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The Implicit Marginal Valuation of Cable Service in the United States

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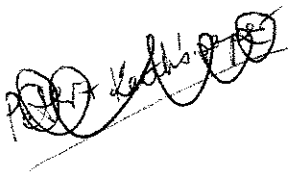

[1] The views expressed are those of the author and do not necessarily represent the policies of the Federal Communications Commission or the views of other Federal Communications Commission staff members.

ABSTRACT

This paper estimates the implicit marginal value of channel offerings by cable systems in the United States. Hedonic analysis is a convenient framework in which to explore the relationship between the price of cable service and the channels offered by a cable system. Two separate hedonic equations are estimated - one for the price of analog cable service and one for the price of digital cable service. With regard to the price of analog cable service, the implicit marginal valuation is statistically significant at the five percent level and positive for just seven of 121 channel offerings and negative for eleven channels. For the price of digital cable service, the implicit marginal valuation is statistically significant and positive for just six of 88 channel offerings and negative for seven channels. The results suggest that a subscriber's utility would be enhanced by a pricing structure different from the typical approach used by cable systems today of offering a bundled package consisting of several channels. One alternative is to allow consumers to subscribe to just those programming services for which they have a positive implicit marginal value (i.e., an a la carte pricing structure).

INTRODUCTION

Cable service in the United States is an example of a bundled commodity. Consumers purchase a group of channels (called tiers) from a cable system without an option of choosing only those channels they prefer. The only programming available on a single item basis is pay-per-view which is available on a per program basis or premium channels such as Home Box Office and the Movie Channel which are offered on a per channel basis, although they are sometimes offered in a bundle of premium channels for a discounted price. This bundling approach makes it difficult to determine the implicit marginal value of individual channel offerings. In what follows a unique data set will be used in conjunction with a modified hedonic model to estimate the implicit price of individual channels provided by a cable system.

The pricing schedule used by most cable systems consists of a basic tier (referred to as BST) that typically consists of local stations (e.g., broadcast channels) plus a few satellite channels and public, educational, and government access (PEG) channels if they are carried.[1] Additionally, most systems offer other tiers, designated cable programming service tiers (CPST). The major CPST typically consists of satellite-delivered channels (e.g., MSNBC, CNN, the Weather Channel, and ESPN). About 90 percent of cable subscribers take both the BST and major CPST while the remaining 10 percent take BST only based on the 2004 FCC Annual Cable Price Survey (Federal Communications Commission, 2003). Both BST and CPST are relatively close to pure bundling as consumers must purchase either the bundle or nothing.

The traditional explanations for bundling include the presence of economies of scope, complementarity in consumption, and as a response to uncertainty in production (Cabral, 2000; Holt & Sherman, 1986). Another explanation is that a firm bundles services in an effort to

[1] Local channel refers to those channels that carry local broadcast stations (either through must-carry requirements or retransmission agreements), public, educational, or government programming, commercial leased access, and other programming that originates locally. The term satellite channels refers to nationally-delivered channels that are, predominately, delivered by satellite to the cable headend. Satellite channels include major regional sports networks regardless of the distribution technology used.

extract consumer surplus and thereby increase its profit (Adams & Yellen, 1976; Varian, 1989). Each of these explanations has been used to characterize the pricing approach adopted by the cable industry (see, e.g., Hindery 1998; Mayo & Otsuka, 1991; Rubinovitz, 1993).

Bundling a service instead of offering its components separately is profitable if demand by a consumer is negatively correlated across goods and/or services or if consumer demand is heterogeneous (Schmalensee, 1984). For an individual consumer (subscriber), the demand for channels is *de facto* negatively correlated because watching one channel necessarily precludes the subscriber from watching another channel at the same time.[2] Moreover, across all subscribers demand is heterogeneous. Consumers subscribe to cable service in order to have access to different types of programming not available via over-the-air broadcasts because they value the service that cable programming provides. It is a simple observation that individual subscribers are, in general, different from one another and that the relative valuation of cable service is different for each one. The price of cable service is just the sum of consumers' willingness to pay to have access to channels they value plus what these subscribers must pay for those channels they do not value (Owen & Wildman, 1985). The implicit prices (i.e., the implicit marginal valuation) of the channels that subscribers value can be estimated using a hedonic approach. The use of the hedonic approach to estimate the implicit value or the willingness to pay of the average subscriber for individual channels requires modification of the traditional hedonic technique because of the nonlinearity in the price function and due to the general absence of competition on the supply side of the market.[3]

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[2] As in many instances, there are exceptions. If the consumer has more than one television set or if the set has picture-in-picture capability then the consumer can watch more than a single channel at any given time. As a general rule, however, just one channel is watched at a time.

[3] Note that the analysis is confined to looking solely at direct subscribers. Indirect subscribers include individuals who are temporary subscribers through hotels or hospitals or more permanent subscribers as when owners or managers of a large apartment complex provide cable service as part of the rental package.

SOME THEORETICAL CONSTRUCTS

Hedonic analysis presents a convenient framework in which to explore the relationship between the price of cable service and the channels offered by a cable system (Waugh, 1928; Court, 1939). Hedonic analysis is based on the premise that a differentiated good or service can be described by an objectively measured set of characteristics. Because market price is expressed as a function of the good or service's characteristics, the availability of objective measures of the good or service's characteristics combined with observations on market prices enable the estimation of the implicit marginal valuation or shadow price of each characteristic. Consequently, the market price can be decomposed into the components that correspond to the characteristic of the good or service (Griliches, 1971; Cowling & Cubbin, 1972; Pakes, 2003).[4]

Rosen (1974) presents a hedonic approach defined by two sides of the market - consumers (demand) and producers (supply). The original approach was enhanced by Freeman (1979). A representative consumer maximizes utility subject to a budget constraint. Utility is a function of the good or service of interest and a composite commodity consisting of all other goods and services. A bid function, Ψ, is defined. It is a function of the characteristics of the good or service, utility of the individual consumer, and income. The partial derivative of Ψ with respect to a given characteristic is defined to be the implicit marginal valuation that the consumer places on the characteristic, holding, of course, utility, income and all other characteristics unchanged. The partial derivative represents the additional amount that must be paid by any household to move to a bundle with a higher level of that characteristic, other things equal (Freeman, 1993). The bid functions will be tangent to the price function for different combinations of the characteristics of the good or service and utility. An individual will maximize utility by moving along the price schedule until the marginal willingness to pay is equal to the implicit marginal valuation (price) of the characteristics. That is, in equilibrium a

[4] A nice survey of this literature is found in Hulten (2003).

consumer's marginal bid for a characteristic equals the marginal price of the characteristic of the good or service of interest.

An analogous approach is used to specify the supply side of the market. A perfectly competitive firm is assumed to maximize profit. From conventional neoclassical microeconomic theory, profit maximization occurs when the marginal revenue from an additional unit of output is equal to the marginal cost of supplying that unit (Martin, 1993). A firm has an offer function, Θ. This is a function of the characteristics of the good or service being produced, revenue, and the cost of production. The offer functions will be tangent to the price function for different combinations of the characteristics of the good or service and profit. That is, in equilibrium a firm's offer function for a characteristic equals the marginal price of the characteristic of the good or service of interest.

The marginal cost of production will equal the implicit marginal valuation of the characteristics of the good or service where the bid functions and the offer functions are both tangent to the price function. The difference among consumers with respect to their income and utility and the variations among firms with regard to the production technology, productive efficiency, and cost of inputs results in a vector of bids and offers that produces an equilibrium price schedule for the characteristics of the good or service.

Using the conventional hedonic approach proposed by Rosen and refined by Freeman to model cable service necessitates a number of adjustments. First, consider the demand side. The hedonic estimation problem is not due to demand-supply interaction. An individual consumer's decision cannot affect suppliers in the hedonic model because an individual consumer does not affect the price.

There is a demand-side estimation problem but from another source. The nonlinearity of the hedonic price function allows the consumer to endogenously choose both quantities and implicit marginal prices. The result is that the disturbance term on the marginal bid function consists of both an unobserved "tastes" components and a purely random component (Bartik,

1987). The marginal bid function, however, can be consistently estimated with correct instruments. If the estimation problem is due to unobserved tastes, any set of variables that exogenously shifts the consumer's budget constraint will be appropriate because the budget constraint shift is correlated with the consumer's choice of the characteristics of the good or service but uncorrelated with unobserved tastes.

Next, consider the supply side. An important assumption in the hedonic formulation is that perfect competition between firms exists. From this it follows that the prices of the characteristics of a good or service equals their marginal cost of production. This equality does not necessarily hold in noncompetitive markets. The market for cable service is, in general, not competitive (Brown & Uri, 2003). Hence, there is no reason to expect that the marginal cost of production of a characteristic will equal the price of that characteristic.

In a noncompetitive market, the behavior of the firm changes relative to that of a firm in a competitive market. The firm is still assumed to have as its objective the maximization of profit. Hence, the characteristic of a good or service will still be produced up to the point where its marginal cost of production is equal to its marginal revenue. With a downward sloping demand curve, price will exceed marginal revenue (see, e.g., Beard et al., 2001; Mayo & Otsuka, 1991). Thus, in equilibrium price will exceed the marginal cost of production of the characteristic. The price charged to the consumer is still the sum of the representative consumer's implicit marginal valuations of the characteristics of the good or service. The utility associated with the consumption of that good or service, however, will be lower because a smaller quantity will be consumed.

For a perfectly competitive market, the price charged is equal to the marginal cost of production and will equal the sum of the implicit marginal valuations of the characteristics of the good or service. As noted, the noncompetitive price, however, will exceed the marginal cost of production by a markup conditional on "own-product" characteristics implying that the price charged by the noncompetitive firm and the implicit marginal valuation by the consumer are on

different indifference curves (Pakes, 2003). Hence, the standard practice of regressing solely the characteristics of cable service on price will yield biased estimates. Instead, it is necessary to account for supplier traits including the degree of monopoly power possessed by the firm in order to obtain meaningful estimates of the implicit valuation of the characteristics of cable service.

Feenstra (1995) has shown that the difference between the price of a good or service in a noncompetitive market and the competitive price can be effectively addressed in a hedonic model by introducing a measure to reflect the degree of market power possessed by the firm. He recommends the use of a measure computed as the difference between the price and the marginal cost of production and nominally refers to this as the markup. Controlling for market power will result in estimates of the implicit prices of the characteristics of cable service reflecting both the implicit marginal valuation of cable service and the marginal cost of production. Because consistent data are not available on the marginal cost of production, various supplier traits will be used as proxies. These include the type and size of the cable system, average programming expenses per subscriber per month, whether the cable system is subject to regulation, whether it is confronted with effective competition, whether it is part of a cluster, and its capacity. Also, there is the likelihood for differences in relative supply efficiency and other difficult to quantify cable service supply factors between cable operators that must be considered.

There is one final issue involving the estimation of the implicit marginal valuation of the characteristics of a good or service. It is often difficult, if not impossible, to obtain consistent estimates of the coefficients on the demand and supply functions that are the basis of the hedonic inference (Epple, 1987). This is not of concern here, however, since the sole objective is to obtain consistent and unbiased estimates of the implicit marginal valuation of the channel offerings by cable systems from the reduced form equation (i.e., the price equation) and not in identifying the structural demand and supply equations per se. Hence, consistent and unbiased estimates of the coefficients of the reduced form equation can be obtained using ordinary least

squares with appropriate adjustments.

DATA ISSUES

Section 623(k) of the Communications Act, as amended by the Cable Television Consumer Protection and Competition Act of 1992, requires the FCC to publish annually a statistical report on cable prices, or more specifically, average rates for the delivery of basic cable service, cable programming service, and equipment.

The 2004 FCC Annual Cable Price Survey requested data from a sample of cable systems[5] as of January 1, 2004, January 1, 2003, and January 1, 2002. The 2004 FCC Annual Cable Price Survey was structured to allow the FCC to compare prices charged by two groups of cable systems: (1) systems that are deemed to face effective competition (nominally referred to as the competitive group); and (2) systems that do not face effective competition (the noncompetitive group).[6] Cable systems in the competitive group are limited to geographic areas where a cable operator has sought and obtained a FCC finding of effective competition. For

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[5] A cable system is defined as the area served by a single headend. A headend is the control center of a cable television system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any original cablecasting, for transmission to subscribers. A system operator is the individual, organization, company, or other entity that operates a cable television system.

[6] Cable systems cannot be subject to rate regulation in areas where the FCC has made a finding of "effective competition." A cable system is subject to effective competition when any one of the following conditions is met: (1) Fewer than 30 percent of the households in its franchise area subscribe to the cable service of a cable system (herein referred to as "the low penetration test"); (2) The franchise area is served by at least two unaffiliated subscription television service distributors each of which offers comparable programming to at least 50 percent of the households in the franchise area and the number of households purchasing subscription television service other than the largest subscription television service distributor exceeds 15 percent of the households in the franchise area (the "overbuild test"); (3) A subscription television service distributor, operated by the franchising authority for that franchise area, offers subscription television service to at least 50 percent of the households in the franchise area (the "municipal test"); (4) A local exchange carrier (LEC) or its affiliate (or any subscription television service distributor using the facilities of such carrier or its affiliate) offers subscription television service directly to subscribers by any means (other than direct-to-home satellite services) in the franchise area of an unaffiliated cable operator which is providing cable service in that franchise area, but only if the video programming services so offered in that area are comparable to the subscription television service provided by the unaffiliated cable operator in that area (the "LEC test"). In other franchise areas, local communities have the authority to regulate the rates of the basic service tier and equipment, but may or may not choose to exercise that authority.

these purposes the FCC's formal legal decisions were used as a basis to determine whether effective competition exists based on the statutory definition of that term. The requirement to compare the price of cable service for systems where effective competition has been found and the price of cable service where effective competition has not been found is important given the objectives of the 1992 Cable Act. The primary data used in this study rely on the results of the survey conducted as a result of this requirement.

The 2004 FCC Annual Cable Price Survey collected information about average monthly rates for the basic service tier (BST) and major cable programming service tier (CPST). The BST typically consists of local stations (e.g., broadcast channels) plus a few satellite channels and public, educational, and government access (PEG) channels if they are carried. The major CPST typically consists of satellite-delivered channels. About 88.4 percent of cable subscribers take both the BST and the major CPST while the remaining share of subscribers take BST only. In addition data were collected for the most highly subscribed digital tier of service. Information was also collected on the average monthly charge for equipment, consisting of an analog addressable converter and remote control and digital converter plus remote control. The 2004 FCC Annual Cable Price Survey further sought information needed to determine average rates per channel. Finally, information was gathered on other factors that affect cable prices and competition in the subscription television service market such as the cable system's best estimate of the number of subscribers to DBS service in the system area, as well as the availability of other services from the cable system such as Internet access and telephony.

Of the 665 Survey questionnaires mailed to cable systems from both groups, respondents completed 641 questionnaires.

The 2004 FCC Annual Cable Price Survey data are keyed to the five digit Zip code associated with the greatest number of subscribers in the franchise area. This allows for merging the data from the 2004 FCC Annual Cable Price Survey with social, economic, housing, and geographic information from auxiliary sources. These supplementary data measure subscriber

traits that potentially serve to influence both the demand and supply of cable service.

While the 2004 FCC Annual Cable Price Survey data are keyed to the five digit Zip code, the decision was made to use three digit Zip code information for the social, economic, and housing data. The first digit of the Zip code represents the geographical area while the second two digits identify the central mail-distribution point known as a sectional center. The location of a sectional center is based on geography, transportation facilities, and population density. The last two digits identify the local delivery area. Cable system service areas are generally larger than a single Zip code area (i.e., a local post office delivery area). Moreover, given the data that are available, it is not possible to precisely assign all Zip codes to a cable service area. Hence, while use of either five digit or three digit Zip code data will not precisely reflect an average of the social, economic, and housing characteristics of cable subscribers for a specific cable system service area, three digit Zip code data were selected as being the better measure for capturing average subscriber and potential subscriber characteristics. This decision is based on an empirical examination and use of the data at these two levels of disaggregation in preliminary analyses.[7]

Data on the social, economic, and housing characteristics of subscribers that serve potentially to impact the unobserved "tastes" component of the of the marginal bid function by three digit Zip code were obtained from the 2000 Census of Population Summary Files provided by the U.S. Census Bureau. These data are quite comprehensive consisting of information on such things as the distribution of the population between rural and urban environments, educational attainment, language spoken, poverty status, type of housing unit, number of occupants, value of housing unit, and tenure of occupancy.

EMPIRICAL ISSUES

[7] In preliminary analyses for the demand side of the market, various measures of social, economic, and housing characteristics at the five digit Zip code level seldom appear significant while better (in a relative sense) results are obtained when three digit Zip code data are employed.

To portray accurately cable service, the analog and digital components need to be considered separately. Digital cable service provides a higher quality signal and hence a better video image than is possible with analog cable service. Cable systems use digital technology to compress video signals, allowing more than one program service to be carried in the bandwidth space normally required for one analog program service. Cable systems use digital technology to compress video signals, allowing more than one program service to be carried in the bandwidth space normally required for one analog program service. Typically, the signal is sent to the home and decompressed in the set-top box for display on the television (National Cable and Telecommunications Association, 2003). Finally, digital cable service offers channels not available via analog cable service. Based on results from the 2004 FCC Annual Cable Price Survey, digital cable channel offerings not available through analog cable service include, for example, America's Store, Arab Radio and Television, Chinese Central TV, EuroNews, Interfaith Channel, MBC Korean, and Saigon Broadcasting Network.

There are a number of empirical issues that must be addressed before presenting the estimation results including the need to use weighted least squares estimation and the presence of heteroscedasticity, the appropriate functional specification, and the existence of outliers in the data. Because the survey collected information from cable systems of widely disparate sizes, the potential for heteroscedastic error terms exists (Davidson & MacKinnon, 1993). The price equations for analog cable service and digital cable service are considered separately. The Goldfeld-Quandt test is used to test for heteroscedasticity with the sample divided between cable systems with more that 70,000 subscribers and those with less than 70,000 (Goldfeld & Quandt, 1965).[8] That is, the observations are divided into two groups in such a way that under the null hypothesis of homoscedasticity, the disturbance variances will be the same while under the alternative hypothesis, the disturbance variances will differ systematically. With a linear price equation specification for analog cable service and the middle 213 observations dropped in order

[8] The median size of the cable systems included in the survey is 70,000 subscribers.

to increase the power of the test, the computed Goldfeld-Quandt test statistic is 3.78. For a semilog specification (i.e., the log of the price of analog cable service is used as the dependent variable), the computed test statistic is 3.91. For a log-linear specification, the computed test statistic is 3.87. The critical value is $F(61, 61) = 1.47$ at the 5 percent level of significance. Alternately, with a linear price equation specification for digital cable service and the middle 204 observations dropped, the computed Goldfeld-Quandt test statistic is 2.42. For a semilog specification, the computed test statistic is 2.77 while for a log-linear specification, the computed test statistic is 2.61. The critical value is $F(85, 84) = 1.42$ at the 5 percent level of significance. Thus, in all instances the null hypothesis of homoscedasticity is rejected at the 5 percent level. Consequently, weighted least squares will be used where the weight for the analog price equation is the number of analog cable subscribers in a system and the weight for the digital price equation will be the number of digital cable subscribers in a system. The usual Eicker-White asymptotic formula is used in computing the robust estimate of the variance-covariance matrix (Davidson & MacKinnon, 1993; White, 1980).

Next consider the issue of the appropriate functional specification. It is typically the case that the functional specification used in hedonic studies specifies price as a linear function of a set of explanatory variables or that the dependent variable (price) is transformed by $\log_e$ (i.e., Napierian logarithms) before empirically estimating the relationship. For completeness, however, the log-linear specification where all of the variables are transformed by $\log_e$ will also be considered. In order to determine whether one specification is preferred to the others, a straightforward nonnested test is used. The test is applied to both the analog cable price equation and the digital cable price equation. The test chosen is the J-test developed by Davidson and MacKinnon (1981, 1993, 2004). The basic idea of the test is to embed a competing regression functional specification in a more general one and then test the original model against it. Each of the specifications is considered in pairwise fashion with each of the functional specifications alternately serving as the correct specification (i.e., the null hypothesis). Each of the

specifications is considered in pairwise fashion with each of the functional specifications alternately serving as the correct specification (i.e., the null hypothesis). The results, presented in Table 1, are insightful. In all instances the computed test statistic exceeds the critical value. This implies that there is no clearly preferred functional specification for either the analog price equation or the digital price equation. That is, there is no empirical basis for selecting one functional specification over another. There is, however, a clear theoretical reason for selecting the linear specification. This is discussed below.

Feenstra (1995) discusses the measurement of the marginal value of a characteristic (i.e., the cable channel offering in the current instance) when the price of the service is above its marginal cost. In general knowledge of the marginal costs of a characteristic is not sufficient to compute its implicit marginal value. It is also necessary to know the price-cost markup and the demand elasticities for the characteristics of the good or service. The problem is simplified in the competitive situation where the firm prices at the marginal cost of production, resulting in equality of the marginal cost and the implicit marginal values of the characteristics.

With pricing above marginal cost, as is the case with cable service, the situation is more complex because the price cost margin is an omitted variable in the hedonic specification thereby biasing the coefficient estimates. For a generic class of utility functions, a linear hedonic specification is shown by Feenstra to provide a measure of the implicit marginal value of a characteristic while a semi-log specification would over-state the value. Given this concern, a linear specification is adopted as the appropriate one for estimating the implicit marginal value for channel offerings by cable systems in the United States.

There is one final issue to be considered before turning to the estimation of the price equations. This involves the presence of outliers in the data. Regression diagnostics is a tool for assessing the quality and reliability of regression estimates. It is used here to test for the presence of outliers. It is especially useful for cross sectional data (the type being used here) in helping to determine in a systematic way the location of data points that are either unusual or

inordinately influential (Greene, 1997).

Regression diagnostic tests were developed by Belsley et al. (1980). The tests systematically search for unusual or influential data. That is, regression diagnostics look for observations that lie outside patterns set by other data, or those that strongly influence the regression results. The impact of such data points is rarely apparent from even a close inspection of the basic data series. The basis of regression diagnostics is an analysis of the response of coefficient estimates to controlled perturbations of the inputs including the parameters to be estimated, error and model specification, and the ordering of the data. Four separate regression diagnostic tests are available including RSTUDENT, HATDIAG, COVRAT, and DFFITS. The interested reader is referred to Belsley et al. (1980) for information on the distribution of the test statistics.

Both the analog cable price equation and the digital cable price equation were subjected to the regression diagnostic tests individually. An observation was judged to be an outlier if it failed two or more of the tests. For the analog cable price equation, eight observations were judged to be outliers and for the digital cable price equation, twenty observations were judged to be outliers. There were no overlaps in the observations determined to be outliers. That is, there was, for example, no observation that was judged to be an outlier for both analog cable price and digital cable price. Moreover, a closer inspection of the observations judged to be outliers did not reveal any obvious problems such as a misplaced decimal point in recording the data or a data transposition error.

For each of the price equations, a qualitative (dummy) variable is introduced to mark the outliers. The variable is defined to equal zero if two or more of the regression diagnostics tests are passed and one if two or more are failed. Defined this way, the impact of the outliers will be corrected only for their impact on the estimate of the constant (intercept) term.

ESTIMATION RESULTS

A considerable amount of preliminary analysis went into determining the final

specifications for the analog cable price equation and the digital cable price equation in order to reflect appropriately subscriber traits and cable system traits. There are few insights to be gleaned from recounting all of the details of this preliminary analysis. Simply note that the objective has been to obtain coefficient estimates that are theoretically consistent and that are credible and robust but that also can give some insight into the nature and extent of the implicit marginal valuation of individual channel offerings by cable systems. Finally, the specifications are data dependent. That is, they have been developed based on the data collected on the 2004 FCC Annual Cable Price Survey.

For the final estimation, not all 641 observations could be used for the digital cable service price equation. There were 28 cable systems that did not provide digital cable service in 2003. It was necessary to drop these observations from the data set for the digital cable price equation. The majority of these systems were either very small or small noncompetitive systems or LEC systems in the competitive group. This gave a total of 613 observations used in the estimation of the digital price equation. By dropping these observations, any inferences with regard to the behavior of subscribers and cable systems must be qualified accordingly. This understanding is implicit and the point is not pursued in the subsequent discussion.

Several channel offerings were also eliminated from the data set. Eight channels from the analog cable price equation data set and nine channels from the digital cable price equation data set were offered by fewer than five cable systems. Moreover, these channel offerings were relatively highly collinear[9] (i.e., only a few cable systems offered these channels and these cable systems tended to offer most of the eight (analog) or nine (digital) channels). To avoid any problems of statistical inference, these channels were dropped from the data set. Finally, all cable systems offer the broadcast network channels. Hence, these are not explicitly included. Their impact is captured in the constant term. This leads to the important insight that because dummy variables are used to characterize cable channel offerings, the broadcast network

[9] The correlation coefficients uniformly exceeded 0.75.

channels establish the baseline from which to measure the marginal implicit valuation of the other channel offerings (Suits, 1984).

The coefficient estimates for the analog cable price equation and the digital cable price equation were obtained using weighted least squares with correction for heteroscedasticity. The weight for the analog cable price equation was the number of analog cable service subscribers and the weight for the digital cable price equation was the number of digital cable subscribers. The estimation results for the analog cable price equation are presented in Table 2 and the estimation results for the digital cable price equation are reported in Table 3. A complete description of the channels and their offerings (i.e., the type of programming) can be found in National Cable and Telecommunications Association (2003). A description of the variables reflecting cable system (supplier) and subscriber (consumer) traits along with their sources is given in the Appendix.

The results are fairly revealing. With regard to the price of analog cable service, the implicit marginal valuation is statistically significantly different from zero at the 5 percent level and positive for just seven of 121 channel offerings and it is negative for ten channels. When the level of statistical significance is raised to 10 percent, an additional seven channels have a positive implicit marginal valuation and three have a negative implicit marginal valuation. Among the channels that have a positive implicit marginal valuation are the C-Span Channels, the National Geographic Channel, The Movie Channel, American Movie Classic, and Turner Classic Movie. Each of these channel offerings has an implicit marginal valuation of between five and fifteen percent ($1.00 to $5.00) of the price of analog cable service. QVC, an e-commerce leader marketing a wide variety of brand name products in such categories as home furnishings, licensed products, electronics and jewelry, also has a positive marginal implicit value. Several TV Guide channels have a negative implicit marginal valuation as does the Game Show Network and the Fine Living channel.

Just as interesting as the coefficients that are statistically significant are the results that

indicate the relatively large number of channels that have neither a positive nor a negative implicit marginal valuation. Ninety five of the analog cable channels offered have no statistically significant implicit marginal valuation at the 10 percent level or better. These channels include the majority of the news channels, many foreign language channels, and sports channels.

Variables introduced to reflect subscriber and cable system traits are, in general, not statistically significant. A large number of variables were considered in preliminary analyses in order to capture the unobserved tastes of subscribers. These variables included school enrollment, educational attainment, marital status, disability, language spoken, employment status, commuting patterns; occupation, income, type of housing unit, number of occupants, house heating fuel, mortgage status, rent, and tenure of occupants. Just a few of these variables were retained in the final specification since almost all did not prove to be statistically significant. Of those retained, the coefficient estimates on three of the MSO dummy variables[10] and the variable accounting for the provision by DBS service of local-into-local broadcasts are statistically significantly different from zero at the five percent level. The estimate of the coefficient on this latter variable is at odds with what one would expect. That is, the provision of local-into-local broadcasts by DBS service should be associated with a lower price, not a higher price as indicated. Clearly, this is an anomalous result.

The penetration of DBS in a cable system service area has no effect on the price analog cable service. This measure captures the degree of competition that cable systems as the dominant firm face from noncable providers, the fringe firm (Uri & Brown, 2003). A one percent increase in the number of DBS subscribers relative to the total number of subscribers will result in no reduction in the price analog cable service.

The coefficient estimates on just six of the variables introduced to control for market

[10] Note that not only are the MSO dummy variables proxies for relative efficiency between cable operators they are also a measure of subscriber satisfaction between cable systems.

power are statistically significant. The coefficient estimates indicate that three of the MSO dummy variables, system capacity, and the presence of effective competition have an identifiable impact on the price of analog cable service. Also, that system capacity measured in terms of megaHertz is significant in explaining the price of analog cable service is precisely what is expected. A larger capacity should lead to a higher cost and a higher price.

With regard to the price of digital cable service, the implicit marginal valuation is statistically significantly different from zero at the 5 percent level and positive for just six of 88 channel offerings but it is also negative for eight channels. When the level of statistical significance is raised to 10 percent, an additional three channels have a positive implicit marginal valuation and an additional six have a negative implicit marginal valuation. Among the channels that have a positive implicit marginal valuation are BBC America, Health Network, Inspirational Network, and the Speed Channel. Each of these channel offerings has an implicit marginal valuation of about five to ten percent ($2.00 to $4.00) of the price of digital cable service. Channels with a negative implicit marginal valuation include Arab Radio and Television, EWTN,[11] Shop NBC, and TV Guide Interactive. These channels have a negative implicit marginal valuation of in the neighborhood of five percent of the price of digital cable service.

As in the case of analog service, of equal, or perhaps greater, interest as the coefficients that are statistically significant are the results that indicate the relatively large number of digital cable channels that have neither a positive nor negative implicit marginal valuation. Sixty six of the digital cable service channels offered have no statistically significant implicit marginal valuation. These channels include most of the news channels, a large number of sports channels, the family channels, foreign language channels, and the home shopping networks.

Moreover, and as was the case for the analog price cable service equation, the coefficient estimates on variables introduced to reflect subscriber and cable system traits are, in general, not

[11] EWTN is America's largest religious cable network.

statistically significant. Only a few of the variables considered in preliminary analysis were retained in the final specification since almost all did not prove to be statistically significant. Of those retained, the coefficient estimates on five of the MSO dummy variables are statistically significantly different from zero at the five percent level.

The penetration of DBS in a cable system service area has a marginally significant positive effect on the price analog cable service. This measure captures the degree of competition that cable systems as the dominant firm face from noncable providers, the fringe firm (Uri & Brown, 2004). A one percent increase in the number of DBS subscribers relative to the total number of subscribers will result in about a 10 percent increase in the price digital cable service. This is obviously another anomalous result, being inconsistent with expectations.

Only one of the variables introduced to control for market power is statistically significant. The coefficient estimate indicates that the presence of effective competition has an identifiable impact on the price of digital cable service.

COMPARISON

There are few studies that attempt to decompose explicitly the price of cable service into its component parts. The data issues are typically insurmountable. Nevertheless, the studies that have endeavored to do this rely on data from Warren Publishing (annual). This source, however, does not contain the level of detail on cable system's channel offerings found in the 2004 FCC Annual Cable Price Survey. Only categories of program offerings are provided (e.g., news, sports, network programming, etc.) are provided in the Warren Publishing data. Also, because the cable industry is so dynamic with cable operators entering and exiting frequently (through mergers and acquisitions), the data are well-know to possess significant measurement error. The information is provided voluntarily by the cable operators. Cable channel offering information is frequently out of date by a year or two because the cable operator neglected to provide an update, price data lags frequently by two to three years, and subscriber counts are under-reported (Beard, et al., 2001).

There is only a single study that has results directly comparable to those obtained here.[12] Anstine (2001) presents estimates of the implicit marginal price of channel groupings in the framework of a conventional hedonic model specification with an adjustment for cable system market power based on data for 1991. The results are obtained using ordinary least squares with no attention to the potential econometric shortcomings in the data and the specification that have been of concern here. It is found that sports networks as a group, news networks as a group, and family networks as a group all have positive implicit marginal values. The results are somewhat at odds with those obtained here. The difference can be attributed to a number of factors. Anstine uses the Warren Publishing data with its inherent measurement errors for some cable systems. The data are for 1991 and cover only about ten percent of all cable systems operating in the United States. The data used come only from those cable systems for which comprehensive information was available. Hence, the data do not represent a randomly selected cross section of cable systems in the United States. By way of contrast, the data used in here were provided by Congressional mandate by the cable systems directly. Moreover, the data come from a stratified random sample of all cable systems and are fairly recent.

TWO FINAL QUESTIONS

There are two questions that remain to be addressed. First, is there an explanation of why subscribers place a nonzero implicit marginal valuation on relatively few of a cable system's channel offerings for both analog and digital cable service? Second, if the estimates obtained here do accurately measure the average implicit marginal valuation of individual channels across subscribers, what are the implications?

Concerning the first question, one possible reason that most individual channels do not have a statistically significant positive or negative implicit marginal valuation relates to bundling. As noted previously, cable service is an example of pure bundling because the

[12] There is a Nielsen Media Research study in 2000 that reported that households receiving more than 70 networks only watch, on average, about 17 of them (General Accounting Office, 2003).

subscriber cannot purchase channel offerings individually from a cable system. Moreover, a cable system ostensibly constructs the bundle to appeal to all or, at least, most potential subscribers. The subscriber interested in news and, say not sports, as well as the subscriber interested in sports and not news are included as subscribers to the same service. To have access to any one channel on a tier, a subscriber must purchase the entire tier. That is, to be able to view one channel, access to all channels on a tier must be paid for. The values estimated here represent the average implicit marginal valuation of channels across all subscribers and cable systems for BST plus CPST service. This includes subscribers who value a channel offering relatively highly, relatively lowly, or not at all with the result that, on average, most channels have no nonzero implicit marginal valuation.

What are the implications of the finding that relatively few of the analog and digital cable channels offered by cable systems have a positive implicit marginal value? It certainly appears that subscribers' utility in the aggregate could be enhanced if a different pricing structure were adopted.[13] That is, for example, adoption of an *a la carte* approach to pricing both analog and digital cable service where the channels offered by a cable system are unbundled would allow a subscriber to pay for just the channels on which he or she places a positive implicit marginal value. This is currently an extremely contentious issue, however, in the cable television industry and such an approach has some potential benefits and well as costs for cable systems.

On the benefit side, because of a cable system's finite channel capacity, carrying a channel with negative or zero implicit marginal value precludes another, perhaps more attractive channel from being offered to subscribers. Additionally, associated with most cable channel offerings is a programming fee paid by a cable system that could be avoided if the channels not valued by subscribers or those with a negative implicit marginal valuation were not carried by the cable system. This would alter the institutional structure of the cable industry since most

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[13] This conclusion is consistent with a recent study by the Consumer Federation of America (2004).

contracts between cable networks and cable operators specify the tier that the network must appear on or it establishes a threshold percentage of subscribers that must be able to see a network (General Accounting Office, 2003).

On the cost side is the potential loss in revenue to cable systems. Whether this would materialize, however, would be a function of the price of individual channel offerings, the aggregate number of subscribers to the various channels offered by the cable system, and so on. There are also additional costs that the cable system and subscribers would incur to upgrade the system to provide channels individually to subscribers. In fact, this is the main argument that cable systems are currently using against adopting an *a la carte* approach to pricing analog and digital cable service (see, e.g., CableFAX Daily, September 2, 2003). Thus, in order to select individual channels, subscribers would need an addressable converter box on each set attached to the cable system to unscramble the signal. In addition to the cost of the converter box, cable operators would also incur costs to monitor and manage an *a la carte* approach. Costs of an *a la carte* approach have been put as high as $187.50 per month although this does not seem credible (Ahrens, 2004).[14]

It is also possible that cable programming diversity might suffer under *a la carte* pricing because a number of cable networks, especially small and independent networks, would not have enough subscribers to support the network.

Finally, there are too many unknown factors to unequivocally conclude whether subscribers will be better off under *a la carte* pricing. These include how cable systems would price their services under an *a la carte* system, the distribution of subscribers' purchasing patterns, and whether niche networks would cease to exist and, if so, how many would exit the industry.

An alternative to *a la carte* programming is minitiers where subscribers would choose

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[14] From the 2004 Annual Cable Price Survey, the average price for BST plus CPST service was just over $40.50 per month.

small tiers of programming that are grouped by genre (e.g., news, sports, and general entertainment). This has the same costs associated with it as an *a la carte* approach, however, without providing the same level of subscriber benefits.

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APPENDIX
Definitions and Data Sources

The analog cable price is the sum of the BST and CPST cable price. The data come from the 2004 FCC Annual Cable Price Survey.

The digital cable price is the price of the most highly subscribed digital tier. The data come from the 2004 FCC Annual Cable Price Survey.

RURAL is the percent of the population in a Zip code area classified as living in a non-urban environment. The data come from the 2000 Census of Population.

SHRDBS is the ratio of the total number of subscription television service subscribers who subscribe to DBS to the number of subscribers to all subscription television service. The data come from the 2004 FCC Annual Cable Price Survey.

DBSLIL is a dummy variable defined to equal one if DBS service available to cable subscribers in the system area carries local channels. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DAD is a dummy variable defined to equal one if the cable system is owned by Adelphia Communications. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DMC is a dummy variable defined to equal one if the cable system is owned by Mediacom Communications. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DCV is a dummy variable defined to equal one if the cable system is owned by Cablevision Systems Corporation. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DCHAR is a dummy variable defined to equal one if the cable system is owned by Charter Communications. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DINS is a dummy variable defined to equal one if the cable system is owned by Insight Communications. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DTWC is a dummy variable defined to equal one if the cable system is owned by Time Warner Cable Communications. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DCOX is a dummy variable defined to equal one if the cable system is owned by Cox Enterprises. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DCOM is a dummy variable defined to equal one if the cable system is owned by Comcast Corporation. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

DWOW is a dummy variable defined to equal one if the cable system is owned by WideOpenWest Holdings. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

LSP is the percent of the population in a Zip code area whose primary spoken language in the home is Spanish. The data come from the 2000 Census of Population.

EDHS is the percent of the population age 25 and older in a Zip code area who highest level of educational attainment is high school (completed). The data come from the 2000 Census of Population.

EDCOL is the percent of the population age 25 and older in a Zip code area who highest level of educational attainment is college (graduated). The data come from the 2000 Census of Population.

HUOCCU is the percent of housing units in a Zip code area that are occupied. The data come from the 2000 Census of Population.

POV is the percent of the population in a Zip code area that is classified as poor. The data come from the 2000 Census of Population.

H20PL is the percent of the housing units in a Zip code area in a structure with twenty or more units. The data come from the 2000 Census of Population.

MEDVAL is the median value of a owner-occupied housing unit in a Zip code area. The data come from the 2000 Census of Population.

INTER is a dummy variable defined to equal one if the cable system offers Internet service to its subscribers. Otherwise, it is equal to zero. The data come from the 2004 FCC Annual Cable Price Survey.

CAP is the cable system capacity as of July 1, 2003 measured in terms of megaHertz. The data come from the 2004 FCC Annual Cable Price Survey.

CLUST denotes whether the cable system is part of a MSO cluster of two or more systems. It is defined to equal one if the cable system is part of a cluster and zero otherwise. The data come from the 2004 FCC Annual Cable Price Survey.

EC denotes whether the FCC has made a finding of effective competition within the community. It is defined to equal one if there is effective competition and zero otherwise. The data come from the 2004 FCC Annual Cable Price Survey.

BSTREG denotes whether the basic service tier price is subject to local regulation for the franchise area. It is defined to equal one if there is local regulation and zero otherwise. The data come from the 2004 FCC Annual Cable Price Survey.

BCPE03S are programming expenses measured as the per subscriber total programming expenses for BST plus CPSTI tiers only. The data come from the 2004 FCC Annual Cable Price Survey.

DNCL and DNCS correspond to the definitions of large and small noncompetitive cable systems found in the text. The category Size - NCM (medium) is omitted to avoid the problem of singularity among the size/type dummy variables. The value of the variable is defined to equal one if the cable operator meets the definition criterion and zero otherwise.

DDBS, DLP, DOB, and DWL correspond to the definitions of DBS, low penetration, overbuild, and wireless competitive cable systems found in the text. The value of the variable is defined to equal one if the cable operator meets the definition criterion and zero otherwise.

DAP is a dummy variable introduced to mark those observations that are judged to be outliers for the analog cable price equation as observations of interest.

DDP is a dummy variable introduced to mark those observations that are judged to be outliers for the digital cable price equation as observations of interest.

Table 1. J-Test of Alternative Functional Specifications*

Equation	Computed Value of the Test Statistic
1. Analog Cable Hedonic Price Equation	
a. H_0: Linear, H_a: Log-linear	2.43
b. H_0: Linear, H_a: Semi-log-linear	8.99
c. H_0: Log-linear, H_a: Linear	1.97
d. H_0: Log-linear, H_a: Semi-log-linear	2.08
e. H_0: Semi-log-linear, H_a: Linear	9.09
f. H_0: Semi-log-linear, H_a: Log-linear	2.89
2. Digital Cable Hedonic Price Equation	
a. H_0: Linear, H_a: Log-linear	2.39
b. H_0: Linear, H_a: Semi-log-linear	5.89
c. H_0: Log-linear, H_a: Linear	2.57
d. H_0: Log-linear, H_a: Semi-log-linear	2.75
e. H_0: Semi-log-linear, H_a: Linear	6.57
f. H_0: Semi-log-linear, H_a: Log-linear	2.07

* The critical value at the 5 percent level is 1.97 given a sample size of 641 for the analog price equation and 613 for the digital price equation. That is, if the computed test statistic is less than the critical value, the null hypothesis, H_0, is accepted. The alternative hypothesis is denoted as H_a.

Table 2. Coefficient Estimates on the Analog Cable Service Price Equation

Variable	Estimated Coefficient	Standard Error	t-statistic	P-value	
Constant	30.4450	6.6997	4.5443	[.000]	**
American Movie Classic	3.0071	1.4073	2.1367	[.033]	**
America's Collectibles	0.2027	0.9852	0.2058	[.837]	
Animal Planet	-1.9377	1.1691	-1.6574	[.098]	*
Arts and Entertainment	-1.4388	1.9973	-0.7204	[.472]	
Bay News 9	-1.6668	2.0785	-0.8019	[.423]	
BBC America	1.3592	2.2612	0.6011	[.548]	
BET Channels	0.3912	0.5359	0.7300	[.466]	
Biography Channel	-0.0405	2.5280	-0.0160	[.987]	
Bloomberg Television	-6.2737	3.8153	-1.6444	[.101]	
Bravo	0.0456	0.5283	0.0863	[.931]	
California Channel	-0.9523	1.1334	-0.8402	[.401]	
Canales channels	2.5013	1.6683	1.4993	[.134]	
Cartoon Network	-1.0215	1.1119	-0.9187	[.359]	
Celtic Vision	1.3574	3.8860	0.3493	[.727]	
Central Florida News	-2.9255	2.3086	-1.2672	[.206]	
Classic Sports Network	1.2998	0.9239	1.4069	[.160]	
Comcast News Networks	0.2036	1.3471	0.1511	[.880]	
CNBC	-0.4168	1.4226	-0.2930	[.770]	
CNN News Channels	2.2032	2.9461	0.7478	[.455]	
CNN in Espanol	-8.1609	6.4895	-1.2576	[.209]	
Comcast SportsNet	-1.0182	1.1909	-0.8550	[.393]	
Comedy Channel	-0.9867	0.8728	-1.1304	[.259]	
Country Music TV	-0.6826	0.6322	-1.0797	[.281]	
Court TV	0.0845	0.7270	0.1162	[.908]	
C-Span Channels	5.9847	2.1743	2.7525	[.006]	**
Discovery Channels	1.7589	2.1174	0.8307	[.407]	
Discovery Espanol	-1.8721	3.3153	-0.5647	[.573]	
Disney Channel	1.7599	1.0559	1.6668	[.096]	*
Do-It-Yourself Network	-1.3631	1.8697	-0.7291	[.466]	
E! Entertainment	0.8134	0.9431	0.8625	[.389]	
E! Style	-0.5286	0.5560	-0.9508	[.342]	
Encore-Starz Channels	0.6237	0.7466	0.8353	[.404]	
ESPN Channels	-1.0226	2.9435	-0.3474	[.728]	
EWTN	0.2176	0.3718	0.5853	[.559]	
Family Channel	-0.5458	0.9248	-0.5902	[.555]	
Fine Living	-2.8153	1.2585	-2.2370	[.026]	**
FIT TV	0.6546	0.6386	1.0250	[.306]	
Food Network	0.2223	0.9368	0.2372	[.813]	
Fox Basic Cable FX	-0.8997	0.7237	-1.2432	[.214]	
Fox Movie Channel	1.3514	0.8865	1.5244	[.128]	
Fox News Channel	0.9339	1.1037	0.8461	[.398]	
Fox Sports Channels	-2.3858	0.6801	-3.5078	[.000]	**
Fox Sports World en Espanol	-0.0548	0.9347	-0.0586	[.953]	
FoxNet	-0.2696	1.1537	-0.2337	[.815]	
Galavision	-0.9721	0.5121	-1.8982	[.058]	*

Game Show Network	-1.9996	0.5237	-3.8180	[.000]	**
GEMS Television	5.5919	3.0728	1.8198	[.069]	*
Golf Channel	-0.2882	0.6071	-0.4747	[.635]	
Goodlife TV	-1.2027	1.1666	-1.0310	[.303]	
Great American Country	-0.1027	0.6204	-0.1656	[.869]	
Gunthy-Rinkler TV	2.9571	1.6883	1.7515	[.080]	*
Hallmark Channel	-0.2712	0.4488	-0.6043	[.546]	
HBO channels	6.0114	2.1967	2.7365	[.006]	*
Health Network	-0.8799	0.6993	-1.2582	[.209]	
History Channel	-0.8936	0.9863	-0.9060	[.365]	
Home and Garden TV	1.3810	0.9615	1.4364	[.152]	
Home Shopping Network	-0.6364	0.6813	-0.9341	[.351]	
iNDemand channels	3.9556	3.5013	1.1298	[.259]	
Inspirational Network	-0.1202	0.4725	-0.2545	[.799]	
International Channel	-0.3253	0.8100	-0.4016	[.688]	
Learning Channel	-0.3073	1.7405	-0.1765	[.860]	
Lifetime Channels	-0.6950	1.5306	-0.4541	[.650]	
MSG Network	-2.5048	3.1965	-0.7836	[.434]	
MSG Metro Guide	6.5529	2.0085	3.2626	[.001]	**
MSG Traffic and Weather	-5.8409	2.9328	-1.9916	[.047]	**
MSNBC	0.1503	0.8674	0.1733	[.862]	
MTV Channels	-0.8749	1.4632	-0.5979	[.550]	
FUSE	1.5343	0.8759	1.7517	[.080]	*
NASA	-1.4864	1.0210	-1.4558	[.146]	
National Geographic Channel	1.2959	0.5963	2.1734	[.030]	**
New England Cable News	-7.5303	5.5622	-1.3538	[.176]	
New England Sports Network	7.9921	5.6700	1.4096	[.159]	
New York 1	-1.0177	3.4651	-0.2937	[.769]	
News 12 Networks	-1.9816	1.4479	-1.3686	[.172]	
News 14 Carolina	1.8587	2.5041	0.7423	[.458]	
News 24 Houston	-7.8777	3.6207	-2.1758	[.030]	**
Nickelodeon Channels	2.7949	2.5640	1.0901	[.276]	
NOGGIN	1.6866	1.9076	0.8842	[.377]	
NorthWest Cable News	0.8072	1.5195	0.5312	[.596]	
Ohio News Network	-0.9699	1.4378	-0.6746	[.500]	
Outdoor Channel	-0.5265	0.7514	-0.7008	[.484]	
Outdoor Life Network	0.0572	0.5162	0.1108	[.912]	
OXYGEN	-0.0804	0.5126	-0.1568	[.875]	
PAX TV	-0.0558	0.4457	-0.1251	[.901]	
Pennsylvania Cable News	-0.8418	1.1232	-0.7495	[.454]	
Product Information Network	0.1716	0.6370	0.2694	[.788]	
QVC	3.8422	1.2418	3.0941	[.002]	**
RTPI Portugal	1.2745	1.9246	0.6622	[.508]	
RAI Italy	-2.6733	2.2305	-1.1985	[.231]	
Sci-Fi Channel	0.2612	0.6443	0.4053	[.685]	
Shop at Home	-0.5345	0.6569	-0.8137	[.416]	
Shop NBC	0.5899	0.4513	1.3072	[.192]	
Showtime channels	-9.7292	4.0791	-2.3852	[.017]	**
SoapNet	0.5177	0.5866	0.8826	[.378]	
Speed Channel	0.2597	0.4632	0.5607	[.575]	
Sunshine Network	-1.9952	1.1805	-1.6902	[.092]	*
Telemundo	-0.4884	0.5987	-0.8158	[.415]	

Texas Cable News	0.5700	1.2500	0.4560	[.649]	
The Movie Channel	6.9303	2.5756	2.6908	[.007]	**
Spike TV	1.1666	0.5957	1.9581	[.051]	*
Toon Disney	0.7610	0.5899	1.2900	[.198]	
Travel Channel	-0.6318	0.6521	-0.9688	[.333]	
Trinity Broadcast Network	-0.8843	0.3674	-2.4068	[.016]	**
Turner Broadcast Service	-0.7892	0.7016	-1.1249	[.261]	
Turner Classic Movie	1.5482	0.4850	3.1922	[.002]	**
Turner Network Television	-3.0508	1.2963	-2.3536	[.019]	**
TV Games Network	0.1663	1.6077	0.1034	[.918]	
TV Guide Channel	-0.4994	0.4969	-1.0050	[.315]	
TV Guide Interactive	-5.1107	2.0124	-2.5396	[.011]	**
TV Guide Sneak Prevue	-6.6376	1.5832	-4.1925	[.000]	**
USA Network	-2.1717	1.7976	-1.2081	[.228]	
ValueVision	-2.3516	2.3725	-0.9912	[.322]	
VH1 channels	-0.9797	1.0615	-0.9230	[.356]	
WAM!	2.7137	1.6865	1.6091	[.108]	
WE: Women's Entertainment	-0.8938	0.5590	-1.5989	[.110]	
Weather Channel	-1.5549	1.1739	-1.3246	[.186]	
Weather Radar	2.1030	1.2559	1.6744	[.095]	*
Weatherscan	1.8857	1.2665	1.4889	[.137]	
WGN Chicago Superstation	0.7294	0.4882	1.4941	[.136]	
Word Network	-1.0077	0.8405	-1.1990	[.231]	
YES Network	1.2384	3.1305	0.3956	[.693]	
RURAL	0.0028	0.0139	0.2012	[.841]	
SHRDBS	2.9473	2.0161	1.4619	[.144]	
DBSLIL	1.0960	0.5684	1.9284	[.054]	*
DAD	0.2215	1.4240	0.1555	[.876]	
DMC	2.3846	4.8496	0.4917	[.623]	
DCV	4.7814	1.5408	3.1032	[.002]	**
DCHAR	3.3218	1.2847	2.5856	[.010]	**
DINS	1.4617	2.3424	0.6240	[.533]	
DTWC	1.7551	1.2234	1.4346	[.152]	
DCOX	1.3617	1.2739	1.0689	[.286]	
DCOM	2.0678	1.2442	1.6620	[.097]	*
DWOW	4.6351	1.7734	2.6138	[.009]	**
LSPA	0.0369	0.0225	1.6391	[.102]	
EDHS	-0.0543	0.0561	-0.9670	[.334]	
HUOCCU	0.0125	0.0464	0.2699	[.787]	
POV	-0.0041	0.0473	-0.0869	[.931]	
H20PL	-0.0359	0.0262	-1.3720	[.171]	
MEDVAL	0.0000	0.0000	-0.3212	[.748]	
INTER	1.0435	1.9578	0.5330	[.594]	
CAP	0.0049	0.0019	2.5759	[.010]	**
CLUST	0.5219	0.8953	0.5829	[.560]	
EC	-3.5309	0.5151	-6.8548	[.000]	**
BSTREG	0.4149	0.4690	0.8847	[.377]	
BCPE03S	-0.0001	0.0041	-0.0199	[.984]	
DNCL	-0.6521	0.5365	-1.2156	[.225]	
DNCS	-0.2994	1.0358	-0.2890	[.773]	
DDBS	0.5958	0.8282	0.7194	[.472]	

DLP	1.9589	1.2286	1.5944	[.111]
DOB	0.4805	0.6370	0.7543	[.451]
DWL	-0.8330	0.8598	-0.9688	[.333]
DAP	1.7282	1.8135	0.9530	[.341]

Coefficient of Determination	0.6853
Adjusted Coefficient of Determination	0.5237
F-statistic	3.0019

** Statistically significantly different from zero at the five percent level.

* Statistically significantly different from zero at the ten percent level.

Table 5. Coefficient Estimates on the Digital Cable Service Price Equation

Variable	Estimated Coefficient	Standard Error	t-statistic	P-value	
Constant	50.6974	6.6645	7.6071	[.000]	**
America's Collectibles	2.3288	2.3315	0.9989	[.318]	
America's Store	-1.6249	2.3664	-0.6866	[.493]	
Arab Radio & Television	-5.6562	2.1042	-2.6880	[.007]	**
Arts and Entertainment	1.7212	6.7477	0.2551	[.799]	
Bay News 9 Espanol	-2.1672	2.9478	-0.7352	[.463]	
BBC America	4.8000	1.2250	3.9184	[.000]	**
BET Channels	0.8607	1.0304	0.8353	[.404]	
Biography Channel	1.5831	1.7264	0.9170	[.360]	
Bloomberg Television	-0.5104	1.0498	-0.4862	[.627]	
Bravo	-1.8930	1.1771	-1.6082	[.108]	
Canales channels	3.5508	1.8338	1.9363	[.053]	*
Chinese Central TV	5.0957	2.7669	1.8417	[.066]	*
Chinese TV Network	-4.2813	2.5995	-1.6469	[.100]	
Cinemax channels	-6.9675	3.8106	-1.8285	[.068]	*
Classic Sports Network	2.5222	2.1594	1.1680	[.243]	
CNBC	0.9196	2.4911	0.3691	[.712]	
CNN News Channels	0.4339	0.8832	0.4913	[.623]	
CNN in Espanol	1.5491	1.8487	0.8379	[.402]	
Country Music TV	-1.5884	1.7970	-0.8839	[.377]	
Court TV	-5.2164	2.7424	-1.9021	[.058]	*
C-Span Channels	0.1742	1.2788	0.1362	[.892]	
Discovery Channels	-0.8018	1.4336	-0.5593	[.576]	
Discovery Espanol	1.7156	1.4213	1.2071	[.228]	
Disney Channel	0.3673	1.4059	0.2612	[.794]	
Do-It-Yourself Network	2.0264	1.2805	1.5825	[.114]	
E! Style	0.7951	0.6924	1.1484	[.251]	
Encore-Starz Channels	-1.7539	0.9467	-1.8527	[.065]	*
ESPN Channels	0.4949	0.8991	0.5504	[.582]	
EWTN	-2.5785	0.8967	-2.8755	[.004]	**
Family Channel	2.8981	2.0229	1.4327	[.153]	
Fine Living	-0.8554	1.5750	-0.5431	[.587]	
FIT TV	-1.3199	1.4629	-0.9022	[.367]	
Fox Movie Channel	0.9615	1.0342	0.9297	[.353]	
Fox Sports Channels	-1.5739	0.9207	-1.7094	[.088]	*
Fox Sports World en Espanol	1.8575	1.9711	0.9424	[.346]	
Galavision	-0.2547	2.6208	-0.0972	[.923]	
Game Show Network	-0.1051	0.8644	-0.1216	[.903]	
Golf Channel	0.1692	1.0552	0.1603	[.873]	
Goodlife TV	-1.5046	0.9829	-1.5307	[.126]	
Great American Country	-0.1777	0.7664	-0.2318	[.817]	
Hallmark Channel	1.0407	1.1880	0.8760	[.381]	
HBO channels	4.1461	3.1690	1.3083	[.191]	
Health Network	2.1948	1.1001	1.9952	[.047]	**
History Channel	-1.3025	2.0003	-0.6512	[.515]	
History Channel International	-1.2951	1.4249	-0.9089	[.364]	

Home and Garden TV	-2.0070	1.6647	-1.2057	[.229]	
iNDemand channels	-0.0215	1.4913	-0.0144	[.989]	
Inspirational Network	2.8200	1.1110	2.5382	[.011]	**
Interfaith Channel	-1.6695	1.3608	-1.2269	[.220]	
International Channel	-0.4611	1.0699	-0.4309	[.667]	
Lifetime Channels	-2.3692	0.9404	-2.5194	[.012]	**
MSG Network	-4.2416	3.5589	-1.1918	[.234]	
Major Broadcasting Cable	3.0969	1.2644	2.4493	[.015]	**
MBC Korean	1.5720	2.2858	0.6877	[.492]	
MSNBC	4.0859	3.4051	1.1999	[.231]	
MTV Channels	-1.1180	1.1836	-0.9446	[.345]	
FUSE	-1.4139	0.9826	-1.4389	[.151]	
NASA	-0.2115	1.6622	-0.1272	[.899]	
National Geographic Channel	-3.2125	1.0498	-3.0602	[.002]	**
News World International	2.1673	2.0071	1.0798	[.281]	
Nickelodeon Channels	1.2070	1.0002	1.2068	[.228]	
NOGGIN	-0.2117	1.2318	-0.1718	[.864]	
Ohio News Network	-3.3620	2.0045	-1.6773	[.094]	*
Outdoor Channel	0.7312	1.2253	0.5967	[.551]	
Outdoor Life Network	-2.5155	0.9285	-2.7093	[.007]	**
OXYGEN	-2.0530	1.8172	-1.1297	[.259]	
Sci-Fi Channel	-1.4729	1.1521	-1.2785	[.202]	
Shop NBC	-2.1088	0.9165	-2.3010	[.022]	**
Showtime channels	-0.1116	2.6196	-0.0426	[.966]	
SoapNet	1.2664	0.8792	1.4404	[.150]	
Speed Channel	2.8482	0.9131	3.1191	[.002]	**
Telemundo	0.9206	4.1489	0.2219	[.824]	
Texas Cable News	2.5630	2.4067	1.0650	[.287]	
The Movie Channel	1.4714	2.1929	0.6710	[.503]	
Tri-State Media News	10.1487	3.6996	2.7432	[.006]	**
Toon Disney	0.1108	0.9177	0.1208	[.904]	
Toon Disney Espanol	-1.9040	1.0483	-1.8162	[.070]	*
Trinity Broadcast Network	0.0000	0.0000	0.0000	[1.00]	
Turner Broadcast Service	1.2485	1.5989	0.7808	[.435]	
Turner Classic Movie	0.1976	1.0719	0.1843	[.854]	
TV Games Network	-0.5272	2.8549	-0.1847	[.854]	
TV Guide Channel	-4.3166	3.9862	-1.0829	[.279]	
TV Guide Interactive	-5.4676	2.4915	-2.1945	[.029]	**
TVN channels	-2.4806	3.0548	-0.8120	[.417]	
VH1 channels	0.4896	1.1152	0.4391	[.661]	
WAM!	-3.4118	1.5655	-2.1793	[.030]	**
WE: Women's Entertainment	1.5189	0.8507	1.7855	[.075]	*
Weatherscan	0.2724	1.0245	0.2659	[.790]	
Word Network	0.6682	1.0007	0.6677	[.505]	
RURAL	-0.0158	0.0171	-0.9266	[.355]	
SHRDBS	4.3300	2.5422	1.7033	[.089]	*
DBSLIL	1.1489	0.7668	1.4982	[.135]	
DAD	0.5992	2.3282	0.2574	[.797]	
DMC	0.8535	6.1471	0.1388	[.890]	
DCV	33.0186	5.7468	5.7456	[.000]	**
DCHAR	-2.6898	1.9568	-1.3746	[.170]	

DINS	2.7304	2.7920	0.9779	[.329]	
DTWC	-5.7025	2.3040	-2.4750	[.014]	**
DCOX	3.9568	1.9235	2.0571	[.040]	**
DCOM	6.1434	1.9473	3.1548	[.002]	**
DWOW	11.2255	2.6352	4.2598	[.000]	**
LSPA	-0.0375	0.0282	-1.3309	[.184]	
EDCOL	-0.0217	0.0470	-0.4610	[.645]	
HUOCCU	-0.1027	0.0592	-1.7356	[.083]	*
POV	0.0153	0.0600	0.2554	[.799]	
H20PL	-0.0157	0.0348	-0.4506	[.653]	
MEDVAL	0.0000	0.0000	1.0564	[.291]	
INTER	2.8831	2.5489	1.1311	[.259]	
CAP	0.0005	0.0026	0.1825	[.855]	
CLUST	0.5371	1.2938	0.4151	[.678]	
EC	-3.7734	0.6682	-5.6467	[.000]	**
BSTREG	0.3096	0.5507	0.5622	[.574]	
BCPE03S	0.0097	0.0055	1.7666	[.078]	*
DNCL	-0.6041	0.6406	-0.9430	[.346]	
DNCS	0.0594	1.3098	0.0453	[.964]	
DDBS	-0.8749	1.0139	-0.8629	[.389]	
DLP	-0.6282	1.2683	-0.4953	[.621]	
DOB	0.6851	0.7558	0.9064	[.365]	
DWL	0.0643	1.0357	0.0621	[.951]	
DDP	10.0920	1.8023	5.5997	[.000]	**

Coefficient of Determination	0.7748
Adjusted Coefficient of Determination	0.6702
F-statistic	5.4883

** Statistically significantly different from zero at the five percent level.

* Statistically significantly different from zero at the ten percent level.