

## **I. Introduction and Statement of Problem**

An important problem for economists and policy-makers concerning the cable industry is whether the cable industry faces direct competition. The regulation of the industry depends critically on the extent of competition. Barring effective competition, the industry will be treated as a natural monopoly much like public utilities. As a result, competition becomes a critical consideration for regulators. Accordingly, this paper studies whether the cable industry faces direct competition in the form of Direct Broadcast Satellite (“DBS”) service, particularly examining the factors, including price and quality, that affect consumers’ choices between DBS and cable. The results illuminate the state of competition between these two services.

Insufficient competition may lead to higher prices and lower quality than would exist in the presence of more robust competition, so determining the extent of competition is extremely important. In a few local areas, cable systems face direct competition from a second "overbuilt" cable system (i.e., where a second company builds a second cable system where an incumbent already provides cable service), but such instances are rare. Only one roughly comparable, nation-wide competitor exists, DBS, but the degree of substitution potential between DBS and cable remains a legal and economic stumbling block. Substitution potential is difficult to measure and legally difficult to prove or disprove. For example, DBS in most cases was prohibited from offering local over-the-air broadcast stations to its subscribers when the data used in this paper were collected. This suggests that DBS is only an imperfect substitute. Part of this rationale is that DBS may impose high initial costs on new subscribers, thereby limiting

its competitive role. The higher the fixed costs of obtaining DBS, the more unlikely it offers direct competition for cable.

By law, the supply of cable services is provided through "local franchises." The market, therefore for cable service is local. Cable system operators were awarded the right to offer service to a given area based on negotiations with the local community, usually many years ago. Adjacent communities often receive service from different cable systems, depending upon which cable system(s) is(are) servicing those areas.

In contrast, DBS is a service offered to almost the entire nation at essentially the same terms and prices. The main factor that varies from community to community is the percentage of households that take DBS service, or the penetration rate. The challenge therefore in determining the relationship between DBS and cable industry behavior is to gain access to comparable data on both industries, at the local level.

Cable operators have been raising prices much faster than general inflation over the last three years.<sup>1</sup> These price fluctuations in cable as well as the current pricing of DBS may indicate that, at least up to this time, DBS does not appear to be a close substitute for cable services. This idea is further supported by the fact that cable prices (that formerly followed the national trend of rapid increase) drop dramatically where a second cable operator overbuilds an existing system, but cable prices are rising quickly

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<sup>1</sup> Cable operators attribute most of these price increases to increases in the cost of programming, implying that such price increases are justified because industry costs are increasing faster than the rate of inflation. Industry cost data are held very closely, however, and Federal Communications Commission and General Accounting Office studies call into question whether the claim of industry cost increases is accurate. See Federal Communications Commission, *Annual Review of Cable Industry Prices, 1998*, and General Accounting Office, *The Changing Status of Competition to Cable Television, July 1999*.

everywhere else in the country. Since DBS is available everywhere, but cable overbuilds exist in only a few places, cable prices may be constrained only where overbuilds exist.

This paper investigates the relationship between DBS and cable - whether DBS represents a close substitute for cable, and comments on the policy implications of the results. Study of the cable industry is constrained by a lack of publicly available data. Consumers may receive different services at different prices, depending upon which company owns the local franchise. One contribution of this thesis is that it uses data that formerly has been unavailable to analysts seeking to estimate determinants of market penetration. These data allow, for the first time, an examination of whether DBS, a national video service, provides competition to cable, a local video service.

## **II. Hypothesis**

My hypothesis is that DBS and cable compete imperfectly in terms of monthly prices, such that there is only a limited amount of substitution based on price. This means that although their own price elasticities can be shown to be appropriately positive, they may be inelastic, suggesting some limited substitution. Moreover their price cross-elasticities should also be low assuming that demand functions are homogeneous of degree zero. I further hypothesize that DBS and cable compete more directly in terms of the premium-level services that they offer.

To test this, I postulate that DBS penetration (the percent of television households in each area taking DBS) is a conditional random variable and a function of the monthly price of cable, demographic variables, and various other cable system characteristics (including size of the system and premium service offerings). The price of DBS will not change in a simple cross-section data set and the overall effect therefore will be indistinguishable from the constant in the regression equations.

The model includes regional dummy variables to account for regional variations. The hypothesis that cable competes by means of price is valid if the coefficient for quality-adjusted price of cable is positive and significant and relatively small, and if the coefficient for number of premium cable services is negative and relatively large.

### III. Background and Previous Research

The recent history of government regulation of cable rates has been marked by sudden and repeated change. With the 1984 Cable Act, Congress deregulated almost the entire cable industry but prevented telephone companies from entering the cable market.<sup>2</sup> Ultimately deregulation and increased competition results in inter-temporally decreasing prices. Examples include trucking, airlines, and natural gas. In the cable industry, however, from 1986 (the point at which the cable industry was completely deregulated) until 1992, cable rates rose three times faster than the rate of inflation. In this case, deregulation with limited entry resulted in higher prices.

Partly as a result of these price increases, the Congress re-regulated the industry in October 1992 with the only bill passed over President Bush's veto. The Telecommunications Act of 1996, conversely, set March 31, 1999 as the ending date of the 1992 rate regulation. Cable prices since deregulation have again increased at a rate several times general inflation.

In general, the question of whether scarcity and marginal cost are driving cable prices remains. Part of the problem is that the cable market operates through local government regulated franchises. This raises a fundamental question concerning federal policy for cable rate regulation: How to measure whether the cable industry, either locally or nationally, is facing competition.

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<sup>2</sup> This statement may require some explanation, since it seems contradictory, but it is what it seems: Congress both deregulated rates *and* protected the industry from what may have been its most likely competitor, the local telephone companies.

The 1984 and 1992 Cable Acts specified very different tests to determine whether cable companies were facing competition. Both Acts freed cable operators from rate regulation if the test for competition were met. The 1984 Act required only the existence of a few over-the-air broadcast stations for a determination of competition and, thus, almost the entire industry was deregulated.

The subsequent rapid increase in cable rates in such markets indicated to some that this test was not strict enough. The 1992 Act's test related more directly to whether another multichannel video provider was offering service to the customers of individual cable operators. In most cases the answer was no and most of the industry was re-regulated.

The 1996 Act set a strict end date for all rate regulation, regardless of the presence of competitors, but clearly in the hope that competition would become widespread before March 31, 1999. The number of markets in which other forms of direct competition, involving wireless or wireline delivery within local markets, has grown since 1992, but at a much slower rate than the members of Congress envisioned when passing the 1996 Act. While consumers in these markets have enjoyed the traditional characteristics of competitive markets, lower prices and higher-quality service than comparable markets with less competition, only a small percentage of markets have direct competition in this form.

Because DBS suppliers provide satellite hook-ups, theirs is often considered a nationwide market. Can nationwide markets offer local market competition?. Many answer this question affirmatively, and they assume that a "market" test, such as that

provided in this analysis confirms competition. The test ultimately reflects whether DBS and cable are substitutes. Therefore, whether cable now faces widespread competition depends upon whether DBS is a direct substitute. The results reported in the literature are mixed.

Prior to 1996, data on direct competition in the cable industry has been very hard to come by, so little research on the cable industry and its substitutes existed. When Congress passed laws, it relied on “number” test, not direct market tests. Very recently, Jerry Hausman has written on the relationship between cable prices and DBS. (Hausman, 1999.) In general, he concludes that DBS is not a substitute for cable because cable prices only respond in the presence of another cable competitor, not to the universal presence of DBS. Hausman attributes this fact to product differences between cable and DBS, such as the inability to provide broadcast signals and high DBS start-up costs. Hausman does not, however, examine quality-adjusted cable price. Recent work by the Federal Communications Commission and General Accounting Office agrees with Hausman’s conclusion, finding significant cable price decreases and cable quality increases where cable overbuild competition exists, but cable price increases everywhere else.<sup>3</sup>

Because of this scarcity of data and also because DBS has only been available since 1993, no further research on the relationship between DBS and cable exists at the time of this writing. Older research on substitution between cable and other products does exist. Douglas Webbink estimated the demand for cable service as a function of

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<sup>3</sup> See, *supra*, fn. 1.

cable price, the quality of the service, the price and availability of substitutes, the income of potential subscribers, and the tastes of subscribers (Webbink, 1986). He also estimated a similar function for the demand for Multipoint Distribution Service ("MDS"), a wireless video service.<sup>4</sup>

Similarly, staff of the National Telecommunications and Information Administration produced a study that estimated several models, all of which related the price of cable service to the number of broadcast signals available (Bykowski and Sloan, 1990). The conclusion was that a higher number of broadcast signals available led to greater competitive pressure on cable systems, expressed as lower cable prices.

Many other researchers have examined the cable industry, but very few in terms of substitution with other services. Robert Rubinovitz examined cable rate increases between 1983 and 1989, a period of increasing deregulation for the cable industry (Rubinovitz, 1993). George Ford and John Jackson employed the same model, slightly modified, to examine the effects of horizontal concentration (i.e., one company owning multiple cable systems) and vertical integration (i.e., one company owning both cable systems and cable programming networks) in the cable industry (Ford and Jackson, 1997). The authors concluded that horizontal concentration resulted in substantial programming cost savings for cable operators. Some of this was passed on to cable subscribers, resulting in a net consumer welfare gain. Vertical integration also led to cost savings for cable operators, but resulted in a net consumer loss due to an increase in producer surplus. John Mayo and Yasuji Otsuka employed a model to study the elasticity

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<sup>4</sup> In an appendix, Webbink does present results from a log-linear form, but these results are worse than his

of demand for different types of cable services in different areas in 1982 (Mayo and Otsuka (1991)).

All three of the papers in the paragraph above use a two-stage least squares model, as I propose below. They also use logarithmic forms in order to estimate elasticities. Finally, Mayo and Otsuka also employ the minimum-chi square weighting method I use. Therefore, the model I use has ample precedent and theoretical support.

Tasneem Chipty, in two papers, studied different aspects of the organization of the cable industry. The first studied the effect of cable operator ownership of programming networks (Chipty, 1994). The second studied whether national size had an effect on bargaining power and pricing (Chipty, 1995). The first paper concluded that cable operators favor affiliated networks, and refuse to carry rivals of affiliated networks. The second paper posited that scale economies in the cable industry result from regional size, and that bargaining power with programmers results from national size. By controlling for regional size, the author was able to study the effect of bargaining power on willingness to supply channels and subscriptions. The author concluded that larger operators supply more channels and subscriptions at all prices.

The second paper by Chipty (1995) does relate to the second element of my hypothesis, that cable system size affects DBS and cable system interaction. Chipty's hypothesis of bargaining power resulting from regional size also supports the idea that very large systems, or clusters, would be able to block competition, perhaps reflected in lower DBS penetration. By using their regional bargaining power, such large systems

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chosen linear model.

could deny DBS operators access to regional programming, especially regional sports programming, thus reducing the competitive threat of DBS. In addition, this paper, like Mayo and Otsuka (1991), uses the minimum-chi square method, as I propose below.

Richard Beil, et al. (Beil, et al., 1993) and Yasuji Otsuka (Otsuka, 1993) examined the welfare effects of Local Franchise Authority regulation of the cable industry, but came to different conclusions.<sup>5</sup> Beil, et al., assumed that franchising was the main barrier to competitive entry in the cable industry between 1984 and 1990 because franchising authorities were only interested in maximizing their franchise fees and calculated that franchising resulted in \$3.6 billion per year in national welfare loss. Otsuka looked at 1982 data, a period of rate regulation, and found welfare gains from franchise regulation. He found that rate regulation constrained rates below monopoly profit maximizing levels, and that franchise regulated areas also had higher quality service (in terms of number of non-local channels offered).

William Emmons and Robin Prager, examined, for 1983 and 1989, the effects of competition and type of ownership (i.e., privately owned versus municipal- or subscriber-owned) on prices and service offered (Emmons and Prager, 1997). The authors found that quality, in terms of number of basic service channels offered, was

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<sup>5</sup> The cable industry, whether rate regulated or rate unregulated has often been subject to some sort of local franchising requirement. Congress, in the 1984 Cable Act, instituted such franchising provisions for the entire country (previously some localities required franchises, and some did not), and required a cable operator to receive permission from the local government before constructing a cable system. The purpose was to allow localities to control who dug up their public rights of way and when. The local franchising authority could extract certain concessions (public access channels, wiring of schools, etc.) from the cable operator as compensation for disruption of public rights of way, and received up to five percent of the cable operator's gross revenues as compensation for the cost of oversight. The 1984 Cable Act allowed local authorities to award one or more franchises, thus allowing localities to block competitive entry. The 1992 Cable Act required local franchising authorities to grant franchises to new entrants under competitively neutral terms, but the franchising requirement still can serve as a barrier to entry.

generally similar in competitive and non-competitive systems, and in privately owned and non-privately-owned systems. Another interesting finding was that new entrants charged lower prices and offered more services than do incumbent firms facing competition. To the authors, this suggested a first mover advantage, and they took this fact as a possible explanation for the lack of overbuild competition. Gregory Crawford estimated a demand function for the cable industry in order to study the consumer welfare effects of the 1992 Cable Act (Crawford, 1996). The author found that strategic restructuring of cable system offerings largely negated the rate regulation instituted by the 1992 Act, and therefore largely negated consumer welfare benefit.

The review above is not a complete catalogue of models of the cable industry. It does indicate the types of models that have been estimated and the general state of understanding of the cable industry from economic study. This review indicates a paucity of studies that examine cable and its possible substitutes. It does provide some support for an approach that relates a penetration rate of a product to the price and characteristics of another product, for the use of two-stage least squares regression in this context, and for the use of the minimum-chi square method. These approaches have been used multiple times to study the cable industry and its competitors, and are outlined below.

#### IV. Empirical Model

I propose the following equation:

$$(1) \text{LDBSP}_i = B0 + B1 \cdot \text{LMOCSAT}_i + B2 \cdot \text{LINC}_i + B3 \cdot \text{LPOP}_i + B4 \cdot \text{COMPETE}_i + B5 \cdot \text{LHHPASS}_i + B6 \cdot \text{INTACC}_i + B7 \cdot \text{LPREM}_i + \varepsilon_i$$

Where (with expected signs in parentheses):

LDBSP is the log of DBS Penetration, or the percentage of television households taking DBS in a local community also served by cable, LMOCSAT is log of the monthly charge per cable satellite channel, a quality-adjusted price for cable,<sup>6</sup> (+, showing substitution)

LINC is the log of Per Capita Income in the community, (+)

LPOP is population density in the community, (+ or -)

COMPETE is a dummy variable that equals one when the cable system faces direct overbuild or wireless competition, and zero if it does not, (+ or -)

LHHPASS is the log of the number of households passed by the cable system,<sup>7</sup> (+ or -)

INTACC is a dummy variable for whether the cable system offers high-speed Internet access that equals one if the system offers the service and zero if not, (+ or -),

LPREM is the log of the number of premium movie channels offered by the cable system.<sup>8</sup>

and  $\varepsilon$  is the error term. Subscript  $i$  denotes cross-section observations 1 through 358. (-) This equation follows the form of several of the models detailed in the literature review, above.

One concern with estimating this equation is that consistent estimation of the parameters is precluded if a simultaneous relationship between LDBSP and LMOCSAT exists. Simply put, LDBSP may be partially determined by LMOCSAT, which may be in turn partially determined by LDBSP. To handle this potential problem, I employed a two-

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<sup>6</sup> "Satellite channels" are channels such as CNN and ESPN that cannot be received locally via over-the-air antennas. A "per satellite channel" charge represents a quality-adjusted price, because it represents the per unit charge for channels that cannot be received without cable or DBS service.

<sup>7</sup> Households passed refers to the number of homes passed by cable plant, which is separate and higher than the actual number of subscribers to the system.

<sup>8</sup> "Premium channels" refer to movie channels, often offered a la carte, such as HBO and Showtime.

stage least squares regression technique. In the first stage, I regressed LMOCSAT on a number of exogenous variables to create an expected value for LMOCSAT. Essentially I treat LMOCSAT as a function of all exogenous elements in a demand and supply system. The “expected” or fitted LMOCSAT is used in place of the original observations. Thus, LMOCSAT becomes a function determined by relevant variables, instead of simultaneously determining and being determined by LDBSP. In the second stage, I regressed LDBSP on the fitted LMOCSAT and the other variables listed above. The variables used as instruments in the first stage were:

LPREM, CLUSTER, MSO, LHHPASS, LINCOM, LPOPDEN, COMPETE, INTACC, MIDATL, NEWENG, MIDWEST, MOUNTAIN, and PACIFIC, where the variables are defined as above, with the addition of:

CLUSTER is a dummy variable, which equals one if the cable system offers service to more than 200,000 subscribers and zero if fewer,  
MSO is a dummy variable, which equals one if the cable system is owned by a company that owns more than one cable system, and zero if not, and  
MIDATL, NEWENG, MIDWEST, MOUNTAIN, and PACIFIC are dummy variables to pick up regional variations; each equals one if the local community in question falls in the region and zero if not.

A second concern when estimating the model described in equation (1) is the existence of heteroskedasticity, given the form of the equation and the cross-sectional data set. In this case the variance of  $\varepsilon_{1i}$ , denoted  $\sigma_{1i}^2$ , may not be fixed.

Heteroskedasticity is a common problem in cross-section studies where observations may not be perfectly homogeneous. Because the data set employed considers different communities, the possibility of non-constant variance raises the issue of the efficiency of the estimator. To account for this problem, I employ a weighted least squares approach that explicitly considers how the variances may vary across observations. In the past, as

detailed above, several authors have employed a minimum-chi square method for weighting the equation.<sup>9</sup> The inverse standard error for the error term in equations 1 is assumed to be a function of DBSP and HHPASS. This appears as a “weight” in the generalized least squares estimation:

$$(2) \quad 1/\sigma_{1i} = [\text{DBSP}_i * (1 - \text{DBSP}_i)] / \text{HHPASS}_i$$

This weight is then used to scale both the dependent and independent variables in the second stage of the instrumental variable estimation.

In general, the intent is to relate DBSP to cable price, cable system characteristics, and various demographic variables. The cable system characteristics were chosen to represent measures of quality in addition to the charge per satellite channel (such as the number of premium channels or whether the system offers high-speed Internet access), and to denote whether the cable system faced overbuild competition (COMPETE). The hope is to describe as much of the variation in DBSP in terms of these characteristics in order to build a coherent picture of the interaction between DBS and cable products.

In general, the coefficients are expected to have signs as follows. The coefficient for LMOCSAT should be positive, indicating that DBS Penetration is lower where the quality-adjusted price of cable is lower. Such a result would support my hypothesis if the magnitude of the coefficient is below one, indicating that DBSP is relatively unresponsive to changes in cable price. (The coefficients represent elasticities in this model.)

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<sup>9</sup> This approach was developed by Amemiya (1976) and is described for both single and simultaneous equations models by Maddala (1983 and 1989). See Chipty (1995) and Mayo and Otsuka (1991) for use of this method on the multichannel video industry.

The sign for the coefficient of LINCOM should be positive, indicating that DBS penetration varies directly with income. Anecdotal evidence suggests that the sign for the coefficient of LPOPDEN should be negative, suggesting a higher penetration of DBS in rural areas, where cable systems tend to be of lower quality and fewer alternative entertainment opportunities exist. The sign for the LPOPDEN coefficient could also be positive, however, simply reflecting associated income or marketing effects.

The coefficients for the LHPASS, COMPETE, and INTACC variables could have a positive or negative sign. Each of these coefficients could have negative signs because cable systems passing greater numbers of homes, facing competition, and offering high-speed Internet access are generally of higher quality and offer more services, and thus are more competitive with DBS. The coefficients also could be positive because larger cable systems, overbuild cable competitors, and cable high-speed Internet access service tend to exist in areas where populations are more accepting of new technology, and thus would be more accepting of DBS.

In the second equation, the sign for the coefficient of LPREM should be negative, indicating that DBS penetration is lower where cable systems offer more specialty channels, such as newly released movies.

## V. Data

Previously, the comparison of DBS information and cable information was difficult or artificial because local DBS data were not available. This study uses new data on DBS that are more appropriate to this task. All of the data used in this paper are cross-sectional. The DBS data on local areas are matched to a Federal Communications Commission study on cable systems, selected in a sample that is intended to be representative of U.S. cable systems. All of the data come from July 1998, unless otherwise noted below. DBS Penetration by zip code is a new data set, which comes from the Satellite Broadcasting and Communications Association, the national trade association of the DBS industry. These data are highly accurate, reported by each operator to its trade association.

These data are matched to cable industry data that come from the Federal Communications Commission's *Annual Survey of Cable Industry Prices* ("*Price Survey*"). This survey examines a sample of cable systems which is representative of the group of all cable systems nationwide. Data from this survey must be reported accurately by law. Finally, demographic data come from the Census Bureau. The data from the Census Bureau are two years older (as of 1996) than the other data (as of July 1998). For descriptive statistics for all the variables, see the Appendix.

One objection to this data set is that the sample for the *Price Survey* was chosen to be representative of the cable industry nationwide. The cable survey data set, however, is very large, and chosen to be representative of a nationwide industry serving almost every community in the nation. It should therefore also be representative of communities

served by DBS nationwide. Once matched up with the DBS data, the total number of observations is 358.

A mention should be made of the potential bias of this sample. The sample was chosen to be representative of cable service received by the average cable subscriber and most cable subscribers receive their cable service from large systems. As a result, the communities that appear in the sample tend to be served by cable systems with a larger number of subscribers, systems that, on average, offer a higher number of channels at higher prices. On the other hand, DBS operators offer packages that are equivalent or superior to the offerings of large cable systems, so that it is appropriate to compare them to large cable systems.

In addition, the sample was chosen with the intention of paying special attention to the effects of overbuild competition to cable systems. To examine this competition, all communities in which “effective competition” exists, as defined by the 1996 Telecommunications Act,<sup>10</sup> were surveyed, but only a sample of the communities in which effective competition does not exist. Thus, even though the competitive communities make up a small percentage of all cable communities, they comprise a much larger proportion of this sample. One potential solution is to use only the non-competitive communities for my regression. Since the overwhelming majority of cable communities are not competitive, the non-competitive group is representative of the

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<sup>10</sup> This definition of “effective competition” includes a group of cable communities that do not face direct competition, those that have below 30% penetration. This group actually makes up the bulk of communities rate deregulated because of a finding of effective competition. This group of “low penetration” communities behaves much more like non-competitive communities than competitive ones. (See the *1998 Price Survey*.) Still, a significant number of cable communities in the competitive sample face direct competition, perhaps enough to bias the results.

entire industry. Instead of using only non-competitive communities, I dealt with the potential bias by using a dummy variables to account for direct overbuild competition.

## VI. Results

The results from the equation detailed above are summarized by the following statistics:

R- Squared	0.919
Adjusted R Squared	0.917
Standard Error of Regression	1.633
SSR	934.094
F-Statistic	570.119
Durbin-Watson Statistic	1.790

In the models, the coefficients for the variables were as follows:

Variable	Coefficient	Standard Error of Coefficient	T	Significance
(Constant)	-11.45	3.505	-3.267	0.001
LMOCSAT	0.044	0.127	0.344	0.731
LPREM	-0.374	0.076	-4.890	0.000
LINCOM	0.874	0.353	2.476	0.014
LPOPDEN	-0.013	0.034	-0.375	0.708
COMPETE	0.501	0.435	1.151	0.251
LHHPASS	0.347	0.052	6.647	0.000
INTACC	0.786	0.111	7.091	0.000

In general, this equation measures the sensitivity of DBSP to various factors such as the characteristics of the local cable system and demographic variables. They form demand equations, with the magnitude of the coefficients representing elasticities.

Therefore, I believe that a valid interpretation of the results above is as follows.

First, the positive sign for the coefficient of LMOCSAT indicates that there is some quality-adjusted price-based substitution between DBS and cable. The magnitude of the coefficient indicates inelastic price cross-elasticity, so that DBSP is relatively

unresponsive to changes in monthly charge per cable satellite channel. This supports my hypothesis. The t-statistic, however, is low, indicating a low level of statistical significance. As a result, it may be more appropriate to interpret that this variable has no effect, and that there is no price-based substitution between cable and DBS.

Second, a negative sign for the coefficient of number of cable premium channels (PREM) could mean that the number of high-end video services offered by the cable operator plays a role in consumers' acceptance of DBS, as would be expected. Thus, again, the quality of cable service available seems to affect acceptance of DBS. This variable has a high t-statistic, indicating a high level of statistical importance. This result, in combination with the low t-statistic for LMOCSAT, may mean that cable and DBS compete in terms of quality measures instead of price. It may also mean that DBS appeals to a certain type of video customer, i.e., one who values premium services, such as premium channels. This result is further supported below.

The fact that the coefficient of INTACC is positive and significant may indicate that acceptance of DBS is higher in areas where demand for advanced services such as high-speed Internet access service is greatest. In general, cable operators have deployed high-speed Internet access in areas where income and acceptance of advanced technology are high.

Third, the positive sign for the coefficients of the LHHPASS, COMPETE, and INTACC variables indicates that DBSP is higher where cable systems pass more homes

(i.e., are larger), where cable systems face overbuild or wireless competition,<sup>11</sup> or where cable systems offer high-speed Internet access. The importance of the COMPETE variable is questionable, however, because of its low t-statistic. Generally, this indicates that consumer acceptance of DBS is higher in these areas, despite the fact that larger cable systems and cable systems offering Internet access are of higher quality. The most likely reason for this result is the fact that communities in these situations have a higher acceptance of advanced services, which is why cable operators begin offering high-speed Internet access or build larger and more advanced systems. DBS is also an advanced service, and therefore DBS is accepted at a higher rate where consumers desire advanced services.

The coefficient of LPOPDEN has a negative sign, indicating that DBS acceptance decreases as the population density increases, as had been observed with the previous generation of satellite television service that was delivered to eight-foot diameter dishes. Anecdotal evidence, such as higher DBSP in rural states such as Montana, supports this result. The t-statistic indicates a low level of statistical significance, however, so it is unlikely that this variable plays a large role in the demand for DBS. The sign for LINCOM is positive and significant, indicating that DBS acceptance increases as income increases, the expected result. The magnitude of the coefficient indicates inelastic income elasticity for DBS.

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<sup>11</sup> “Overbuild” competition, as indicated above, is where a second cable operator builds an entirely separate system to compete with an incumbent cable system. “Wireless” cable is video service transmitted via microwaves, but similar to cable in most other respects.

## **VII. Conclusion**

Overall, this model generates interesting results that may point to areas for policy action and for further investigation. These results indicate that DBS may compete with cable in terms of a quality-adjusted price, and in terms of higher quality services offered, such as premium movie channels. The responsiveness of DBSP to changes in cable quality-adjusted price is not statistically significant, however, indicating that DBS will not constrain cable price.

It also appears that DBS is more accepted by consumers in the same areas where cable operators are building large systems and offering high-speed Internet access. This may indicate that these communities have populations that demand advanced services, such as high-speed Internet access and DBS. Further investigation of this point is necessary to confirm it. DBS penetration may be responsive to income levels, with higher acceptance of DBS as income rises. This makes it a normal good, but the responsiveness to income changes is inelastic.

Since these results imply that DBS will not exercise strong restraint on cable prices, or perhaps no restraint at all, the presence of DBS as a national competitor may not justify deregulation of cable rates. Rate deregulation of the cable industry in the past has always been predicated on the existence of a competitor, presumably one that will constrain cable rate increases. At a minimum, this indicates that government monitoring of cable rates should continue to determine trends in cable rates, and to monitor the relationship between cable prices and the presence of competitors.

## VIII. References

Amemiya, T., "The Maximum Likelihood, The Minimum Chi-Square and the Nonlinear Weighted Least Squares Estimation in the General Qualitative Response Model," *Journal of the American Statistical Association*, Vol. 71, pp. 347-351, 1976.

Beil, Richard O., Jr., et al., "Competition and the Price of Municipal Cable Television Services: An Empirical Study," *Journal of Regulatory Economics*, Vol. 6, pp. 401-415, Dec. 1993.

Bykowsky, Mark M. and Timothy Sloan, "Competitive Effects of Broadcast Signal on the Price of Basic Service," *National Telecommunications and Information Administration Staff Paper*, Apr. 6, 1990.

Chipty, Tasneem, "Vertical Integration and Market Foreclosure: Evidence from the Cable Television Industry," Feb. 1994.

Chipty, Tasneem, "Horizontal Integration for Bargaining Power: Evidence from the Cable Television Industry," *Journal of Economics & Management Strategy*, Vol. 4, pp. 375-397, Summer 1995.

Crawford, Gregory S., "The Impact of the 1992 Cable Act on Consumer Demand and Welfare," *Journal of Regulatory Economics*, Sept. 9, 1996.

Emmons, William M. and Robin A. Prager, "The Effects of Market Structure and Ownership on Prices and Service Offerings in the U.S. Cable Television Industry," *RAND Journal of Economics*, Winter 1997.

Federal Communications Commission, *Annual Review of Cable Industry Prices, 1998*, MM Docket No. 92-266.

Ford, George S. and John D. Jackson, "Horizontal Concentration and Vertical Integration in the Cable Industry," *Review of Industrial Organization*, Vol. 12, pp. 501-518, 1997.

General Accounting Office, *The Changing Status of Competition to Cable Television*, Jul. 1999.

Hausman, Jerry, *Declaration of Professor Jerry A. Hausman, Appendix A to Petition of SBC Communications To Deny Application In the Matter of Applications for Consent to the Transfer of Control of Licenses of MediaOne Group, Inc., Transferor To AT&T Corp., Transferee*, Federal Communications Commission, CS Docket No. 99-251, filed Aug. 23, 1999.

Johnston, Jack, and John DiNardo, *Econometric Methods*, 4<sup>th</sup> Edition, The McGraw-Hill Companies, Inc., 1997.

Maddala, G.S., *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, 1983 and 1989.

Mayo, John W., and Yasuji Otsuka, "Demand, Pricing, and Regulation: Evidence from the Cable TV Industry," *RAND Journal of Economics*, Vol. 22, pp. 396-410, Autumn 1991.

Otsuka, Yasuji, "A Welfare Analysis of Local Franchise and Other Types of Regulation: Evidence from the Cable Industry," *Journal of Regulatory Economics*, Vol. 11, pp. 157-180, Nov. 1993.

Rubinovitz, Robert N., "Market Power and Price Increases for Basic Cable Service Since Deregulation," *RAND Journal of Economics*, Vol. 24, pp. 1-18, Spring 1993.

Webbink, Douglas W., "The Demand for Cable TV and for MDS," *Presented at the Fourteenth Annual Telecommunications Policy Research Conference*, Airlie, VA, Apr. 28, 1986.

### Appendix: Descriptive Statistics

<b>Table 3: Descriptive Statistics</b>					
<b>Variable<sup>12</sup></b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Standard Deviation</b>
DBSP	358	0.00	0.86	4.92 E <sup>-02</sup>	0.10
MOCSAT	358	0.30	2.92	0.87	0.35
HHPASS	358	131.00	1,031,023.00	122,895.8	166,327.1
INCOM	358	13,378.00	64,411.00	24,577.39	6264.65
POPDEN	358	1.70	32,618.90	1,241.20	2,831.91
PREM	358	0.00	33.00	10.98	6.24
COMPETE	36	N/A	N/A	N/A	N/A
CLUSTER	32	N/A	N/A	N/A	N/A
MSO	358	N/A	N/A	N/A	N/A
INTACC	64	N/A	N/A	N/A	N/A
MIDATL	57	N/A	N/A	N/A	N/A
NEWENG	27	N/A	N/A	N/A	N/A
MIDWEST	91	N/A	N/A	N/A	N/A
MOUNTAIN	32	N/A	N/A	N/A	N/A
PACIFIC	63	N/A	N/A	N/A	N/A

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<sup>12</sup> The variables are defined in the text above.

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