ENTRY AND POTENTIAL COMPETITION IN UNITED STATES CABLE TV MARKETS[1]

SCOTT J. SAVAGE
University of Colorado, Boulder, CO

MICHAEL WIRTH
University of Denver, Denver, CO

ABSTRACT

Entry and potential competition in the US cable TV industry is empirically examined for about 400 markets. Logit estimates indicate new wireline overbuild and LEC entrants are more likely to enter monopoly markets with high population density, income, and household growth. Entry is less likely in regulated city markets, and markets served by an incumbent MSO with a large base of national subscribers. Predicted entry probabilities from logit estimation are used to calculate an index of potential competition. A supply-demand model is simultaneously estimated that allows investigation of the effect of potential competition on monopoly operator's pricing and channel programming decisions. Model results show that more channels are offered to consumers in monopoly markets with a higher probability of entry and potential competition.

August 31 2002

Key words cable television, competition, entry, price, quality

JEL classification L8, L9, L11

The FCC (1994; 2001, January 2) suggests the market for delivery of video programming to households is highly concentrated and characterized by substantial barriers which increase the cost of potential entry. These barriers include regulations that delay rivals' access to public rights-of-way, technology limitations (e.g., direct broadcast satellite (DBS) and multichannel multipoint distribution service (MMDS) line-of-sight problems), and incumbent operator behaviours that raise rivals' costs (e.g., limiting programming

[1] Presented at the 30th Research Conference on Communication, Information and Internet Policy (TPRC 2002), September 28-30, 2002, Hilton Hotel, Alexandria, Virginia. The authors thank Armando Galarraga and Nana Puangpathumanond for research assistance. Jane Frenette and Jonathan Levy provided excellent help with FCC cable system data.

availability). Cable ownership attribution and vertical integration also have implications for costs, prices and entry as a few multiple-system-operators (MSOs) accumulate an increasing share of national cable systems and programming. As noted by Owen and Wildman (1992), Chipty (1995), and Ford and Jackson (1997), a higher concentration of cable systems and programming can increase an MSO's subscriber base, and its ability to bargain down the prices paid for programs.[2] Beard and Ford (1999) also find higher monthly subscription prices in cable communities served by MSOs which own cable systems serving a relatively large number of subscribers on a national basis.

Despite entry barriers, many incumbent cable operators face competition from DBS, MMDS, wireline overbuilders, and/or local-exchange carriers (LECs). Several studies examine the effect of actual competition on cable pricing and programming. Beard and Ford (1999) show that monthly subscription prices for monopoly cable communities are 13 to 17 percent higher than their overbuilt, duopoly counterparts. The GAO (2000) finds lower prices, and a greater number of channels, in markets where wireline overbuilders and/or LECs are present. Further, in response to an increase in DBS market share, cable incumbents increase the number of channels offered in their service packages, but charge higher prices. More recently, the FCC (2002) estimates a 6.3 percent subscription price differential between "competitive" and monopoly communities. The FCC's results show that operators tend to offer more channels at a lower price when there is competition from overbuilders. However, these same results show no significant effect on cable demand or cable prices from DBS competition.

[2] Chipty's (1995) 'bargaining power hypothesis' implies that MSOs that serve a large number of national subscribers can obtain better deals from program suppliers. Controlling for regional size and other characteristics, he finds owners with a large base of national subscribers have lower marginal costs, and supply more cable subscriptions and pay channels.

While both the GAO (2000) and FCC (2002) acknowledge that non-price competitive behaviour (particularly increases in the number of channels in service packages) is a key feature of contemporary subscription video markets, analysis of the effect of potential competition on incumbent's pricing and programming decisions is scarce.[3] It is possible that the threat of entry from a potential competitor may force incumbents to reduce subscription prices directly, and/or indirectly, by adjusting quality through changes in channel programming. This paper examines entry and potential competition for about 400 US cable TV markets in the 1990s. A logistic function is estimated where the decision to enter a cable market reflects underlying cost, demographic, and industry structure variables. Predicted entry probabilities from logit estimation are used to calculate a potential competition index which is included in a supply-demand model. Simultaneous estimation of the supply-demand model allows investigation of the effect of potential competition on monopoly operator's pricing and channel programming decisions.

The paper is organised as follows. Some background on US cable markets and policy is provided in Section I. Section II outlines the empirical approach for testing the effect of potential competition on cable pricing and programming. Data used for estimation are described in Section III, while estimation results are discussed in IV. Section V contains concluding remarks, and discusses future avenues of research.

[3] The GAO (2000) and FCC (2002) include an exogenous wireline competition dummy variable in their price and quality equations to gauge the effect of actual competition.

I. Industry Overview

The cable business began in 1948 as a retransmission service (i.e., no original programming was provided), initially delivering one to four retransmitted over-the-air TV stations via wire to subscribers who paid a monthly fee (Baldwin & McVoy, 1988).

Because cable systems developed as local franchised monopolists, cable operators rarely faced competition from other multichannel subscription television distributors.[4] When cable was a local/regional broadcast television reception and retransmission business, the number of local over-the-air television stations that subscribers could receive had a significant impact on local system penetration. However, with the advent of satellite delivered cable networks (both basic and premium), consumer demand for cable was no longer strictly tied to the availability (or lack thereof) of over-the-air TV stations in a market. If consumers "wanted their MTV," there was usually only one place to get it – their local cable company. As a result, local cable operators became the "gatekeepers" for a large quantity of non-broadcast programming. In the absence of any meaningful competition for cable, policy makers became increasingly concerned with cable's market power (Wirth, 1990).

In spite of the fact that most cable operators did not face meaningful multichannel competition, the FCC was a strong proponent of cable deregulation during the 1980s. Part of the FCC's reasoning was based on its belief that, as a result of competition from broadcasters, no more than about 50 percent of U.S. television households would ultimately subscribe to cable. Additionally, the FCC believed that market entry, by

[4] A small number of traditional cable overbuilders have had an impact on incumbent cable operators in a limited number of local communities. However, the economics of laying cable down the same street as the incumbent cable provider to compete as an overbuilder continue to be difficult (S*ee* Neel, 2002; Noam, 1985; Owen & Greenhalgh, 1986; Johnson, 1994; Rizzuto & Wirth, 1998).

entrepreneurs using alternative distribution technologies, would ultimately provide a significant degree of competition (Parsons & Frieden, 1998; FCC, 1979).[5] Potential alternative multichannel delivery technologies included: DBS (also called Direct to the Home or DTH); MMDS (also called Wireless Cable); and SMATV (Satellite Master Antenna Television also called Private Cable).[6]

A number of events took place during the 1990s, which have had a significant impact on the multichannel television competitive landscape including: passage of the 1992 Cable Act, the development of digital signal compression, the rise of the DBS industry, and passage of the 1996 Telecommunications Act.

A. *The 1992 Cable Act*

The 1992 Cable Act established Program Access Rules, which require that all MSO-owned satellite delivered cable program networks be made available to all multichannel subscription television distribution competitors at a reasonable price (47 U.S.C. Sec. 548). These rules have provided DBS (and other cable competitors) with affordable and guaranteed access to a multitude of national cable programming networks, significantly reducing the risk of launching services to compete with incumbent cable operators (Southwick, 1998; Baldwin, McVoy & Steinfield, 1996; Shiver, 1993). Without the

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[5] In this 1979 report, the FCC indicated, "all of the available information suggests that under foreseeable circumstances cable penetration is unlikely to exceed about 48% of the nation's television households."

[6] The FCC also believed that videocassette recorders would continue to provide significant competition for cable. Since their first introduction in 1975, videocassette rentals and sales have been the primary viewer-programmed in-home video program source. Today, VCRs are in the process of being replaced by DVDs. However, the Home Video Marketplace (both rental and sales) continues to generate close to $20 billion per year and is by far the largest source of revenue for the Hollywood film community (*See* Laird & Mundorf, 1993; Delmark & Seggern, 1995; Roberts, 2001).

Program Access Rules, it is highly unlikely that meaningful multichannel television competition would have been able to develop.[7]

B. *Digital Signal Compression*

Dramatic advances in digital signal compression technology are revolutionizing the communications industry (Van Tassel, 1995; Van Tassel, 2001). DIRECTV (along with Stanley Hubbard's USSB), launched the first successful high powered DBS system in 1994 as an all-digital system allowing it to deliver four or more video channels per satellite transponder for a total of 150 channels (Southwick, 1998). More recently, cable entrepreneurs have utilized digital signal compression technology to launch a number of additional services including: digital cable (designed to directly counter DBS's competitive threat) (Kang, 2002), near video on demand/video on demand (Rizzuto & Wirth, 2002), high speed Internet access, and a variety of other interactive television services. Over-the-air television broadcasters are also in the process of utilizing digital signal compression technology to convert the over-the-air broadcast system from analog to digital (Van Tassel, 2001). Telephone companies are also using digital compression technology to experiment with the delivery of multichannel video programming over the telephone network using VDSL (very high bit-rate digital subscriber line) (Van Tassel, 2001).

C. *DBS*

Hughes' launch of "DBS 1" in December 1993 was the beginning of the first successful high-powered DBS system (Paul Kagan Associates, 1999; Eckhouse, 1993). It

[7] Baldwin, McVoy & Steinfield (1996, p. 263) indicate that failure to gain access to cable's key program

took a risky up front investment of over $1 billion dollars to come into a marketplace littered with failed attempts to enter (e.g., STC, USCI, Sky Cable, etc.) and facing a highly entrenched incumbent (i.e., the cable industry) (Shiver, 1993; Owen, 1999). From the outset, it was assumed in the industry that high-powered DBS would become a competitor for cable.

> "The ball game appears to be not only that of home satellite purveyors drawing from rural and underserved suburban markets but also moving into direct competition with the cable industry … The real question is whether satellite could be a competitor to cable. Our conclusion is that it certainly can be (Sky Trends, 1994)."

As of June 2002, there were 18.2 million DBS subscribers in the U.S. (10.7 million DirecTV subscribers and 7.5 million EchoStar Dish subscribers), making DBS by far the largest multichannel television rival to cable (Sky Trends, 2002). Prospects for continued DBS growth appear to be good regardless of whether the proposed merger between DirecTV and EchoStar is approved (Figler, 2002, August 19; Blum, 2002).

D. *Telephone Companies & the 1996 Telecommunications Act*

After Judge Harold Greene allowed the Regional Bell Operating Companies (RBOCs) to enter the information-services business (July 25, 1991), the feeling was that it would be "only a matter of time before Congress allows phone companies to compete directly with cable by offering television programs (Washington, 1991)."[8] On July 16, 1992, the FCC decided, "to allow RBOCs to compete with cable [by carrying], but not originating, video signals (Dominello, 1995, p. 47)." This signaled the creation of what became known as video dialtone (VDT) service. The FCC eventually granted a small number of VDT

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brands (e.g., HBO, MTV, ESPN, etc.) would leave multichannel video competitors with little desirable programming to offer their subscribers.

applications (Dominello, 1995, p. 52). However, passage of the *Telecommunications Act of 1996* eliminated the need for telephone companies to act as common carriers when distributing video programming (Parsons & Frieden, 1998).[9]

A number of RBOCs initially moved forward to aggressively compete with cable. For example, Ameritech (now part of SBC Communications) obtained over 100 cable franchises within its local telephone market area and aggressively "overbuilt" the incumbent cable systems. Ameritech had approximately 250,000 cable subscribers and its systems passed about 1.5 million homes (Cho, 2000) prior to its decision to exit the multichannel television business by selling its cable systems to WideOpenWest in December 2001 (Neel, 2002). The RBOCs have also almost completely abandoned MMDS as a means of providing video programming. For example, Bell South decided to partner with EchoStar to convert all of its MMDS customers (in New Orleans, Atlanta, Orlando, Jacksonville, and Daytona Beach) to DISH subscribers. Verizon (formerly Bell Atlantic) also abandoned attempts to provide video programming via MMDS or cable overbuilds. Both Verizon and SBC have entered into partnerships with DirecTV to provide the video portion of the bundled telecommunication packages available to their customers. The final RBOC, Qwest (formerly U.S. West), is the only RBOC, which has commercially deployed VDSL (i.e., very high bit-rate digital subscriber line) (Brown, 2000). Qwest is currently using VDSL to deliver multichannel television on an experimental basis in Phoenix, AZ, Highlands Ranch, CO and Omaha, NE (Qwest, 2002). As of May 2002, Qwest has over 41,000 multichannel television subscribers in Phoenix (Figler, 2002, August 5).

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[8] The U.S. Secretary of Commerce and the Department of Justice requested that Congress allow telephone

In sum, telephone companies have provided a relatively small amount of competition for cable and other multichannel subscription television providers to date (FCC, 2001, p. 5). VDSL technology holds promise for allowing telephone companies to become significant video distribution competitors. However, such competition is likely to be slow to develop in the near term because of: the upgrade costs of replacing billions of copper local loops with fiber and a dispute over what line code to use in modulating the VDSL signal (Brown, 2000).

E. *Current State of Multichannel Television Competition*

According to the FCC (2001, December 27, p. 95), as of June 2001 almost 69 million of the 88.3 million multichannel subscription television households were cable subscribers giving cable entrepreneurs a 78% share of the multichannel television marketplace; DBS had more than 16 million subscribers for an 18% market share; MMDS had 0.7 million subscribers for a 0.8% market share; SMATV had 1.5 million subscribers for a 1.7% share; HSD (home satellite dish) had 1.0 million subscribers for a 1.13% share; and OVS (open video systems) had 0.06 million subscribers for a 0.07% market share.

The largest cable overbuilders include: RCN Corp. with 486,900 subscribers (passing 1.7 million households), WideOpenWest (WOW) with 312,600 subscribers (passing 1.35 million households), and Knology Holdings with 114,400 subscribers (passing 0.4 million households) (*K book*, 2002, p. 8). RCN, WOW and Knology are the 11th, 13th, and 26th largest MSOs respectively. The FCC (2001, December 27, p. 8) indicates that the

companies to enter the multichannel television market in competition with cable (Farhi, 1990).

[9] In March 1996, the FCC ended video dialtone (Lucido, 1996).

> "Broadband Service Providers (BSPs) … are overbuilding existing cable systems with state-of-the-art systems that offer a bundle of telecommunication services, including video, voice and high-speed Internet access. BSPs are carefully selecting which communities to serve, based on factors such as favorable demographics and high population density. Their strategy is to increase per subscriber revenue and decrease churn."

Significant challenges faced by BSPs include: obtaining capital to build these capital-intensive high-end broadband systems; and competing with entrenched cable incumbents.[10]

In sum, although there has been only a limited amount of competitive BSP entry into existing cable markets, incumbent cable operators no longer have the multichannel television marketplace to themselves. Between the actual competition provided by DBS and the actual and/or potential competition provided by BSP overbuilders, cable operators, such as Insight Communications' CEO Michael Willner, indicate "I feel competitive pressure in every one of my markets, whether there is a wireline competitor or not (Neel, 2002, p. 20)."

II. Empirical Model

Some indication of the competitive pressure discussed by Insight Communications' CEO Michael Willner is obtained from a two-step empirical investigation of the effect of potential competition on cable prices and programming quality. Step one recognizes potential competition can be inferred from the probability of market entry.[11] Logit model estimation, which explains the cable operator's decision to enter a market as a function of

[10] Yankee Group analyst Michael Goodman indicates, "Until they can show someone that they can make money using their business model the capital markets are going to be shut off to these guys. Investors want proof of profitability, and the overbuilders haven't been able to really show that yet (Neel, 2002, p. 18)."
[11] Several studies estimate determinants of entry in telecommunications markets, but do not relate entry to potential competition and pricing (*See* Rosston and Wimmer, 2000; Prieger, 2001).

cost, demographic, and industry structure, allows an index of potential competition (PCOM) to be inferred from the predicted probability of entry. Step two estimates a supply-demand model that includes PCOM as an exogenous variable in incumbent monopoly cable operators' price and quality equations, respectively. Estimated parameters for PCOM in the inverse-supply and quality equations allow empirical testing of the effect of potential competition on monopoly cable operators' pricing and programming decisions.

A. *Market Entry*

Theory suggests that firms enter markets when they expect to earn above normal profit. As such, a new cable operator's marginal entry decision is based on the expected profits (π) from entering cable market i:

$$\pi_i = \boldsymbol{\beta}'\mathbf{x}_i + \varepsilon_i \tag{1}$$

where $\boldsymbol{\beta}$ is a vector of coefficients, $\mathbf{x}$ is a vector of exogenous variables which affect the expected revenues and costs of operation, and ε_i is a disturbance term. While the expected profitability of the new entrant is not observable, it is possible to observe whether a new entrant has entered (ENTRY = 1) or not entered (ENTRY = 0) market i:

$$\pi_i = 1 \text{ when } \pi^*_i > 0, \quad \text{and} \qquad \pi_i = 0 \text{ when } \pi^*_i \leq 0 \tag{2}$$

where π^*_i is unobserved profit from market entry, and $\boldsymbol{\beta}'\mathbf{x}_i$ is now an index function. Given a symmetric distribution, the underlying empirical model for the probability (P) of entry is:

$$P(\pi^*_i > 0) = P(\varepsilon_i < \boldsymbol{\beta}'\mathbf{x}_i) = F(\boldsymbol{\beta}'\mathbf{x}_i) \quad (3)$$

where multichannel competitive entry has occurred leading the FCC to award a market "competitive status", and F(.) is the logistic distribution. Exogenous variables included in **x** are: growth rate of households in the cable systems' primary county of service (HHG); income in the systems' county (INC); population density of the system's county (DEN); hourly wage of cable system technical employees (WAGE); system age (AGE); an indicator of whether the cable market is in an incorporated city (CITY); incumbent's share of national subscribers (NSUB); incumbent's share of national systems (NSYS); number of systems owned by the incumbent in the state corresponding to market i (SYS); and the age distribution for the population in the system's county (POP).

Variables in **x** are selected to approximate the new entrant's determination of price, quantity, and profits. HHG and INC measure expected subscriber demand after entry. Since demand should be higher in markets with higher household growth and larger income, a positive relationship is expected between HHG and probability of entry, and INC and probability of entry. DEN and WAGE approximate cost variables associated with network deployment and operation. New entrant costs should be lower in markets with high population density and low wage rates for cable employees. As such, a positive sign is expected for DEN and a negative sign for WAGE. AGE, NSUB, NSYS, and SYS are strategic variables that approximate any competitive advantages held by the incumbent cable operator. Older cable systems with less sophisticated infrastructure and service delivery may attract entry from cable overbuilders and LECS with more efficient technologies and marketing strategies, and as such, a positive relationship is expected between AGE and the probability of entry. Incorporated cities typically have more local rules and regulations that make it relatively harder for new entrants to obtain and operate a cable franchise. Accordingly a negative relationship is expected between CITY and ENTRY. The bargaining power hypothesis implies a cost advantage to incumbents with large national presence, and new entrants are less likely to enter these markets. Controlling for regional size (SYS), a negative sign on NSUB and/or NSYS may be interpreted as evidence of bargaining power (Chipty 1995). SYS and POP are controls for regional size and subscriber age profile. Their signs remain an empirical question.

B. *Supply-Demand Model*

To enable consistent estimation of the effect of potential competition on cable pricing and channel programming, monopoly operator's decisions are modelled within a system of jointly determined supply-demand equations. The system is essentially a variation of the structural models estimated by Mayo and Otsuka (1991), Rubinovitz (1993), GAO (2000), and the FCC (2002), emphasizing simultaneity between cable subscription, price, and quality. Cable operators are assumed to choose how many channels to provide in a basic package, and what to charge for a package of channels, rather than deciding on a price per channel. Consumers, however, consider the price per channel in their cable subscription decision. Demand, inverse-supply, and quality equations are:

$$\begin{aligned} SUB_i = \alpha_{0j} + \alpha_1(PRICE_i/CHAN_i) + \alpha_2 SIZE_i + \alpha_3 AGE_i \\ + \alpha_4 INC_i + \alpha_5 NWHITE_i + \alpha_6 COLL_i + \alpha_7 GRAD_i + e_i \end{aligned} \qquad (4)$$

$$PRICE_i = \delta_{0j} + \delta_1 SUB_i + \delta_2 CHAN_i + \delta_3 AREA_i + \delta_4 WAGE_i + \delta_5 URB_i + \delta_6 PCOM_i + \delta_7 SSYS_i + \delta_8 TCI_i + \delta_9 TWC_i + u_i \quad (5)$$

$$CHAN_i = \phi_{0j} + \phi_1 SUB_i + \phi_2 INC_i + \phi_3 DWELL_i + \phi_4 PCOM_i + \phi_5 SSYS_i + \phi_6 TCI_i + \phi_7 TWC_i + v_i \quad (6)$$

where SUB is number of 'basic' (basic plus expanded basic) cable subscribers, PRICE is the monthly subscription price for a basic service package, CHAN is the total number of channels in the basic package, SIZE is miles of coaxial plant in use (a proxy for the upper limit or potential size of the market in the short-run), HHZ is average household size in the systems' primary county of service, NWHITE is the percentage of non-white population in the systems' primary county of service, COLL is the percentage of the over 25 population with a college education in the systems' primary county of service, GRAD is the percentage of the over 25 population with a graduate education in the systems' primary county of service, URB is the percentage of the population living in an urban area, AREA is the average cable system size in the state where market i is located (a proxy for the geographical size of system i), PCOM is potential competition, SSYS is the incumbent's share of state systems, DWELL is the percentage of multiple unit dwellings, TCI and TWC indicate Tele-Communications Inc. and Time Warner Cable are the incumbent cable operator, respectively, α, δ, and ϕ are parameters to be estimated, and e, u, and v are disturbance terms. In the absence of state specific dummies to control for local regulation and DBS competition, the j = 1, … 9 intercepts vary by "type of incorporation" of the cable community according to FCC classification.[12]

Theory and prior evidence provide *a priori* expectations for supply and demand arguments in (4) through (6). Consumer behaviour theory predicts $\alpha_1 < 0$ and $\alpha_4 \geq 0$.[13] Larger markets have potential for a larger subscriber base so $\alpha_2 > 0$ is expected. Both the GAO (2000) and FCC (2002) argue demand is higher in older cable communities as consumers are more aware of the availability and quality of service so $\alpha_3 > 0$. Previous studies suggest that non-white households are more likely to subscribe to additional telephone services and $\alpha_5 > 0$ would support this finding for cable TV (*See* Duffy-Deno, 2001; Eisner & Waldon, 2001). COLL and GRAD capture both income and opportunity cost of time effects, and the signs on the education variables remain an empirical question. The signs for SUB and CHAN in the price equation can be positive, negative, or zero depending on scale economies with respect to additional subscribers and channels, respectively. Holding the number of subscribers constant, the larger the geographical size of the community the larger the costs of serving the area so $\delta_3 > 0$ is expected for AREA. Costs will be higher in high wage markets, but lower in densely populated urban markets so $\delta_4 > 0$ and $\delta_5 < 0$ are expected. Entry is more likely in high income markets with a large number of subscribers and multiple-dwelling residences. A finding of $\phi_{1,} > 0$, $\phi_2 > 0$,

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[12] Although consumers in non-urban communities may view DBS as a closer substitute for cable, evidence from the FCC (2002) and Goolsbee and Petrin (2001) suggest that DBS competition had no measurable effect on cable system prices and the number of channels offered in 1998. Given our cable data is obtained prior to 1998, we focus on the effect of potential overbuild and LEC competition on prices and channels, and control for DBS with dummies.

[13] The estimate of α_1 measures the effect of price per channel on demand. For instance, an increase in the number of channels for a given price reduces the quality-adjusted price and consumers demand more.

and $\phi_3 > 0$ would suggest incumbents provide more channels in these markets to make their packages more attractive than those of potential new entrants.

Estimates for PCOM in (5) and (6) also allow examination of the extent of potential price and non-price competition in cable TV markets. $\delta_6 < 0$ shows a negative price response by incumbents when facing entry and potential competition, while $\delta_6 \geq 0$ suggests incumbents do not exercise limit pricing. $\delta_6 \leq 0$ and $\phi_4 > 0$ together suggest incumbents facing a higher probability of competition will reduce quality-adjusted prices, by providing more channels for a given monthly subscription price, to retain and attract subscribers. Parameter estimates for SSYS,TCI, and TWC control for the effect of MSO size on cable prices and number of channels offered.[14] We expect horizontally integrated MSOs with a large percentage of state systems (as captured by SSYS) and large horizontally and vertically integrated MSOs (such as TCI and TWC) to have a relative cost advantage over single cable system operators and smaller MSOs.[15] However, large incumbent MSOs may also be able to negotiate larger increases in regulated prices with local franchise authorities, or provide less channels for a given price. As such, the signs for δ_7, δ_8, δ_9, ϕ_5, ϕ_6, and ϕ_7 remain an empirical question.

III. Data and Variable Descriptions

To estimate (3) through (6) a sample of 500 cable systems was initially drawn from the FCC's list of US cable communities located at www.fcc.gov/mb. Data for cable system

[14] Several studies find empirical evidence of scale economies in cable TV when scale is measured by the number of subscribers or systems in a regional cluster. A regional cluster is usually defined as a group of cable systems operated by one owner, that are close to each other but far from all other systems owned by this owner (Chipty, 1995) . In the absence of these data we use SSYS, the incumbents share of systems in the state, to proxy for regional cluster effects.

cost, size, demand, programming, and industry structure are sourced from the *Warren Cable and Television Factbook* (Warren Publishing Inc., 1999). Census-based demographic data for each systems' primary county of service are obtained from *The Right Site Market Analysis Edition* (Easy Analytic Software Inc., 1998). These data are collected from the period 1994 through 1997. After eliminating systems with incomplete data the sample reduced to 399 communities representing 49 states and the District of Columbia. All systems were monopolies at 1997, however, 14 communities were awarded "competitive status" by the FCC during 1998 through 2001 as a result of wireline overbuild and/or LEC entry. These 14 systems provide the basis for predicting the probability of cable market entry, and calculation of the potential competition index used in (5) and (6).

Table 1 provides cable system characteristics for the 399 communities. The average sample system is 310 months old and serves 22,560 basic subscribers. On average, basic service packages have 32 channels and retail at a monthly subscription price of $23.36. There are 58 different system owners in the sample, and all systems are operated by MSOs except Sumner Cable TV Company in Wellington, Kansas. TCI owns the most national systems, 1,151, and has the highest share of national subscribers at 19.46 percent. A full description of the variables and data sources used for estimating the market entry equation and the supply-demand system are provided in Table A1 and Table A2 of the Appendix.

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[15] Lower programming and financing costs would be reflected in lower monthly subscription prices and/or

TABLE 1 CABLE SYSTEM CHARACTERISTICS

Characteristics	Mean	SD	Min	Max
Number of subscribers	22,560	42,461	155	447,909
Monthly subscription price ($)	23.36	5.86	7.94	65.28
Number of channels	32	9.50	11	65
System age (months)	310	114	1	582
National systems for each incumbent	519	476	1	1,151
Incumbent's percent of national subscribers	9.04	8.73	7.34E-04	19.46

Note. n=399. SD is standard deviation. Min is minimum value. Max is maximum value.

IV. Estimation Results

Logit model results from estimation of the entry equation (3) for 399 markets are provided in Table 2. Because the purpose of (3) is to calculate the potential competition index for step-two supply-demand estimation, only a brief discussion of the logit results are provided. The models is reasonably well specified and a likelihood ratio test (χ^2 = 38.818) indicates a significant relationship between entry, and demographic, cost, and industry structure variables. Signs for most of the variables conform to *a priori* expectations. Wireline overbuilders and LECs are more likely to enter markets with high household growth, income, and population density. The quadratic terms INC^2 and DEN^2 indicate the probability of entry dampens at higher levels of household income and density. Entry is also likely in markets where the percentage of the over 18 population (POP) is relatively high. The positive sign for AGE suggests that new entrants are attracted to markets where the incumbent has a system of older vintage. Here, wireline overbuilders and LECS may have a relative advantage by deploying new infrastructure and technology, and/or by providing service to subscribers that are aware of the availability and quality of service provided through cable TV. Entry is less likely in high-wage markets, markets where the

more channels offered (*See* Waterman & Weiss, 1997).

incumbent MSO has a large base of national subscribers, and incorporated cities. The latter findings suggest bargaining power advantages and excessive city rules and regulations, may dissuade potential new operators from entering cable markets.

TABLE 2 ESTIMATES OF MARKET ENTRY EQUATION

Variable	Coefficient	Standard error
HHG	6.2747	2.3552[a]
INC	23.670	9.2816[a]
INC^2	-3.2620	1.2992[a]
DEN	7.7801	3.0686[a]
DEN^2	-3.6646	1.7842[a]
WAGE	-0.2483	0.1487[b]
AGE	0.0101	0.0037[a]
CITY	-1.9652	0.7349[a]
NSUB	-8.7262	5.0986[b]
NSYS	-2.1753	1.9329
SYS	0.0135	0.0124
POP	23.025	10.275[a]
INTERCEPT	-50.046	17.464[a]
Log likelihood	-41.241	

Note. Sample size is 399. Dependent variable is ENTRY. [a]denotes significant at the five percent level. [b]denotes significant at the ten percent level.

The log linear supply-demand system (4) through (6) is estimated by three stage least squares (3SLS) for 385 monopoly markets.[16] The three endogenous variables are SUB, PRICE, and CHAN, while PCOM is treated as exogenous because its value is predetermined from estimation of (4). Estimating equations allow the intercepts in each equation to vary by: incorporated city; incorporated town; unincorporated area; incorporated township; incorporated village; unincorporated unnamed area; incorporated borough; and state or federal reservation. A likelihood ratio test (χ^2 = 0.0426) does not

[16] Since the log of zero is undefined, one is added to URB, DWELL, and PCOM prior to log transformation.

reject the restriction that the signs on PRICE and CHAN in (4) are of equal magnitude but opposite sign, and supports the specification of price per channel in the demand equation.

TABLE 3 3SLS ESTIMATES OF SUPPLY-DEMAND MODEL

Variable	ln SUB (4)	ln PRICE (5)	ln CHAN (6)
	Coefficient	Coefficient	Coefficient
ln SUB		0.0111 (0.0234)	0.0829 (0.0120)[a]
ln (PRICE/CHAN)	-2.0212 (0.3105)[a]		
ln CHAN		0.2228 (0.1956)	
ln SIZE	0.8464 (0.0281)[a]		
ln AGE	0.4456 (0.0514)[a]		
ln INC	0.0582 (0.1380)		0.0484 (0.0532)
ln NWHITE	-0.0425 (0.0212)[a]		
ln COLL	0.2788 (0.1043)[a]		
ln GRAD	0.0686 (0.0865)		
ln AREA		0.0426 (0.0170)[a]	
ln WAGE		0.2221 (0.1008)[a]	
ln URB		-0.1461 (0.0730)[a]	
ln DWELL			1.0594 (0.3127)[a]
ln PCOM		0.1662 (0.2379)	0.4183 (0.2426)[b]
ln SSYS		-0.0169 (0.0131)	-0.0349 (0.0126)[a]
TCI		-0.0304 (0.0308)	-0.0355 (0.0320)
TWC		0.0220 (0.0406)	-0.0454 (0.0426)
INTERCEPT	1.0297 (1.6536)	1.3877 (0.7238)[b]	2.1661 (0.5995)[a]
Log likelihood			-181.67

Note. Sample size is 385. [a]denotes significant at the five percent level. [b]denotes significant at the five percent level

Coefficient estimates and standard errors are reported in Table 3. Price per channel (PRICE/CHAN), market size (SIZE), system age (AGE), and college education (COLL) are significant determinants of basic cable demand. The price elasticity of demand, –2.02, is similar to prior studies but somewhat smaller in absolute value compared to recent GAO (2000) estimates of –3.22.[17] As expected, demand increases with market size and the age of the system, with the latter finding supporting the FCC (2002) and GAO (2000) conjecture that demand is higher in older cable communities because consumers are more aware of the availability and quality of service. Demographic variables show no significant relationship between demand and income, but demand decreases with the percentage of the non-white population. The latter finding for cable TV contrasts results from Duffy-Deno (2001) and Eisner and Waldon (2001) for additional telephone services. Positive and zero signs for COLL and GRAD, respectively, suggest a non-linear relationship between cable demand and level of education. That is, cable demand is higher in residences where the head of the household has a college education, but declines for residences where the head of the household has a graduate degree. Insignificant coefficient estimates for SUB and CHAN in the PRICE equation provides no evidence of scale economies in the provision of cable service to additional subscribers, and the provision of additional channels, respectively. Estimated coefficient signs for other cost proxies in the PRICE equation conform to expectations. All other things constant, costs and prices increase with the geographical size of the system and cable technical employee wages, but are lower in areas with a high degree of urbanization. CHAN equation

[17] Using aggregate market data, Mayo and Otsuka (1991) estimate a price elasticity of demand of –0.69 to –1.51, Rubinovitz (1993) estimates –1.46, Chipty (1995) estimates –1.05 to –2.34, and the FCC (2002) estimate –2.19. Goolsbee and Petrin (2001) use micro data and discrete choice modelling to estimate a price elasticity of demand for basic cable of –0.43 to –0.55.

estimates support the hypothesis that incumbents provide more channels in markets with a larger base of subscribers, and a higher percentage of multiple dwelling units. Such strategies raise the attractiveness of their service packages relative to those of potential new entrants.

The signs for PCOM in (5) and (6) provide an empirical test of the effect of potential competition on prices and quality in cable TV markets. Potential competition has no measurable effect on incumbent's prices. This finding does not support the practice of limit pricing. However, after controlling for demand, prices and costs, a positive sign on PCOM in the CHAN equation suggests that incumbents, facing a higher probability of competition, will improve quality by providing more channels for a given monthly subscription price. Some insight into how this behaviour affects the price per channel faced by subscribers is obtained by comparing the number of channels offered to subscribers in markets with the average level of potential competition with the number of channels offered in markets with the highest level of potential competition. A 69 percent increase in PCOM from the average to highest level of potential competition would see subscribers offered nine more channels, with the price per channel declining from $0.73 to $0.59. Finally, we examine parameter estimates for SSYS, TCI, and TWC, which control for the effect of MSO size on cable prices and the number of channels offered. After controlling for the number of subscribers in the system, there is no evidence that larger MSOs have scale economies, and/or pass these on to consumers in terms of lower prices and more channels offered. By contrast, the negative effect of SSYS on CHAN is *prima facie* evidence that MSOs with a larger number of regional franchises have some market power, and may reduce the number of channels offered in their service packages.

V. Conclusions

Recent deregulation of the US cable and telecom sectors seeks to open up these traditional monopoly markets to entry and encourage competition, both within and across sectors. While the GAO (2000) and FCC (2002) show that non-price competitive behaviour, particularly increases in the number of channels in service packages, is a key feature of contemporary subscription video markets, actual competition from wireline builders and LECs has rolled out very slowly. Because most cable markets continue to be served by a monopoly wireline provider, or at best, are highly concentrated around the incumbent, analysis of the effect of actual entry does not provide a complete picture of the state of competition in the cable industry as a whole. With recent market deregulation it is possible that the threat of entry from a potential competitor may force incumbents to reduce subscription prices directly, and/or indirectly, by adjusting quality through changes in the number of channels provided.

Entry and potential competition in the US cable TV industry is empirically examined for about 400 markets. Logit estimates indicate new wireline overbuild and LEC entrants are more likely to enter monopoly markets with high population density, income, and household growth. Entry is less likely in regulated city markets, and markets served by an incumbent MSO with a large base of national subscribers. These estimates can be used to profile how cable industry competition is developing in the evolving liberal environment, and to make predictions about where overbuild and LEC market entry is likely to arise in the future. Accordingly, predicted entry probabilities from logit estimation are used to calculate an index of potential competition. A supply-demand model is simultaneously estimated that allows investigation of the effect of potential competition on monopoly operators' pricing and channel programming decisions. Model results show large incumbent operators (in terms of subscribers) offer significantly more channels than small cable operators. Further, consumers in monopoly markets with a higher probability of entry and potential competition are provided with more channels, and pay a lower price per channel for basic cable service. This finding is somewhat consistent with traditional oligopoly behaviour where incumbents tend to compete through non-price quality differentiation.

Limitations of the current study include: (1) the time period on which this study focuses, 1994-1997; (2) the lack of system-by-system DBS subscriber data; (3) the need for better control variables to measure vertical integration; and (4) the use of list price (as opposed to actual) data as obtained from the *Television and Cable Factbook*. Future work in this area should obtain and incorporate system-by-system DBS subscriber data, if possible, to control for and measure the impact of DBS on the competitive decision making of local cable systems. Additionally, use of more recent data would allow for the incorporation of cable operators' new revenue stream strategies (i.e., high speed Internet access, residential telephony, and digital cable services) to evaluate their response to actual and potential competitive entry by multichannel competitors.

APPENDIX

TABLE A1 VARIABLE DESCRIPTIONS FOR ENTRY EQUATION

Variable	Description and data source	Mean
ENTRY	Equals one when the community has wireline overbuild and/or LEC entry during 1998-2001, and zero otherwise. Source: FCC (2001).	0.0316
HHG	Projected household growth during 1990s. Source: Easy Analytic Software Inc. (1998).	0.1161
INC	Median household income (10^4). Source: Easy Analytic Software Inc. (1998).	3.4918
DEN	Persons per square mile (10^3). Source: Easy Analytic Software Inc. (1998).	0.4156
WAGE	Hourly wage for telecom equipment installers and repairers. Source: Bureau of Labor Statistics (1999).	19.950
AGE	System age in months. Source: Warren Publishing Inc. (1999).	310.01
CITY	Equals one when the community is an incorporated city, and zero otherwise. Source: FCC (2001).	0.7143
NSUB	Incumbent's percentage of national subscribers. Source: Warren Publishing Inc. (1999).	9.04
NSYS	Incumbent's percentage of national systems. Source: Warren Publishing Inc. (1999).	17.96
SYS	Number of systems owned by the incumbent in the state corresponding to market i. Source: Warren Publishing Inc. (1999).	33.582
POP	Percentage of population aged under 18 years. Source: Easy Analytic Software Inc. (1998).	26.32

TABLE A2 VARIABLE DESCRIPTIONS FOR SUPPLY-DEMAND MODEL

Variable	Description and data source	Mean
SUB	Number of basic and expanded basic subscribers to the system. Source: Warren Publishing Inc. (1999).	22,308
PRICE	Monthly subscription price ($). Source: Warren Publishing Inc. (1999).	23.28
CHAN	Number of channels. Source: Warren Publishing Inc. (1999).	32
SIZE	Miles of coaxial plant in use in the system. Source: Warren Publishing Inc. (1999).	396.09
AGE	System age in months. Source: Warren Publishing Inc. (1999).	309.52
INC	Median household income (10^4). Source: Easy Analytic Software Inc. (1998).	3.4941
NWHITE	Percentage of non-white population. Source: Easy Analytic Software Inc. (1998).	16.77
COLL	Percentage of population over 25 years of age with college education. Source: Easy Analytic Software Inc. (1998).	13.91
GRAD	Percentage of population over 25 years of age with post-graduate education. Source: Easy Analytic Software Inc. (1998).	6.31
AREA	Area ($mile^2$) covered by average state system corresponding to market i. Source: Warren Publishing Inc. (1999).	363.48
WAGE	Hourly wage for telecom equipment installers and repairers. Source: Bureau of Labor Statistics (1999).	19.971
URB	Percentage of population residing in urban areas. Source: Easy Analytic Software Inc. (1998).	55.44
PCOM	Predicted probability of entry from logit estimation of (3).	0.0316
SSYS	Incumbent's percentage of state systems corresponding to market i. Source: Warren Publishing Inc. (1999).	12.02
TCI	Equals one when the incumbent is TCI, and zero otherwise. Source: Warren Publishing Inc. (1999).	0.3169
TWC	Equals one when the incumbent is TWC, and zero otherwise. Source: Warren Publishing Inc. (1999).	0.1117
DWELL	Percentage of households in multiple dwelling units (10 or more). Source: Easy Analytic Software Inc. (1998).	5.50

REFERENCES

Baldwin, Thomas and McVoy, D. Stevens. (1988). *Cable Communication* (2nd ed., p. 5). Englewood Cliffs, NJ: Prentice Hall.

Baldwin, Thomas; McVoy, D. Stevens; and Steinfield, Charles. (1996). *Convergence: Integrating Media, Information & Communication* (p. 263). Thousand Oaks, CA: Sage Publications.

Beard, T.R., and Ford, G. (1999). 'Competition Between Wireline Networks as Fragmented Duopoly with an Empirical Application to the Cable Television Industry', Phoenix Center for Advanced Legal and Economic Public Policy Studies.

Blum, Jonathan. (2002, August 19). DBS Reality Check. *CableWorld*, p. 6.

Brown, Karen. (2000, May 8). Telcos Breathe Life into VDSL, *CableWorld*, p. 61-2.

Bureau of Labor Statistics. (1999). Occupational Employment Statistics. Retrieved June 19, 2002, from http://stats.bls.gov/oes/1999/oessrcst.htm.
Chipty, T. (1995). 'Horizontal Integration for Bargaining Power: Evidence from the Cable Television Industry', *Journal of Economics and Management Strategy*, 4, 375-397.
Cho, Joshua. (2000, May 30). Ameritech Left Wondering? *CableWorld*. Retrieved July 17, 2001, from http://www.cableworld.com.
Delmark, Cary and Seggern, Ray. (1995). Home Video, in Grant, August (Ed.), *Communication Technology Update*, (4th ed., pp. 266-79). Boston, MA: Focal Press.
Dominello, James. (1995). Video Dialtone. In Grant, August (Ed.). *Communication Technology Update*, (4th ed., p. 47). Boston, MA: Focal Press.
Duffy-Deno, K.T. (2001). 'Demand for Additional Telephone Lines: An Empirical Note', *Information Economics and Policy*, 13, 283-299.
Easy Analytic Software, Inc. (1998). *The Right Site Market Analysis Edition*. Vineland, New Jersey: Easy Analytic Software, Inc.
Eckhouse, John. (1993, December 16). Satellites Threaten Cable TV Operators. *The San Francisco Chronicle*, p. C1. Retrieved September 14, 2001, from http://www.lexis-nexis.com.
Eisner, J., and Waldon, T. (2001). 'The Demand for Bandwidth: Second Telephone Lines and On-line Services', *Information Economics and Policy*, 13, 301-309.
Farhi, Paul. (1990, June 27). White House Fights Cable Rate Curbs; Phone Firms Backed on Bid to Compete. *The Washington Post*, p. H1. Retrieved July 17, 2001, from http://www.lexis-nexis.com.
Federal Communications Commission. various publications www.fcc.gov/csb/.
Federal Communications Commission. (1994). *1994 Report*. FCC Rcd at 228-245, Washington, DC: FCC.
Federal Communications Commission. (1979). *Inquiry into the economic relationship between television broadcasting and cable television*. 71 FCC 2d 632. Washington, DC: FCC.
Federal Communications Commission. (2001, January 2). *Seventh annual report: In the matter of annual assessment of competition in the market for the delivery of video programming* [CS Docket No. 00-132]. Retrieved January 18, 2001, from http://ftp.fcc.gov/Bureaus/Cable/Reports/fcc01001.pdf.
Federal Communications Commission. (2001, December 27). *Eighth annual report: In the matter of annual assessment of competition in the market for the delivery of video programming* [CS Docket No. 01-129]. Retrieved January 21, 2002, from http://www.fcc.gov/mb/csrptpg.html.
Federal Communications Commission. (2002). *Report on Cable Industry Prices*, MM Docket No. 92-266, FCC, Washington D.C.
Figler, Andrea. (2002, August 5). "Cox Aims to Get Back on Track in Phoenix," *CableWorld*, p. 36.
Figler, Andrea. (2002, August 19). Sats See Sub Surge in 2005. *CableWorld*, p. 6.
Ford. G., and Jackson, J. (1997). 'Horizontal Concentration and Vertical Integration in the Cable Television Industry', *Review of Industrial Organization*, 12, 501-518.
Goolsbee, A., and Petrin, A. (2001). 'The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV', *mimeo*, Graduate School of Business, University of Chicago.

Johnson, Leland. (1994). *Toward Competition in Cable Television* (pp. 22-6). Cambridge, MA: The MIT Press/Washington, DC: American Enterprise Institute.
K book: The guide to broadband stats and standings. (2002, Spring/Summer). New York: Media Central/Primedia.
Kang, Myung-Hyun. (2002). Digital Cable: Exploring Factors Associated with Early Adoption. *Journal of Media Economics*, 15, 193-207.
Laird, Kenneth and Mundorf, Norbert. (1993). Videocassette Recorders, in Grant, August and Wilkinson, Kenton (Eds.), *Communication Technology Update: 1993-94* (3rd ed., pp. 203-15). Austin, TX: Technology Futures.
Lucido, Brad. (1996). Switched Video Services. In Grant, August (Ed.). *Communication Technology Update* (5th ed., p. 68). Boston, MA: Focal Press.
Mayo, J., and Otsuka, Y. (1991). 'Demand, Pricing, and Regulation: Evidence from the Cable TV Industry', *Rand Journal of Economics*, 22, 396-410.
Neel, K.C. (2002, March 18). Deadend at the Headend, *CableWorld*, pp. 17-20.
1992 Cable Act, Sec. 19: Development of Competition and Diversity in Video Programming Distribution; 47 U.S.C. Sec. 548.
Noam, Eli. (1985). Economies of Scale in Cable Television: A Multiproduct Analysis, in Noam, Eli (Ed.), *Video Media Competition: Regulation, Economics and Technology* (pp. 93-120). New York: Columbia University Press.
Owen, Bruce. (1999). *The Internet Challenge to Television* (p. 252). Cambridge, MA: Harvard University Press.
Owen, Bruce and Greenhalgh, Peter. (1986). Competitive Policy Considerations in Cable Television Franchising, *Contemporary Policy Issues*, 4, 69-79.
Parsons, Patrick and Frieden, Robert. (1998). *The Cable and Satellite Television Industries* (p. 59). Boston, MA: Allyn and Bacon.
Paul Kagan Associates. (1999). *The State of DBS 2000* (p. 33). Carmel, CA: Paul Kagan Associates.
Qwest. (2002). "Qwest's Current VDSL Markets." Retrieved August 23, 2002, from http://www.qwest.com/vdsl/learn/markets.html.
Rizzuto, Ronald and Wirth, Michael. (1998). *Costs, Benefits, and Long-Term Sustainability of Municipal Cable Television Overbuilds*, Denver, CO: GSA Press.
Rizzuto, Ronald and Wirth, Michael. (2002). "The Economics of Video on Demand: A Simulation Analysis," *Journal of Media Economics*, 15, 209-25.
Roberts, Johnnie L. (2001, August 20). The Disc that Saved Hollywood, *Newsweek*, pp. 30-2.
Rosston, G., and Wimmer, B. (2000). 'From C to Shining C: Competition and Cross-Subsidy in Communications', SIEPR Discussion Paper No. 00-21, Stanford Institute for Economic Policy Research, Stanford.
Rubinovitz, R. (1993). 'Market Power and Price Increases for Basic Cable Service Since Deregulation', *Rand Journal of Economics*, 24, 1-18.
Shiver, Jube, Jr. (1993, November 21). Beating Swords into Sitcoms? Defense Giant Hughes Takes on Cable with Satellite TV, *Los Angeles Times*, p. 1. Retrieved July 17, 2001, from http://www.lexis-nexis.com.
Sky Trends. (1994, 1st Quarter). Money Talks. *SkyReport*, 1, 1.
Sky Trends. (2002, August). DTH Counts. *SkyResearch*, 9, 3.

Southwick, Thomas. (1998). *Distant Signals* (p. 316). Overland Park, KS: Primedia Intertec.
Telecommunications Act of 1996. (1996). P.L. No. 104-104, 110 Stat. 56.
United States General Accounting Office (GAO). 2000. *The Effect of Competition from Satellite Providers on Cable Rates*, July 2000, United States General Accounting Office, Washington, D.C.
Van Tassel, Joan. (1995). Digital Video Compression. In Grant, August (Ed.). *Communication Technology Update* (4th ed., p. 10). Boston, MA: Focal Press.
Van Tassel, Joan. (2001). *Digital TV over Broadband: Harvesting Bandwidth*. Boston, MA: Focal Press.
Warren Publishing Inc. (1999). *1999 Television and Cable Fact Book*. Washington, DC: Warren Publishing Inc.
Washington, Mark. (1991, August 12). Why Cable Companies Are Playing So Rough. *Business Week*, p. 66. Retrieved September 14, 2001, from http://www.lexis-nexis.com.
Waterman, D., and Weiss, A. (1997). *Vertical Integration in Cable Television*, The American Enterprise Institute, Washington, D.C.
Wirth, Michael. (1990). Cable's Economic Impact on Over-the-Air Television Broadcasting, *Journal of Media Economics*.