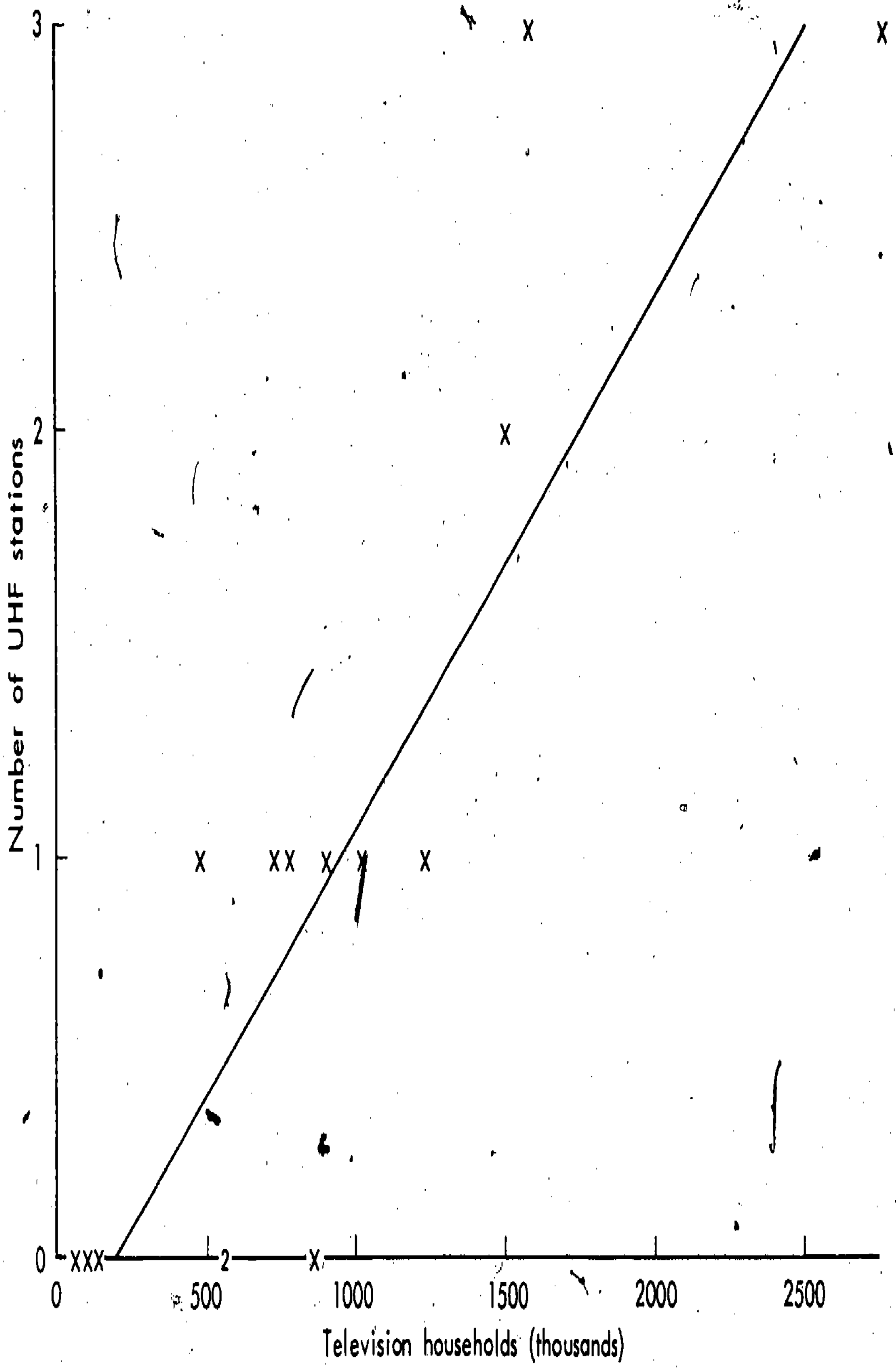

Fig. A.6—Relationship of UHF stations to television households for markets with four VHF stations

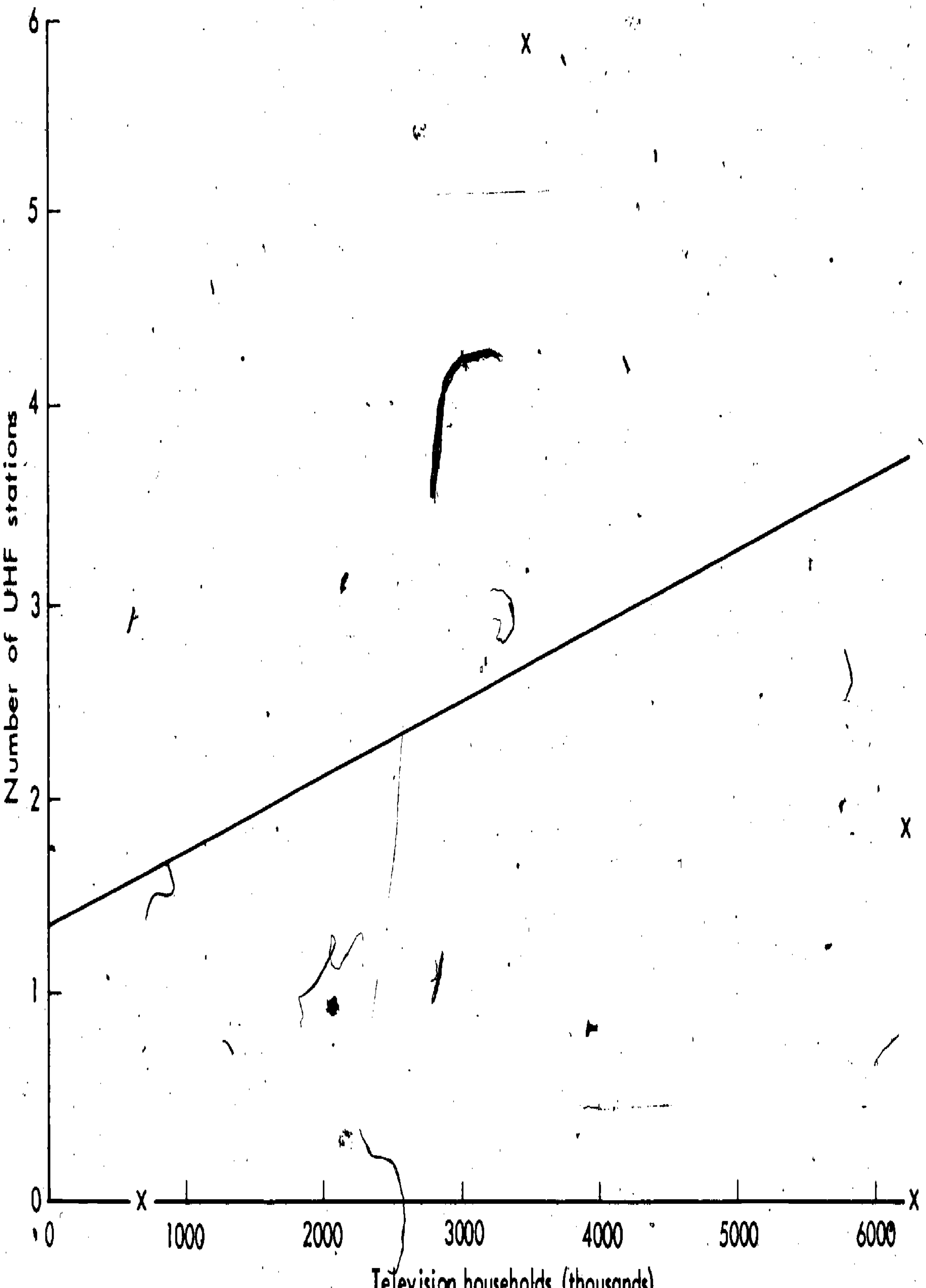

Fig. A.7—Relationship of UHF stations to television households for markets with five or more UHF stations of the plots for NVHF equal to 1 through 4 stations.

The separate regressions explain nearly twice as much of the variance in NUHF as does equation (A.1); R-squared for the separate regressions together equals .70 instead of .40. This increase is statistically significant far beyond the .01 level, so we can decisively reject equation (A.1) in favor of the separate regressions.*

Furthermore, the slopes estimated in separate regressions vary in a systematic and reasonable way, as shown in Figure A.8. The more VHF stations there are in a market, the larger is the increment in TVH associated with an additional UHF station.

Based on these descriptive results, we shall next specify a model of the determination of the number of viable UHF stations--a model that avoids the unrealistic constraints of equation (A.1).

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*The additional variance explained by estimating 9 additional parameters in the separate equations is 62.5, or a mean square of 6.94. This compares to the residual sum of squares of 60.43 with 185 degrees of freedom, or a mean square of .327. The resulting F statistic, 6.94/.327 = 21.2, far exceeds $F_{9, 187, .01} = 2.50$.

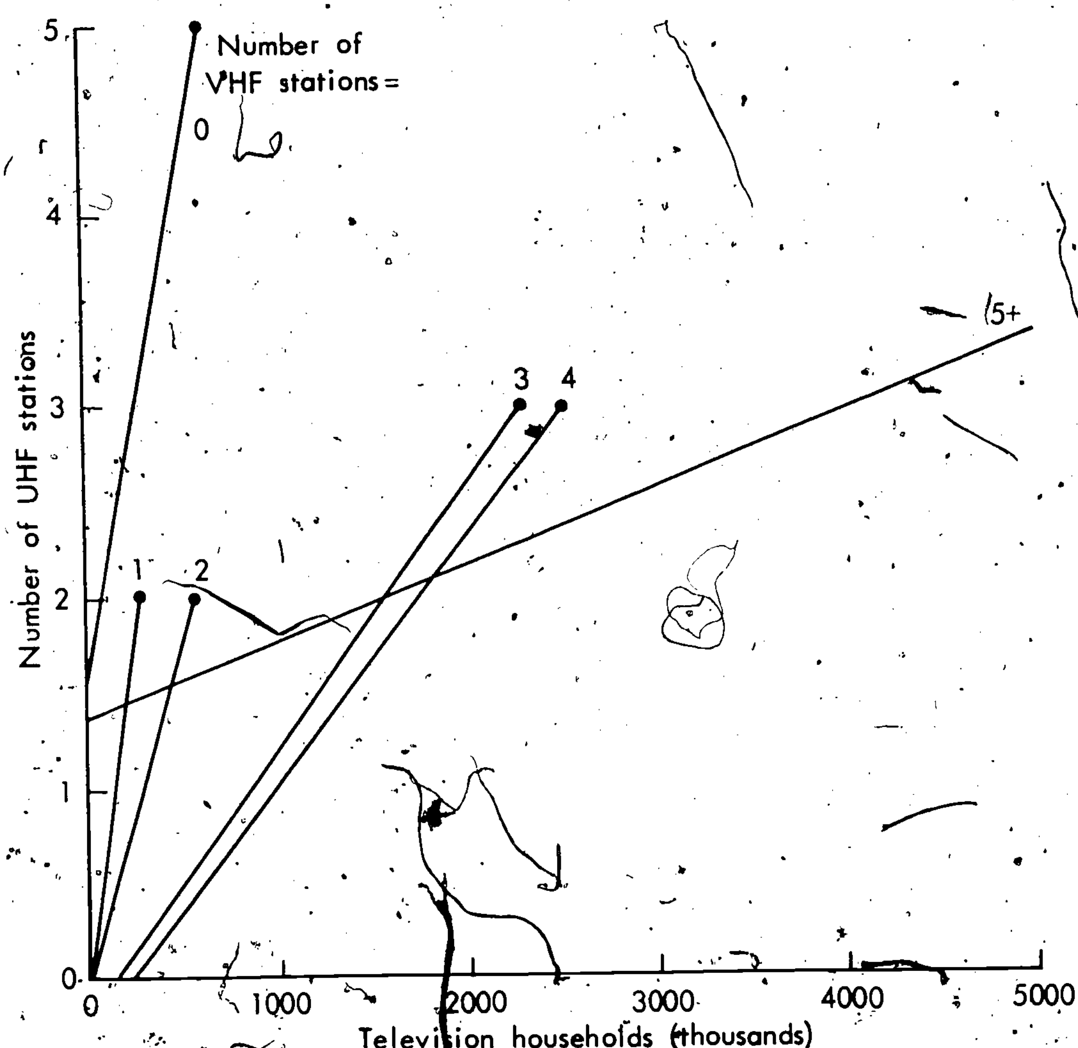


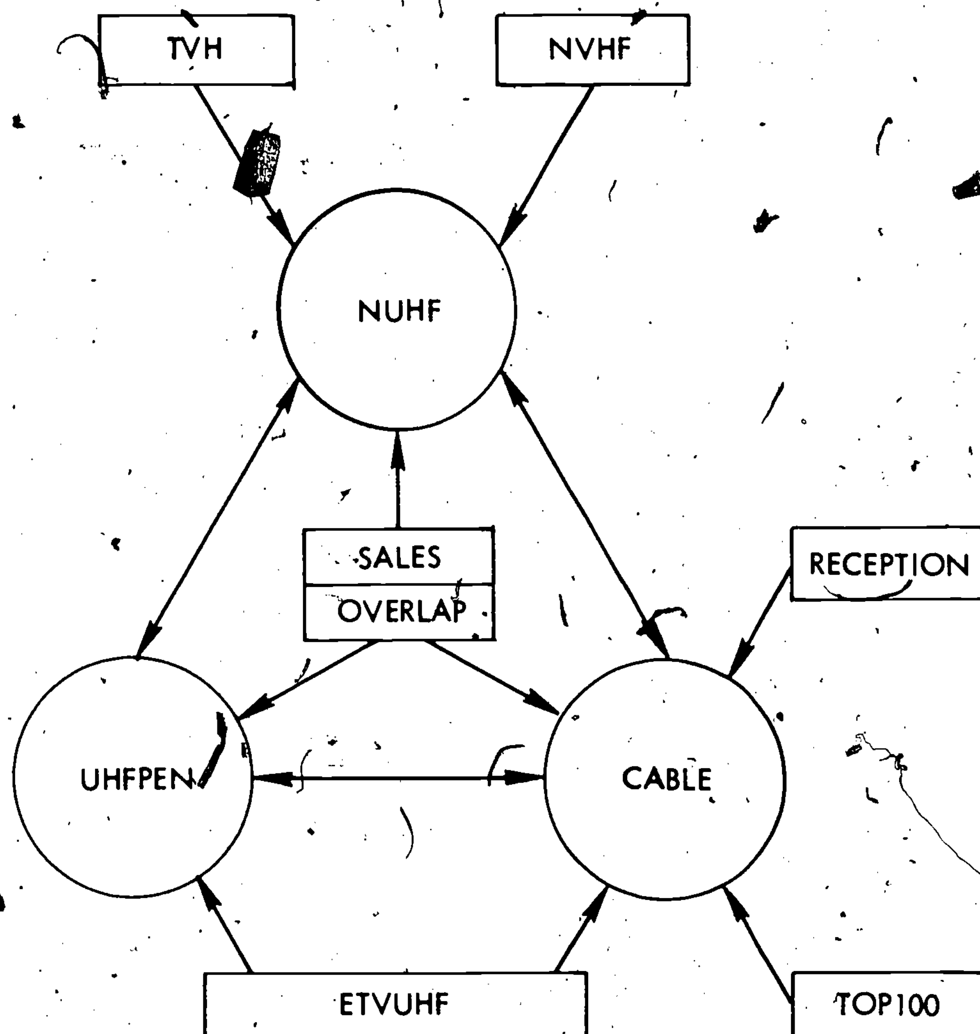
Fig. A.8 — Separate regression relationships for number of UHF stations, VHF stations, and television households

A BROADER SPECIFICATION

To go beyond mere description and specify a model of the determination of the number of viable UHF stations, we must account for the influence on NUHF of other potentially important variables, in addition to NVHF and TVH. For example, richer markets may be more attractive to advertisers, and hence, able to support more stations than can poorer markets. Thus, some measure of market wealth should be included in the model.

Also, one strongly suspects that the number of viable UHF stations must depend on the number of homes that are equipped to receive UHF signals--the greater is UHF set penetration, the more viable UHF stations there should be. But estimating this relationship is complicated by the fact that it works the other way, too--the more UHF stations there are, the greater is the incentive to buy a new set with UHF capability in order to be able to receive them, and so the greater is the UHF penetration. Our model allows for both effects--the influence of UHF penetration on the number of UHF stations, and the influence of UHF stations on UHF penetration--and our estimating method allows us to separate the two.

Other variables may be important as well. Figure A.9 summarizes those that we include in the model, as well as the hypothesized relationships among them. The three variables in circles--NUHF, UHF penetration (UHFPEN), and cable penetration (CABLE)--are jointly determined endogenous variables.



TVH = Television households
NVHF = Number of VHF stations
NUHF = Number of UHF stations
UHFPEN = Penetration of UHF receivers in the market
ETVUHF = Dummy variable indicating whether or not the only public television in market is on UHF

Fig. A.9—Schematic representation of the viable stations model

Each of them influences, and is influenced by, the other two. The other variables, shown in rectangular boxes, are assumed to be exogenous--determined by forces outside of the model.

We first discuss the measurement and hypothesized influence of each of the variables, then set out the equations to be estimated.

NUHF: This is the number of UHF stations in a market, counted as described in Section A.2. Increasing NUHF should increase UHFPEN as discussed above. It may also increase CABLE, since one reason for subscribing to cable service is to improve the reception of UHF signals.

By treating NUHF as endogenous, we are assuming that it is determined by market forces, not constrained by FCC frequency allocations. In fact, there are unused commercial UHF allocations in most markets. (See Table A.2.) Even in those markets with no unused assignments, we can assume that a UHF channel could and would be activated if there were an economic justification. Even in those cases, then, the real determinants of NUHF are economic forces, not limited allocations. At the same time, it is clear that this is *not* true for VHF where most channels *are* being used and little leeway exists for reallocations under existing allocation criteria.

UHFPEN: This is the fraction of TVH in the market that has television sets with UHF receivers. Increasing UHFPEN should increase NUHF, as discussed above. Insofar as buying a set with UHF receiver and subscribing to cable are competing ways to get access to UHF signals, increasing UHFPEN may decrease CABLE.

CABLE: This is the fraction of TVH in the market that subscribes to cable service. (We use Nielsen figures.) Increasing CABLE may have either a positive or negative effect on NUHF. Cable improves UHF reception, tending to help UHF stations, but it also brings in distant signal competition, tending to hurt them. The direction of influence on CABLE on NUHF depends on which effect predominates. Also, CABLE may have a negative effect on UHFPEN because of the competitive relationship noted above.

TVH: Thousands of ADI television households.

NVHF: The number of VHF stations, counted as in Section A.2. By treating this as an exogenous variable, we are assuming that it is determined by FCC frequency allocations. The fact that there are very few unused VHF allocations, and none at all in markets with UHF stations,* supports this assumption.

We saw in Section A.2 that TVH is positively related to NUHF, and NVHF is negatively related to NUHF. We expect these relationships to hold in our model, as well. The way in which these variables enter the model is based on the discussion in Section A.2. We want to allow different slopes and intercepts in the relationship of NUHF to TVH, depending on the value of NVHF. To accomplish this, we define the following variables.

NVHF0, ... NVHF5: Six dummy variables, equal to 1 if NVHF = 0, ... 5 or more, and 0 otherwise.

NVHF0*TVH, ... NVHF5*TVH: The products of TVH and the six dummy variables.

SALES: This is our measure of market wealth. It is calculated as ADI retail sales per TVH ($1000 per year per household). We would expect it to have a positive influence on all three of the endogenous variables.

OVERLAP: This variable is included to account for the fact that television markets are not autarkic; stations in one market compete, to

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*There are a few apparent exceptions in Table A.2, but in all such cases the unused VHF allocations are for smaller communities far away from the markets' major cities.

a greater or lesser degree, with stations in adjacent markets. Our measure of OVERLAP is the ratio of NWC to TVH, where NWC is market net weekly circulation (the largest NWC for any station in the market).* The bigger this ratio, the more important is competition with adjacent markets. We allow for the possible influence of OVERLAP on each of the endogenous variables; but we shall not specify the expected direction of influence *a priori*.

RECEPTION: Over-the-air reception quality certainly has an effect on CABLE, but we lack a convenient way to measure it directly. Thus, as proxies for RECEPTION, we shall use:

STATE1, ... STATE48: Dummy variables equal to 1 if the market is located in the first, ... forty-eighth state, and 0 otherwise. These dummies should capture the effect of differences in average terrain, which is surely related to over-the-air reception quality. They will also pick up the effect of non-reception state-specific influences on CABLE, such as the long freeze on franchising in Connecticut.

TOP100: This is a dummy variable equal to 1 if the observation is one of the 100 largest television markets, and 0 otherwise. FCC regulations have imposed requirements and restrictions on cable operation in the top 100 markets that have tended to limit CABLE there. Also, this variable will pick up the effect of the generally good over-the-air television service in larger markets. We expect it to have a negative influence on CABLE.

ETVUHF: This is a dummy variable equal to 1 if the only non-commercial television service in the market is on UHF, and 0 otherwise.

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*We calculate OVERLAP using 1971 rather than 1974 figures for NWC and TVH. That is the last year for which a convenient table of market NWC was published. This variable should be quite stable over time.

ETVUHF represents an incentive, in addition to that offered by NUHF, to buy a UHF set or subscribe to cable. Thus we expect it to have a positive influence on UHFPEN and CABLE.

These relationships taken together make up a three equation simultaneous system:

NUHF = f(UHFPEN, CABLE, NVHF1, ... NVHF5, TVH*NVHF0, ... TVH*NVHF5, SALES, OVERLAP) (A.2)

UHFPEN = f(NUHF, CABLE, SALES, OVERLAP, ETVUHF) (A.3)

CABLE = f(NUHF, UHFPEN, SALES, OVERLAP, TOP100, ETVUHF, STATE1, ... STATE48). (A.4)

ESTIMATION

We estimate equations (A.2), (A.3), and (A.4) as multiplicative functions using both our narrow and our broad station counts and observations on all 197 markets. (Estimates using alternative specifications presented in the following subsection.) The estimation technique is two-stage least squares. The results are shown in Table A.6.

We are primarily interested in estimates of equation (A.2), since NUHF is what we want to explain. The most important features of this equation are:

1. UHFPEN has a significant and substantial impact on NUHF. Any increase in UHFPEN is estimated to increase NUHF in at least the same proportion.

2. CABLE has no detectable influence on NUHF one way or the other. Apparently the reception and fragmentation effects approximately balance out to zero.

Table A.6

ESTIMATED EQUATIONS

Right-hand variable	log(1+NUHF) Narrow	log(1+NUHF) Broad	log(UHFPEN) Narrow	log(UHFPEN) Broad	log(1-CABLE) Narrow	log(1-CABLE) Broad
log(1+NUHF)			.146	.144	.046	.102
			(12.38)	(11.82)	(.69)	(1.43)
log(UHFPEN)	1.059	1.361			-.035	-.254
	(2.07)	(2.39)			(-.09)	(-.61)
log(1-CABLE)	.134	.144	.011	-.017		
	(.64)	(.63)	(.33)	(-.49)		
NVHF1	-.752	-1.044				
	(-1.47)	(-1.71)				
NVHF2	-.683	-.606				
	(-1.23)	(-1.01)				
NVHF3	-.928	-.900				
	(-1.70)	(-1.43)				
NVHF4	-2.212	-2.413				
	(-2.96)	(-2.84)				
NVHF5	-3.834	-2.965				
	(-2.70)	(-2.72)				
NVHF0*log(TVH)	.269	.260				
	(2.90)	(2.44)				
NVHF1*log(TVH)	.341	.413				
	(4.96)	(4.84)				
NVHF2*log(TVH)	.265	.263				
	(3.25)	(3.30)				
NVHF3*log(TVH)	.235	.252				
	(3.82)	(3.48)				
NVHF4*log(TVH)	.437	.479				
	(5.00)	(4.89)				
NVHF5*log(TVH)	.639	.534				
	(3.70)	(4.04)				
log(SALES)	.195	.099	.108	.109	-.339	-.322
	(1.09)	(.49)	(2.91)	(2.80)	(-3.33)	(-3.12)
log(OVERLAP)	-.151	-.131	-.039	-.034	-.092	-.083
	(-1.86)	(-1.43)	(-2.30)	(-1.90)	(-2.11)	(-1.89)
TOP100					.185	.182
					(6.61)	(6.58)
ETVUHF			.032	.031	.029	.033
			(2.92)	(2.75)	(.89)	(1.00)
CONSTANT	-.296	-.063	-.459	-.474	See Table A.7	
	(-.50)	(-.09)	(-6.74)	(-6.68)		
R-squared						
Second stage	.687	.645	.521	.518	.548	.553
Corrected	.743	.701	.617	.585	.551	.541
Untransformed predictions	.754	.700	.627	.590	.544	.526
RMSE	.507	.618	.052	.054	.101	.103

NOTE: Corrected R-squared, R-squared for untransformed predictions, RMSE (root mean squared error) and t-statistics are all based on variance estimates using actual rather than predicted values for right hand side endogenous variables.

Table A.7

INDIVIDUAL CONSTANT TERMS FOR STATES IN THE CABLE REGRESSION

	Narrow Count		Broad Count	
State	Constant	t-Statistic[a]	Constant	t-Statistic[a]
AL	.284	1.15	.157	0.61
AR	.321	1.35	.217	0.89
AZ	.426	1.71	.337	1.33
CA	.150	0.59	.337	0.13
CN	.399	1.40	.255	0.85
CO	.317	1.32	.232	0.95
DC	.347	1.26	.214	0.73
FL	.339	1.39	.234	0.92
GA	.371	1.49	.264	1.04
IA	.391	1.68	.274	1.10
ID	.378	1.54	.290	1.15
IL	.327	1.32	.221	0.88
IN	.349	1.39	.227	0.88
KS	.311	1.23	.213	0.83
KY	.299	1.15	.174	0.65
LA	.385	1.63	.286	1.18
MA	.402	1.57	.276	1.04
MD	.074	0.30	-.020	-0.08
ME	.341	1.35	.225	0.84
MI	.286	1.19	.180	0.72
MN	.390	1.59	.297	1.18
MO	.374	1.56	.266	1.08
MS	.290	1.18	.179	0.70
MT	.232	0.97	.141	0.58
NC	.389	1.49	.271	1.00
ND	.416	1.49	.303	1.06
NE	.338	1.43	.255	1.06
NM	.226	0.86	.134	0.50
NV	.510	1.99	.445	1.72
NY	.264	1.14	.170	0.72
OH	.220	0.93	.119	0.49
OK	.312	1.33	.203	0.82
OR	.252	1.04	.168	0.68
PA	.059	0.24	-.061	-0.25
RI	.407	1.61	.346	1.36
SC	.448	1.74	.317	1.17
SD	.345	1.31	.246	0.92
TN	.397	1.53	.283	1.06
TX	.259	1.07	.163	0.66
UT	.363	1.31	.277	0.99
VA	.301	1.26	.182	0.72
WA	.192	0.77	.929	0.37
WI	.398	1.63	.301	1.21
WV	.011	0.05	-.094	-0.39
WY	.186	0.69	.862	0.31

[a]Based on variance estimates using actual rather than predicted values for right-hand side endogenous variables.

3. The relationship of NUHF to TVH and NVHF, after accounting for the influence of all the other variables, is generally significant, as we would expect from the discussion in Section A.2. The separate effects of the NVHF dummies and the dummies multiplied by log(TVH) are not well estimated because they are pairwise highly collinear. The simple correlations range from .980 to .994. This presents no problem for prediction, since these variables will be similarly correlated in the future.

4. Somewhat surprisingly, the impact of SALES on NUHF is not statistically significant, although it does have the expected sign.

5. The coefficient of OVERLAP is negative and almost significant at the .05 level. This might be considered weak evidence that out-of-market competition tends to depress the number of viable UHF stations.

6. The explanatory power of the equation is substantial. Using the narrow count of stations, over three quarters of the variance is explained, and the root mean squared error is about half a station.

The other two equations are of direct interest only insofar as good results for them tend to confirm that our model specification is reasonable. In this respect, the UHFPEN equation is very encouraging, and the CABLE equation is somewhat less so. We discuss the UHFPEN equation first:

7. As expected, the presence of UHF stations has a substantial and highly significant influence on UHFPEN.

8. CABLE has no detectable influence on UHFPEN one way or the other.

9. SALES has a significant positive effect on UHFPEN in accordance with our prior expectations.

10. OVERLAP has a significant negative effect on UHFPEN. Although we did not specify the sign for this a priori, it is easy to rationalize. One explanation would be that the greater the out-of-market competition, the more total VHF viewing options there are, hence the smaller the incentive to get a UHF set.

11. ETVUHF has a positive and significant effect on UHFPEN as expected.

12. The explanatory power of the equation is respectable, though not quite as good as that for NUHF.

The dependent variable in the CABLE equation is specified as log(1-CABLE) to avoid taking the logarithm of zero. Thus it is actually a NONCABLE equation, and the signs of the coefficients are reversed. This equation does somewhat less well than the other two.

13. Neither NUHF nor UHFPEN has a significant estimated impact on CABLE.

14. SALES is postively and significantly related to CABLE, as expected.

15. OVERLAP is also significantly and positively related to CABLE. This can be interpreted in the following way. High OVERLAP indicates the presence of many nearly out-of-market stations that can be carried by cable systems, increasing the incentive to subscribe to cable service.

16. TOP100 is negatively and very significantly related to CABLE as expected.

17. ETVUHF, like commercial NUHF, has no discernible impact on CABLE.

18. The STATE dummies taken as a group are not statistically significant.

The relatively poor performance of the CABLE equation may arise because the STATE dummies are not doing a good job of capturing reception differences. A check of the within-state and between-state variance in CABLE lends support to this conjecture, showing that the state means are not as good predictors of individual market values as we expected. The state means account for only about one-third of the total variance.

All-in-all, though, the model performs quite well.

ADDITIONAL SPECIFICATIONS

In Tables A.8 and A.9, we present estimates of alternative versions of the NUHF equation. The equation discussed above (Table A.6) is of the form

$$\log(1+NUHF) = \alpha_i + \beta_i \log(TVH) + \ldots$$

where there is a separate intercept α_i and a separate slope β_i for each NVHF category (NVHF0, NVHF1, etc.). The modifications in Tables A.8 and A.9 all constrain the α_i and β_i in one way or another. The goal is to see if simpler versions of the equation will do almost as good a job of explaining the data as does the unconstrained equation.

We noted above that the NVHF category dummies are very highly correlated with the same dummies multiplied by log(TVH). This suggests

Table A. 8

ALTERNATIVE SPECIFICATIONS OF NUHF EQUATION: COMMON SLOPE OR COMMON INTERCEPT, NARROW COUNT, 1974

Right-hand variable	Equation Number (1)	(2)	(3)
log(UHFPEN)	1.059 (2.07)	1.095 (2.22)	1.010 (2.00)
log(1-CABLE)	.134 (.64)	.042 (.22)	.131 (.67)
NVHF1	-.752 (-1.47)		-.434 (-4.39)
NVHF2	-.683 (-1.23)		-.708 (-6.17)
NVHF3	-.928 (-1.70)		-1.157 (-8.27)
NVHF4	-2.212 (-2.96)		-1.169 (-7.09)
NVHF5	-3.834 (-2.70)		-1.030 (-3.84)
NVHF0*log(TVH)	.269 (2.90)	.438 (6.73)	
NVHF1*log(TVH)	.341 (4.96)	.358 (6.09)	
NVHF2*log(TVH)	.265 (3.25)	.295 (5.86)	
NVHF3*log(TVH)	.235 (3.82)	.222 (4.84)	
NVHF4*log(TVH)	.437 (5.00)	.234 (5.25)	
NVHF5*log(TVH)	.639 (3.70)	.264 (6.72)	
log(TVH)			.300 (5.94)
log(SALES)	.195 (1.09)	.172 (1.00)	.243 (1.38)
log(OVERLAP)	-.151 (-1.86)	-.129 (-.159)	-.155 (-1.90)
CONSTANT	-.296 (-.50)	-1.109 (-2.02)	-.539 (-1.07)
R-squared:			
Second stage	.687	.663	.676
Corrected	.743	.723	.727
Predicting NUHF	.754	.722	.746
RMSE	.507	.538	.514

NOTE: Corrected R-squared, R-squared for untransformed predictions, RMSE (root mean squared error) and t-statistics are all based on variance estimates using actual rather than predicted values for right hand side endogenous variables.

Table A.9

ALTERNATIVE SPECIFICATIONS OF NUHF EQUATION: QUADRATIC SLOPE AND/OR QUADRATIC INTERCEPT, NARROW COUNT, 1974

Right-hand variable	Equation Number (1)[a]	(2)	(3)	(4)
log(UHFPEN)	1.205 (2.37)	.979 (2.00)	.861 (1.71)	1.308 (2.48)
log(1-CABLE)	.080 (.42)	-.014 (-.08)	.000 (.00)	.090 (.47)
NVHF	.045 (.19)		-.579 (-9.19)	.038 (.16)
NVHF**2	-.081 (-1.55)		.066 (7.16)	-.077 (-1.50)
log(TVH)	.361 (5.29)	.451 (7.02)	.302 (5.93)	.357 (5.24)
NVHF*log(TVH)	-.092 (-2.41)	-.113 (-9.53)		-.091 (-2.39)
NVHF**2*log(TVH)	.021 (2.92)	.014 (9.28)		.020 (2.89)
log(SALES)	.240 (1.38)	.211 (1.21)	.282 (1.57)	.140 (.65)
log(OVERLAP)	-.138 (-1.79)	-.087 (-1.13)	-.106 (-1.33)	-.127 (-1.64)
CONSTANT	-.841 (-1.62)	-1.224 (-2.22)	-.623 (-1.22)	-.626 (-1.03)
R-squared:				
Second stage	.672	.657	.662	.671
Corrected	.737	.716	.710	.741
Predicting NUHF	.785	.748	.752	.787
RMSE	.473	.512	.508	.472

[a]"Basic quadratic equation."

NOTE: Corrected R-squared, R-squared for untransformed predictions, RMSE (root squared error) and t-statistics are all based on variance estimates using actual rather than predicted values for right hand side endogenous variables.

including the dummies only once in the equation, that is, either multiplied by log(TVH) or alone, but not both together. This is equivalent to constraining the equations for all NVHF categories to have the same slope, $\beta_i = \beta$, or the same intercept, $\alpha_i = \alpha$.

Table A.8 shows the results of imposing these constraints. Column (1) reproduces the unconstrained equations from Table A. for easy comparison. Column (2) shows the equation with a common intercept, and column (3) shows the equation with a common slope. The t-statistics for the slope and intercept terms in the constrained equations are substantially increased, and R-squared falls only slightly. Equation (3), with separate intercepts, fits the data slightly better than does equation (2), with separate slopes. Equation (2) is rejected in favor of equation (1) by an F test at the .05 level, but equation (3) is not.

In Table A.9, we impose another kind of a constraint. We note in Table A.7 that there appears to be a fairly regular, but nonlinear, pattern in the estimated slopes and intercepts. We should expect some pattern, since the categories are naturally ordered by the number of VHF stations, NVHF.

In column (1) of Table A. 9, we impose quadratic smoothing on the slopes and intercepts. That is, we specify

$$\alpha = \alpha_0 + \alpha_1 * NVHF + \alpha_2 * NVHF**2$$

and

$$\beta = \beta_0 + \beta_1 * NVHF + \beta_2 * NVHF**2.$$

We estimate seven fewer coefficients for this equation than for the unconstrained equation, and R-squared decreases only slightly. In fact, the additional variance explained by the unconstrained equation falls far short of being significant at the .05 level.

Again, though, the coefficients of the slope and intercept terms are imprecisely estimated because of multicollinearity among the variables NVHF, NVHF**2, log(TVH), NVHF*log(TVH), and NVHF**2*log(TVH). This suggests trying the equations shown in columns (2) and (3). In (2), we specify a common intercept and quadratic slope. In (3), we specify a quadratic intercept and common slope. Both constraints must be rejected at the .05 significance level.*

On statistical grounds, then, we have our choice of an equation with separate intercept for each NVHF category and a common slope (equation (3), Table A.8), or an equation with quadratic slopes and intercepts (equation (1), Table A.9). Of the two, we choose equation (1), Table A.9 on astatistical grounds. One reason is that it does a better job of predicting untransformed NUHF (as opposed to log(1 + NUHF)); its R-squared of .785 is better even than that for the unconstrained equation.

Another reason is that its patterns of predictions are more reasonable. *All* of the equations predict more UHF stations for markets with more VHF stations for some (relatively high) values of NVHF and TVH. A priori, this is an unreasonable result, but it reflects relationships

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*Column (4) of Table A.9 is the same equation as column (1) estimated using a corrected data base. See the footnote discussion of two data problems relating to Table A.3 above.

that are present in the data. Equation (3), Table A.8, is somewhat guiltier in this respect, since a fifth VHF station would increase predicted NUHF for *any* value of TVH, while equation (1), Table A.9 does so only for relatively large markets (approximately 1.5 million TVH or larger).

Consequently, we use quadratic slopes and intercepts ("basic quadratic equation," equation (1), Table A.9) for most of our projections and as the starting point for the further investigation in the next section.

A.4. CHANGES IN THE UHF HANDICAP

Our estimates clearly show that UHF stations are helped by increasing UHF set penetration, just as one would expect. But even when UHF penetration reaches 100 percent, UHF will continue to suffer, relative to VHF, from reception and tuning difficulties that collectively have come to be called the UHF handicap. This handicap may be decreasing over time as UHF stations increase their power and as more households install UHF antennas, and it will probably decrease still more in the future as more and more sets with push button tuning for both VHF and UHF come into use.

FOUR-YEAR EQUATION

We would like to check how fast the UHF handicap has declined in the past, as a guide to projecting further declines in the future. As a simple way to do so, we estimate the model using data for all four years, 1971-1974, and including dummy variables for 1972, 1973, and 1974. The results are shown in the first column of Table A.10.

Surprisingly, the year effects *decrease* significantly over the four-year period. That is, the number of UHF stations increased *less* rapidly over this period than one would expect to result from changes in the factors included in the model--primarily increasing UHFPEN and TVH. This is just the opposite of what we expected to find. We thought that the decreasing UHF handicap would result in a faster increase in the number of UHF stations than could be explained by the factors included explicitly in the model.

What must be happening is that factors that are not included in the model--for example, high interest rates and unsettled economic conditions--

Table A.10

TRENDS IN UHF HANDICAP OVER TIME, 1971-1974[a]

Right-hand variable	Coefficient	t-statistic
log(UHFPEN)	1.702	8.22
log(1-CABLE)	.195	1.97
NVHF	.108	.97
NVHF**2	-.102	-4.04
log(TVH)	.273	8.05
NVHF*log(TVH)	-.081	-4.48
NVHF**2*log(TVH)	.021	6.33
log(SALES)	.059	.96
log(OVERLAP)	-.088	-2.32
1972	-.065	-2.49
1973	-.161	-5.46
1974	-.159	-5.36
CONSTANT	.048	.21
R-squared:		
Second stage	.665	
Corrected	.738	
Predicting NUHF	.787	
RMSE	.457	

[a]"Four year equation."

NOTE: Corrected R-squared, R-squared for untransformed predictions, RMSE (root mean squared error) and t-statistics a are all based on variance estimates using actual rather than predicted values for right hand side endogenous variables.

depressed the number of UHF stations in 1972, 1973, and 1974 relative to 1971. The estimated year effect, then, combines the effects of economic conditions, any change in the UHF handicap, and all other factors that vary from year to year and affect the number of UHF stations but are not included as variables in our model.

CONSTRAINED EQUATION

Although there is no way to separate out trends in the UHF handicap in our model, another approach lets us make projections on the assumption that the handicap disappears entirely. In other words, we cannot tell how fast the handicap is approaching zero, but we can project what will happen when (and if) it gets there.

We note that an unhandicapped UHF station is by definition indistinguishable from a VHF station. Thus our task is equivalent to estimating how many VHF stations each market would support if there were no limits on VHF allocations; we shall refer to this as the "unlimited" VHF relationship or the "unlimited" VHF line. The thing that makes estimating an unlimited VHF relationship difficult is that VHF allocations are in fact limited and almost all of them are in use. Many, if not most, markets would use more allocations if they were available; thus we must use an indirect approach to estimating an unlimited VHF relationship. Our approach builds on the work of Besen and Hanley (1975), who derive an unlimited VHF line from an estimate of equation (A.1).* The key observation

*And variants of (A.1) as mentioned in the first footnote on p. 147.

that makes this possible is that the existence of UHF stations in a market is an indication of pressure on VHF allocations; conversely, the absence of UHF stations indicates a lack of pressure.* One way to proceed, then, would be to estimate an unlimited VHF line using only markets without any UHF stations. However, this would neglect the information contained in observations on other markets. To make use of this information too, one can estimate (A.1), set NUHF equal to zero (the no-pressure condition), and solve for NVHF in terms of TVH. Our estimate of (A.1) from Table A.5 is

$$NUHF = 1.41 + .0013\ TVH - .516\ NVHF,$$

so the implied unlimited VHF line is

$$NVHF = 2.73 + .0025\ TVH. \qquad (A.5)$$

Adapting this approach to the viable stations model is somewhat complicated. At first thought, it seems as though one could simply set NUHF equal to zero in our basic quadratic equation and solve for NVHF to get an limited VHF relationship. However, this leads to two problems. First, the basic quadratic equation has no real-valued solution for some values of (This is another aspect of the anomaly noted at the end of Section A.3.) Second, where a solution exists, it implies that the position of the unlimited VHF line depends strongly on the value of UHFPEN, an unreasonable result.

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*If there are all-VHF markets that would support an additional VHF sta tion but not a UHF, this is not precisely true. To the extent that such ma kets are included in our sample, our estimate of the unlimited VHF relationship is biased downward.

Consequently, we specify the following version of the viable stations model, including constraints that eliminate the two problems. We take unlimited NVHF to be a linear function of TVH only:

$$NVHF = \alpha_0 + \alpha_1 TVH. \qquad (A.6)$$

Ideally, one would want to let the slope of this line depend on some of the other variables in the model--SALES, OVERLAP, possibly CABLE. However, doing so results in a nonlinear equation that would be very difficult to estimate, as the reader can easily verify by substituting $(\alpha_1 + \alpha_2 SALES + \alpha_3 OVERLAP + \alpha_4 CABLE)$ for α_1 below. Following Besen and Hanley, we solve (A.6) for the value of $\overline{TVH}$ that corresponds to the allocations-limited value of $\overline{NVHF}$:

$$\overline{TVH} = (\overline{NVHF} - \alpha_0)/\alpha_1. \qquad (A.7)$$

Finally we specify NUHF as a multiple of the excess of TVH over $\overline{TVH}$:

$$NUHF = (\beta_0 + \beta_1 UHFPEN + \beta_2 CABLE + \beta_3 SALES + \beta_4 OVERLAP)(TVH - \overline{TVH}). \qquad (A.8)$$

Here the multiplier does depend on factors other than TVH that may influence NUHF. Substituting from (A.7) in (A.8) and rearranging terms we get

$$NUHF = \frac{\alpha_0}{\alpha_1}(\beta_0 + \beta_1 UHFPEN + \beta_2 CABLE + \beta_3 SALES + \beta_4 OVERLAP)$$
$$+ (\beta_0 + \beta_1 UHFPEN + \beta_2 CABLE + \beta_3 SALES + \beta_4 OVERLAP) TVH$$
$$- \frac{1}{\alpha_1}(\beta_0 + \beta_1 UHFPEN + \beta_2 CABLE + \beta_3 SALES + \beta_4 OVERLAP)\overline{NVHF}$$

$$= \beta_0\left(TVH - \frac{1}{\alpha_1}\overline{NVHF} + \frac{\alpha_0}{\alpha_1}\right)$$

$$+ \beta_1\left(TVH - \frac{1}{\alpha_1}\overline{NVHF} + \frac{\alpha_0}{\alpha_1}\right)UHFPEN$$

$$+ \beta_2\left(TVH - \frac{1}{\alpha_1}\overline{NVHF} + \frac{\alpha_0}{\alpha_1}\right)CABLE$$

$$+ \beta_3\left(TVH - \frac{1}{\alpha_1}\overline{NVHF} + \frac{\alpha_0}{\alpha_1}\right)SALES$$

$$+ \beta_4\left(TVH - \frac{1}{\alpha_1}\overline{NVHF} + \frac{\alpha_0}{\alpha_1}\right)OVERLAP. \qquad (A.9)$$

As before, this is one of three structural equations in the model, and we estimate it by two-stage least squares with UHFPEN and CABLE treated as endogenous variables. An iterative procedure is used to estimate (A.9). Initial values of the α coefficients from (A.5) are used to calculate values of the composite variables in the second form of (A.9). Regressing NUHF on these composite variables with the intercept suppressed yields an estimate of the β coefficients. These are used to calculate the composite variables in the first version of (A.9). Regressing NUHF $-(\beta_0 + \beta_1$UHFPEN $+ \ldots + \beta_4$OVERLAP) on the other two composite variables, again suppressing the constant term, gives revised estimates of the α coefficients with which to begin the next iteration. This process converges to the estimates given in Table A.11.

Table A.11

CONSTRAINED EQUATION

Coefficient	Estimated Value	Conditional t-Statistic[a,b]
α_0/α_1	1526.	20.3
$1/\alpha_1$	423.	13.0
β_0	-.00484	9.5
β_1	.00696	12.9
β_2	-.00040	-1.3
β_3	-.00003	.8
β_4	-.00004	.6
R-squared:		
Second stage	.654	
Corrected[b]	.739	
RMSE[b]	.522	

[a]The t-statistics for the α coefficients are conditional on the estimated values of the β coefficients, and vice versa. They cannot be used for significance tests.

[b]Based on variance estimate using actual rather than predicted values for right-hand side endogenous variables.

Appendix B

THE RELATIONSHIP BETWEEN TELEVISION SERVICE AND TELEVISION VIEWING

B.1. INTRODUCTION

In this paper we investigate the determinants of television viewing levels. The estimates of television market audience from this appendix would feed into a model of the determination of television station profits as described in Section IX of the main body of this report. In particular, we are interested in the extent to which an increase in the number of viewing options (for example, from two to three network stations) increases the amount of viewing.

We analyze audience data at two levels of aggregation: first the market level, then the county level. The two analyses produce results that seem, on the surface, to be in conflict. The market-level analysis (Section B.2) suggests that the number of viewing options has a fairly large effect on viewing levels, and the county-level analysis (Section B.3) suggests that the effect is very slight. The apparent discrepancy is discussed and the two analyses reconciled in Section B.4.

B.2. MARKET-LEVEL ANALYSIS

There is a wide range in the number of commercial stations in different television markets: only one in quite a few small markets, on up to more than a dozen in Los Angeles. Thus it looks as though we should be able to tell a lot about the effect of the number of viewing options on total viewing in a market. This would probably be true if each market's signals were confined to exclusive geographical areas--if New York stations, for example, were watched only in an area within which no other market's stations were watched. But in fact there is, in most cases, considerable overlap between adjacent markets. This complicates the analysis and clouds the results.

One way to proceed in the face of this difficulty is simply to ignore it, hoping that overlap, though ubiquitous, is not important enough to seriously distort the results. Using this approach, we initially assume that markets are autarkic, that is, that each market's stations are watched only within that market's area of dominant influence (ADI).* Then we can measure total market viewing by adding up the audience attracted by all stations in a market (AUD) and dividing by the number of television households (TVH) in that market's ADI. Calculating this measure of viewing using 1967 data on prime-time** audience yields a distribution of values that is summarized on the first line of Table B.1. The mean value (.599) is consistent with the well-known fact that approximately 60 percent of all television households watch television during prime time, but the range

*A market's ADI consists of all those counties (or in some cases portions of counties) in which that market's stations attract more audience than do those of any other single market.

**As defined by ARB: 7:30-11:00 p.m. in the eastern and Pacific time zones, 6:30-10:00 p.m. in the central and mountain time zones, seven days a week.

Table B.1

MARKET-LEVEL DATA SUMMARY, 1967-1971

Year	Variable	Mean	Standard Deviation	Minimum	Maximum
1967	AUD/TVH	.599	.107	.248	.987
1967	AUD/NWC	.460	.133	.123	.676
1967	NWC/TVH	1.421	.571	.750	5.100
1971	AUD/NWC	.446	.135	.102	.664
1971	NWC/TVH	1.382	.571	.386	5.314
1971	CABLE	.142	.131	.000	.549

is so wide as to make one doubt in advance that this approach will work out very well. At the upper end of the range, it shows nearly all households watching television in prime time; at the lower end, only one-quarter. Both figures are too extreme to be believable. Still, one can hope that the wide variation is random noise superimposed on an underlying pattern and attempt to discern the pattern.

Our provisional assumption that markets are autarkic makes it easy to specify the viewing options in each market: they consist simply of all local stations. Lacking any strong a priori knowledge of the form of the relationship between options and viewing levels, we specify the dummy variable structure shown in Table B.2. We do suspect that network affiliation and perhaps VHF or UHF transmission will affect viewing levels, and the dummy variables are defined to take these factors into account. Table B.3 shows the number of markets that fall into each class.

In our first attempt to relate viewing levels to viewing options, we simply regress prime-time audience divided by ADI TVH on the eleven dummy variables, with the results shown as line (1) in Table B.4. The broad pattern of the coefficients of the network dummies is reasonable: generally speaking, the better network service is; the higher is predicted viewing. The range is from .412 for a one-network UHF market to .643 for a three-network all-VHF market (or, somewhat anomalously, .671 for a three-network all-UHF market). These results are roughly comparable to those of Noll, Peck
also used market-level data. The presence of independent stations has no significant effect on aggregate viewing in this equation. The

*Roger G. Noll, Merton J. Peck, and John J. McGowan, *Economic Aspects of Television Regulation*, The Brookings Institution, Washington, D.C., 1973, p. 52.

Table B.2

DUMMY VARIABLES FOR MARKET-LEVEL ANALYSIS

Number of Networks in Market on UHF Only	Number of Networks in Market on VHF			
	0	1	2	3
0		D1	D2	D3
1	D4	D5	D6	
2	D7	D8		
3	D9			

D10: Markets with at least one VHF independent.

D11: Markets with no VHF independents but at least one UHF independent.

Table B.3

NUMBER OF MARKETS IN DIFFERENT NETWORK CLASSES, 1967 and 1971

Network Class	Number of Markets 1967	Number of Markets 1971
D1	43	38
D2	47	29
D3	80	81
D4	4	4
D5	5	5
D6	10	23
D7	2	2
D8	4	10
D9	8	10
Total	203	202
D10: At least one VHF independent	22	19
D11: No VHF independents but at least one UHF independent	28	34

Table B.4

MARKET-LEVEL REGRESSION RESULTS

	Year	Dependent Variable	Network Service Class 1	2	3	4	5	6	7	8	9	Independent VHF	Independent UHF Only	NWC TVH	Cable	R^2	SEE[a]
(1)	1967	AUD/TVH	.525	.601	.643	.412	.632	.583	.600	.626	.671	-.012	-.007			.237	.096
			(35.88)	(42.33)	(47.08)	(8.57)	(13.62)	(19.00)	(8.83)	(13.04)	(19.71)	(-.52)	(-.30)				
(2)	1967	AUD/NWC	.299	.440	.553	.270	.422	.442	.452	.395	.544	.049	.004			.645	.081
			(24.14)	(36.66)	(47.94)	(6.65)	(10.77)	(17.04)	(7.87)	(9.73)	(18.88)	(2.39)	(.20)				
(3)	1967	AUD/NWC	.497	.588	.674	.432	.578	.579	.588	.559	.671	.034	.001	-.102		.784	.063
			(24.45)	(36.05)	(47.63)	(12.36)	(17.13)	(24.37)	(12.63)	(15.96)	(26.54)	(2.12)	(.07)	(-11.09)			
(4)	1971	AUD/NWC	.265	.419	.538	.219	.295	.431	.348	.430	.518	.072	.015			.737	.072
			(22.74)	(30.57)	(53.96)	(6.10)	(9.17)	(28.15)	(6.85)	(18.93)	(22.77)	(3.85)	(1.02)				
(5)	1971	AUD/NWC	.277	.430	.543	.236	.308	.436	.350	.436	.526	.070	.013		-.050	.738	.072
			(17.35)	(24.73)	(49.94)	(6.01)	(8.92)	(27.13)	(6.88)	(18.56)	(21.98)	(3.21)	(.91)		(-1.06)		
(6)	1971	AUD/NWC	.418	.529	.626	.348	.413	.539	.421	.542	.614	.062	.011	-.077		.808	.067
			(20.15)	(29.98)	(46.33)	(10.12)	(13.35)	(29.33)	(9.49)	(22.97)	(27.18)	(3.87)	(.91)	(-8.40)			
(7)	1971	AUD/NWC	.464	.571	.647	.406	.461	.563	.432	.570	.644	.055	.007	-.085	-.138	.817	.060
			(19.05)	(27.00)	(44.52)	(10.78)	(13.85)	(29.19)	(9.97)	(23.32)	(27.10)	(3.49)	(.56)	(-9.17)	(-3.38)		

[a]Standard error of estimate.

equation, though statistically significant, explains less than one-quarter of the variance of AUD/TVH.

When we abandon the assumption that markets are autarkic, the problem becomes more difficult, for now we must recognize that a market's stations attract some audience from outside its ADI, and stations from other markets attract audience within the first market's ADI. Furthermore, the amount of competition varies from place to place in and around the ADI. We cannot hope to deal definitively with these complexities using market-level data, but we can press on in an *ad hoc* way.

Recognizing that some audience comes from beyond the ADI, we use market net weekly circulation (NWC)* instead of ADI TVH to measure the number of television households in a market's service area. Then the variable to be explained is the fraction of households in the service area that watch the market's stations during prime time, AUD/NWC. The results using 1967 data are shown as line (2) in Table B.4. The pattern is much the same as in line (1): more network signals generally mean higher AUD/NWC. There are, however, two important differences between line (1) and line (2). First, R-squared is nearly tripled to .645. Second, in (2) a VHF independent station adds a statistically significant amount to AUD/NWC.

By using AUD/NWC, we have taken account of the fact that some audience comes from beyond the ADI. We can further improve the explanatory power of the equation by including a variable in recognition of

*Market NWC is defined as the maximum of any station's NWC in the market. Station NWC is the number of households that watch the station's during at least one quarter-hour period per week.

the fact that local stations face out-of-market competition. Out-of-market competition is presumably higher the greater the overlap with adjacent markets; we measure overlap with the ratio of NWC to TVH. This variable has the expected negative sign and is highly significant in line (3); it further increases R-squared to .784 without much changing the relative magnitudes of the other coefficients. Note, however, that there is some danger that the high partial correlation between AUD/NWC and NWC/TVH is a statistical artifact resulting from the use of NWC in creating both variables.

In later years we have data on another measure of out-of-market competition: the percentage of cable households (CABLE) in the market's ADI. Most cable systems carry out-of-market signals, providing good reception of stations that can be received only poorly or not at all over the air. Hence the competition facing local stations is higher in cable than in non-cable households, and so CABLE should be negatively related to AUD/NWC.

We have data on CABLE for 1971. Lines (4) through (7) in Table B.4 show results for that year. Lines (4) and (6) are without the CABLE variable for comparison with lines (2) and (3). Lines (5) and (7) add CABLE to each of the two specifications. In both cases its coefficient is negative as expected. When NWC/TVH is also included in the equation, line (7), it is statistically significant, though small. According to this estimate, the effect of increasing cable penetration from 25 up to 50 percent would be to reduce local station AUD/NWC by .035. For a three-network VHF market with average NWC/TVH, this would be from .496 to .461, a seven percent reduction.

All in all, the picture that emerges from the market-level analysis is that television viewing is quite sensitive to the number of signals available. In all of the Table B.4 equations, expected prime-time viewing differs by a factor of about two between the best-served and the worst-served market classes. But these results are clouded by the difficulties with market-level data discussed above, and so we turn next to an analysis using county-by-county audience data.

B.3. COUNTY-LEVEL ANALYSIS*

The county-level analysis is conceptually cleaner than the market-level analysis in two ways. (1) In the market-level analysis, we were forced to use NWC as a rough measure of households in a market's (amorphous) service area. In the county-level analysis, the number of television households in the county is well-defined. (2) In the market-level analysis, we had no good way to measure the number of out-of-market television signals, a number that in any event varies from place to place in the market. Most counties, though, are small enough geographically so that it is reasonable to assume that they have homogenous television reception throughout.** Thus the number of viewing options can be counted up in a (reasonably) straightforward manner.

Perhaps the main disadvantage of the county data is that some of the samples used by ARB are very small: fewer than ten households in some small counties. Consequently the estimates of viewing levels in some individual counties are not very precise due to sampling error. There are, however, a sufficiently large number of counties to work with so that we can hope to make reasonably precise estimates of *average* viewing in broad *categories* of counties. In particular, we shall classify counties by levels of television service and hope to detect any differences in viewing levels between poorly served and well served counties.

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*In some cases, ARB divides counties into two more-homogeneous parts. We use "county" to mean "county or ARB-defined portions of a county."

**But see Franklin M. Fisher and Victor E. Farrall, Jr., in association with David Belsley and Bridger M. Mitchell, "Community Antenna Television Systems and Local Television Station Audience," *Quarterly Journal of Economics*, May 1966, for an analysis that takes into account differences *within* counties.

In principle, our classification scheme is very simple. We divide counties into five categories:

Category	Number of Networks	Number of Independent Stations
1	1	0
2	2	0
3	3	0
4	3	1 or more
5	less than 3	1 or more

In practice, there are two complications. First, consider a county in which only one station is received--a station that is affiliated with all three networks. Should that county be counted as a one-network county or a three-network county? On the one hand, there is only one network signal available at any given time. But on the other hand, the station presumably chooses the most popular shows from each network and so offers better than one-network service. We run the calculations both ways: (a) considering only the primary affiliation of each station in determining how many networks are received in each county, and (b) considering all affiliations, primary, secondary, and tertiary.

To illustrate the second complication, consider a county that reports viewing of three stations: ABC and CBS affiliates that each receive 49 percent of the audience and an NBC affiliate that receives only 2 percent. Do we really want to classify this as a three-network county? What if the percentages were 46, 46, and 8? Again, we solve the problem by running the calculations in a variety of ways: (a) counting everything, no matter how small its audience in the county; (b) counting a network as received if its affiliates attract at least 5 percent of all viewing in the county and independents as received if they collectively attract at least 2 percent; (c) and (d) successively higher cutoffs as follows:

Cutoff	Network	Independents
(a)	0	0
(b)	5	2
(c)	10	4
(d)	15	6

Combining the two complications, there are eight different ways of putting counties into our five categories. Table B.5 shows the results for all 3094 counties. The table shows several statistics for each category: n, the number of counties in the category; $\bar{x}$, the average percentage of television households watching television during prime time; $s_{\bar{x}}$, the standard error of estimate for $\bar{x}$; $t_{\bar{x}}$, the t statistic for the difference between $\bar{x}$ for the category and the overall mean for all counties; and, where appropriate, t_{adj}, the t statistic for the difference between adjacent category means; for example, between average viewing in one-network and two-network counties.

The same general pattern appears no matter which of the eight ways of assigning counties to categories is used: Total viewing increases slightly but significantly with the level of television service. On the first line, for example, prime-time viewing goes from about 54 percent where only one network is received, to 56 with two networks, 58 with three, and 59 where an independent is added to the three networks. There are so few counties where only one network

Table 8.5

COUNTY-LEVEL ANALYSIS OF PRIME-TIME VIEWING: ALL COUNTIES

(percent of television households)

Cutoff Shares: Net	Cutoff Shares: Ind	1 Network: n	1 Network: $\bar{x}$	1 Network: $s_{\bar{x}}$	1 Network: $t_{\bar{x}}$	1 Network: t_{adj}	2 Networks: n	2 Networks: $\bar{x}$	2 Networks: $s_{\bar{x}}$	2 Networks: $t_{\bar{x}}$	2 Networks: t_{adj}	3 Networks: n	3 Networks: $\bar{x}$	3 Networks: $s_{\bar{x}}$	3 Networks: $t_{\bar{x}}$	3 Networks: t_{adj}	3 Networks and Independen[t]: n	3 Networks and Independen[t]: $\bar{x}$	3 Networks and Independen[t]: $s_{\bar{x}}$
Counting primary affiliation only																			
0	0	11	53.80	2.95	1.54	.75	150	56.16	1.13	1.94	1.64	1737	58.04	.17	1.51	4.87	1189	59.22	.17
5	2	18	54.86	2.11	1.61	.54	295	56.08	.64	3.46	3.24	1842	58.24	.16	.58	4.89	909	59.51	.20
10	4	50	55.55	1.04	2.70	.47	480	56.08	.44	4.95	5.20	1800	58.53	.16	.78	4.92	708	59.92	.23
15	6	96	55.43	.75	3.84	1.50	741	56.41	.32	5.67	6.99	1652	58.90	.16	2.54	4.74	528	60.37	.26
Counting primary, secondary, and tertiary affiliation																			
0	0	6	52.08	4.92	1.28	.96	30	57.06	1.63	.80	.52	1862	57.92	.20	2.02	5.27	1193	59.22	.17
5	2	12	53.39	2.89	1.72	1.21	76	56.29	.92	2.24	1.83	2067	58.00	.17	1.70	5.73	932	59.47	.19
10	4	21	54.37	1.98	2.01	1.11	182	56.08	.56	3.95	3.55	2127	58.16	.16	.97	5.51	742	59.71	.23
15	6	40	54.24	1.31	3.13	1.74	393	56.61	.36	4.52	4.40	2056	58.37	.16	.00	5.67	527	60.08	.26

For all 3094 counties, $\bar{x}$ = 58.40 and $s_{\bar{x}}$ = .13.

n: number of counties

$\bar{x}$: mean prime-time viewing in percent for each service category

$s_{\bar{x}}$: standard error of estimate for $\bar{x}$

$t_{\bar{x}}$: t statistic for the difference of $\bar{x}$ and 3094 county mean

t_{adj}: t statistic for the difference of $\bar{x}$ and the mean for the next service category to the right.

is received that our estimate of $\bar{x}$ for this category is not very precise, but the general pattern is clear and significant.

It might be objected that something other than the level of television service causes the differences in viewing apparent in Table B.5. For example, one- and two-network counties are generally rural, and the people who live there may well have systematically different tastes and opportunities for the use of time than do people who live in cities. To check on this, we ran the calculations reported in Table B.6 for rural counties only.* The results are not substantially different than those for all counties, lending some additional support to the hypothesis that level of service affects total viewing.

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*ARB defines four county sizes as follows:

1. Counties within one of the 26 largest standard metropolitan statistical areas (SMSAs).
2. Counties (not of size 1) with population at least 120,000, or within the metropolitan area of a city in a size 2 county.
3. Counties (not of size 1 or 2) with population at least 32,000, or within the metropolitan area of a city in a size 3 county.
4. All counties not of size 1, 2 or 3.

Table B.6 uses counties of size 3 and 4 only.

Table B.6

COUNTY-LEVEL ANALYSIS OF PRIME-TIME VIEWING: RURAL COUNTIES ONLY

(percent of television households)

Cutoff Shares		1 Network					2 Networks					3 Networks					3 Networks and Independent				Less than 3 Networks and Independent			
Net	Ind	n	$\bar{x}$	$s_{\bar{x}}$	$t_{\bar{x}}$	t_{adj}	n	$\bar{x}$	$s_{\bar{x}}$	$t_{\bar{x}}$	t_{adj}	n	$\bar{x}$	$s_{\bar{x}}$	$t_{\bar{x}}$	t_{adj}	n	$\bar{x}$	$s_{\bar{x}}$	$t_{\bar{x}}$	n	$\bar{x}$	$s_{\bar{x}}$	$t_{\bar{x}}$
Counting primary affiliation only																								
0	0	11	53.80	2.95	1.47	.74	149	56.12	1.13	1.61	1.49	1588	57.84	.18	.54	2.53	917	58.53	.21	2.26	7	56.82	2.42	.47
5	2	18	54.86	2.11	1.43	.52	292	56.04	.65	3.89	2.98	1668	58.04	.17	.37	2.56	664	58.77	.23	2.99	30	56.90	1.35	1.08
10	4	50	55.55	1.04	3.30	.43	475	56.04	.45	4.09	5.62	1609	58.33	.17	1.67	2.51	485	59.14	.28	5.83	53	56.00	.95	2.05
15	6	96	55.43	.79	3.30	.97	727	56.37	.33	4.44	6.36	1447	58.65	.17	3.07	1.90	330	59.43	.37	3.72	72	56.73	.77	1.56
Counting primary, secondary, and tertiary affiliation																								
0	0	6	52.08	4.92	1.19	.91	29	56.82	1.71	.66	.52	1713	57.71	.19	1.04	2.91	921	58.53	.21	2.26	3	54.49	4.98	.70
5	2	12	53.39	2.89	1.58	.93	75	56.20	.92	1.89	1.70	1891	57.80	.18	.71	3.04	687	58.70	.24	2.66	7	57.10	3.87	.25
10	4	21	54.37	1.98	1.80	.81	181	56.04	.57	3.29	3.25	1932	57.96	.17	.00	3.07	516	58.94	.27	3.20	22	56.53	1.58	.90
15	6	40	54.24	1.31	2.82	1.74	386	56.61	.33	3.42	3.72	1844	58.12	.17	.72	2.52	368	59.10	.35	3.03	34	57.27	1.20	.58

For all 2672 rural counties, $\bar{x}$ = 57.96 and $s_{\bar{x}}$ = .14.

n: number of counties

$\bar{x}$: mean prime-time viewing in percent for each service category

$s_{\bar{x}}$: standard error of estimate for $\bar{x}$

$t_{\bar{x}}$: t statistic for the difference of $\bar{x}$ and 2672 county mean

t_{adj}: t statistic for the difference of $\bar{x}$ and the mean for the next service category to the right.

B.4. CONCLUSION

The two seemingly conflicting analyses in this appendix correspond to two conflicting strands in past research. On the one hand, our market-level analysis indicates that additional signals have a substantial effect on aggregate viewing levels. This matches Noll, Peck, and McGowan's conclusion, which was also based on market-level data. On the other hand, it has been frequently assumed (e.g., Park, 1973),* or asserted based on rather casual evidence (e.g., Owen, Beebe, and Manning, 1973; FCC, 1969),** that total audience does not depend on the choice of signals. This is (approximately) supported by our county-level analysis, where we find that additional signals add only slightly to total audience.

Which conclusion is correct? In a sense both are, but they are conclusions about different effects. It is important for modeling and forecasting to understand the difference.

Consider the following example, which is consistent with both sets of results. Market A is a three-network market surrounded by other three-network markets. Within A's ADI, 58 percent of households watch television during prime time. Both county-level and market-level data show total ratings of 58. Market B is a two-network market surrounded by three-network markets. Within B's ADI,

*Park, Rolla Edward, *New Television Networks*, The Rand Corporation, R-1408-MF, December 1973; abridged version appears in *Bell Journal of Economics*, Autumn 1975.

**Owen, Bruce M., Jack H. Beebe, and Willard G. Manning, Jr., *Television Economics*, D. C. Heath, Lexington, Ma., 1974; Federal Communications Commission, "The Economics of the TV-CATV Interface," prepared by the Research Branch, Broadcast Bureau, Washington, D.C., July 15, 1970.

total viewing is the same as in A's: 58 percent. But a substantial share of this total is watching the third network signal from adjacent markets. Thus the total rating for Market B's two stations is substantially less than 58 percent.

The county-level results are correct in showing that total viewing in any given geographical area is only slightly affected by the number of signals received there. The market-level results are correct in showing how that total is shared among adjacent markets with different numbers of local stations.

Appendix C

TELEVISION MARKET REVENUE

C.1. INTRODUCTION

Fisher, et al. (1966) and Park (1970)* have reported strong linear relationships between television station audience and revenue. Regressing 1963 net broadcast revenue, r, on March 1964 prime-time** audience, a_p, Fisher obtained

$$r = 103.3 + 26.63\, a_p \quad \text{(C.1)}$$
$$\quad (2.28) \quad (68.\ \ )$$

The numbers in parentheses are t statistics and the coefficient of determination (R^2) is .897. Using 1968 data, Park obtained

$$r = 13.4 + 43.20\, a_p \quad \text{(C.2)}$$
$$\quad (0.22) \quad (81.34)$$

with R^2 = .924***

Although both equations look quite good by conventional standards -- high R^2, high t statistics --, there are several reasons for trying to

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*Fisher, Franklin M., and Victor E. Ferrall, Jr., in association with David Belsey and Bridger M. Mitchell, "Community Antenna Television Systems and Local Television Station Audience," *Quarterly Journal of Economics*, May 1966, pp. 227-251;

Park, Rolla Edward, *Potential Impact of Cable Growth on Television Broadcasting*, The Rand Corporation, R-587-FF, October 1970.

**As defined by ARB: 7:30-11:00 p.m. in the eastern and Pacific time zones, 6:30-10:00 p.m. in the central and mountain time zones seven days a week.

***The difference between the two estimated coefficients of a_p is largely due to three factors: (1) price inflation over the five-year period between the estimates; (2) an increase in the real value of audience to advertisers; and (3) a downward bias in Fisher's estimate due to regressing (smaller) 1963 revenue on (larger) 1964 audience.

go beyond them in our present work. Most compelling, perhaps, is the fact that these equations constrain the value of audience to be the same in all markets; for example, a viewing household is assumed to be worth as much in a poor market as in a rich one. A look at the data (Section C.2) shows that there is considerable market-to-market variation in the amount of revenue per viewing household. In the work reported here, we explain some of this variation.

Another reason has to do with the fact that we plan to use our results for prediction. R^2 is scaled wrong to be a very good measure of predictive merit. A better one is the standard error of estimate (SEE), which (ignoring correction for degrees of freedom) equals $\sqrt{1-R^2}$ times the sample standard deviation. So while the equations leave only one-tenth or so of the sample variance unexplained, their SEE is about .3 times the sample standard deviation. Since the sample standard deviation is itself very large, SEE for the two equations is large. The equations developed here are more precise predictors. (Some uncertainty is, of course, inevitable. Even with an R^2 as high as .99, an equation has an SEE of .1 times sample standard deviation.)

Additional reasons have to do with the statistical properties of the estimates. For one thing, the error variance in equations (C.1) and (C.2) is certainly larger for large stations than for small stations. In the presence of this heteroscedasticity, the reported coefficients are estimated inefficiently and the reported t statistics are biased upward. In our estimates we attempt to stabilize the error variance.

For another thing, depending on the model assumed, the estimates in (C.1) and (C.2) may be subject to simultaneous equation bias. Certainly a_p is an endogenous variable, since it is affected by station programming decisions. Therefore, unless it is determined "above" r in a recursive system, it does not belong on the right hand side of an equation estimated by ordinary least squares.

In the remainder of this section we discuss the data that are used in the study (Section C.2) and fit two different sets of equations using data that are now available extending through 1972 (Section C.3). In Section C.4, we subject the methods of Section C.3 and others to a hard test of their predictive merit: Pretending to stand in 1967, we compare the various methods as predictors of 1972.

C.2. THE DATA

The data used are summarized in Table C.1 and discussed in this section. Table C.1 shows summaries for 1967 and 1972 only. These two years play special roles in our analysis in this note, although data for the full ten-year period 1963-72 were also used in some cases.

THE SAMPLE

Our unit of observation is ARB-defined areas of dominant influence (ADIs). These make up an exhaustive and mutually exclusive geographic partitioning of the United States. Each ADI includes all counties (or in some cases portions of counties) in which a particular market's stations capture a plurality of viewing hours. Some cities that are traditionally considered to be separate television markets (such as Akron, Ohio) have no ADI. For our purposes, stations in such markets are assigned to the ADI in which they are located (Cleveland, in the case of Akron). Also, satellite stations are considered to be simply extensions of their parents. Data for satellites, when separately reported, are added to those for the parent and the aggregate entity is treated as a single station.

Only markets within the 48 contiguous states are analyzed. Border markets -- those whose stations attract a large fraction of their audience from outside the U.S. -- are excluded from our analysis because we do not have data on foreign audiences.

Table C.1

TELEVISION MARKET REVENUE: DATA SUMMARY

Item	1967 (196 Markets)				1972 (195 Markets)			
	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Network revenue	1,488,000	1,979,600	62,290	19,176,000	1,089,500	1,366,400	40,232	13,166,000
National and regional spot revenue	5,340,800	14,938,000	36,677	143,348,000	5,694,600	14,531,100	38,150	138,980,000
Local spot revenue	2,220,500	3,115,400	40,283	25,370,000	3,806,400	5,820,[illegible]	41,272	50,002,000
Net broadcast revenue	8,062,300	17,121,000	178,160	160,560,000	9,311,100	18,283,000	113,500	159,430,000
Average daily audience	97,900	194,700	1,200	2,081,700	117,400	215,800	1,000	2,156,000
Network r/a	20.59	8.29	8.38	78.20	13.71	7.45	5.52	58.54
National and regional spot r/a	33.71	17.29	5.09	110.50	33.99	15.12	10.58	100.57
Local spot r/a	28.66	10.56	8.46	76.43	37.43	15.51	13.04	132.82
Net broadcast r/a	77.37	17.13	44.27	153.65	77.99	23.14	41.69	199.35
Television households	275,000	526,000	9,000	5,537,000	317,000	581,000	4,000	5,984,000
Retail sales/TVH	6,674	807	4,977	9,619	6,301	1,059	3,794	12,188
	Number				Number			
1-station markets	43				40			
2-station markets	43				28			
3-station markets	72				86			
4-or-more station markets	38				41			

REVENUE

Our revenue figures come from FCC files of financial reports made annually by all U.S. commercial television stations. Four different revenue figures are reported: three by type of revenue and one all-inclusive figure. The categories are network, national and regional spot, and local spot. The all-inclusive figure, net broadcast revenue, is the sum of the three categories plus a generally small amount of non-timesale revenue less commissions to advertising agencies and representative agencies.

In this appendix, we ignore two possible problems with the revenue data. First, the allocation of reported revenue between national-regional spot and local spot is somewhat arbitrary. Thus the sum of the two spot categories may be more reliably measured than is either one individually. This argues in favor of analyzing total spot revenue rather than national-regional and local separately, but we do not do so here.

Second, network revenue is not strictly comparable with spot revenue. The latter reflects the full amount paid by advertisers, but the former does not. Network advertisers do not pay stations directly; they pay the networks. The networks retain a large part of this revenue as implicit compensation for network programs fed to the stations without explicit charge. This clouds the meaning of figures that include the sum of network and spot revenue, and argues (perhaps) for analyzing only the separate figures. In this note, however, we do parallel analyses of all four reported revenue figures.

All revenue figures for our sample period 1963-72 are inflated to 1972 dollars using the implicit price deflators for total gross national

product reported in *Economic Report of the President* (1973).*
Market revenue figures are obtained by adding together the figures for all stations in the market.

AUDIENCE

Our audience data are based on ARB estimates of the average number of households tuned to each station between 9 a.m. and 12 p.m. Monday through Sunday. This is a more comprehensive measure than the prime-time audience figures used by Fisher and Park in the work described in Section C.1, but it is highly correlated with prime-time audience. The estimates for each year are averages for the February/March survey that year and the November survey of the previous year. Station audience figures are added together to get market audience.

REVENUE/AUDIENCE RATIOS

These figures are obtained simply by dividing each of the four revenue figures for each market by total market average daily audience. It is convenient to think of and refer to the resulting figures as "price" of audience, although that is only a rough, heuristic interpretation.

TELEVISION HOUSEHOLDS

ARB estimates the number of television households (TVH) in each ADI as of several dates scattered through our ten-year time period, as shown by the triangles above the time line in Fig. C.1. We interpolated

Economic Report of the President, U.S. Government Printing Office, Washington, D. C., 1973, p.196.

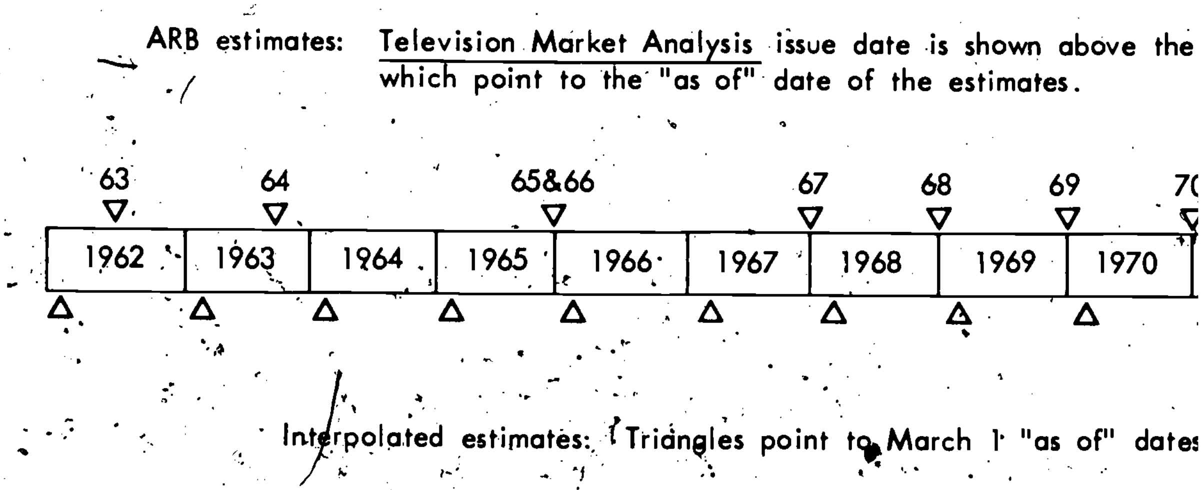

Fig. C.1 — Interpolation of ARB estimates of television household
in area of dominant influence (ADI)

linearly between the ARB estimates to produce our own estimates evenly spaced throughout the period at March 1 of each year.

RETAIL SALES/TELEVISION HOUSEHOLD

Our measure of the affluence of each market is calculated by dividing annual ADI retail sales is reported by ARB by our interpolated estimates of TVH. Like revenue, these sales figures are inflated to 1972 dollars using the implicit GNP price deflator.

MARKET RANK

The top 100 market rankings are assigned according to the list in the cable television regulations, FCC (1972).* The rest of the rankings are assigned in order of 1972 ARB prime-time television households.

*Federal Communications Commission, Cable Television Report and Order in Dockets 18397, 18397-A, 18373, 18416, 18892 and 18894, 37 Fed. Reg. 3252-3341, February 12, 1972.

C.3. 1972-BASED ESTIMATION

In this section we report on two methods of estimating revenue using data now available. First is a cross section regression approach that avoids some of the problems with the work of Fisher and Park discussed in Section C.1. Second is an analysis of covariance approach that uses data for the full 1963-72 period and allows for the existence of persistent market effects.

CROSS-SECTION REGRESSION

Under this approach we use 1972 data to estimate a set of relationships between "price" of audience and market characteristics. The equations estimated allow for the possibility of the following effects:

1. We expect that the "price" of audience will be higher in rich markets than in poor markets, and so include retail sales/TVH in the equations.

2. We expect that "price" may vary systematically with market size for any number of reasons, and so include TVH and TVH^2 in the equations.

3. Market rank is of course correlated with market size, but it may independently affect "price." For example, we know that spot advertisers sometimes buy markets from the top down until their budget is exhausted. To capture effects of market rank, we include dummy variables T10, T25, T50, T100 and T200, which equal one for markets 1-10, 11-25, 26-50, 51-100, 101-222, respectively, and zero otherwise.

4. Competition among more stations might be expected to lead to a lower "price." This is especially true of network revenue: With only one or two stations in the market, the networks will bid up compensation competing for affiliates. With four or more stations, the stations will bid down compensation competing for affiliation. To capture this effect, we include dummy variables D1, D2, D3, and D4 which equal 1 for one-station, two-station, three-station and four-or-more-station markets, respectively.

Estimating the resulting equations, we found that the T dummies failed to explain significant additional variance when the D dummies were already in the equations, and similarly, the Ds did not contribute significantly when added to the Ts. Consequently, in each final equation, we included only the set of dummies that contributed more to that equation: the Ds for network revenue, the Ts for the others. Also, TVH and TVH^2 were not significant in the local spot and net broadcast revenue equations (t statistics were less than one), and were dropped in the final version.

The final estimates, shown in Table C.2, are generally consistent with our prior expectations, but their explanatory power is disappointingly low.

ANALYSIS OF COVARIANCE

The factors included in our cross-section regressions fail to explain very much of the market-to-market variation in "price" of audience. We made several attempts to find additional factors that would substantially increase the explanatory power of these equations.

Table C.2

1972 CROSS SECTION REGRESSION RESULTS FOR TELEVISION REVENUE

Dependent Variable	D1	D2	D3	D4	T10	T25	T50	T100	T200	Sales / TVH	1000 / TVH	$\left(\frac{1000}{TVH}\right)^2$	R^2	SEE[a]
Network r/a	12.42 (4.22)	9.06 (2.99)	6.72 (2.31)	5.76 (1.69)						.116 (2.67)	-.640 (-2.51)	.0000944 (2.03)	.291	6.39
National-regional spot r/a					18.25 (1.48)	26.94 (3.53)	16.52 (2.81)	9.54 (1.80)	13.86 (2.79)	.207 (2.75)	2.58 (2.96)	-.000344 (-2.72)	.509	10.82
Local r/a					7.54 (0.97)	16.54 (2.26)	15.23 (2.37)	8.71 (1.30)	19.39 (2.93)	.349 (3.48)			.155	14.48
Net broadcast r/a					48.86 (4.30)	51.74 (4.86)	40.33 (4.31)	27.06 (2.77)	44.57 (4.63)	.596 (4.08)			.197	21.06

NOTE: Figures in parentheses are t-statistics.

[a]Standard error of estimate.

These efforts, which included interviews with station representatives and experimentation with additional explanatory variables, were not successful. Thus we turned to the analysis of covariance approach described here.

The idea behind this approach is that there are a whole host of factors that affect "price" of audience in a particular market: the age, occupation, education, race, and income distribution of its population; its climate; its industrial, commercial and financial make-up; activities, tastes, and opportunities of its population -- anything that affects the advertising buyer's image of the market. There are far too many potentially important factors to include them all in a regression equation, even if they were all measurable. But if we hypothesize that this complex of market characteristics is relatively stable over time, we can capture its effect with a set of dummy variables, one for each market.

To estimate these persistent market effects, we must of course have more than one observation per market. Thus we turn to the 1963-72 panel data and estimate equations of the form

$$r/a = \alpha_i + \beta_t + \Sigma\gamma_j x_j \qquad (C.3)$$

where α_i is the persistent market effect for market i, β_t is a year effect for year t, and the x_j are the independent variables included in our cross-section equations.

When equation (C.3) was estimated, the coefficients of the x_j turned to be generally insignificant. Fig. C.2 shows a simplified picture of wha to be happening. Assume we have observations on r/a and retail sales/TVH three markets in each of three years. The observations for each market are clustered as shown in the figure. Then a cross section regression would estimate the sloping line and show a significant relationship between r/a and sales/TVH. However, when individual market dummies are included for the analysis of covarience, the regression fits lines that have separate intercepts for each market and a common slope determined by the within-market relationship between r/a and sales/TVH. Apparently there is too little within-market variation to produce statistically significant slope estimates in our analysis of covariance.

Consequently, the analyses were rerun with just the market and time dummies in the equation. The results are shown in Table C.3 (which shows the year effects and goodness-of-fit measures for each equation) and Table C.4, which shows the persistent market effects.

The analysis of covariance approach has substantially higher explanatory power than does the cross section regression approach, strongly suggesting the importance of persistent market effects.

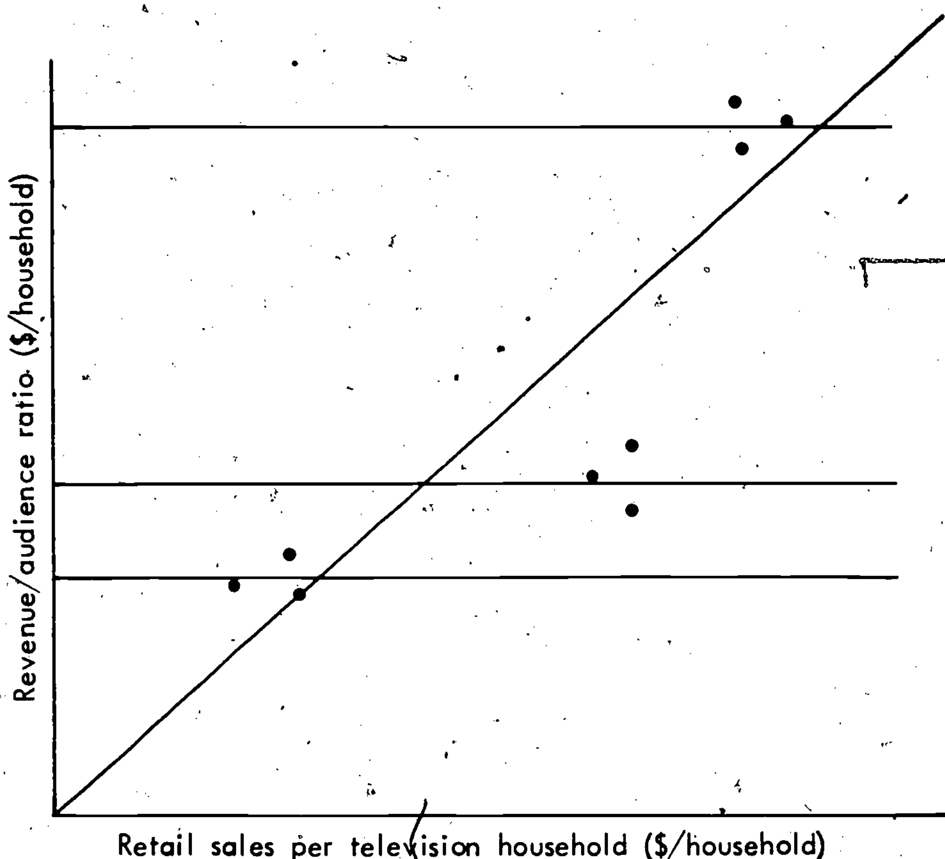

Fig. C.2 — Simplified example of analysis of covariance (conceptual)

Table C.3

1963-72 ANALYSIS OF COVARIANCE: YEAR EFFECTS

Dependent Variable	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	R^2	SEE
Network r/a	5.93	7.19	7.23	5.87	6.83	6.74	5.88	4.78	2.79	0.0	.763	4.27
	(13.64)	(16.63)	(16.72)	(13.57)	(15.78)	(15.61)	(13.61)	(11.10)	(6.48)			
National-regional spot r/a	-.40	3.29	3.54	1.05	-.36	3.24	2.99	2.86	-.81	0.0	.904	5.73
	(-0.68)	(5.66)	(6.10)	(1.81)	(-0.61)	(5.59)	(5.15)	(4.95)	(-1.40)			
Local spot r/a	-11.49	-8.73	-9.45	-9.92	-8.51	-4.34	-3.47	-1.44	-.87	0.0	.819	6.37
	(-17.71)	(-13.52)	(-14.63)	(-15.36)	(-13.18)	(-6.72)	(-5.38)	(-2.25)	(-1.35)			
Net broadcast r/a	-3.48	3.21	2.31	-1.78	-.38	6.10	5.31	6.14	1.55	0.0	.759	10.89
	(-3.14)	(2.91)	(2.49)	(-1.62)	(-0.35)	(5.54)	(4.82)	(5.59)	(1.41)			

NOTES: Year effects are estimated relative to 1972 (0.0).
Figures in parentheses are t statistics.

Table C.4

1963-72 ANALYSIS OF COVARIANCE: MARKET EFFECTS

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
1 NY NY	3.25	2.36	64.74	34.91	17.74	8.61	74.97	21.28
2 LA CA	4.01	2.90	90.77	48.95	41.00	19.89	113.17	32.13
3 CHCAGOIL	4.97	3.60	85.44	46.07	27.96	13.56	104.53	29.67
4 PHIL PA	5.71	4.14	60.67	32.71	25.86	12.54	76.73	21.78
5 DTROITMI	6.23	4.51	53.79	29.01	28.95	14.04	75.65	21.48
6 BOSTONMA	5.66	4.10	73.16	39.45	29.52	14.32	89.43	25.39
7 SF CA	7.46	5.40	101.67	54.83	40.87	19.83	127.35	36.15
8 CLVLNDOH	6.29	4.55	55.10	29.71	28.91	14.02	81.37	23.10
9 WASH DC	5.71	4.14	70.79	38.18	28.44	13.80	95.39	27.08
10 PITT PA	6.90	4.99	53.88	29.06	26.97	13.08	74.28	21.09
11 STLOUSMO	7.06	5.11	62.87	33.90	25.79	12.51	80.49	22.85
12 DALLASTX	7.30	5.28	64.20	34.62	42.63	20.68	101.76	28.89
13 MINN MN	8.19	5.93	58.06	31.31	46.62	22.61	101.06	28.69
14 BALT MD	8.74	6.33	66.38	35.80	35.50	17.22	94.37	26.79
15 HOUSTNTX	8.20	5.94	72.21	38.94	37.30	18.09	101.88	28.92
16 INDPLSIN	6.45	4.67	53.32	28.75	37.55	18.21	85.10	24.16
17 CINCI OH	9.31	6.74	46.93	25.31	29.53	14.32	79.35	22.53
18 ATLANTGA	7.30	5.28	62.17	33.52	40.19	19.50	93.23	26.47
19 HARTFDCN	10.86	7.86	78.33	42.24	27.93	13.55	99.75	28.32
20 SEATLEWA	7.34	5.31	62.97	33.96	34.03	16.51	89.18	25.31
21 MIAMI FL	7.60	5.50	75.32	40.62	40.36	19.58	108.71	30.86
22 KANCTYMO	8.85	6.41	61.04	32.92	32.83	15.92	87.25	24.77
23 MILWAUWI	9.67	7.00	60.61	32.68	37.36	18.12	91.78	26.05
25 SACRA CA	7.30	5.29	58.45	31.52	35.34	17.14	85.55	24.29
26 MEMPH TN	9.24	6.69	36.83	19.86	26.86	13.03	64.96	18.44
27 COLUMBOH	8.05	5.83	56.88	30.67	40.27	19.53	91.92	26.09
28 TAMPA FL	6.96	5.04	47.36	25.54	33.27	16.14	75.14	21.33
29 PORTLNOR	9.33	6.76	56.62	30.53	32.92	15.97	85.31	24.22
30 NASHVLTN	7.17	5.19	28.92	15.60	32.59	15.81	61.68	17.51
31 NEWORLLA	9.01	6.52	46.46	25.06	45.69	22.16	87.52	24.84
32 DENVERCO	8.22	5.95	65.89	35.53	48.59	23.57	107.83	30.61
33 PROVIDRI	12.47	9.03	53.43	28.81	26.57	12.89	78.05	22.16
34 ALBANYNY	11.42	8.27	48.00	25.89	27.07	13.13	74.01	21.01
35 SYRACUNY	10.82	7.83	50.02	26.97	23.60	11.45	71.75	20.37
36 CHARLSWV	11.55	8.37	24.35	13.13	24.32	11.80	54.31	15.42
37 GRNDRPMI	14.58	10.56	54.11	29.18	23.67	11.48	84.61	24.02
38 LOUSVLKY	12.71	9.20	46.87	25.27	32.65	15.84	81.04	23.00
39 OKCITYOK	11.62	8.42	52.84	28.50	29.80	14.45	82.94	23.54
40 BRIM AL	17.43	12.62	42.22	22.77	29.27	14.20	78.14	22.18
41 DAYTONOH	14.01	10.14	44.64	24.07	40.29	19.54	87.46	24.83
42 CHARLTNC	16.45	11.91	50.34	27.14	31.63	15.34	89.12	25.30
43 PHOENXAZ	7.09	5.14	58.46	31.52	56.45	27.38	108.36	30.76
44 NORFLKVA	11.86	8.59	30.95	16.69	37.07	17.98	71.65	20.34
45 SANANTTX	9.70	7.02	38.14	20.57	40.38	19.59	76.17	21.62

Table C.4
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
46 GRNVLESC	8.51	6.16	35.77	19.29	21.60	10.48	58.26	16.54
47 GRNBRONC	11.78	8.53	35.18	18.97	30.51	14.80	67.86	19.26
48 SALTLKUT	8.30	6.01	37.25	20.09	40.74	19.76	78.88	22.39
49 WLKSBRPA	9.02	6.53	23.50	12.67	24.86	12.06	50.91	14.45
50 LITLRKAR	6.90	5.00	24.59	13.26	34.60	16.78	59.49	16.89
52 TOLEDOOH	18.76	13.59	46.54	25.10	33.60	16.30	86.65	24.60
53 OMAHA NE	13.75	9.96	39.49	21.29	31.13	15.10	76.26	21.65
54 TULSA OK	9.86	7.14	35.82	19.32	33.99	16.48	70.66	20.06
55 ORLAN FL	8.88	6.43	34.21	18.45	34.53	16.75	67.60	19.19
56 ROCHESNY	15.48	11.21	41.99	22.65	38.22	18.54	83.95	23.83
57 HARISBPA	16.60	12.02	45.87	24.74	31.17	15.12	80.17	22.76
58 SHRVPTLA	8.96	6.49	24.81	13.38	25.35	12.29	51.41	14.59
59 MOBILEAL	8.98	6.50	25.66	13.84	27.91	13.54	56.22	15.96
60 DAVENPIA	14.74	10.68	29.11	15.70	19.39	9.40	57.48	16.32
61 FLINT MI	11.08	8.02	41.40	22.32	33.84	16.41	74.49	21.15
62 GRNBAYWI	9.59	6.95	23.56	12.70	25.90	12.56	55.79	15.84
63 RICHMNVA	11.84	8.57	31.96	17.23	33.84	16.41	69.69	19.78
64 SPRNGFIL	12.42	8.99	35.22	18.99	39.10	18.97	79.30	22.51
65 CORRAPIA	10.74	7.78	29.12	15.71	27.73	13.45	60.64	17.21
66 DMOINEIA	11.11	8.04	41.24	22.24	31.73	15.39	73.94	20.99
67 WICHTAKS	11.59	8.39	27.22	14.68	34.95	16.95	68.01	19.31
68 JKSNVLFL	12.49	9.04	58.69	31.65	33.44	16.22	90.21	25.61
69 PADUCAKY	10.24	7.41	24.17	13.03	16.37	7.94	46.21	13.12
70 ROANOKVA	11.38	8.24	25.94	13.99	28.57	13.86	59.45	16.88
71 KNOXVLTN	11.25	8.15	32.56	17.56	26.51	12.86	62.87	17.85
72 FRESNOCA	10.17	6.97	41.51	21.18	34.22	15.71	73.06	19.63
73 RALEIGNC	24.39	17.66	38.29	20.65	29.06	14.10	81.82	23.23
74 JOHNSTPA	16.29	11.79	26.62	14.36	20.18	9.79	58.59	16.63
75 PORTLNME	12.91	9.35	30.64	16.52	28.38	13.77	64.90	18.42
76 SPOKANWA	9.38	6.79	33.71	18.18	23.27	11.29	56.52	16.04
77 JACKSNMS	9.51	6.89	21.91	11.82	31.57	15.31	58.26	16.54
78 CHATTNTN	9.65	6.99	22.35	12.05	29.69	14.40	55.45	15.74
79 YGSTN OH	8.97	6.49	26.95	14.53	23.00	11.16	53.18	15.10
80 SBEND IN	8.93	6.46	23.01	12.41	30.43	14.76	57.16	16.22
81 ALBUQ NM	10.70	7.75	24.57	13.25	47.66	23.12	73.22	20.78
82 FTWAYNIN	11.28	8.17	33.81	18.23	35.63	17.28	71.66	20.34
83 PEORIAIL	11.97	8.67	28.96	15.62	37.71	18.29	70.38	19.98
84 GRNVLENC	12.15	8.79	27.57	14.87	26.94	13.07	62.20	17.66
85 SIOUXFSD	15.74	11.40	34.56	18.63	24.36	11.81	69.24	19.66
86 EVANSVIN	13.33	9.65	23.48	12.66	37.86	18.36	68.27	19.38
87 BATONRLA	9.72	7.04	21.99	11.86	50.07	24.28	74.59	21.17
88 BEAUMTTX	10.13	7.33	23.02	12.41	33.04	16.02	58.07	16.49
89 DULUTHMN	17.38	12.59	25.25	13.62	26.25	12.73	65.97	18.73
90 WHLINGWV	14.67	10.62	28.86	15.56	18.81	9.12	57.15	16.22

Table C.4.
(contd)

	MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
91	LINCLNNE	15.96	11.55	30.36	16.37	34.39	16.68	74.87	21.25
92	LANSNGMI	12.84	9.29	40.78	21.99	26.14	12.68	71.56	20.31
93	MADISNWI	13.07	9.47	40.69	21.94	29.16	14.14	74.87	21.25
94	COLUMBGA	17.33	12.55	16.02	8.64	33.32	16.16	63.27	17.96
95	AMARILTX	9.17	6.64	20.79	11.21	43.07	20.89	68.55	19.46
96	HUNTSVAL	9.62	6.97	23.73	12.80	43.89	21.29	72.74	20.65
97	ROCKFDIL	23.69	17.16	24.21	13.05	46.42	22.52	89.89	25.52
98	FARGO ND	17.42	12.61	24.60	13.27	39.81	19.31	79.31	22.52
99	MONROELA	14.06	10.18	23.98	12.93	32.97	15.99	64.89	18.42
100	COLUMBSC	13.30	9.63	44.17	23.82	36.15	17.54	86.26	24.49
101	SALNASCA	15.59	11.29	43.15	23.27	39.25	19.04	90.14	25.59
103	WPALMBFL	7.65	5.54	29.10	15.69	64.91	31.48	100.87	28.63
104	SPRNGFMA	9.87	7.15	37.58	20.26	42.53	20.63	78.15	22.18
105	BINGHMNY	19.74	14.29	31.86	17.18	37.39	18.14	79.65	22.61
106	WILMNGNC	11.44	8.28	19.55	10.54	37.91	18.39	68.67	19.49
108	AUGUSTGA	22.66	16.41	18.58	10.02	38.01	18.44	76.13	21.61
109	BRSTOLVA	12.95	9.38	24.35	13.13	26.32	12.77	58.81	16.69
110	LAFAYTLA	7.06	5.11	17.86	9.63	46.92	22.76	67.85	19.26
111	TRREHTIN	17.38	12.59	24.50	13.21	28.39	13.77	64.51	18.31
112	MONTGMAL	15.37	11.13	36.10	19.47	36.22	17.57	81.83	23.23
114	LUBUCKTX	17.40	12.60	26.02	14.03	54.45	26.41	92.25	26.19
115	ALBANYGA	10.38	7.52	27.01	14.57	27.48	13.33	59.29	16.83
116	SIOUXCIA	20.45	14.81	26.03	14.04	27.72	13.45	67.53	19.17
118	CHARLSSC	16.76	12.14	19.49	10.51	38.39	18.62	68.45	19.43
119	ERIE PA	21.33	15.45	22.66	12.22	36.69	17.79	73.16	20.77
120	TALLAHFL	11.72	8.48	27.58	14.87	35.52	17.23	69.39	19.70
121	WACO TX	14.52	10.52	29.62	15.97	37.90	18.38	74.36	21.11
122	JOPLINMO	14.59	10.56	23.95	12.91	22.84	11.08	57.68	16.37
123	SPRNGFMO	10.67	7.72	25.88	13.96	34.37	16.67	66.34	18.83
124	LXNGTNKY	11.27	8.16	31.73	17.11	38.96	18.90	77.12	21.89
125	FLORNCSC	14.18	10.26	21.60	11.65	39.98	19.39	71.46	20.29
126	AUSTINTX	16.46	11.92	57.90	31.22	51.37	24.91	115.57	32.81
127	TOPEKAKS	10.80	7.82	36.09	19.46	35.87	17.40	77.96	22.13
128	ROCHESMN	15.02	10.88	18.96	10.22	34.13	16.55	64.58	18.33
129	DOTHANAL	13.46	9.75	21.85	11.78	33.14	16.07	66.03	18.74
130	STJO MO	23.73	17.19	21.70	11.70	48.63	23.59	86.35	24.51
131	WICHFLTX	10.20	7.39	19.02	10.26	39.73	19.27	65.69	18.65
132	TRAVRSMI	15.31	11.09	21.27	11.47	29.33	14.23	62.38	17.71
133	LACROSWI	13.17	9.54	28.86	15.57	33.70	16.35	71.08	20.18
134	UTICA NY	24.21	17.53	39.89	21.51	37.62	18.25	98.13	27.86
135	ALEXNDLA	6.81	4.93	31.37	16.92	42.11	20.43	71.30	20.24

Table C.4
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
136 TUCSONAZ	9.47	6.86	30.99	16.71	56.86	27.58	86.44	24.54
137 YAKIMAWA	23.96	17.35	26.90	14.51	39.88	19.34	81.73	23.20
138 CORPUSTX	11.12	8.05	23.91	12.89	39.90	19.35	67.07	19.04
139 BAKERSCA	17.93	12.98	31.64	17.06	49.42	23.97	91.90	26.09
140 SNBARBCA	26.05	18.86	40.93	22.07	53.88	26.14	107.84	30.61
141 MACON GA	11.54	8.35	28.47	15.36	33.65	16.32	68.01	19.31
142 CHICO CA	15.83	11.46	23.16	12.49	38.69	18.77	70.23	19.94
143 QUINCYIL	21.52	14.75	18.30	9.34	31.86	14.62	67.03	18.01
144 ELPASOTX	10.31	7.47	26.88	14.50	54.52	26.45	84.80	24.07
145 COLSPRCO	10.15	7.35	28.30	15.26	37.52	18.20	66.63	18.91
146 EUGENEOR	7.71	5.58	36.64	19.76	49.13	23.83	85.51	24.27
147 BLUFLDWV	9.70	7.02	7.93	4.28	25.08	12.16	40.21	11.41
148 COLUMBMO	14.26	10.33	24.48	13.20	29.09	14.11	61.16	17.36
149 BILOXIMS	8.99	6.19	14.03	7.19	69.93	32.26	86.92	23.47
150 SAVANAGA	12.81	9.28	17.65	9.52	33.66	16.33	62.08	17.62
151 TYLER TX	20.13	14.57	26.72	14.41	52.54	25.48	94.26	26.76
152 ALEXNDMN	6.35	4.60	25.21	13.60	26.58	12.89	61.89	17.57
153 BANGORME	19.00	13.76	16.74	9.03	32.64	15.83	64.67	18.36
154 WAUSAUWI	19.70	14.26	20.61	11.12	37.36	18.12	74.78	21.23
155 GRNWD MS	18.62	13.48	7.13	3.85	33.34	16.17	57.08	16.20
156 PANAMAFL	9.14	6.62	15.76	8.50	41.58	20.17	64.77	18.39
157 MINOT ND	13.43	9.72	24.37	13.14	42.68	20.70	83.17	23.61
158 ODESSATX	10.23	7.41	23.50	12.67	39.30	19.06	71.08	20.18
159 MERID MS	15.87	11.49	14.32	7.72	28.20	13.68	54.45	15.46
160 BOISE ID	18.94	13.71	23.17	12.49	40.87	19.82	77.88	22.11
161 LVEGASNV	8.22	5.95	29.04	15.66	108.50	52.63	141.79	40.25
162 ABILENTX	14.52	10.52	19.93	10.75	41.15	19.96	71.29	20.24
163 OTUMWAIA	22.57	16.34	17.32	9.34	31.69	15.37	70.24	19.94
164 FTSMTHAR	11.48	8.31	21.06	11.36	50.49	24.49	75.68	21.48
165 COLUMBMS	11.29	8.18	14.73	7.95	29.36	14.24	51.32	14.57
166 CLRKBGWV	16.10	11.66	14.67	7.91	21.38	10.37	50.80	14.42
168 MNKATOMN	3.53	2.56	13.86	7.48	39.12	18.97	55.05	15.63
169 CHEYENWY	16.58	12.00	27.92	15.06	43.93	21.31	78.74	22.35
170 MCALLNTX	15.59	11.29	21.56	11.63	46.44	22.53	78.34	22.24
171 LAURELMS	10.41	7.54	18.56	10.01	48.99	23.76	78.65	22.33
172 MEDFRDOR	20.96	15.17	25.62	13.82	44.87	21.76	84.82	24.08
173 RENO NV	18.97	13.74	22.46	12.11	71.09	34.48	106.66	30.28
174 HARRSNVA	35.08	25.40	22.60	12.19	39.40	19.11	93.74	26.61
175 JACKSNTN	23.83	17.26	17.11	9.23	32.55	15.79	69.91	19.85
176 LKCHARLA	8.23	5.96	51.23	27.63	49.08	23.81	102.23	29.02
177 LIMA OH	11.81	8.55	43.82	23.63	46.23	22.42	107.51	30.52
179 RPDCTYSD	21.84	15.81	17.88	9.64	37.93	18.40	75.36	21.39
180 ARDMORCK	14.35	10.39	30.55	16.48	42.42	20.58	82.29	23.36

Table C.4
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
181 MAROTEMI	18.47	13.37	21.66	11.68	30.59	14.84	71.36	20.26
182 ELMIRANY	3.47	1.40	5.34	1.60	34.41	9.30	43.69	6.91
183 BUTTE MT	25.50	18.47	23.78	12.82	21.22	10.29	64.51	18.31
184 JONESBAR	5.20	3.58	16.93	8.68	57.75	26.64	78.20	21.11
185 MSOULAMT	47.91	34.70	28.52	15.38	47.79	23.18	121.40	34.46
186 IDFALSID	25.82	18.70	27.94	15.07	28.79	13.96	75.40	21.40
187 BLLNGSMT	28.59	20.71	24.37	13.14	36.91	17.90	84.11	23.88
188 FTMYERFL	12.38	8.49	35.88	18.31	70.07	32.16	113.39	30.46
190 ROSWELNM	16.68	12.08	20.42	11.01	38.37	18.61	72.24	20.51
191 GREATFMT	30.74	22.26	22.19	11.96	40.91	19.84	85.98	24.41
192 SALISBMD	13.99	10.13	16.48	8.88	44.28	21.48	76.83	21.81
193 TUPELOMS	7.64	5.54	16.65	8.98	23.60	11.45	45.34	12.87
195 CASPERWY	33.97	24.59	28.16	15.18	29.29	14.21	84.94	24.11
197 EUREKACA	16.40	11.87	19.65	10.60	42.27	20.50	72.00	20.44
199 ZANESVOH	17.37	12.57	36.95	19.93	67.92	32.94	116.93	33.19
200 GRANDJCO	16.78	12.15	34.01	18.34	35.58	17.26	80.05	22.73
203 TWNFLSID	31.12	22.54	17.59	9.49	40.67	19.73	88.81	25.21
206 SANANGTX	26.80	19.41	23.24	12.53	49.07	23.80	92.25	26.19
207 ELCENTCA	20.70	13.41	35.85	17.29	38.56	16.73	89.29	22.67
211 PRESQUME	15.38	11.13	18.30	9.87	38.48	18.66	69.75	19.80
212 PLMSPRCA	8.42	3.40	44.15	13.27	109.21	29.53	165.41	26.17
214 NPLAT NE	10.12	7.33	12.49	6.73	47.46	23.02	70.45	20.00
216 KFALLSOR	18.55	13.43	30.37	16.38	44.69	21.67	84.97	24.12
217 LAREDOTX	33.76	24.44	40.66	21.93	91.06	44.17	152.56	43.31
218 DICKNSND	18.01	13.04	17.05	9.19	42.56	20.64	90.45	25.68
219 HELENAMT	47.55	32.75	34.58	17.74	61.67	28.45	142.85	38.57
222 GLNDIVMT	29.07	15.07	33.69	13.01	44.53	15.46	102.39	20.81

C.4. PREDICTION FROM 1967 to 1972

Reports of econometric work conventionally include measures of the model's in-sample predictive ability -- R^2 and standard error of estimate, as in Tables C.2 and C.3. It is much less common to test and report on the model's ability to predict outside the sample used to estimate it. However, since a major purpose of our work is extra-sample prediction, it seems important to perform such tests here.

In this section, we pretend to stand in 1967 and see how well we can do predicting 1972 using our cross-section and analysis of covariance approaches, plus some variants of the two basic approaches. The results are summarized in Table C.5, which presents four measures of merit for each approach as a predictor of 1972 r/a and as a predictor of 1972 revenue.

MEASURES OF MERIT

R^2 is defined as 1-SSE/VAR, where SSE is the sum of squared differences between actual and predicted values, and VAR is the sum of squared departures from the mean. When measuring the in-sample predictive ability of an unconstrained regression equation, R^2 is always positive. Measuring extra-sample prediction, however, it may well be negative. A negative R^2 indicates that the method used is not as good a predictor as the actual mean value. If there were some way to predict the actual mean value with certainty, one would always choose to use it in preference to

Table C.5

SUMMARY COMPARISON OF 1972 PREDICTION METHODS FROM 1967 DATA

Estimating Method		Predicting 1972 r/a				Predicting 1972 Revenue			
		R^2	SEE $	SEE/$\bar{X}$	SEE/s	R^2	SEE $$10^6$	SEE/$\bar{X}$	SEE/s
1. 1972 cross section equation	N	.291	6.27	.457	.842	.801	.610	.560	.447
	S	.509	10.60	.312	.701	.979	2.101	.369	.145
	L	.159	14.22	.380	.917	.932	1.522	.400	.261
	B	.198	20.72	.266	.895	.980	2.600	.279	.142
2. 1963-72 analysis of covariance	N	.820	3.16	.230	.424	.861	.510	.468	.373
	S	.780	7.08	.208	.469	.983	1.917	.337	.132
	L	.831	6.37	.170	.411	.978	.858	.225	.147
	B	.824	9.71	.124	.419	.993	1.476	.159	.081
3. 1967 cross section equation	N	-.333	8.60	.627	1.154	.140	1.268	1.163	.928
	S	.366	12.04	.354	.796	.932	3.791	.666	.261
	L	-.259	17.40	.465	1.122	.656	3.414	.897	.587
	B	.159	21.23	.272	.917	.980	2.590	.278	.142
4. 1963-67 analysis of covariance	N	-.446	8.68	.638	1.202	-.074	1.420	1.285	1.036
	S	.622	9.19	.271	.615	.978	2.160	.374	.148
	L	.237	12.24	.331	.874	.888	1.957	.507	.335
	B	.587	13.74	.178	.643	.991	1.752	.185	.095
5. 1963-67 analysis of covariance with time trend	N	.476	5.23	.384	.724	.800	.613	.554	.447
	S	.622	9.19	.271	.615	.978	2.185	.378	.149
	L	.596	8.91	.241	.636	.940	1.434	.371	.245
	B	.587	13.75	.178	.643	.990	1.794	.190	.098
6. 1967 r/a	N	-.415	8.59	.631	1.190	.282	1.161	1.050	.847
	S	.609	9.34	.276	.625	.964	2.788	.482	.191
	L	.208	12.47	.338	.890	.803	2.593	.671	.443
	B	.600	13.52	.175	.632	.992	1.678	.178	.091
7. 1967 cross section equation plus 1967 residuals	N	-.208	8.19	.597	1.099	.387	1.069	.982	.783
	S	.521	10.47	.308	.692	.956	3.035	.523	.209
	L	.056	15.07	.403	.972	.743	2.950	.775	.507
	B	.415	17.70	.227	.765	.993	1.475	.158	.081

N: Network.
S: National and regional spot.
L: Local spot.
B: Net broadcast revenue.

n: number of observations (markets).
X: value to be predicted.

$$VAR = \sum_1^n (X_i - \bar{X})^2 \qquad R^2 = 1 - \frac{SSE}{VAR}$$

$$SSE = \sum_1^n (X_i - \hat{X})^2 \qquad s = \sqrt{\frac{VAR}{n}}$$

$$SEE = \sqrt{\frac{SSE}{n}}$$

a method with negative R^2, but of course there is not. A predicting method with negative R^2 may conceivably be the best feasible alternative.

The standard error of estimate, SEE, for extra-sample prediction is calculated without correction for degrees of freedom as the root mean squared prediction error, $\sqrt{SSE/n}$. No degrees-of-freedom adjustment is necessary since none of the extra-sample degrees of freedom are "used up" in making the estimates.

If the errors are approximately normally distributed with constant variance (as in our estimates of r/a), a band of width SEE on either side of a predicted value would contain the actual value about two-thirds of the time. If the errors are non-normally distributed with variance that depends on the magnitude of the actual value (as in our estimates of revenue), the picture of expected errors is more complicated. SEE no longer suffices for the construction of a two-thirds confidence band for all predictions, but it still conveniently summarizes the size of prediction errors on average.

Because the absolute magnitude of SEE is of interest only in comparison to the magnitude of the variable being predicted, we also report two ratios: SEE as a fraction of the mean value of the quantity being predicted, and SEE as a fraction of the standard deviation of the quantity being predicted. (This later ratio is simply equal to $\sqrt{1-R^2}$.)

ESTIMATION METHODS

In this subsection, we describe the estimation methods compared in Table C.5. A discussion of their relative performance is in the next subsection.

In all cases, the estimating method is applied directly to estimate 1972 market r/a. The estimates of 1972 revenue are obtained by multiplying estimated r/a by actual 1972 market audience.

1 & 2: 1972-based Predictions

For comparison purposes, we begin with the cross section and analysis of covariance equations estimated in Section III. Items 1 and 2 report on the performance of these 1972-based estimators, using the four measures of merit described above. For item 1, the 1972 cross section equation, this is straight in-sample performance. For item 2, it is partial in-sample performance, since the estimates based on the full period 1963-72 are used to predict 1972 only.

3 & 4: 1967-based Cross Section Equation and Analysis of Covariance

For items 3 and 4, we reestimate our cross-section and analysis of covariance equations using 1967 and 1963-67 data, respectively. The reestimated equations are reported in Tables C.6, C.7, and C.8. Items 3 and 4 in Table C.5 show how well they do in predicting 1972. The item 3 estimates are obtained by applying the 1967 cross-section equation to 1972 values of the independent variables.* Item 4 simply uses 1963-67 estimated persistent market effects as estimators of 1972 r/a.

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*Actually, the estimates for local spot and net broadcast revenue are made using equations estimated before TVH and TVH^2 were dropped. The comparisons were not rerun using the final equations because of time pressure and because the very low significance of TVH and TVH^2 in the equation actually used makes it seem unlikely that the predictive performance would change very much.

Table C.6

1967 CROSS SECTION REGRESSION RESULTS FOR TELEVISION REVENUES

Dependent Variable	D1	D2	D3	D4	T10	T25	T50	T100	T200	Sales/TVH	1000/TVH	$(1000/TVH)^2$	R^2	SEE
Network r/a	14.58	14.93	10.75	8.94						.154	-.813	.000121	.255	7.28
	(3.29)	(3.36)	(2.44)	(1.87)						(2.37)	(-2.62)	(1.96)		
National-regional spot r/a					9.02	20.86	10.84	3.64	1.15	.304	3.85	-.000569	.736	9.06
					(0.78)	(2.67)	(1.73)	(0.62)	(0.21)	(3.70)	(4.67)	(-4.41)		
Local spot r/a					6.27	13.52	13.43	12.11	20.70	.184			.203	9.57
					(0.92)	(2.03)	(2.31)	(2.04)	(3.52)	(2.12)				
Net broadcast r/a					46.53	45.87	35.85	25.95	35.15	.646			.235	15.21
					(4.31)	(4.34)	(3.87)	(2.75)	(3.76)	(4.68)				

NOTE: Figures in parentheses are t statistics.

Table C.7

1963-67 ANALYSIS OF COVARIANCE: YEAR EFFECTS

Dependent Variable	1963	1964	1965	1966	1967	R^2	SEE [a]
National r/a	-.93 (-2.76)	.37 (1.09)	.40 (1.20)	-.96 (-2.86)	0.0	.804	3.32
National-regional spot r/a	-.09 (-0.21)	3.64 (8.56)	3.90 (9.17)	1.41 (3.31)	0.0	.951	4.21
Local spot r/a	-3.01 (-5.81)	-.22 (-0.42)	-.93 (-1.81)	-1.41 (-2.73)	0.0	.858	5.10
Net broadcast r/a	-3.20 (-3.56)	3.59 (4.02)	2.69 (3.01)	-1.40 (-1.57)	0.0	.806	8.84

NOTES: Year effects are estimated relative to 1967 (0.0).
Figures in parentheses are t statistics.

[a] Standard error of estimate.

Table C.8

1963-67 ANALYSIS OF COVARIANCE: MARKET EFFECTS

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
1 NY NY	9.57	6.39	59.41	31.23	12.79	5.55	73.28	18.35
2 LA CA	11.11	7.41	91.62	48.15	33.13	14.38	113.89	28.52
3 CHCAGOIL	12.19	8.13	84.04	44.17	22.11	9.60	106.71	26.72
4 PHIL PA	12.85	8.58	60.72	31.91	16.30	7.08	75.98	19.03
5 DTROITMI	13.59	9.07	47.06	24.74	20.52	8.91	70.98	17.77
6 BOSTONMA	12.67	8.45	65.70	34.53	21.97	9.54	84.46	21.15
7 SF CA	15.40	10.28	92.95	48.86	34.75	15.09	124.59	31.20
8 CLVLNDOH	12.82	8.56	53.49	28.11	19.55	8.49	79.73	19.97
9 WASH DC	13.79	9.20	68.05	35.77	17.26	7.49	93.53	23.42
10 PITT PA	14.07	9.39	56.63	29.76	20.35	8.84	78.73	19.71
11 STLOUSMO	14.60	9.74	62.24	32.71	17.48	7.59	80.81	20.23
12 DALLASTX	15.46	10.32	62.12	32.65	32.25	14.00	98.99	24.79
13 MINN MN	15.77	10.52	52.71	27.70	36.10	15.67	98.26	24.61
14 BALT MD	16.77	11.19	63.45	33.35	25.33	11.00	92.43	23.14
15 HOUSTNTX	16.93	11.30	71.28	37.47	24.25	10.53	98.49	24.66
16 INDPLSIN	13.91	9.28	53.77	28.26	26.73	11.61	86.19	21.58
17 CINCI OH	17.14	11.44	48.55	25.52	20.05	8.71	81.62	20.44
18 ATLANTGA	15.58	10.40	57.04	29.98	30.33	13.17	88.84	22.25
19 HARTFDCN	18.13	12.10	78.16	41.08	16.48	7.16	98.45	24.65
20 SEATLEWA	14.66	9.78	59.19	31.11	24.51	10.64	86.54	21.67
21 MIAMI FL	15.27	10.19	72.86	38.30	28.56	12.40	107.26	26.86
22 KANCTYMO	17.12	11.42	64.79	34.05	21.81	9.47	89.66	22.45
23 MILWAUWI	17.13	11.44	60.68	31.90	29.42	12.77	92.56	23.18
25 SACRA CA	14.69	9.81	60.33	31.71	25.69	11.15	85.57	21.43
26 MEMPH TN	17.30	11.55	37.10	19.50	17.27	7.50	64.82	16.23
27 COLUMBOH	15.62	10.43	59.16	31.10	30.92	13.42	94.84	23.75
28 TAMPA FL	14.76	9.85	48.28	25.3[illegible]	22.66	9.84	73.90	18.50
29 PORTLNOR	17.47	11.66	55.75	29.30	25.25	10.96	86.25	21.60
30 NASHVLTN	14.64	9.77	28.65	15.06	[illegible].21	11.38	62.94	15.76
31 NEWORLLA	17.26	11.52	49.33	25.93	35.[illegible]	15.43	88.31	22.11
32 DENVERCO	15.34	10.24	61.30	32.22	31.82	13.82	99.41	24.89
33 PROVIDRI	21.32	14.23	56.07	29.47	17.84	7.75	81.64	20.44
34 ALBANYNY	19.25	12.85	49.42	25.98	19.10	8.29	76.82	19.24
35 SYRACUNY	18.24	12.17	50.94	26.78	16.22	7.04	73.97	18.52
36 CHARLSWV	19.33	12.90	23.28	12.23	18.01	7.82	56.22	14.08
37 GRNDRPMT	23.17	15.46	54.38	28.58	15.51	6.74	89.77	22.48
38 LOUSVLKY	20.70	13.82	48.51	25.50	22.87	9.93	81.83	20.49
39 OKCITYOK	20.04	13.38	59.87	31.47	19.55	8.49	89.34	22.37
40 BRIM AL	24.46	16.32	43.57	22.90	20.05	8.71	78.34	19.62
41 DAYTONOH	22.30	14.89	46.23	24.30	30.58	13.28	90.28	22.61
42 CHARLTNC	27.28	18.21	49.21	25.87	22.73	9.87	93.16	23.33
43 PHOENXAZ	14.17	9.46	51.86	27.26	41.53	18.03	96.76	24.23
44 NORFLKVA	21.47	14.33	33.09	17.39	29.31	12.73	77.01	19.28
45 SANANTTX	18.14	12.11	41.48	21.80	31.33	13.60	79.16	19.82

Table C.8
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
46 GRNVLESC	16.28	10.86	31.30	16.45	15.34	6.66	57.60	14.42
47 GRNBRONC	20.74	13.84	36.81	19.35	21.50	9.34	70.77	17.72
48 SALTLKUT	16.13	10.76	36.51	19.19	31.29	13.59	78.30	19.61
49 WLKSBRPA	16.60	11.08	24.33	12.79	18.10	7.86	54.27	13.59
50 LITLRKAR	14.38	9.60	24.43	12.84	23.16	10.06	57.16	14.31
52 TOLEDOOH	26.48	17.67	49.94	26.25	29.27	12.71	93.78	23.48
53 OMAHA NE	21.68	14.47	42.45	22.31	22.70	9.86	80.11	20.06
54 TULSA OK	17.53	11.70	42.51	22.34	21.95	9.53	73.03	18.29
55 ORLAN FL	17.20	11.48	33.21	17.45	24.85	10.79	67.70	16.95
56 ROCHESNY	25.43	16.97	45.31	23.82	31.51	13.68	91.15	22.82
57 HARISBPA	25.66	17.12	47.45	24.94	24.47	10.63	84.80	21.23
58 SHRVPTLA	16.28	10.86	27.74	14.58	20.34	8.83	57.00	14.27
59 MOBILEAL	16.47	10.99	27.52	14.47	19.42	8.43	57.90	14.50
60 DAVENPIA	23.51	15.69	32.28	16.96	12.24	5.31	62.35	15.61
61 FLINT MI	19.32	12.89	44.24	23.25	22.73	9.87	75.94	19.01
62 GRNBAYWI	16.53	11.03	22.92	12.05	15.28	6.64	52.28	13.09
63 RICHMNVA	20.45	13.65	29.83	15.68	24.79	10.76	71.13	17.81
64 SPRNGFIL	20.11	13.42	38.83	20.41	29.81	12.94	81.69	20.46
65 CDRRAPIA	18.28	12.20	32.13	16.89	16.76	7.28	61.37	15.37
66 DMOINEIA	18.92	12.63	42.36	22.27	24.09	10.46	76.60	19.18
67 WICHTAKS	18.65	12.45	30.10	15.82	26.48	11.50	69.95	17.52
68 JKSNVLFL	19.80	13.22	56.72	29.81	23.21	10.08	87.00	21.79
69 PADUCAKY	17.44	11.64	24.77	13.02	8.89	3.86	48.13	12.05
70 ROANOKVA	19.54	13.04	22.05	11.59	21.15	9.18	58.13	14.56
71 KNOXVLTN	19.55	13.05	33.35	17.53	21.33	9.26	67.51	16.91
72 FRESNOCA	17.85	11.91	45.74	24.04	27.65	12.01	78.20	19.58
73 RALEIGNC	35.70	23.83	40.15	21.10	21.78	9.46	88.20	22.09
74 JOHNSTPA	25.77	17.20	31.91	16.77	14.17	6.15	67.47	16.90
75 PORTLNME	20.02	13.36	31.42	16.52	20.19	8.76	65.60	16.43
76 SPOKANWA	15.98	10.66	34.04	17.89	17.29	7.51	58.23	14.58
77 JACKSNMS	17.55	11.71	22.66	11.91	23.01	9.99	60.15	15.06
78 CHATTNTN	18.21	12.15	23.67	12.44	20.75	9.01	57.90	14.50
79 YGSTN OH	17.27	11.53	27.08	14.23	16.85	7.32	57.70	14.45
80 SBEND IN	16.78	11.20	23.94	12.58	19.11	8.30	57.20	14.32
81 ALBUQ NM	17.18	11.47	24.01	12.62	39.93	17.34	72.86	18.24
82 FTWAYNIN	20.16	13.45	36.09	18.97	24.39	10.59	73.35	18.37
83 PEORIAIL	19.66	13.12	31.15	16.37	28.23	12.26	71.70	17.95
84 GRNVLENC	20.74	13.84	24.87	13.07	20.83	9.05	63.65	15.94
85 SIOUXFSD	22.63	15.11	34.00	17.87	18.96	8.23	72.04	18.04
86 EVANSVIN	20.53	13.70	27.75	14.59	28.62	12.43	72.19	18.08
87 BATONRLA	15.47	10.32	25.57	13.44	40.86	17.74	76.98	19.27
88 BEAUMTTX	17.35	11.58	24.15	12.69	26.46	11.49	60.44	15.13
89 DULUTHMN	24.80	16.55	26.88	14.13	16.81	7.30	66.63	16.69
90 WHLINGWV	21.23	14.17	35.26	18.53	9.35	4.06	60.54	15.16

Table C.8
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
91 LINCLNNE	22.81	15.22	29.28	15.39	26.96	11.70	74.71	18.71
92 LANSNGMI	20.55	13.72	37.82	19.88	19.38	8.42	70.93	17.76
93 MADISNWI	19.77	13.19	40.95	21.52	21.77	9.45	76.52	19.16
94 COLUMBGA	24.60	16.42	15.31	8.05	23.82	10.34	62.58	15.67
95 AMARILTX	16.75	11.18	22.19	11.67	37.33	16.21	73.11	18.31
96 HUNTSVAL	16.34	10.90	26.26	13.80	48.79	21.19	87.38	21.88
97 ROCKFDIL	32.46	21.67	24.57	12.91	35.72	15.51	91.77	22.98
98 FARGO ND	24.36	16.26	24.61	12.93	28.12	12.21	75.69	18.95
99 MONROELA	21.54	14.38	22.12	11.63	26.76	11.62	67.27	16.85
100 COLUMBSC	22.55	15.05	45.41	23.87	30.41	13.20	90.61	22.69
101 SALNASCA	21.18	14.13	40.12	21.09	30.79	13.37	86.00	21.53
103 WPALMBFL	15.49	10.34	24.19	12.72	60.32	26.19	103.88	26.01
104 SPRNGFMA	17.87	11.93	35.56	18.69	37.86	16.44	81.98	20.53
105 BINGHMNY	26.20	17.48	33.21	17.45	27.90	12.11	79.16	19.82
106 WILMNGNC	20.77	13.86	18.60	9.78	34.16	14.83	75.00	18.78
108 AUGUSTGA	26.72	17.83	17.99	9.46	30.46	13.22	73.54	18.41
109 BRSTCLVA	21.78	14.53	22.83	12.00	18.97	8.24	61.00	15.27
110 LAFAYTLA	14.26	9.52	16.55	8.70	37.92	16.47	66.72	16.71
111 TRREHTIN	23.45	15.65	30.11	15.82	21.44	9.31	69.16	17.32
112 MONTGMAL	24.88	16.61	35.40	18.61	32.09	13.94	88.28	22.11
114 LUBUCKTX	24.60	16.42	28.83	15.15	47.96	20.82	96.71	24.22
115 ALBANYGA	18.01	12.02	25.40	13.35	22.84	9.92	64.87	16.24
116 SIOUXCIA	24.27	16.20	29.51	15.51	17.09	7.42	64.43	16.13
118 CHARLSSC	28.01	18.69	17.18	9.03	36.17	15.27	76.52	19.16
119 ERIE PA	32.55	21.73	23.99	12.61	25.67	11.15	75.69	18.95
120 TALLAHFL	18.78	12.54	22.10	11.62	27.89	12.11	69.02	17.28
121 WACO TX	20.76	13.86	30.13	15.84	28.04	12.18	71.82	17.98
122 JOPLINMO	16.98	11.33	24.84	13.05	13.83	6.00	53.06	13.29
123 SPRNGFMO	17.99	12.01	23.32	12.26	24.44	10.61	64.87	16.24
124 LXNGTNKY	17.98	12.00	26.16	13.75	34.33	14.91	76.87	19.25
125 FLORNCSC	22.95	15.32	22.36	11.75	31.77	13.80	71.56	17.92
126 AUSTINTX	23.88	15.94	55.54	29.19	34.35	14.91	107.24	26.85
127 TOPEKAKS	18.03	12.03	35.45	18.63	24.98	10.85	74.67	18.70
128 ROCHESMN	22.51	15.02	20.53	10.79	26.73	11.60	67.37	16.87
129 DOTHANAL	18.92	12.62	21.71	11.41	21.96	9.53	59.42	14.88
130 STJO MO	23.75	15.85	15.95	8.38	35.31	15.33	70.67	17.70
131 WICHFLTX	17.11	11.42	20.28	10.66	30.47	13.23	65.42	16.38
132 TRAVRSMI	22.54	15.04	20.08	10.56	21.41	9.30	63.30	15.85
133 LACROSWI	20.80	13.88	33.20	17.45	24.63	10.70	74.87	18.75
134 UTICA NY	33.43	22.31	39.01	20.51	28.34	12.31	97.83	24.50
135 ALEXNDLA	13.78	9.19	34.59	18.18	39.27	17.05	78.62	19.69

Table C.8
(contd)

	MARKET	NETWORK		NATIONAL-REG		LOCAL		NET BROADCST	
		COEFF.	T	COEFF.	T	COEFF.	T	COEFF.	T
136	TUCSONAZ	16.18	10.80	28.55	15.01	45.73	19.86	81.77	20.48
137	YAKIMAWA	33.03	22.04	29.17	15.33	36.46	15.83	90.31	22.61
138	CORPUSTX	19.52	13.03	26.91	14.15	26.31	11.42	66.41	16.63
139	BAKERSCA	24.24	16.18	31.26	16.43	44.37	19.27	96.30	24.11
140	SNBARBCA	32.16	21.47	41.77	21.95	48.42	21.02	110.64	27.71
141	MACON GA	19.11	12.76	28.08	14.76	26.38	11.46	69.29	17.35
142	CHICO CA	20.33	13.57	22.21	11.67	33.13	14.38	70.13	17.56
143	QUINCYIL	29.68	19.81	17.07	8.97	24.17	10.49	67.53	16.91
144	ELPASOTX	17.82	11.89	27.66	14.54	40.61	17.64	80.92	20.26
145	COLSPRCO	16.90	11.28	26.12	13.73	29.96	13.01	65.44	16.39
146	EUGENEOR	13.35	8.91	37.89	19.92	40.11	17.41	85.15	21.32
147	BLUFLDWV	16.85	11.25	6.35	3.34	19.06	8.28	40.80	10.22
148	COLUMBMO	21.05	14.05	24.30	12.77	19.67	8.54	60.46	15.14
149	BILOXIMS	14.49	8.67	10.45	4.93	61.48	23.94	83.90	18.84
150	SAVANAGA	21.23	14.17	15.04	7.91	26.47	11.49	62.35	15.61
151	TYLER TX	28.03	18.71	26.81	14.09	37.00	16.07	87.80	21.99
152	ALEXNDMN	11.63	7.76	23.17	12.18	20.53	8.92	60.78	15.22
153	BANGORME	29.96	20.00	17.96	9.44	24.42	10.60	69.59	17.43
154	WAUSAUWI	26.33	17.57	22.40	11.77	25.97	11.28	72.69	18.20
155	GRNWD MS	26.59	17.75	5.10	2.68	32.94	14.30	63.65	15.94
156	PANAMAFL	16.06	10.72	13.47	7.08	31.23	13.56	63.14	15.81
157	MINOT ND	19.80	13.21	20.24	10.64	35.04	15.22	80.47	20.15
158	ODESSATX	16.13	10.77	25.71	13.52	32.85	14.26	74.27	18.60
159	MERID MS	22.51	15.02	15.52	8.16	20.79	9.03	55.41	13.87
160	BOISE ID	25.47	17.00	21.05	11.06	33.39	14.50	77.03	19.29
161	LVEGASNV	12.73	8.50	19.15	10.06	96.02	41.69	133.51	33.43
162	ABILENTX	19.43	12.97	20.09	10.56	31.08	13.50	67.66	16.94
163	OTUMWAIA	22.11	14.75	18.88	9.92	23.47	10.19	63.81	15.98
164	FTSMTHAR	18.26	12.19	23.07	12.12	42.80	18.58	76.56	19.17
165	COLUMBMS	15.87	10.60	16.05	8.43	25.73	11.17	53.98	13.52
166	CLRKBGWV	25.04	16.71	14.89	7.83	14.83	6.44	55.24	13.83
168	MNKATOMN	8.07	5.39	11.53	6.06	29.72	12.90	49.66	12.43
169	CHEYENWY	19.61	13.09	27.47	14.44	35.77	15.53	73.96	18.52
170	MCALLNTX	21.53	14.37	21.29	11.19	33.21	14.42	73.30	18.35
171	LAURELMS	20.08	13.40	18.41	9.67	47.68	20.70	86.83	21.74
172	MEDFRDOR	28.82	19.23	27.85	14.64	39.56	17.18	90.10	22.56
173	RENO NV	27.12	18.10	18.88	9.92	59.79	25.96	102.97	25.78
174	HARRSNVA	30.70	20.49	30.93	16.25	29.93	13.00	88.61	22.19
175	JACKSNTN	26.65	17.79	17.79	9.35	23.58	10.24	64.23	16.08
176	LKCHARLA	15.68	10.47	54.61	28.70	44.80	19.45	108.18	27.09
177	LIMA OH	21.59	14.41	41.16	21.63	39.98	17.36	109.51	27.42
179	RPDCTYSD	23.26	15.52	16.01	8.41	31.17	13.54	68.96	17.27
180	ARDMOROK	20.34	13.58	30.23	15.89	28.81	12.29	75.32	18.86

Table C.8
(contd)

MARKET	NETWORK COEFF.	NETWORK T	NATIONAL-REG COEFF.	NATIONAL-REG T	LOCAL COEFF.	LOCAL T	NET BROADCST COEFF.	NET BROADCST T
181 MARQTEMI	22.19	14.81	20.76	10.91	21.93	9.52	63.23	15.83
183 BUTTE MT	29.18	19.47	22.32	11.73	17.29	7.51	63.78	15.97
184 JONESBAR	12.14	7.27	12.35	5.82	61.64	24.00	86.04	19.32
185 MSOULAMT	35.55	23.73	29.98	15.76	37.88	16.45	99.48	24.91
186 IDFALSID	29.78	19.88	25.15	13.22	21.37	9.28	69.75	17.47
187 BLLNGSMT	28.52	19.04	23.56	12.39	25.65	11.14	73.24	18.34
188 FTMYERFL	16.49	11.00	32.54	17.10	49.53	21.51	95.27	23.86
190 ROSWELNM	27.63	18.44	15.72	8.26	29.96	13.01	72.08	18.05
191 GREATFMT	32.19	21.49	20.86	10.97	35.55	15.43	81.59	20.43
192 SALISBMD	20.40	13.62	13.27	6.97	43.13	18.73	84.29	21.11
193 TUPELOMS	9.10	6.07	14.91	7.83	11.62	5.05	35.62	8.92
195 CASPERWY	28.84	19.25	23.05	12.11	19.96	8.67	68.65	17.19
197 EUREKACA	21.34	14.24	19.39	10.19	38.09	16.54	71.67	17.95
199 ZANESVOH	26.13	17.44	42.51	22.34	67.62	29.36	131.44	32.91
200 GRANDJCO	16.22	10.83	28.37	14.91	27.95	12.14	69.60	17.43
203 TWNFLSID	44.87	29.95	3.33	1.75	34.14	14.82	82.31	20.61
206 SANANGTX	35.45	23.66	21.50	11.30	33.81	14.68	84.80	21.23
207 ELCENTCA	27.77	18.53	40.36	21.22	35.46	15.40	98.89	24.76
211 PRESQUME	22.27	14.86	15.58	8.19	31.32	13.60	67.64	16.94
214 NPLAT NE	16.93	11.30	9.56	5.03	39.20	17.02	69.40	17.38
216 KFALLSOR	24.96	16.66	28.51	14.98	29.94	13.00	76.28	19.10
217 LAREDOTX	29.96	20.00	25.63	13.47	57.62	25.02	104.44	26.15
218 DICKNSND	19.22	12.83	15.05	7.91	33.07	14.36	79.25	19.84
219 HELENAMT	50.19	30.04	32.38	15.26	33.95	13.22	118.22	26.55

5: 1963-67 Analysis of Covariance With Time Trend

Item 5 was not realistically available in 1967, but is included nevertheless because it is instructive. Recall that our analysis of covariance estimates both market effects and year effects. For item 5, we assume that we know in 1967 what the 1972 year effect is. Then we estimate 1972 r/a as the difference between 1972 and 1967 year effects plus 1963-67 market effects.

6: 1967 r/a

Item 6 is a very simple method of estimating persistent market effects. Here we just assume that 1967 r/a values continue to apply in 1972.

7: 1967 Cross-Section Equation Plus 1967 Residuals

Item 7 represents another way to take account of persistent market effects. The effect of unmeasured factors in each market is estimated as the residual from the 1967 cross-section equation. Estimates for 1972 are then obtained by applying the 1967 equation to 1972 values of independent variables and adding the 1967 residual.

DISCUSSION

The following are what seem to us to be the major points to be made concerning the comparisons in Table C.5.

1. We can explain a much higher fraction of the variance of revenue than we can of the variance of r/a. For example, the 1972 cross-section equation (item 1 in the table) explains only 20 percent of the variance of net broadcast r/a, but 98 percent of the variance of net broadcast revenue. This is to be expected because revenue and audience are highly

correlated across the full, wide range of market sizes.

2. Even when R^2 is very high, SEE is substantial, both absolutely and relative to the values being predicted. For example, the 1963-72 analysis of covariance (item 2 in the table) predicts 1972 net broadcast revenue with an R^2 of .993, but SEE is nearly $1.5 million. This is about 16 percent of the mean value for market revenue, and 8 percent of its standard deviation.

3. Because the error variance is not constant across markets, it is not necessarily true for any particular market that revenue is predicted plus or minus two SEE with about 95 percent confidence. In smaller markets the confidence bands are narrower than that and in large markets they are wider.

4. Persistent market effects are very important. In the 1972-based net broadcast r/a predictions, allowing for persistent market effects increases R^2 from about .20 to over .80 and decreases SEE from .266 to .124 (items 1 and 2). In the 1967-based predictions, any of the methods that allow for persistent market effects (items 4 through 7) do better than the 1967 cross-section equation (item 3), which does not.

5. Time trends are also potentially very important. National-regional spot r/a and net broadcast r/a show very little change between 1967 and 1972. (Their 1967 and 1972 year effects in the analysis of covariance are approximately the same; see Table C.3). On the other hand, network r/a decreases and local spot r/a increases substantially over the same period. This is the reason that 1967-based predictions of 1972 r/a are generally much better for national-regional spot and net broadcast revenue, than for network and local spot (items 3, 4, 6, and 7). If there had been some way to predict the change in year effects for

network and local, their estimates could be much improved (item 5). However, we certainly would not have been able to make accurate predictions by examining the trend of year effects from 1963-67 (Table C.7), so item 5 must be considered an unattainable method.

6. The three attainable prediction methods that allow for persistent market effects (items 4, 6, and 7) all performed about equally well. Of the three, the method that uses the 1967 cross-section equation plus 1967 residuals is to be preferred because it is the only method that allows one to simulate the effect of changes in any variables other than audience (specifically, retail sales and TVH).

Appendix D

INDIVIDUAL STATION SHARES OF TELEVISION MARKET REVENUE

D.1 INTRODUCTION

In Appendix C, we explored a number of ways to project television revenues by market. In this appendix, we investigate the division of market aggregates into individual station shares. Here, too, we check out a number of different methods. Any one of the methods of projecting market revenue, combined with any one of the methods of predicting station shares, will yield predictions of individual stations' revenue.

There is a substantial amount of variation in the shares of stations of the same type:

	1972 Shares				1967 Shares			
	Mean	Standard Deviation	Maximum	Minimum	Mean	Standard Deviation	Maximum	Minimum
Network VHF	.370	.130	.915	.085	.382	.134	.897	.061
Network UHF	.253	.124	.571	.019	.266	.144	.640	.025
Independent VHF	.141	.064	.257	.021	.131	.059	.216	.009
Independent UHF	.052	.037	.130	.001	.021	.018	.064	.0004

Some of this variation is the result of different amounts of competition facing different stations; the models in this note take difference in competition into account.

However, there is also substantial variation between stations that are competitively equally situated, as shown by plots of proprietary data. This variation between shares of equally situated stations may be impossible to explain in an economic model.

D.2. RATIO MODEL

Park (1970)* used a ratio model to predict the division of television audiences among competing stations. It was hypothesized that each station could be assigned an "attractiveness index," a_i , such that audiences would tend to split in proportion to $a_i/\Sigma a_i$, where the summation is over all stations in the market.

In this section, we use the same functional form to explain the division market revenue among stations. We assign each station to one of four categories: network affiliated VHF (NV), network affiliated UHF (NU), independent VHF (IV), and independent UHF (IU), and assume that all stations in a category have the same weight, a_{NV} , a_{NU}, a_{IV} , and a_{IU} , respectively. Then a station's expected revenue share is

$$SHR = \frac{NVa_{NV} + NUa_{NU} + IVa_{IV} + IUa_{IU}}{NNVa_{NV} + NNUa_{NU} + NIVa_{IV} + NIUa_{IU}} \quad . \qquad (D.1)$$

NV is a dummy variable that equals 1 if the station is a network VHF, 0 otherwise, and NU, IV, and IU are analogously defined. NNV is the number of network VHFs in the market, and NNU, NIV and NIU are numbers of the other types of stations.

In this formulation, a station's revenue share depends both on its own characteristics and on the amount and type of competititon it faces. The major advantage of this formulation is that the sum of the shares of all stations in the market is constrained to be 1 in the formula, as it is in actuality. The major disadvantage is that a new station is assumed to reduce all existing stations' shares in the same proportion. That is, the specification makes no allowance for the possibility that, for example, a new independent might have more impact on other independents than on network affiliates.

With a little manipulation, equation (D.1) can be changed into a form suitable for econometric estimation. First note that the scale of the

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*Park, Rolla Edward, *Potential Impact of Cable Growth in Television Broadcasting*, R-587-FF, The Rand Corporation, October 1970, pp. 28-35.

weights, a, does not matter, only their relative size. Thus we can normalize by setting $a_{NV} = 1$. Making this substitution and manipulating (D.1), we get

$$SHR_i NNV - NV = a_{NU} (NU - SHR_i NNU) + a_{IV} (IV - SHR_i NIU) + a_{IU} (IU - SHR_i NIU), \quad (D.2)$$

which can be estimated by ordinary least squares regression with the intercept suppressed.

The sample used to estimate (D.2) (and the different equations specified in the next section of this note) is made up as follows. The unit of observation is a television station in an ADI market in the 48 contiguous states. Satellite revenues are added to the parents and the aggregate treated as a single station. Outlying stations (for example, the Worcester stations in the Boston ADI and the Akron station in the Cleveland ADI) are omitted from the sample. All stations in border markets are omitted. One-station markets were omitted to make possible a fair comparison of the ratio model with the model fitted in the next section. The ratio model automatically fits such markets perfectly, so there is no information to be gained by including them. Separate estimates were made using 1972 and 1967 data. The numbers of stations in the sample for each year were as follows:

Year	NV	NU	IV	IU	Total
1972	352	82	22	42	503
1967	353	57	19	23	452

The results from estimating (D.2) are shown in Table D.1. In both years, stations without a VHF allocation, without network affiliation, or without both, could expect substantially less revenue than VHF network stations in their market. These handicaps were, though, somewhat smaller by 1972 than they were in 1967. The fit to the data is fairly good. One-half to three-quarters of the variance in SHR is explained by the model, differing somewhat in the two years and depending on whether the variance for all stations or for independents only is being explained.

Table D.1

RATIO MODEL FOR DIVISION OF TELEVISION AUDIENCES AMONG COMPETING STATIONS

Year	NV[a]	NU	IV	IU	R-squared[b]			Root Mean Squared Error[b]		
					(1)	(2)	(3)	(1)	(2)	(3)
1972	1.	.301 (11.39)	.513 (12.06)	.146 (5.52)	.387	.726	.519	.200	.082	.045
1967	1.	.228 (5.75)	.458 (8.59)	.040 (.99)	.195	.658	.700	.229	.094	.038

[a] Equals 1. by normalization.

[b] (1) For the equation as run, that is, predicting SHR·NNV - NV.
(2) Predicting SHR for all stations in 2-or-more station markets.
(3) Predicting SHR for independent stations only.

In Table D.2, the 1972 estimates are applied to calculate revenue shares in some typical markets (all with 3 network Vs). The table extrapolates somewhat beyond present experience to markets with 10 independents (5 Vs and 5 Us -- impossible given present frequency allocations, except on cable). There are two main problems with the estimates: UHF independents in markets with independent Vs do not do as well as indicated, and an independent V in a 1-IV market often does better than indicated. Both of these discrepencies may arise because of the equal-proportional-impact assumption built into the ratio model. In the next section we fit a model that does not impose this constraint.

Table D.2

REVENUE SHARES PREDICTED BY RATIO MODEL, 1972 ESTIMATES

NIV		NIU 0	1	2	3	4	5
0	3 NV	1.000	.954	.911	.873	.837	.804
	Each IV	–	–	–	–	–	–
	Each IU	–	.046	.044	.042	.041	.039
1	3 NV	.854	.820	.788	.759	.732	.707
	Each IV	.146	.140	.135	.130	.125	.121
	Each IU	–	.040	.038	.037	.036	.034
2	3 NV	.745	.719	.695	.672	.651	.631
	Each IV	.127	.123	.119	.115	.111	.108
	Each IU	–	.035	.034	.033	.032	.031
3	3 NV	.661	.640	.621	.603	.586	.569
	Each IV	.113	.109	.106	.103	.100	.092
	Each IU	–	.031	.030	.029	.028	.028
4	3 NV	.594	.577	.561	.546	.532	.519
	Each IV	.102	.099	.096	.093	.091	.089
	Each IU	–	.028	.027	.027	.026	.025
5	3 NV	.539	.525	.512	.500	.488	.477
	Each IV	.092	.090	.088	.085	.083	.081
	Each IU	–	.026	.025	.024	.024	.023

D.3 LOGARITHMIC MODEL

In this section we postulate a model that allows for different impact of each category of station on stations in each category:*

$$
\begin{aligned}
SHR = \exp\,(\alpha_1 + \alpha_2\ NU + \alpha_3\ IV + \alpha_4\ IU) \\
\cdot\ NVNV^{\beta_1}\ NVNU^{\beta_2}\ NVIV^{\beta_3}\ NVIU^{\beta_4} \\
\cdot\ NUNV^{\beta_5}\ NUNU^{\beta_6}\ NUIU^{\beta_7} \\
\cdot\ IVIV^{\beta_8}\ IVIU^{\beta_9} \\
\cdot\ IUNV^{\beta_{10}}\ IUNU^{\beta_{11}}\ IUIV^{\beta_{12}}\ IUIU^{\beta_{13}}
\end{aligned} \qquad (D.3)
$$

where NVNU, for example, is a term for the impact on a network V by a network U. It is equal to (1 + NV·NCNU), where NV is the network V dummy and NCNU is the number of competing network Us. Thus if the station is not a network V, or if it has no network U competitors, $NVNU^{\beta_2}$ equals 1 and this term has no effect on the estimated share for that station. NUIV, IVNV, and IVNU terms were omitted because we do not have data to estimate these effects; there are no NUs with IV competition and vice versa; all IVs have 3 NV competitors. Also, there is little variation in some of the other competition terms, so we should not be surprised if some of the effects are not well estimated.

We estimated this model using the same data as for the ratio model. One-station markets are omitted for a somewhat different reason than before. The ratio model fits such stations automatically so there was no information to be gained by including them. In contrast, the logarithmic model of this section does not automatically yield total shares equal to 1, even in 1-station markets, so there is something to be said for including these markets in the sample. The argument for omitting them, however, is more compelling. The functional form in (D.3) is nothing more

*A less elaborate model in the same spirit is used in Noll, R., M. J. Peck, and J. McGowan, *Economic Aspects of Television Regulation*, The Brookings Institution, Washington, D.C., 1973.

than an approximation to the unknown "true" form of the relationship. It can better approximate the true relationship for 2-or-more-station markets if it does not have to fit 1-station markets as well. And after all, we don't need any help in estimating shares in 1-station markets; we know they always equal 1.

The estimates for the logarithmic model are shown in Table D.3. The first line for each year includes all of the competition effects. In the second line, we impose the a priori reasonable constraint that no competitive impacts are positive* and omit all variables whose estimated coefficients have t-statistics less than 1 in absolute value. The R-squareds are respectable, running from .63 to .75, somewhat better than for the ratio model.

The results suggest that it was correct to relax the equal-proportional-impact assumption of the ratio model. Particularly striking are the different estimated effects of IVs. In the 1972 estimates, they have a substantially larger negative impact on other IVs than on NVs, and their impact on IUs is larger still.

Applying the 1972 second-line equation gives the estimated shares for various market configurations shown in Table D.4. The estimated share of an independent V in a 1-IV market may still be somewhat low, but the shares for independent Us look quite reasonable.

LOGARITHMIC MODEL ESTIMATED FOR INDEPENDENTS ONLY: A DIGRESSION

Before starting to work with the full logarithmic model discussed above, we estimated a similar model using data on independent station shares only. The results were sufficiently interesting to be worth reporting here. The initial specification was

$$SHR = \exp(\alpha_1 + \alpha_2 IU) \cdot IVIV^{\beta_1}\ IVIU^{\beta_2}\ IUIV^{\beta_3}\ IUIU^{\beta_4} \cdot TVH^{\beta_5} . \qquad (D.4)$$

*Possible exception: By encouraging people to buy UHF sets and training them in the use of UHF tuners, UHF network affiliates may have a positive impact on independent Us.

Table D.3

LOGARITHMIC MODEL

Year	Constant	NU	IV	[illegible]U	NVNV	NVNU	NVIV	NVIU	NUNV	NUNU	NUIU	IVIV	IVIU	IUNV	IUNU	IUIV	IUIU	R-squared[a] (1)	(2)	(3)	Root Mean Squared Error[a] (1)	(2)	(3)
1972	-.225	-.553	-1.849	[illegible]719	-.809	-.179	-.205	-.122	-1.116	-.252	-.133	-.751	.466	[illegible]122	-.341	-1.332	-.161	.792	.696	.624	.379	.087	.039
	(-1.81)	(-2.00)	(-10.[illegible]7)	(-2.76)	(-6.68)	(-1.66)	(-2.67)	(-2.00)	(-4.96)	(-1.13)	(-.75)	(-4.30)	(2.47)	(.18)	(-.56)	(-10.63)	(-1.09)						
1972	-.225	-.565	-1.639	-2.546	-.809	-.179	-.205	-.122	-1.110	-.250		-.495			-.445	-1.332	-.168	.789	.706	.629	.382	.085	.039
	(-1.80)	(-2.04)	(-10.03)	(-16.31)	(-6.65)	(-1.65)	(-2.66)	(-2.00)	(-4.92)	(-1.12)		(-3.51)			(-2.42)	(-10.59)	(-1.19)						
1967	-.118	-1.002	-1.973	-4.848	-.919	-.215	-.231	-.045	-1.221	.121	-.095	-.890	.742	.543	.916	-.607	-.012	.803	.636	.698	.407	.097	.038
	(-.96)	(-2.94)	(-10.65)	(-3.96)	(-7.48)	(-1.69)	(-2.73)	(-.55)	(-4.57)	(.41)	(-.44)	(-4.46)	(3.05)	(.62)	(1.10)	(-3.63)	(-.06)						
1967	-.112	-.889	-1.810	-3.581	-.927	-.219	-.247		-1.312			-.524		-.374		-.614		.798	.637	.754	.412	.097	.034
	(-.92)	(-6.21)	(-10.19)	(-11.40)	(-7.56)	(-1.72)	(-3.09)		(-10.49)			(-3.27)		(-1.63)		(-[illegible].69)							

[a](1) For the regression as run, that is, predicting log(SHR).
(2) Predicting SHR for all stations in 2-or-more-station markets.
(3) Predicting SHR for independent stations only.

Table D.4

REVENUE SHARES PREDICTED BY LOGARITHMIC MODEL, 1972 ESTIMATES FOR INDEPENDENT STATIONS ONLY, TVH EQUALS SAMPLE MAXIMUM[a]

NIV		NIU 0	1	2	3	4	5
0	3 NV	.985	.905	.861	.832	.809	.792
	Each IV	-	-	-	-	-	-
	Each IU	-	.063	.056	.052	.050	.048
1	3 NV	.854	.785	.747	.722	.702	.687
	Each IV	.155	.155	.155	.155	.155	.155
	Each IU	-	.025	.022	.021	.020	.019
2	3 NV	.786	.723	.688	.664	.646	.632
	Each IV	.110	.110	.110	.110	.110	.110
	Each IU	-	.014	.013	.012	.011	.011
3	3 NV	.741	.681	.648	.626	.609	.596
	Each IV	.090	.090	.090	.090	.090	.090
	Each IU	-	.010	.009	.008	.008	.008
4	3 NV	.708	.651	.619	.598	.582	.569
	Each IV	.078	.078	.078	.078	.078	.078
	Each IU	-	.007	.007	.006	.006	.006
5	3 NV	.682	.627	.597	.576	.561	.548
	Each IV	.070	.070	.070	.070	.070	.070
	Each IU	-	.006	.005	.005	.005	.004

[a]5,984 thousand households.

No terms for network competition were included since there is so little variation in network competition facing independent stations. The number of television households in the ADI, TVH, was included because independents may well do better in larger markets where their coverage handicap relative to the networks is less severe.* (TVH was also tried in the full logarithmic model above, but proved to be insignificant.)

The estimates for (D.4) are shown on the first line of Table D.5. They do not refute the hypothesis that IUs have no impact on IVs, nor the hypothesis that the (proportional) impact of IVs on IVs is the same as that of IUs on IUs. The second line of the table shows estimates incorporating these constraints, where SAME is IVIV + IUIU. The large negative impact of IVs on IUs offers some confirmation of the similar effect estimated in the full model. The coefficient of TVH is significant and positive as expected; we do not know why it is significant here but not in the full model above.

The explanatory power of this model is about the same as that of the two estimated previously. Estimates for shares in typical markets (shown in Tables D.6, D.7, and D.8 for different values of TVH) appear to be reasonable.

*This hypothesis is suggested by R. E. Park, *New Television Networks*, The Rand Corporation, R-1408-MF, December 1973.

Table D.5

LOGARITHMIC MODEL ESTIMATED FOR
INDEPENDENT STATIONS ONLY

Year	Constant	IU	IVIV	IVIU	IUIV	IUIU	SAME	TVH	R-squared[a]		Root Mean Squared Error[a]	
									(1)	(2)	(1)	(2)
1972	-4.220 (-3.45)	-.911 (-2.78)	-1.002 (-2.69)	.019 (.04)	-1.522 (-5.36)	-.517 (-1.50)		.363 (1.80)	.598	.669	.719	.037
1972	-4.147 (-3.78)	-.732 (-3.22)			-1.435 (-5.53)		-.726 (-2.62)	.337 (2.04)	.588	.646	.728	.038

[a](1) For the equation as run, that is, predicting log(SHR).
(2) Predicting SHR for independent stations only.

Table D.6

REVENUE SHARES PREDICTED BY LOGARITHMIC MODEL, 1972 ESTIMATES FOR INDEPENDENT STATIONS ONLY, TVH EQUALS SAMPLE MAXIMUM[a]

Independent VHFs	Shares of	Number of Independent UHFs (NIU) 0	1	2	3	4	5
0	3 NV	1.000	.857	.826	.807	.792	.778
	Each IV	-	-	-	-	-	-
	Each IU	-	.143	.086	.064	.052	.044
1	3 NV	.704	.651	.640	.632	.627	.622
	Each IV	.296	.296	.296	.296	.296	.296
	Each IU	-	.053	.032	.024	.019	.016
2	3 NV	.642	.612	.606	.602	.599	.596
	Each IV	.179	.179	.179	.179	.179	.179
	Each IU	-	.029	.018	.013	.011	.009
3	3 NV	.600	.580	.576	.573	.571	.569
	Each IV	.133	.133	.133	.133	.133	.133
	Each IU	-	.012	.012	.009	.007	.006
4	3 NV	.567	.553	.550	.548	.546	.545
	Each IV	.108	.108	.108	.108	.108	.108
	Each IU	-	.014	.009	.006	.005	.004
5	3 NV	.539	.528	.526	.525	.523	.522
	Each IV	.092	.092	.092	.092	.092	.092
	Each IU	-	.011	.007	.005	.004	.003

[a] 5,984 thousand households.

Table D.7

REVENUE SHARES PREDICTED BY LOGARITHMIC MODEL, 1972 ESTIMATES FOR INDEPENDENT STATIONS ONLY, TVH EQUALS SAMPLE MEAN[a]

Independent VHFs	Shares of	Number of Independent UHFs (NIU) 0	1	2	3	4	5
0	3 NV	1.000	.907	.888	.874	.864	.856
	Each IV	–	–	–	–	–	–
	Each IU	–	.093	.056	.042	.034	.029
1	3 NV	.807	.772	.765	.760	.757	.753
	Each IV	.193	.193	.193	.193	.193	.193
	Each IU	–	.034	.021	.015	.013	.011
2	3 NV	.766	.747	.743	.740	.738	.737
	Each IV	.117	.117	.117	.117	.117	.117
	Each IU	–	.019	.012	.009	.007	.006
3	3 NV	.739	.726	.724	.722	.720	.719
	Each IV	.087	.087	.087	.087	.087	.087
	Each IU	–	.013	.008	.006	.005	.004
4	3 NV	.718	.708	.706	.705	.704	.703
	Each IV	.071	.071	.071	.071	.071	.071
	Each IU	–	.009	.006	.004	.003	.003
5	3 NV	.700	.693	.691	.690	.689	.689
	Each IV	.060	.060	.060	.060	.060	.060
	Each IU	–	.007	.004	.003	.003	.002

[a]1681.6 thousand households.

Table D.8

REVENUE SHARES PREDICTED BY LOGARITHMIC MODEL, 1972 ESTIMATES FOR INDEPENDENT STATIONS ONLY, TVH EQUALS SAMPLE MINIMUM[a]

Independent VHFs	Shares of	Number of Independent UHFs (NIU)					
		0	1	2	3	4	5
0	3 NV	1.000	.965	.958	.953	.949	.946
	Each IV	-	-	-	-	-	-
	Each IU	-	.035	.021	.016	.013	.011
1	3 NV	.927	.914	.911	.910	.908	.907
	Each IV	.073	.073	.073	.073	.073	.073
	Each IU	-	.013	.008	.006	.005	.004
2	3 NV	.912	.905	.903	.902	.901	.901
	Each IV	.044	.044	.044	.044	.044	.044
	Each IU	-	.007	.004	.003	.003	.002
3	3 NV	.902	.897	.896	.895	.895	.894
	Each IV	.033	.033	.033	.033	.033	.033
	Each IU	-	.005	.003	.002	.002	.001
4	3 NV	.894	.890	.889	.889	.888	.888
	Each IV	.027	.027	.027	.027	.027	.027
	Each IU	-	.003	.002	.002	.001	.001
5	3 NV	.887	.884	.884	.883	.883	.883
	Each IV	.023	.023	.023	.023	.023	.023
	Each IU	-	.003	.002	.001	.001	.001

[a] 93 thousand households.

D.4 COMPARISON OF THE RESULTS

The power of all of the models to explain variance in SHR among stations is respectable but not spectacular. (But we should not expect spectacular performance in light of the large (inexplicable) variation in performance of equally situated stations noted in the introduction.) However, predicting SHR is only an intermediate step; we are more interested in the predictions of station revenue obtained by multiplying estimated SHR by estimated market revenue. Table D.9 compares the power of the various methods to predict both SHR and station revenue, using the same four summary measures of performance used for market predictions in Appendix C.

There are several notable features to observe in Table D.9. First, revenues for all stations including network affiliates are somewhat better predicted (with R-squareds on the order of .95) than are revenues for independent stations alone (R-squareds around .85). Second, standard errors of estimate are substantial, on the order of \$1 million for all stations and \$2 million for independents only. As a percentage of mean revenue, these are about 30 percent and 50 percent respectively. Third, if one were to choose among the several models, the full logarithmic model seems to have a slight edge.

Fourth, the performance of the station revenue estimators is not very sensitive to the quality of the market revenue estimates. Predictions using actual market revenue and predictions using market revenue estimates from 1967 revenue-to-audience ratios are compared in the table, and it makes very little difference which is used. This strongly suggests that there is not much to be gained from further refinement of our market revenue estimators. Even if we could predict market revenue perfectly (which of course we cannot do), we would not substantially improve our estimates of station revenue.

Table D.9

COMPARISON OF VARIOUS METHODS OF PREDICTING STATION REVENUE SHARES AND STATION REVENUES[a]

Method	Predicting Revenue Shares								Predicting Station Revenue Using Actual Market Revenue								Predicting Station Revenue Using Predicted Market Revenue[b]							
	R^2		SEE[c]		SEE/$\bar{x}$[d]		SEE/s[e]		R^2		SEE[c] \$10[6]		SEE/$\bar{x}$[d]		SEE/s[e]		R^2		SEE[c] \$10[6]		SEE/$\bar{x}$[d]		SEE/s[e]	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Ratio model, 1972	.726	.519	.082	.045	.262	.534	.523	.693	.951	.799	1.068	2.156	.297	.541	.221	.449	.962	.802	1.163	2.137	.323	.536	.241	.444
Ratio model, 1967	.658	.700	.084	.038	.276	.529	.584	.547	.942	.855	1.220	2.098	.355	.516	.242	.381								
Logarithmic model, 1972	.706	.629	.085	.039	.271	.470	.542	.609	.961	.847	.950	1.880	.264	.471	.196	.391	.956	.869	1.013	[illegible]	.261	.437	.210	.363
Logarithmic model, 1967	.637	.754	.097	.034	.286	.484	.602	.496	.940	.848	1.231	2.145	.358	.528	[illegible]	.389								
Logarithmic model, 1972, (Independent stations only		.646		.038		.463		.595		.823		2.020		.506		.420		.793		[illegible]		.549		[illegible]

[a](1) Predictions for all stations in 2-or-more station markets.
(2) Predictions for independent stations only.

[b]Market revenue is predicted by multiplying the 1967 revenue-to-audience ratio by 1972 audience.

[c]Standard error of estimate.

[d]Standard error of estimate as a fraction of sample mean.

[e]Standard error of estimate as a fraction of sample standard deviation.

Appendix E

TELEVISION STATION PROFITS

E.1 DATA DESCRIPTION

This appendix reports on our attempts to explain television station profits directly as a function of market size and competition variables. Our data base is a 1972 cross section of television stations in ADI markets in the 48 contiguous states. Financial data for satellite stations, when separately reported, are added to those for parents and the aggregate is treated as a single station. Outlying stations (for example, the Worcester stations in the Boston ADI and the Akron station in the Cleveland ADI) are omitted from the sample. All stations in border markets and all part-year stations are omitted. This is the same as the 1972 sample used in Appendix D, but 1-station markets, which were excluded there, are included here.

Table E.1 summarizes the after-depreciation profit data. We see as expected that UHF stations are generally less profitable than VHF stations, and that independent stations are less profitable than network affiliates. There is considerable variation *within* station type; we expect this to be related to market size, with bigger profits in larger markets. Plots of proprietary profit data confirm this expectation only partially. Plotting profits against ADI TVH for the four classes of stations: NV, NU, IV, and IU, one sees that profits for network Vs are clearly related to market size, but there is no obvious relationship for the other three station classes. In Section E.2, we attempt to explain some of this variation on the basis of other factors, most notably the amount of competition that a station faces. However, there are definite limits to how successful this attempt can be, limits to which we now turn.

Table E.1

SUMMARY STATISTICS FOR 1972 STATION PROFITS

Class	Number of Stations	Mean ($1000)	Standard Deviation ($1000)	Minimum ($1000)	Maximum ($1000)
Network VHF	390	1,083	1,870	-819	11,660
Network UHF	86	25	198	-422	577
Independent VHF	22	844	1,291	-1,533	4,213
Independent UHF	42	-311	616	-2,120	1,118
All stations	540	796	1,697	-2,120	11,660

A MAJOR PROBLEM: UNEQUAL PERFORMANCE OF EQUALLY SITUATED STATIONS

In all of our work, including the work reported in this appendix, we use models that predict equal performance for equally situated stations, that is, stations of the same class located in the same competitive environment. For example, the equations in this note predict the same profits for all independent Us in the same market. This seems like a natural approach: after all, these stations all suffer from the same handicaps of non-affiliation and UHF transmission and compete with the same line-up of stations for the same audience. Why should they perform substantially differently?

We will look at some possible reasons in a moment, for the fact is that there are substantial differences in the performance of equally situated stations. This statement is confirmed by a look, for example, at the proprietary plot showing the profits of independent Us.* In the right-hand portion of the figure, it is easy to pick out stations in the same market; they are plotted along the same vertical line at the value of TVH for each market. Similar variation is apparent in the plots for the other classes of stations.

Since it may be very difficult to build quantitative models that are capable of predicting different performance for equally situated stations, it is reasonable to ask how well we can do in the absence of such models. We *never* expect to predict perfectly; perhaps the systematic differences *between* markets and station classes are sufficiently important so we can accept errors of prediction

* This is in Appendix G, which is separately bound and available only to the FCC because of the proprietary nature of the data displayed.

within station class and market. To evaluate this possibility we calculate an upper bound on the quality of predictions based on models that treat all equally situated stations the same. The best we could possibly do with such a model would be to predict perfectly the *average* profit for each class of station in each market, and use that average value as our estimate of the profit of each station in the class.

Table E.2 summarizes the quality of the resulting predictions. As the top part of the table shows, upper bounds on R-squared range from about .9 for network Vs to .6 for independent Us, and minimum standard errors of estimate are quite large for all station classes. If we exclude singleton stations (that is, stations that are the only one of their class in the market, and hence automatically perfectly predicted), R-squared values drop considerably for all except network Vs, and standard errors of estimate correspondingly increase. All in all, these upper bound calculations are not very encouraging. No prediction method that treats equally situated stations the same can do better than the upper bound, and the upper bound is not very good.

There are a number of possible reasons for the unequal performance of equally situated stations. Among network stations, *which* network (ABC, CBS, NBC) certainly affects profit, so affiliation could be used to improve the fit. However, we are primarily interested in projecting new stations for the top-100 markets where affiliations are all used up; a better fit to the network classes would not help us in this task.

Table E.2

UPPER BOUNDS ON THE PERFORMANCE OF MODELS THAT TREAT EQUALLY SITUATED STATIONS THE SAME

Sample	NV	NU	IV	IU	All
Full sample					
R-squared	.909	.791	.663	.593	.908
Standard error of estimate ($1000)	564	90	750	393	516
Number of stations	390	86	22	42	540
Excluding singleton stations					
R-squared	.906	.537	.285	.519	.902
Standard error of estimate ($1000)	602	116	1,172	531	581
Number of stations	342	52	9	23	426

For all station classes, management skills or goals probably differ from station to station. Thus one might expect systematic differences in performance of stations under different group ownership. Another possibility is that reception quality varies enough among VHF stations or among UHF stations so that stations with lower channel numbers do better than those with higher numbers, even within the same frequency band. (That is, channel 2 is better than channel 13; channel 14 is better than channel 70.) Perhaps audience loyalty builds up over long periods, so that older stations are generally more profitable than newer stations. Perhaps there is some sort of specialization, with each station going after a different category of audience, some more profitable than others. This is clearly the case with foreign language stations; is there some more subtle form of specialization by other stations? More generally, the literature on audience preferences and station programming behavior* suggests that there should be a regular *distribution* of audience shares, and hence profits, among equally situated stations. We investigated each of these possibilities in enough detail to convince ourselves that none of them would improve our profit predictions for independent UHF stations sufficiently to make them useful for projecting new stations.

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*Peter Steiner, "Program Patterns and Preferences, and the Workability of Competition in Radio Broadcasting," *Quarterly Journal of Economics*, May 1952; Bruce M. Owen, Jack H. Beebe and Willard H. Manning, Jr., *Television Economics*, Lexington, MA, 1974; Stanley M. Besen and Bridger M. Mitchell, *Watergate and Television: An Economic Analysis*, The Rand Corporation, R-1712-MF, May 1975.

In a broader context, there is an important lesson to be learned from the unequal performance of equally situated stations: There appears to be a great deal of flexibility in the television broadcasting system; there is room for a wide range of styles of station operation. This suggests that the system may be better able to withstand competition from new technologies such as cable than would otherwise be the case, because adjustments can be made in station operation to soften any negative impact on profits.

profits if some of its competitors are handicapped; we expect β_3, β_5, and β_7 to be positive. For a more extensive discussion and justification of equation (E.1), see Besen (1973). The results of estimating this equation for our 1972 cross section of stations are shown on the first line of Table E.3. All of the coefficients have the expected signs and are highly significant. The explanatory power of the estimated equation is high, somewhat over .8.

The results are somewhat improved if we use profit before depreciation as the dependent variable. Depreciation is a major component of expense that often bears no relationship to actual operating cost. It is calculated by arbitrary formulas using an arbitrary life for each asset, and on the basis of purchase, not replacement, price; thus, during periods of general price inflation, two stations with identical equipment, purchased at different times, would be calculating depreciation on a different base. Further confusing the issue is the fact that when a station is sold, the value of the license and other intangibles is capitalized into the price of the plant and equipment, and this becomes the base for depreciation. Thus two identical stations built in the same year could report widely different values of depreciation, and thus profit, if one was held by the original owners while the other had been recently sold.

Table E.4 summarizes the data on depreciation and our new dependent variable, profit plus depreciation. The regression results, shown on line (2) of Table E.3, are somewhat sharper than those for profit alone, but the pattern of estimated coefficients is not much changed.

Table E.3

ORDINARY LEAST SQUARES PROFIT EQUATIONS
FOR TELEVISION STATIONS

Line	Sample	Dependent Variable	Constant (1000)	$\frac{TVH}{N}$	$NU(\frac{TVH}{N})$	$(\frac{NCNU}{N-1})(\frac{TVH}{N})$	$IV(\frac{TVH}{N})$	$(\frac{NCIV}{N-1})(\frac{TVH}{N})$	$IU(\frac{TVH}{N})$	$(\frac{NCIU}{N-1})(\frac{TVH}{N})$	R^2	SEE[a] ($1000)
(1)	All	PROFIT	-207 (-2.99)	9.19 (11.64)	-8.94 (-6.16)	6.04 (3.36)	-12.51 (-22.39)	5.68 (4.32)	-14.83 (-28.55)	17.86 (12.38)	.808	749
(2)	All	PROFIT + DEPR	-109 (-1.58)	10.01 (12.70)	-9.58 (-6.62)	6.17 (3.44)	-12.41 (-22.27)	4.58 (3.49)	-15.34 (-29.60)	18.55 (12.89)	.822	7[illegible]7
(3)	NV	PROFIT + DEPR	-95 (-1.24)	8.44 (9.76)		9.34 (3.86)		7.14 (4.41)		22.59 (14.19)	.857	735
(4)	NU	PROFIT + DEPR	-71 (-1.64)	1.85 (2.61)		3.10 (4.93)				5.73 (2.56)	.388	165
(5)	IV	PROFIT + DEPR	-210 (-.35)	7.11 (1.37)				-18.37 (-2.14)		5.88 (.58)	.401	1215
(6)	IU	PROFIT + DEPR	13 (.05)	.08 (.04)		-3.56 (-.46)		-.15 (-.05)		-3.82 (-.96)	.090	603

[a] Standard error of estimate.

Table E.4

SUMMARY STATISTICS FOR DEPRECIATION AND FOR PROFIT PLUS DEPRECIATION

Sample	Number of Stations	Mean ($1000)	Standard Deviation ($1000)	Minimum ($1000)	Maximum ($1000)
		Depreciation			
NV	390	185	144	0	1044
NU	86	113	68	0	423
IV	22	372	271	18	1036
IU	42	149	107	15	501
All	540	178	148	0	1044
		Profit plus Depreciation			
NV	390	1267	1933	-676	11,849
NU	86	138	206	-288	697
IV	22	1216	1421	-1366	4871
IU	42	-162	594	-1618	1272
All	540	974	1758	-1618	11,849

E.2. ESTIMATED EQUATIONS

We adopt the specification used in Besen (1973)* to estimate station time rates and apply it to estimate profits:

$$\begin{aligned} \text{PROFIT} = \beta_0 &+ \beta_1 \frac{TVH}{N} \\ &+ \beta_2 NU\left(\frac{TVH}{N}\right) + \beta_3 \left(\frac{NCNU}{N-1}\right)\left(\frac{TVH}{N}\right) \\ &+ \beta_4 IV\left(\frac{TVH}{N}\right) + \beta_5 \left(\frac{NCIV}{N-1}\right)\left(\frac{TVH}{N}\right) \\ &+ \beta_6 IU\left(\frac{TVH}{N}\right) + \beta_7 \left(\frac{NCIU}{N-1}\right)\left(\frac{TVH}{N}\right), \end{aligned} \tag{E.1}$$

where TVH is the number of television households in the ADI; N is the number of television stations in the market; NU, IV, IU are station class dummies; and NCNU, NCIV, NCIU are the number of stations in each class that compete with the station to which the observation refers.

The first line of equation (E.1) would be the specification if all stations were equal. We expect profit to increase with TVH/N, so β_1 should be positive. The remaining lines allow for the fact that all stations are not equal. The terms to the left of the remaining three lines reflect the handicaps of UHF transmission, lack of network affiliation, or both; we expect β_2, β_4, and β_6 to be negative. The terms to the right reflect our expectation that a station will make higher

*Stanley M. Besen, *The Value of Television Time and the Prospects for New Stations*, Rand R-1328-MF, October 1973.

We also tried other specifications. In one, we added both payments to owners and depreciation to profit to create the dependent variable. In others, we specified the competition and handicap variables in different ways, and in some we included ADI retail sales as an explanatory variable. None of these other specifications produced results that were substantially different or better than those reported here.

SOME PROBLEMS WITH THE RESULTS

Superficially, the estimated equation on the second line of Table E.3 looks remarkably good. A closer look, however, shows that it is not without some serious problems.

Poor Estimates of Profits for Handicapped Stations

The overall R-squared for the equation, .822, is quite respectable. Unfortunately, the high R-squared is due entirely to the ability to predict the profits of network Vs. The equation does a very poor job of predicting profits for the other three classes of stations, as shown in Table E.5.

In-sample predictive performance can be increased by estimating separate equations for each class of station. The resulting equations are on lines (3) through (6) of Table E.3. In addition to the equation for network Vs, the ones for network Us and independent Vs look fairly good. The separate NU equation is a clear improvement over the application of line (2) to predict NUs' profits, and the IV equation has a fair amount of explanatory power. There is, though, a complete lack of systematic relationships in the IU equation. Thus we are

Table E.5

GOODNESS OF FIT MEASURES FOR PROFIT PLUS DEPRECIATION EQUATION

Measure	NV	NU	IV	IU	All
R-squared	.853	.037	-.024	-1.249	.822
Root mean squared error ($1000)	741	202	1438	891	741

left without any means of predicting profits for independent Us, the class of stations that may be of most interest.

Number of Stations is Not Really Exogenous

The application of the estimated equations produces some counter-intuitive results that strongly suggest that it is not legitimate to treat numbers of stations (N, NCNU, NCIV, NCIU) as exogenous variables. For example, the equations imply that the addition of a UHF independent to a market would *increase* the profits of stations already in the market.* Certainly we would not expect this to be the case in actuality. The additional competition should decrease the existing stations' profits--

*Say we add an independent U to a 3-network V market. Using line (2) of Table E.3, predicted profit plus depreciation for each of the network Vs would increase from

$$-109 + 10.01\ (\frac{TVH}{3})$$

to

$$-109 + 10.01\ (\frac{TVH}{4}) + 18.55\ (\frac{TVH}{4})(\frac{1}{3})$$

or by

$$(18.55 - 10.01)(\frac{TVH}{12}) ,$$

where profit is measured in $1000 and TVH is measured in 1000 households.

possibly not by very much, but it certainly should not increase them.

Another example: Consider a market with three network Vs and one independent V. The estimated equation (line (2)) predicts that the independent station loses money, and its losses will be larger the larger is the market.* Again, this prediction conflicts with common sense:

The problem in these two examples is not that the equation fits the data poorly. On the contrary, it fits NV profits quite well. The first example (adding an IU to increase the profits of stations already in the market) reflects the fact that in our sample, independent Us tend to be located in the same markets as high-profit network Vs. The problem comes in interpreting this as a causal relationship. The independent Us do not cause high profits for the network Vs; arbitrarily plunking down a new U in a market would not increase the Vs' profits. Instead, it is more reasonable to suppose that the same forces lead to the presence of both highly profitable network Vs and independent Us in some markets. In short, the number of independent Us is really an *endogenous* variable, and we explicitly take this fact into account in our variable stations model described in Appendix A.

The problem is similar in the second example (the bigger the market, the more a singleton independent station loses). In this case, the equation does not fit the data well, but that is not the basic problem. The basic problem is again that we are treating the number of independent stations as an exogenous variable, and it is not. In reality, and in our data, we never find a very large market with only one independent station, and the equation is not capable

---

*Predicted profit plus depreciation equals

$$-109 + (10.01 - 12.41)\left(\frac{TVH}{4}\right).$$

of telling us what would happen if such a market existed. The equation can and does predict positive profits for independent Vs located in markets with other independent stations. There are forces at work that lead to the presence of several independent stations in large markets; again, it is incorrect to treat the number of independents as exogenous.

To handle this problem econometrically, we use a two-stage procedure: First estimate directly the number of stations in each market as a function of market size and VHF allocations, then rerun the regressions in this section using estimated instead of actual numbers of stations as independent variables. This procedure should produce asymptotically unbiased estimates that avoid the counter-intuitive features of the equations in Table E.3, but we do not expect it to improve the fit to our data. Profits, particularly those of independent Us, would continue to have a large unexplained component.

E.3. TWO-STAGE ESTIMATION OF STATION PROFIT EQUATIONS

The root of the problem discussed at the end of the previous section is that the number of stations in a market is not really exogenous; the number of stations and the profitability of stations are simultaneously determined. Large markets, for example, often contain both highly profitable network VHF stations and (not necessarily profitable) independent UHF stations. Ordinary least squares regression incorrectly attributes the Vs' high profits to the presence of the Us; hence the incorrect inference that an additional U would increase the Vs' profits. Correct estimation methods must take the simultaneity explicitly into account.

We use one such method here--a two-stage least squares (TSLS) procedure in which the number of stations is first estimated as a function of exogenous variables, and then the profit equation is estimated using observations on predicted rather than actual numbers of stations. The number-of-stations equation used here has a very simple form:

$$NUHF = \alpha_0 + \alpha_1 \; TVH + \alpha_2 \; NVHF \; , \qquad (E.2)$$

where NUHF is the number of UHF stations in the market and NVHF is the number of VHF stations. We expect to find (other things being equal) more UHF stations in larger markets ($\alpha_1 > 0$) and fewer UHF stations where VHF competition is greater ($\alpha_2 < 0$).*

Note that we are treating NVHF as an exogenous variable. This is

---

*Equation (E.2) is equivalent to one of the forms used by Stanley M. Besen and Paul J. Hanley in "Market Size, VHF Allocations, and the Viability of Television Stations," Rice University, Economics Department justifiable for the sample that we used to estimate (E.2), which includes only markets with 3 or more stations. There are no unused VHF allocations in such markets, so it seems legitimate to treat NVHF as being set exogenously by frequency allocation decisions rather than determined endogenously by economic forces.

In other respects, the sample used to estimate (E.2) is consistent with our previous work: In includes ADI markets within the contiguous states and excludes border markets. Satellite stations are not separately counted. Part-year stations and stations that did not file financial reports with the FCC are not counted, nor are outlying stations such as the Akron station in the Cleveland market.

The first line of Table E.6 shows estimates of equation (E.2); all coefficients are highly significant and have the expected signs. Several goodness-of-fit measures are shown for this equation. Shown first, labeled untransformed predictions for all markets, are the usual measures supplied by most regression programs: R-squared, standard error of estimate, and standard error of estimate expressed as a fraction of the mean value of the dependent variable. These are all based on NUHF predicted directly by the equation, which in general will be a fractional number of stations. Since fractional stations don't exist, we also predict NUHF by rounding to the nearest integer value. Goodness-of-fit measures for these integer predictions are also shown in the table. Both fits are fairly good, with R-squareds over .7.

We are particularly concerned with the largest markets, say the

Table E.6

FIRST STAGE EQUATION FOR NUMBER OF UHF STATIONS

				Predictions for All Markets						Predicting for Top 50 Markets					
				Untransformed Predictions			Integer Predictions			Untransformed Predictions			Integer Predictions		
Sample	Constant	TVH[a]	NVHF	R^2	SEE[b]	$SEE/\bar{X}$[c]	R^2	SEE	$SEE/\bar{X}$	R^2	SEE	$SEE/\bar{X}$	R^2	SEE	$SEE/\bar{X}$
All markets	2.59 (20.60)	.117 (13.53)	-.852 (-16.82)	.723	.562	.53	.743	.540	.51	.379	.778	.81	.353	.794	.83
Top-50 markets	1.82 (4.88)	.0891 (6.33)	-.514 (-3.92)							.466	.721	.75	.197	.885	.93

[a]100,000 ADI television households.

[b]Standard error of estimate; $\sqrt{SEE/(n-3)}$ where SSE is the sum of squared errors and n is the number of observations.

[c]SEE as a fraction of the mean number of UHF stations.

top 50, where serious spectrum shortages seem most likely to occur. The other entries in Table E.6 reflect this concern. The top right corner of the table shows how well the equation estimated using the full sample does at predicting for just the top 50 markets. Unfortunately, it fits large markets less well than it does the full sample, with R-squared for either integer or untransformed predictions around .35. Hoping to improve the fit, we reestimated equation (E.2), using data on the top 50 markets only, with the results shown on the second line of the table. R-squared for untransformed predictions is increased somewhat but, curiously, that for integer predictions drops. The reason for this is not clear; it may be because (E.2) is an over-simple specification.

We use the estimates in Table E.6 to generate predicted values of numbers of stations to use in estimating the profit equation (E.1) as a second stage. We take both the number of network Vs (NNV) and the number of independent Vs (NIV) as exogenously determined by VHF allocations according to the following relationships:

$$NNV = \min(3, NVHF)$$

$$\text{and} \quad NIV = NVHF - NNV.$$

That is, we assume, consistent with reality, that VHF stations have first chance at network affiliation in each market and that any Vs left after all affiliations are taken operate as independents. The

*We use integer predictions for $\widehat{NUHF}$.

numbers of affiliated and independent UHF stations, NNU and NIU, are determined endogenously by economic factors, so we use predicted values (indicated by hats) rather than actual values:

$$\widehat{NNU} = \min\,(3 - NNV,\ \widehat{NUHF})$$

$$\text{and } \widehat{NIU} = \widehat{NUHF} - \widehat{NNU}.^{*}$$

That is, if affiliations are still available after VHF stations have first choice, Us will take them, and any remaining Us will operate as independents. To get the values that actually enter equation (E.1), we simply calculate

$$NCNV = NNV - NV,$$

$$NCIV = NIV - IV,$$

$$\widehat{NCNU} = \widehat{NNU} - NU,$$

$$\widehat{NCIU} = \widehat{NIU} - IU,$$

$$\text{and } \hat{N} = NVHF + \widehat{NUHF}.$$

Table E.7 shows TSLS estimates of profit equations and OLS estimates for comparison. On line (2) of Table E.7, the TSLS estimate for all stations using data for all markets is a remarkable improvement over the corresponding OLS estimate (shown on line (1), duplicating line (1) of Table E.3). In discussing the OLS estimate previously, we saw that it predicted that adding a UHF station to the market would increase the profits of stations already in the market. Take as an example an independent U coming into a 3 network V market. Line (1) predicts

Table E.7

PROFIT EQUATIONS[a] FOR ALL MARKETS AND TOP 50 MARKETS

Line	Method	Sample	Constant (1000)	$\frac{TVH}{N}$[b]	$NU(\frac{TVH}{N})$	$(\frac{NCNU}{N-1})(\frac{TVH}{N})$	$IV(\frac{TVH}{N})$	$(\frac{NCIV}{N-1})(\frac{TVH}{N})$	$IU(\frac{TVH}{N})$	$(\frac{NCIU}{N-1})(\frac{TVH}{N})$	R^2	SEE[c] ($1000)
							All Markets					
(1)	OLS	All	-207 (-2.99)	9.19 (11.64)	-6.94 (-6.16)	6.04 (3.36)	-12.91 (-22.39)	5.68 (4.32)	-14.83 (-28.55)	17.86 (12.38)	.808	749
(2)	TSLS	All	-441 (-6.51)	13.54 (16.60)	-9.31 (-6.03)	5.37 (2.94)	-12.81 (-20.26)	5.25 (3.77)	-15.82 (-26.93)	7.73 (5.91)	.78[illegible]	782
(3)	OLS	NV	-187 (-2.42)	7.54 (8.62)		9.45 (3.86)		8.64 (5.27)		21.83 (13.55)	.844	744
(4)	TSLS	NV	-325 (-4.13)	8.54 (7.91)		11.25 (3.98)		14.45 (7.06)		17.53 (9.44)	.831	768
(5)	OLS	NU	-169 (-3.77)	2.08 (2.82)		2.36 (3.61)				2.54 (1.10)	.286	171
(6)	TSLS	NU	-163 (-4.00)	1.94 (3.26)		2.33 (3.55)				3.68 (1.78)	.283	167
(7)	OLS	IV	-476 (-.85)	7.62 (1.57)				-18.17 (-2.26)		2.44 (.26)	.368	1135
(8)	TSLS	IV	-744 (-.86)	8.71 (1.70)				-12.46 (-1.94)		-3.51 (-.47)	.288	1089
(9)	OLS	IU	-33.3 (-.11)	-.75 (-.35)		-2.76 (-.35)		.87 (.30)		-2.64 (-.64)	.097	624
(10)	TSLS	IU	214 (.34)	-2.47 -.75		.76 (-.19)		2.23 (.59)		.70 (.16)	.063	596
							Top 50 Markets					
(11)	OLS	All	256 (1.08)	6.87 (3.74)	-11.66 (-3.18)	7.31 (1.47)	-12.15 (-13.55)	7.95 (3.24)	-14.66 (17.43)	19.08 (7.46)	.782	1155
(12)	TSLS	All	-893 (-2.61)	19.23 (6.24)	-12.32 (-2.72)	-.04 (-.01)	-13.88 (-10.45)	.68 (.20)	-17.90 (-12.14)	-.78 (-.18)	.707	1338
(13)	OLS	NV	218 (.76)	5.29 (2.45)		12.94 (1.80)		10.83 (3.50)		23.09 (7.92)	.785	1183
(14)	TSLS	NV	-62 (-1.93)	12.05 (2.77)		10.48 (1.33)		11.68 (2.21)		11.45 (1.69)	.743	1269
(15)	OLS	NU	-896 (-4.11)	7.94 (4.95)		2.87 (3.85)				3.32 (2.32)	.869	64.8
(16)	TSLS	NU	-605 (-.25)	5.31 (.34)		-.00 (-.00)				-.02 (-.00)	-1.77	210
(17)	OLS	IV	-464 (-.65)	7.55 (1.34)				-18.08 (-1.99)		2.49 (.24)	.317	1203
(18)	TSLS	IV	-1319 (-.73)	12.67 (1.16)				-16.60 (-21.45)		8.45 (.59)	.152	1199
(19)	OLS	IU	-68.70 (-.18)	-.49 (-.19)		-3.88 (-.39)		.57 (.17)		-3.06 (-.65)	.087	660
(20)	TSLS	IU	750 (1.21)	-5.12 (-1.73)		3.64 (.44)		4.13 (1.28)		5.85 (1.14)	-.200	705

[a] R^2, SEE, and t-statistics (in parentheses) for TSLS estimates are all based on variance estimates using actual rather than predicted values for right hand side endogenous variables.

[b] TVH in 1000 households.

[c] For TSLS estimates, SEE is root mean squared error without degrees-of-freedom correction.

that profits for each V would change from $-207 + 9.19 (\frac{TVH}{3})$ to $-207 + 9.19 (\frac{TVH}{4}) + 17.86 (\frac{TVH}{4})(\frac{1}{3})$, an *increase* of $(18.55 - 10.01)(\frac{TVH}{12})$. Line (2) predicts that the "increase" is negative as it should be; and equal to $(7.73 - 13.54)(\frac{TVH}{12})$.

In another example, profit predicted for a singleton independent V from line (1) is $-207 + (9.19 - 12.51) \frac{TVH}{4}$; that is, the OLS estimates indicate implausibly that it loses more money the larger the market in which it operates. The TSLS estimate on line (2), on the other hand, puts its profit at $-441 + (13.54 - 12.81)(\frac{TVH}{4})$, which increases with market size as it should.

By taking the simultaneous determination of profits and number of stations explicitly into account, we have markedly increased the plausibility of predictions made by the overall profits equation estimated from the full sample. Nevertheless, the problem of unequal performance of equally situated stations, discussed above, still remains. Profit predictions made using line (2) of Table 3 are surrounded by wide bands of uncertainty, particularly for stations that are handicapped by UHF transmission, lack of network affiliation, or both. Although to a large extent this is *necessarily* true of any model that treats equally situated stations equally, we saw above that the fit could be somewhat improved by estimating separate equations for each station class. Consequently, we estimated separate TSLS equations for each station class. They are shown, together with the comparable OLS equations, in lines (3) through (10) of Table E.6. These separate TSLS equations are disappointing in at least two respects: Except for the network V equation, significance levels are generally very low; and the network V equation is not purged of its implausible predictions by our two-stage procedure. We also estimated all of the equations for top 50 markets only, lines (11) through (20), with similarly disappointing results.

E.4. CONCLUSION

We have seen that many equally situated stations realize quite unequal profits. For example, three independent UHF stations in one large market are all handicapped by lack of network affiliation and UHF transmission, and they all face the same line-up of competing stations. Yet their profits span a range of more than $2 million, extending from a modest positive profit to a large loss. This phenomenon makes the prediction of profits very difficult. Indeed, nearly half of the variance in the profits of independent Us is *necessarily* inexplicable by any model that treats equally situated stations equally. Further, we found that in our sample, there was no significant relationship whatsoever between the profits of independent Us and variables that ought to be important: market size and competition. One could explain more of the variance in profits of other classes of stations, but there, too, much remains unexplained.

This is bad news for the econometrician, who would like to project station profits with some degree of precision. One could look more closely at stations that perform especially unpredictably, and try to understand in a qualitative way what leads to the extreme results. But we would not expect to be able to produce quantitative projections of profits that are not surrounded by large bands of uncertainty.

But if this is bad news for the econometrician, it is good news for those concerned with the preservation of broadcast television service. Some spokesmen for broadcasters have argued that any loss of audience to competing technologies would lead rigidly to a leveraged reduction in profits that would drive many stations off the air. But our results indicate that there is a good deal of flexibility in the system; there seems to be room for many different modes of station operation, all viable. Certainly stations will react to competition from new technologies by adjusting their operations in ways that would soften the impact on profits. Indeed, the relationship between competitive factors and profits is so tenuous that any impact of new technologies on profits may get lost in the static.

Appendix F

A SIMULTANEOUS EQUATIONS MODEL OF TELEVISION STATION REVENUE AND EXPENDITURE*

*This Appendix was written by Professor Stanley M. Besen of Rice University, a consultant to The Rand Corporation.

F.1. INTRODUCTION

This appendix describes one way to predict television station profitability. Before turning to details in the next section, we sketch here an overview of the approach and indicate how it is related to the other methods we have studied.

We think of a television station as a firm that is in the business of "producing" audience and selling it to advertisers. The more audience it has to sell, the higher its revenues. But additional audience can be produced only at increased cost--for better programs, stronger promotion, upgraded technical facilities, etc. For a typical station, the relationships between revenue and audience, and between cost and audience, may be as shown in Fig. 5, repeated here for convenience. We hypothesize that the station will choose to produce the amount of audience, A*, that maximizes the difference between its revenue and its cost.

The approach we take in this note is to estimate equations that represent the revenue and cost curves of Fig. 5. This is a fairly complex process for at least two reasons. First, different stations will have different revenue and cost curves, depending on their own characteristics, their competition, and the market they operate in. Second, it is necessary to use simultaneous equation estimation techniques to avoid biased estimates. Audience, for example, is endogenous to the system and cannot legitimately be treated as just another independent variable. These complications are discussed in Sections F.2 and F.3.

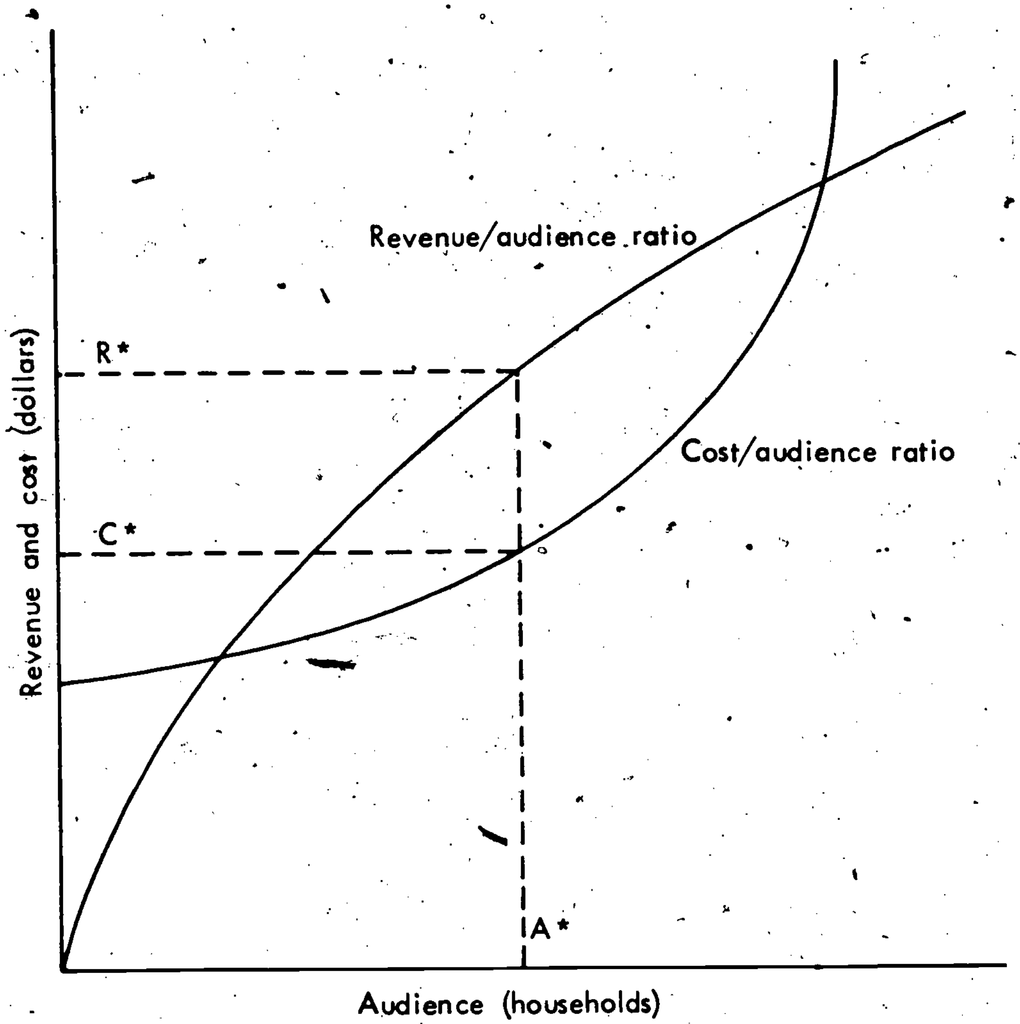

Fig. 5—Revenue and cost curves for a typical television station (conceptual)

The distinguishing feature of this approach is that we estimate the *functions* that face the firm in its decisionmaking--revenue and cost as functions of audience. These are structural equations in our model. Given these functions, we can in principle recreate the station's output decision by finding the audience that maximizes the difference between its revenue and cost. Thus the functions, together with our profit-maximization assumption, yield solution values for audience, revenue, cost, and profit. And at the same time, they illuminate the process by which we arrive at the solution.

In contrast, our other approaches to estimating station profits estimate solution values directly as functions of exogenous variables only. These are reduced-form equation approaches. They may perform as well as, or better than, the structural form of the model in predicting equilibrium outcomes, but they do little to illuminate the structure of the process.

F.2. MODEL SPECIFICATION

It is convenient to think of the "product" that television stations sell as access to audience. Stations acquire or produce programs to attract the attention of viewers who are then exposed to messages that advertisers wish to convey. Station profitability depends on the size of its audience, on the price it receives for each viewer exposure, and on the costs of producing its audience.

There are several ways in which television stations can produce audiences. They can air programs produced by the station's own employees. They can acquire them by direct purchase in the syndication market. Network affiliates obtain much of their programming through a contractual relationship with the networks, which acquire programs from independent program suppliers or produce the programs themselves.

Presumably each station fills its program schedule with the collection of programs that promises it the largest prospective return. Given the relationships between the revenues it earns and the costs it incurs, it chooses to "produce" the audience that maximizes its profits. Cost and revenue functions differ among stations in the same market as well as among stations in different markets. Consequently, the decisions made by stations as to the audience they will seek will differ among stations. We might expect that a station that has a high cost of attracting viewers because, for example, it is handicapped by UHF transmission or competes with a number of very strong stations, will seek to serve a smaller audience than will one with lower costs. It is not that the high-cost station desires a smaller audience per se but only that its profits are maximized with such an audience. If it increased its audience through larger expenditures on programming, it would earn smaller profits.

Two considerations are central to the approach we take in this appendix:

First, we analyze the determination of a station's expenditures and revenues as a single process. Additional expenditures by a station are made to increase its audience and, therefore, its revenues. A station that is attempting to maximize its profits will increase its expenditures so long as each additional dollar spent produces more than one dollar of additional revenues. In a given market, different stations will have different audiences largely because their costs of reaching any given audience will differ. Given its own characteristics and those of its competitors, a station will determine the expenditure level which will maximize its profits and this will, at the same time, determine its audience and revenue.

The second consideration is that our approach recognizes the interdependence of station behavior within a market. We expect that a station's cost of attracting viewers depend on the amount that other stations in the market are spending. In the jargon of economists, there are externalities among the cost functions of stations in the same market. Each station's cost function therefore has as arguments the level of expenditure of other stations in its market.

A second kind of interdependence concerns the setting of advertising rates. Given the relatively small number of stations in most markets, it is reasonable to inquire whether interdependences in rate-setting result and whether, therefore, the observed level of advertising rates can be linked to measures of market concentration.

A number of factors affect the costs of a station in reaching viewers. First, stations that are affiliated with the networks have lower costs because the networks bear the costs of program acquisition. (The fact that their revenues may be lower for any quantity of audience produced will be discussed below.) While both independent stations and network affiliates engage in program production and acquire programs in the syndication market, the fact that the affiliates have one programming source, the network, that is unavailable to the independents should mean that the network station's cost function will be lower. (It is important to remember that we are talking about the cost *functions* and not about the actual expenditures of the stations. Since a lower cost function will generally have result that profit is maximized at a larger audience, a station may spend more even if its cost function is lower than that of another station.) Second, because of reception difficulties and the still incomplete penetration of all-channel receivers, UHF stations have higher costs of reaching any given number of viewers than do VHF stations. In order to overcome the UHF handicap, a UHF station would have to spend more on programming than would an otherwise comparably situated VHF station. In this way, viewers would be induced to watch in spite of the poorer reception, or to acquire improved antennas, or to acquire all-channel sets, or perhaps subscribe to cable. The profit maximizing behavior of such a station might well be to seek a smaller audience than a similarly situated VHF station. (Its actual expenditures could conceivably be larger, however.)

Stations may face different revenue functions as well as different cost functions. The most obvious difference between stations is that between network affiliates and independents. While independents retain all of the payments made by advertisers, only a share of total advertising revenues goes to affiliates, with the remainder being retained by the network. (The nature of this relationship is analyzed in Besen and Soligo, 1973.)* Even if an affiliate earns less per viewer produced than an independent, that does not, of course, mean that the former is less profitable. The lower revenue per viewer produced has a counterpart in the lower cost for producing viewers, which was discussed above.

A second factor that can affect the price received per viewer is the *transactions cost*, in this case the cost of purchasing television spots, which is likely to have a component independent of the size of the audience reached. If this is the case, stations with a small audience will receive a smaller net price per viewer than will stations with large audiences even if advertisers are willing to pay the same price per viewer on all stations. The reason is that the full cost of advertising includes the transactions costs and, when these costs are considered, only by paying the smaller station a lower price per viewer can advertiser cost per viewer be equated for all stations.

A third factor that may affect the price received per viewer is differences in the demographics of different markets. If, because viewers are richer, or younger, etc., it is more profitable to advertise

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*S. M. Besen and R. Soligo, "The Economics of the Network-Affiliate Relationship in the Television Broadcasting Industry," *American Economic Review*, June 1973.

in one market than in another, we would expect the price per viewer to be higher in the former than in the latter.

Finally, the price that a station receives per viewer delivered may depend on the degree of competition in its market. Stations can, by restricting the number of viewers delivered, increase their profits, since producing additional viewers involves additional costs for a station. The extent to which the price charged and quantity of viewer exposures produced differs from the outcome under perfect competition depends on the extent to which the stations in a market, either by direct collusion or through a tacit understanding based on their perceived interdependence, can act as if they are a single firm. (Of course, there are some markets in which there is only one television station, so that collusion is not required, although even monopoly television stations may face competition from other media.) It is more likely that the monopoly outcome will be achieved the smaller the number of firms that must interact, so that we must inquire as to whether the price charged per viewer differs among markets depending on the extent of competition.

The full model contains an equation to explain a station's total revenue, one to explain its total costs, a profit maximizing condition, and a condition indicating that if a station is not earning a profit it will go off the air.

Each station is faced with a relationship that indicates how much it can earn for each viewer "delivered" to advertisers. This equation must allow for the fact that a network affiliate receives less per viewer than the advertiser pays since the network shares in advertsing revenues. The disparity in these rates should depend on the number of potential affiliates in the market. Each station also faces a function relating the number of viewers it can deliver to the expenditure it incurs. This relationship is assumed to depend on the expenditures of the station's rivals, and on its own characteristics and those of its competitors. Shifts in the expenditures of other stations change the "productivity" of a station's own expenditures as do changes in the number of stations in the market.

Given the cost and revenue function for a station, we can determine what its optimal level of "output", i.e., audience, will be. The station will increase its expenditures until the extra revenue produced by the last dollar spent is equal to one dollar. Moreover, it will not operate in the long run unless profits are positive. There may be no audience level at which the station is profitable.

These considerations lead us to specify the following system of equations:

$$\text{REVENUE} = \exp(\alpha_0 + \alpha_1\,\text{NU} + \alpha_2\,\text{IV} + \alpha_3\,\text{IU})$$
$$\exp(\alpha_4\,\text{D1} + \alpha_5\,\text{D2} + \alpha_6\,\text{D4}) \qquad \text{(F.1)}$$
$$\cdot\text{TVH}^{\alpha_7}\ \text{SALES}^{\alpha_8}\ (\text{AUD/TVH})^{\alpha_9}$$
$$\exp(u)$$

$$COST = \exp(\beta_0 + \beta_1\ NU + \beta_2\ IV + \beta_3\ IU)$$

$$CCNV^{\beta_4}\ CCNU^{\beta_5}\ CCIV^{\beta_6}\ CCIU^{\beta_7} \qquad (F.2)$$

$$(1+NCNV)^{\beta_8}\ (1+NCNU)^{\beta_9}\ (1+NCIV)^{\beta_{10}}\ (1+NCIU)^{\beta_{11}}$$

$$TVH^{\beta_{12}}\ CABLE^{\beta_{13}}\ [(NU+IU)CABLE]^{\beta_{14}}$$

$$AUD^{\beta_{15}}\ \exp(u)\ .$$

$$\frac{\partial REVENUE}{\partial AUD} = \frac{\partial COST}{\partial AUD} \qquad (F.3)$$

$$REVENUE - COST \geq 0\ . \qquad (F.4)$$

Equation (F.1) is the revenue function. Its variables, and the expected signs of their coefficients, are as follows:

REVENUE: The station's net broadcast revenue.

NU, IV, IU: Dummy variables that equal 1 if the station is a network affiliated UHF, an independent VHF, or an independent UHF, respectively, 0 otherwise. We expect the coefficients of IV and IU to be positive, because independent stations don't have to share their revenue with the networks.

D1, D2, D4: Dummy variables that measure the degree of competition in the market. Categories 1 through 4 represent successively greater competition, and the dummy variables equal 1 if the market falls in the corresponding category, 0 otherwise. Categories 1, 2, and 3 are markets in which 1, 2, or 3 networks have primary affiliates and there are no serious competitors for affiliation. A serious competitor is a VHF independent in a market in which all three networks have VHF outlets, or a UHF independent in markets where some or all of the networks have only UHF affiliates. If it includes a serious competitor for affiliation, a market falls in category 4. D3 must be omitted from the regression to identify the equations. We expect the coefficients of D1 and D2 to be positive, and that of D4 to be negative, reflecting the greater possibility of collusive pricing in stations with fewer markets.

TVH: The number of television households in the market's ADI. We expect its coefficient to be positive.

SALES: ADI retail sales per ADI TVH. We expect its coefficient to be positive.

AUD/TVH: The station's average daily audience expressed as a fraction of ADI TVH. Expected coefficient: positive.

u: A random error term.

Equation (F.2) is the cost function. Its variables are:

COST: The station's total expenditures.

NU, IV, IU: We expect the coefficients of these dummy variables to be positive, reflecting their technical and non-affiliation handicaps.

CCNV, CCNU, CCIV, CCIU: Average total expenditures of competing stations by category: network affiliated VHF, network affiliated UHF, independent VHF, and independent UHF, respectively. Expected signs are positive.

NCNV, NCNU, NCIV, NCIU: Number of competing stations by category. Expected signs: positive.

TVH: Sign is expected to be positive.

CABLE: Cable penetration expressed as a fraction of ADI TVH. By importing distant signals, cable systems increase the station's competition and so increase its cost of producing any specified level of audience. Hence, we expect the coefficient of CABLE to be positive.

(NU+IU)CABLE: As an offset to the distant signal effect above, cable systems improve UHF reception, and so may lower the cost of NU and IU stations only. This coefficient should be negative.

AUD: Expected coefficient is positive.

The third and fourth equations, which will not be estimated, close the system. Equation (F.3) is the condition for profit maximization for a station which is operating and equation (F.4) states that the firm must at least break even for it to continue to operate.

F.3. EMPIRICAL ESTIMATES

Equations (F.1) and (F.2) are estimated using a 1971 cross section of television stations. All stations within the 48 contiguous states are included, except those in border markets, those that were in operation only part of the year, those for which some or all of the required data are missing, outlying stations (for example, the Akron station in the Cleveland ADI) and a few stations whose performance was so far below equally situated stations in the same market that the profit-maximization hypothesis seemed clearly untenable in their cases. Data for satellite stations are aggregated with those for their parents. Five hundred and twenty-nine stations remain in the sample after these exclusions.

Because (F.1) and (F.2) include endogenous explanatory variables, they must be estimated by simultaneous equation techniques to avoid biased estimates. We used a two-stage instrumental variables procedure. The instrumental variables for the first stage regressions are NU, IV, IU and a dummy variable for each market.

We also estimated the equations using standard two-stage least squares, where the instrumental variables for the first stage are all of the exogenous variables in equations (F.1) and (F.2), but not the market dummies. The results were similar to those reported here, but with generally lower significance levels.

REVENUE EQUATION

The estimated revenue equation is

$$\log(\text{REVENUE}) = \underset{(56.54)}{8.754} - \underset{(-7.16)}{.309\ \text{NU}} - \underset{(-4.09)}{.325\ \text{IV}} - \underset{(-11.25)}{.967\ \text{IU}}$$

$$+ \underset{(4.45)}{.302\ \text{D1}} + \underset{(1.57)}{.071\ \text{D2}} + \underset{(4.99)}{.222\ \text{D4}}$$

$$+ \underset{(47.75)}{.984 \log(\text{TVH})} + \underset{(3.29)}{.179 \log(\text{SALES})}$$

$$+ \underset{(16.39)}{.721 \log(\text{AUD/TVH})}$$

$$R^2 = .905\ . \qquad (F.1')$$

The numbers in parentheses are adjusted t statistics, not simple t's for the second-stage regression. They are calculated by basing the estimate of the variance of the error term on the squared residuals obtained when actual values of the right-hand-side endogenous variable (rather than values predicted by the first stage equation) are plugged into the estimated equation. Similarly, R^2 reflects the fit of the equation using actual rather than fitted values of AUD/TVH.

Several important elements of the equation are worth noting: first, a one percent increase of a station's potential audience, TVH, leads to approximately a one percent increase in its revenues, given its share.

Second, a one percent increase in a station's share leads to approximately a .7 percent increase in its revenues, given TVH. This implies that there are "diminishing returns" to increasing a station's share. Third, the economic well-being of a station's market, as measured by retail sales, has a slight effect on a station's revenues. For a station with a given potential audience and a given share, hence with a given audience, a one percent increase in retail sales increases the station's revenues by about .2 percent.

The principal anomaly in the above results is the negative coefficients of IV and IU. Since the network shares in the revenues that advertisers pay for advertising on affiliated stations, we had expected that these would both be positive. Also unexpected is the significant positive coefficient of D4. We had expected that the greater degree of competition in markets in category 4 would shift the revenue curve downward.

COST EQUATION

When equation (F.2) was estimated as specified in the previous section the results were quite poor. Although the overall fit was good, many of the coefficients had the wrong signs or implausible magnitudes. Consequently we tried estimating equation (F.2) as an "inverse cost function," with AUD as the dependent variable and COST as an endogenous variable on the right-hand side. The results in this form were much better, except for the coefficients of the CABLE variables, both of which were insignificant and had the wrong signs. When these variables were dropped, the estimated equation was:

$$\log(AUD) = \underset{(-5.01)}{-3.960} \; \underset{(-10.86)}{-.621\,NU} \; \underset{(-5.94)}{-.533\,IV} \; \underset{(-13.41)}{-1.323\,IU}$$

$$\underset{(-6.37)}{-.0313\log(CCNV)} \; \underset{(-1.72)}{-.0075\log(CCNU)} \; \underset{(-5.98)}{-.0216\log(CCIV)} \; \underset{(-3.49)}{-.0133\log(CCIU)}$$

$$\underset{(-5.85)}{-.786\log(1+NCNV)} \; \underset{(-.68)}{-.113\log(1+NCNU)} \; \underset{(-2.59)}{-.408\log(1+NCIV)} \; \underset{(-2.68)}{-.294\log(1+NCIU)}$$

$$+ \underset{(11.79)}{.740\log(TVH)} + \underset{(7.85)}{.517\log(COST)}$$

$$R^2 = .894 \qquad (F.2')$$

Several facets of this equation are notable. First, the coefficients of NU, IV, and IU are all negative and significant, as expected. Moreover, the coefficient of IU is larger in absolute value than the coefficient of either of the others, which is what we expect given the double handicap which independent UHF stations face. Second, the coefficient of log(TVH) is significant indicating that an increase in the potential market of a station increases the audience which can be obtained at any expenditure level. The coefficient implies that a one percent increase of TVH leads to about a .7 percent increase in audience with station expenditure held constant. Third, a one percent increase of station expenditures will lead to about a .5

percent increase in the audience. Since this equation implies that cost rises faster than does audience and the estimate of (F.1′) implies that revenue rises more slowly than does audience, a determinate equilibrium will exist. Of the variables designed to capture the effects of the expenditures of other stations, both the average expenditures and the number of competing network VHF stations are highly significant and negative, as expected. This means that as the total expenditures of this group of competitors increases, either because of an increase in the number of stations or because of an increase in their average spending, the cost of attracting any given number of viewers also increases. The coefficients of the variables measuring competition from independent stations, both VHF and UHF, are also negative and significant. Those for network affiliated UHF have the right sign but are not significant.

REDUCED-FORM AUDIENCE EQUATION

In principal, estimated equations (F.1′) and (F.2′), together with the profit maximization assumption (F.3′) are all that we need to calculate equilibrium values of audience, revenue, cost and profit for any station. Adding the positive profit constraint (F.4), we could further calculate by iteration the number of stations any market could profitably support. In practice, we may well obtain better estimates starting with a reduced-form audience equation. The form of such an equation is derived by applying equation (F.3) to (F.1) and (F.2) and solving for audience. Estimating the resulting equation we obtain

$$\log(AUD) = \underset{(7.91)}{2.116} \quad \underset{(-14.17)}{-.869\ NU} \quad \underset{(-4.18)}{-.482\ IV} \quad \underset{(-19.97)}{-1.851\ IU}$$

$$\underset{(-9.00)}{-.0499 \log(CCNV)} \quad \underset{(-1.37)}{-.0077 \log(CCNU)} \quad \underset{(-4.39)}{-.0207 \log(CCIV)} \quad \underset{(-2.00)}{-.0098 \log(CCIU)}$$

$$\underset{(-6.13)}{-1.033 \log(1{+}NCNV)} \quad \underset{(-1.82)}{-.384 \log(1{+}NCNU)} \quad \underset{(-4.97)}{-.921 \log(1{+}NCIV)} \quad \underset{(-1.80)}{-.255 \log(1{+}NCI}$$

$$\underset{(30.74)}{+\ 1.174 \log(TVH)} \quad \underset{(-.15)}{-.011 \log(SALES)}$$

$$R^2 = .824 \qquad \text{(F.3')}$$

The right-hand-side variables are all those regarded as exogenous to the station. Thus, a station's own expenditures are excluded. The equation is designed to show the movement of a station's *equilibrium* audience in response to changes in the exogenous variables that it faces. As expected, equilibrium audience is smallest for independent UHF stations and largest for network VHF stations. A doubled market size, TVH, leads to an approximate doubling of the audiences of all stations. Both the number of competing network VHF stations and their average expenditures significantly affect a station's audience and the same is true for independent VHF stations. The picture is mixed for UHF stations although all coefficients have the expected signs.