

# Vertical Ownership, Program Network Carriage, and Tier Positioning in Cable Television: An Empirical Study

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**Abstract** Using a 2004 cross-sectional database of digital cable systems in the U.S., we provide new evidence that the effects of vertical ownership ties between systems and programming suppliers persist in spite of extensive channel capacity expansion, as well as new competition from direct broadcast satellites. Focusing on four program network groups (basic outdoor entertainment, basic cartoon, basic movie, and premium movie), we generally find that integrated cable systems carry their affiliated networks more frequently and carry unaffiliated rival networks less frequently—a pattern identified by previous studies using data prior to DBS or the capacity expansion effects of digital cable. We also find that integrated systems that do carry rival networks often position them on digital tiers having more limited subscriber access, a pattern not investigated in previous studies.

**Keywords** Vertical integration · Cable television · Program carriage · Program positioning

## 1 Introduction

Previous authors have found that local cable television systems in the U.S. having vertical ownership ties to certain cable programming networks offer significantly different programming menus in terms of network availability and pricing

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(Waterman and Weiss 1996; Chitty 2001). In particular, their studies report that vertically integrated cable systems have carried their affiliated networks more frequently, and rival networks less frequently, than have systems without vertical ties. Those studies, however, relied on data from the late 1980s or early 1990s, before massive expansions of cable system channel capacity due to digital technology and before serious competition from Direct Broadcast Satellites (DBS). Those forces may be expected to reduce or eliminate any incentives that integrated cable operators had in the past to “favor” their own networks or to “foreclose,” or otherwise limit, consumer access to rival networks.

These issues in cable television reflect longstanding concerns in industrial organization that vertically integrated firms having monopoly power in a downstream market might limit the access of an upstream rival’s inputs to that market—whether those effects result from the pursuit of efficiency (Blair and Kaserman 1978; Schmalensee 1973), or from anticompetitive foreclosure or other strategic behavior (Salinger 1988; Hart et al. 1990; Ordovery et al. 1990; Bolton and Whinston 1993). In information industries such as cable television, freedom of expression, as well as potential anti-trust issues, are also raised (Owen 1975).

In this paper, we re-examine the effects of vertical integration in the U. S. cable television industry using cross-sectional data for 561 cable systems operating in 2003–04, focusing on four distinct groups of cable networks having similar programming content. As in the earlier studies, we compare the carriage of affiliated and rival networks on vertically integrated local systems with carriage by systems not having such ties. The digital transformation of cable has also opened a new dimension to our study: whether vertically integrated cable systems position the networks they do carry on analog versus digital program tiers differently—potentially to the disadvantage of the rivals.

## 2 Background and Previous Research

Cable networks package and market their programming to cable operators, which act as retailers by signing up subscribers at the local level. The subscribers purchase programming as parts of various bundles or a-la-carte by buying individual subscription networks or pay-per-view programs. Generally, subscribers must buy a basic analog tier to have access to any a-la-carte premium networks (such as HBO) that might be carried on it, or to have access to a digital tier, which in turn provides access to additional bundles as well as digital premium networks. Most of the over-11,000 local cable systems in the U.S.—which rarely compete head to head at the local level—are owned by Multiple Cable System Operators (MSOs). The MSOs engage in master agreements with cable network providers. Among other terms, those contracts typically specify per-subscriber fees to be paid to the networks carried by the MSO’s systems. In some cases, a certain network may be carried by all the systems of an MSO, but especially with less established networks, only a subset of the systems may carry it. Tier positioning of individual networks may also vary from system to system.

As of the end of 2003, 33% of the 339 national cable programming networks then in business were vertically affiliated with one or more MSOs.<sup>1</sup> Most of these relationships involved the two largest MSOs. The leading firm, Comcast, served 22.7% of all U.S. cable subscribers, and had ownership interests in 41 programming networks, including, for example, Outdoor Life Network and E! Entertainment. The second largest MSO, Time Warner, owned systems serving 11.6% of the national market, and had ownership interest in 62 networks, including CNN and Home Box Office (HBO).<sup>2</sup>

How might vertical integration in this market environment lead to differences in program availability and pricing at the local level? In the cable industry, limits on the availability of rivals' programming, or marketing practices that favor affiliated networks, might occur for benign, efficiency-based reasons, or they may have anti-competitive motives. First, transactions efficiencies may lower the implicit marginal cost to the cable system of carrying a network in which it has an ownership interest, due for example, to elimination of double marginalization or reduced risk of opportunistic behavior. Salinger (1991) shows that the end result of such a cost reduction on final prices of substitute goods in a two-product case can in theory be virtually anything. It is reasonable to expect, however, that in the case of an a-la-carte premium network, the lower input cost will reduce the affiliated network's optimal final price relative to that of a rival. If so, demand will be drawn from a rival network that is perceived by subscribers to be a close substitute. Like grocers who decide which cereal brands to carry, cable systems face capacity constraints. The rival network would thus be eliminated from the system's menu if demand falls below some threshold level.

A variation of this logic applies to a network carried as part of a program package that is offered to subscribers for a single price. In the case of basic cable networks, which are usually supported by a combination of advertising and per-subscriber fees, an implicit reduction of the fee due to the vertical affiliation increases the profitability of a given network's inclusion in the package, and reduces that of an unaffiliated rival—similar to the premium network case. Also, the cable operators do not share in the advertising revenues earned by an unaffiliated basic network.<sup>3</sup> Other things equal, the inclusion of a similar ad-supported rival in a package can be expected to draw away viewers from the affiliated network, further reducing the profitability of carrying the rival.

An anticompetitive, "raising rival's costs" theory in this industry has also attracted attention of economists and policymakers.<sup>4</sup> Like many other media products, cable networks are subject to substantial economies of scale with respect to the number of subscribers reached. That cost condition implies that strategic exclusion of an

<sup>1</sup> Federal Communications Commission (2004), paragraph 141.

<sup>2</sup> The number of networks in which Comcast and Time Warner had ownership interest was obtained by counting iN Demand's 35 multiplexed channels separately (Federal Communications Commission 2004, paragraph 143).

<sup>3</sup> National cable networks often have advertising slots available to local cable systems, but local advertising amounts to a minor proportion of total cable advertising.

<sup>4</sup> See Competition, Rate Deregulation and the Commission's Policies Relating to the Provision of Cable Television Service, Report, MM Dkt. No. 89-600, FCC 90-276, 67 Rad. Reg. 2d (P&F) (1990), and subsequent FCC documents involving horizontal and vertical ownership restrictions pursuant to the 1992 Cable Television Act.

unaffiliated rival network by an MSO would raise that rival's average programming cost per subscriber, thus limiting its ability to invest in program quality, and potentially inducing it to exit the market altogether. For an ad-supported basic cable network, moreover, cost-per-thousand advertising rates are known to be an increasing function of the network's national audience reach, and advertisers regard geographic gaps in the national audience coverage of a given network to be a serious disadvantage.<sup>5</sup> In this case, strategic vertical foreclosure may thus compound a rival network's disadvantage in offering a competitive quality of programming.

Presumably, such anticompetitive foreclosure would reduce economic welfare. Even if a reduction in the availability of unaffiliated rival networks due to vertical integration is benign in its intent, thus raising no antitrust concerns, the results may still be socially undesirable. A history of federal legislation, Federal Communications Commission (FCC) rulings and other constraints on media firms have reflected social concerns with preserving adequate diversity of information sources and equality of access to the public by program suppliers.<sup>6</sup>

Among existing studies of the effects of vertical integration in cable television, [Waterman and Weiss \(1996\)](#) found, using 1989 data, that integrated cable operators' likelihood of carrying the four main rival premium movie networks of the time (HBO, Cinemax, Showtime, and The Movie Channel) was higher than average if the operator was vertically affiliated with the network, and lower if the network was unaffiliated. They also found that given the decision to carry a rival network, cable operators favored their affiliated networks in pricing and marketing activities, as inferred by subscriber-ship penetration rates. [Waterman and Weiss \(1997\)](#) supplemented this study with econometric evidence that operators vertically affiliated with seven basic cable networks carried those networks more frequently than did unaffiliated cable operators in nearly all cases. In these studies, the authors did not attempt to distinguish between efficiency and anti-competitive motives for carriage pattern differences.

[Chipty \(2001\)](#) studied vertical integration in cable using 1991 data. At the individual network level, she found that cable operators vertically integrated with the TV shopping service, QVC, were less likely to carry the competing independent service, HSN. In addition, she found that Time Warner and Viacom, both MSO owners of premium networks at the time, were less likely to carry the basic movie service,

<sup>5</sup> [Waterman and Yan \(1999\)](#) offer empirical evidence that limited national coverage negatively affects cost-per-thousand advertising rates charged by basic cable networks. [Chipty and Snyder \(1999\)](#), however, argue that the concave relationship between national coverage of networks and advertising rates is evidence that MSOs have limited market power in the programming market.

<sup>6</sup> See in particular, "In the Matter of Time Warner, Inc., Turner Broadcasting Systems, Inc, Telecommunications, Inc, and Liberty Media Corporation, United States of America, Before the Federal Trade Commission, Agreement Containing Consent Order, File No. 961-0004 (September 12, 1996). The FTC Ruling required Time Warner to carry at least one basic cable news service in addition to CNN as a condition of the Time Warner-Turner merger. As directed by the 1992 Cable Act, the FCC also promulgated rules in 1993 that limit the proportion of a cable system's channel capacity that can be occupied by programming services in which the operator has a financial interest to 40% for systems with a capacity of fewer than 75 channels, but these rules have had little if any practical effect. (In the Matter of Implementation of Sections 12 and 19 of the Cable Television and Consumer Protection Act of 1992: Development of Competition and Diversity in Video Programming Distribution and Carriage, Second Rep. & Order, MM Dkt. No. 92-265 (1993) par 41.)

American Movie Classics (AMC). At the aggregate level, Chipty also found that vertical integration with basic and premium cable networks affected the total number of services offered, and she reported evidence that consumer welfare increased as a result of the vertical integration. In another empirical study, Ford and Jackson (1997) found that vertical integration between cable operators and networks, as well as horizontal concentration of MSOs, lowered programming costs.

Since the data for these previous studies were collected, there have been major changes in system capacity, network entry, and competition with cable at the system level. In 1994 (three years after the period examined by the last major economic study), the average cable system was able to provide 37 analog video channels.<sup>7</sup> By 2004, the average number of analog channels had increased to 70, and the average number of digital channels was about 120.<sup>8</sup> Some of the capacity increase has followed from more efficient hardware such as fiber optic cable. The digital component of the increase has been largely due to the extensive diffusion of digital compression technology since the mid-1990s. That technology, in combination with various hardware components, generally allows 12 or more digital channels of comparable video quality to be offered in place of one analog channel. As a result, most operators now offer “digital tiers” of 30 to 100 or more additional channels that include certain basic and premium subscription networks and pay-per-view or video-on-demand program channels. Prior to 1997, no cable operator in the U.S. offered digital video service, while as of June 2003, digital cable services were available to about 90% of all cable subscribers.<sup>9</sup> Simultaneous with these changes has been a large increase in the number of competing cable networks: The FCC reported only 106 networks in 1994, as compared to the 339 networks reported in 2003.<sup>10</sup>

Given these increases in channel capacity and network competition, it is interesting to examine whether the observed program carriage or marketing patterns found in earlier studies still persist. First, the expansion of system capacities implies a reduction of channel carriage opportunity costs. Secondly, increased audience fragmentation due to more competing networks implies that viewer substitution effects—and thus the incentive of operators to exclude “rival” networks, for either efficiency or anticompetitive motives—should diminish.

Another change affecting cable is the competition from DBS, nationally distributed services offering a menu that includes most of the same basic and premium networks. “True” DBS began with the 1994 launch of DirecTV.<sup>11</sup> By 2003, DBS penetration had reached 21.6%.<sup>12</sup> In general, satellite competition should mitigate vertical effects by increasing the marginal incentive of cable operators to offer a programming menu

<sup>7</sup> Authors’ calculation based on Table 3 in Federal Communication Commission (1994).

<sup>8</sup> Federal Communication Commission (2004), paragraph 25.

<sup>9</sup> Federal Communication Commission (2004), paragraph 41. Although digital services are widely available, only 31.26% of the basic cable subscribers, or about 20.6 million, actually subscribed to digital services as of June 2003.

<sup>10</sup> Federal Communications Commission (2004), Table 8.

<sup>11</sup> Federal Communications Commission (2004), paragraph 9. Although relatively marginal “home satellite dish” (HSD) systems existed in 1990, its U.S. household penetration never exceeded about 3.5%.

<sup>12</sup> Federal Communications Commission (2004), paragraph 16.

of maximum appeal to subscribers or by decreasing the marginal effectiveness of a strategic foreclosure strategy.<sup>13</sup>

Finally, the emergence of digital cable service introduces a more subtle issue in cable system behavior that has not been systematically studied. Besides the choice of whether to carry a particular programming network, a cable operator decides whether to offer it on an analog or digital tier. Basic cable networks average about two-thirds of their revenues from advertising, and they generally regard carriage on a basic analog tier to be more desirable in order to maximize audience exposure. Also, demand for a-la-carte premium networks will generally be higher on more accessible tiers. Digital tiers are typically offered to subscribers for an extra monthly charge of \$9.95 or more, and thus have much lower audience exposure. As of June 2003, only 20.6 million of the 65.9 million cable subscribers in the US, or about 31%, actually received any digital tier programming.<sup>14</sup> Tier positioning is an important source of friction in basic network/operator negotiations, suggesting that vertical ownership may lead to a greater tendency for an integrated basic network to be carried on an analog tier, and a rival network on a digital tier.<sup>15</sup> Other interpretations for differential tiering by integrated operators are also possible, but we postpone them until the discussion.

### 3 Selection of Networks for Study

We focus on four groups of programming networks: basic outdoor entertainment, basic cartoon, basic movie, and premium movie channels. Our first criterion for the selection of these groups was that programming within them belonged to a distinct market segment, within which the networks can be presumed to be reasonably close substitutes. The second criterion was that within each group, one or more of the networks were vertically affiliated with an MSO while at least some other networks in the group were unaffiliated. Although we attempted to select the most interesting cases, our selections necessarily represent an incomplete picture of vertical integration in the cable television market.<sup>16</sup>

The selected groups are displayed in Table 1, along with launch dates of the individual networks. Within the outdoor entertainment segment, Outdoor Life Network (OLN), owned by Comcast, and the independently owned Outdoor Channel, are basic networks with advertiser support that have offered generally comparable program menus in fishing, boating and other outdoor sports and activities. A similar situation

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<sup>13</sup> See Goolsbee and Petrin (2004) for an empirical analysis of the effects of DBS competition on cable television.

<sup>14</sup> This proportion is obtained by dividing the number of digital cable subscribers (20.6 million) by the number of basic cable subscribers (65.9 million). See Table 1 and paragraph 41 of Federal Communications Commission (2004).

<sup>15</sup> See, for example, *Cable Program Investor* (Kagan World Media), October 22, 2004, p. 1.

<sup>16</sup> Among other possibilities, programming on the general-interest cable networks (e.g., USA Network, TNT, and TBS) is fairly diverse. Cable news services (including CNN, Fox News, and CNBC) are more distinct but had become almost ubiquitous by 2003. Sports, music, and some other categories with distinct content lacked significant ownership affiliations with MSOs.

Table 1 Programming Networks for Analysis

Market Segment	Programming Network	MSO Ownership (%)	Launch Date	Subscribers (mil)
Outdoor Entertainment	<i>Outdoor Life Network</i>	Comcast (100)	Jul-95	52.2
	<i>Outdoor Channel</i>	-	Apr-93	23.1
Cartoon	<i>Cartoon Network</i>	Time Warner (100)	Oct-92	83.0
	<i>Toon Disney</i>	-	Apr-98	39.4
Basic Movie Service	<i>Turner Classic Movies</i>	Time Warner (100)	Apr-94	63.8
	<i>American Movie Classics</i>	Cablevision (60)	Oct-84	83.6
	<i>Independent Film Channel</i>	Cablevision (60)	Sep-94	26.8
	<i>Fox Movie Channel</i>	-	Nov-94	24.7
Premium Network	<i>HBO</i>	Time Warner (100)	Nov-72	20.5
	<i>Cinemax</i>	Time Warner (100)	Aug-80	8.0
	<i>Showtime</i>	-	Jun-76	8.7
	<i>The Movie Channel</i>	-	Dec-79	5.8
	<i>Encore</i>	-	Apr-91	13.8
	<i>Starz!</i>	-	Mar-94	7.6
	<i>Flix</i>	-	Aug-92	6.7
	<i>Sundance Channel</i>	-	Feb-96	9.9

Source: Federal Communications Commission (2004); Kagan World Media (2003), Cable Program Investor, June

Notes: The information of vertical integration and number of subscribers is as of June 2003

applies to the second group, cartoons. The better-established Cartoon Network, owned by Time Warner, had competed head to head with Toon Disney as an advertiser-supported basic network for several years.

The third segment, basic movie services, is somewhat broader, but all four of the services we include specialize in classic or other older Hollywood films (notably Turner Classic Movies (TCM), American Movie Classics (AMC), and Fox Movie Channel (FMC), or more contemporary but generally out of the mainstream theatrical films, notably the Independent Film Channel (IFC)). These four networks are entirely or mainly sold by cable systems as part of basic or expanded basic tiers, although only IFC and AMC sold advertising.<sup>17</sup> Time Warner obtained 100% ownership of TCM through its merger with Turner Broadcast System (TBS) in 1996. Both AMC and IFC were majority-owned by another MSO, Cablevision Systems, which had a relatively small national share of subscribers (3.1%) in 2003.

The fourth group, premium (or pay) movie-based networks, is the largest and arguably most diverse segment. The two longest established rivals, HBO and Showtime, offer some original series in addition to their main menu of recent Hollywood features. The others all specialize in relatively recent major films, although Flix, Sundance, and Encore (sometimes known as “mini-pays”) generally charge lower prices and have less generally attractive, or less mainstream movies. None of the networks in this group carry advertising and all are sold as premium subscription networks in most, or at least a large majority of cases.<sup>18</sup>

Notably, all four network groups involved integration as of 2004 with one of the two largest MSOs: Comcast or Time Warner. Although two of the basic movie networks, AMC and IFC, were also affiliated with Cablevision, we did not investigate that MSO’s behavior due to inadequate data.<sup>19</sup>

#### 4 Data Sources and Description

Our main data source is the *Television and Cable Factbook* (2004; the *Factbook* hereafter) published by Warren Communication News, Inc. The *Factbook* is an

<sup>17</sup> *Cable Program Investor* (Kagan World Media), March 15, 2004, p. 3. For both networks, advertising is only a minor source of their revenue. In 2003, 14% of IFC’s total revenue was from advertising, and advertising was 28% for AMC.

<sup>18</sup> Unlike the four oldest premium networks (HBO, Cinemax, Showtime, and The Movie Channel), Starz!, Encore, Flix, and Sundance Channel may sometimes be included in a cable system’s basic program package. In our sample, the percentages of cable systems that place these four networks in a basic package are respectively 0.2%, 19.8%, 10.3%, and 32.8%. Since these networks are not ad-supported and the large majority of cable systems still treat them as pay services along with the other four, we follow the convention of calling them premium networks.

Showtime, The Movie Channel, Flix, and Sundance Channel are owned by Viacom Inc., which formerly held cable system assets. However, Viacom divested all of its cable systems in 1996. Starz! and Encore are both owned by Liberty Media, which holds cable system assets through its ownership of Cablevision of Puerto Rico. Since our dataset does not include any cable systems in Puerto Rico, Starz! and Encore are treated as non-integrated networks with respect to our study. When offered on analog tiers, premium networks are typically sold a la carte. When offered only on digital tiers, premium networks are often sold as part of a package of similar pay networks.

<sup>19</sup> Our sample of 561 networks contained only four observations for Cablevision systems. See Section IV below.



annual volume that contains detailed information concerning cable operators' program carriage information for virtually all local cable systems in the United States. It reports what program packages are offered to a cable system's subscribers (e.g., analog or digital, basic or premium), what networks are included in each package, and the number of subscribers that the network has. The *Factbook* also reports location, ownership, digital service availability, and various demand or cost-related system characteristics.

A sample of 680 observations with complete information for the model variables was first randomly drawn from the 2004 *Factbook*. The results we report in this study below are based only on the 561 systems among this sample that offered at least one digital tier.<sup>20</sup> Approximately 24.1% of these systems were owned by Comcast, and 12.7% were owned by Time Warner, reflecting the actual end-of-2003 national market shares as reported by the FCC reasonably well.

Table 2 cross-tabulates cable system program carriage information by MSO for the four network groups. The proportion of Comcast systems that carried OLN in 2004 is substantially higher, and the proportion that carried Outdoor Channel is substantially lower, than for unaffiliated MSOs. For Time Warner, the descriptive picture is mixed. For both the cartoon and basic movie segments, Time Warner systems had a greater likelihood of carrying their affiliated services (Cartoon and TCM, respectively), but also a greater tendency to carry rivals AMC, Fox, and Toon Disney. For premium networks, all cable operators' carriage rates are very high for the four oldest services (HBO, Cinemax, Showtime, and The Movie Channel), with slight differences in the latter two cases. For the four newer premium services, however, Time Warner systems were less likely to carry Encore, Flix and Sundance Channel, while the difference in the carriage rates of Starz! was negligible.

Table 3 summarizes analog versus digital tier positioning for the subject networks, given that the networks were actually carried. The proportions of Comcast systems that carry their affiliated service, OLN, in the analog tier and that carry rival Outdoor Channel in the digital tier, are higher than for other cable operators. In the cartoon case, Time Warner's Cartoon Network was nearly ubiquitous on the analog tiers of all cable systems, but Time Warner more commonly offered its rival, Toon Disney, only as a digital service than did unaffiliated systems. In the basic movie category, Time Warner more commonly offered its affiliate TCM as an analog service, but positioning differences for the other three networks were relatively minor. For the premium networks, the data show a general pattern: the more established services (like HBO, Cinemax, Showtime, and The Movie Channel) were more likely to be placed in the analog tier than were the relatively new services. The data also show that Time Warner has a lower analog tier carriage rate for almost all the premium services considered (except Flix)—including its affiliates HBO and Cinemax.

<sup>20</sup> As of June 2003, the proportion of subscribers who had access to digital services had reached about 90% (Federal Communications Commission 2004, paragraph 41). The systems without any digital service were generally smaller ones located in less populated areas. The number of subscribers served by these systems accounted for only 2% of the total subscribers in our sample. Since one of the main contributions of this study is to examine cable systems' decisions of analog versus digital program positioning, we choose to focus on those digitally capable systems only. We also estimated all of our models with those non-digital systems included and the results for the key MSO variables are qualitatively the same. Those estimation results are available from the authors upon request.

**Table 2** Descriptive Statistics: Program Carriage

Market Segment	Programming Network	Comcast	Other
Outdoor Entertainment	<i>Outdoor Life Network</i>	94.1%	77.5%
	<i>Outdoor Channel</i>	38.5%	74.4%
Cartoon		<b>Time Warner</b>	<b>Other</b>
	<i>Cartoon Network</i>	97.2%	81.4%
Basic Movie Service	<i>Toon Disney</i>	93.0%	70.2%
	<i>Turner Classic Movies</i>	98.6%	92.5%
	<i>American Movie Classics</i>	98.6%	88.7%
	<i>Fox Movie Channel</i>	76.1%	52.9%
Premium Network	<i>Independent Film Channel</i>	67.6%	75.1%
	<i>HBO</i>	100.00%	100%
	<i>Cinemax</i>	100.00%	100%
	<i>Showtime</i>	98.6%	98.8%
	<i>The Movie Channel</i>	98.6%	96.7%
	<i>Starz!</i>	95.8%	95.3%
	<i>Encore</i>	91.6%	94.7%
	<i>Flix</i>	46.5%	54.7%
	<i>Sundance Channel</i>	50.7%	56.3%

These raw tabulations for network carriage and positioning suggest that there may exist systematic behavioral differences between MSOs vertically affiliated with networks within a group and MSOs without such affiliations.

## 5 Structural and Empirical Models

A local cable system's profit function consists of revenues from sales of various packages plus individual a-la-carte networks. System costs depend on license fees for the individual networks, marketing expenditures, and an array of system-related costs such as physical plant maintenance. Subscriber demand for any individual network depends not only on its own price and tier positioning, but also (via substitution or complementary effects) on the full array of other networks and tier options offered, and their prices, as well as marketing expenditures. Network supply decisions in terms of carriage and tier position are made by system operators based on the same set of demand side variables, plus the array of system-related costs. We have also hypothesized that profit maximizing carriage and positioning decisions may vary by MSO due to different cost conditions or strategic behavior.

Following from this basic structural model, we estimate the likelihood that individual cable systems carry certain networks and the likelihood that they are placed on an analog tier, depending on the system's ownership by an MSO, and controlling for other factors that may affect costs or demand in local markets. Specifically, we have

**Table 3** Descriptive Statistics: Program Positioning

	Comcast		Other	
	Analog	Digital only	Analog	Digital only
<i>Outdoor Life Network</i>	42.5%	57.5%	35.2%	64.9%
<i>Outdoor Channel</i>	5.8%	94.2%	26.2%	73.8%
	Time Warner		Other	
	Analog	Digital only	Analog	Digital only
<i>Cartoon Network</i>	100.0%	0.0%	99.7%	0.3%
<i>Toon Disney</i>	3.0%	97.0%	34.0%	66.0%
<i>Turner Classic Movie</i>	87.1%	12.9%	53.4%	46.6%
<i>American Movie Classics</i>	98.6%	1.4%	100.0%	0.0%
<i>Fox Movie Channel</i>	7.40%	92.6%	11.6%	88.4%
<i>Independent Film Channel</i>	2.1%	97.9%	1.1%	98.9%
<i>HBO</i>	53.5%	46.5%	63.7%	29.3%
<i>Cinemax</i>	50.7%	49.3%	52.5%	47.5%
<i>Showtime</i>	50.0%	50.0%	52.1%	47.9%
<i>The Movie Channel</i>	20.0%	80.0%	33.3%	66.7%
<i>Starz!</i>	17.6%	82.4%	24.8%	75.2%
<i>Encore</i>	12.3%	87.7%	27.4%	72.6%
<i>Flix</i>	6.1%	93.9%	4.5%	95.5%
<i>Sundance Channel</i>	2.8%	97.2%	3.3%	96.7%

Notes: Percentages were calculated given that the networks are carried

the following econometric models of program carriage and positioning for network  $j$  on cable system  $i$ :

$$\Pr (NET_{ij} = 1) = \alpha_0 + \alpha_1 MSO_i + \alpha'_2 X_i + \varepsilon_{ij}. \tag{1}$$

$$\Pr (ANALOG_{ij} = 1) = \beta_0 + \beta_1 MSO_i + \beta'_2 X_i + u_{ij}. \tag{2}$$

In (1),  $NET_{ij}$  is a dummy variable indicating whether network  $j$  is carried by cable system  $i$ .  $MSO_i$  is equal to  $COMCAST_i$  or  $TW_i$ , which are two dummy variables respectively indicating whether system  $i$  is a subsidiary of Comcast or Time Warner.  $X_i$  is a vector of system-specific cost and demand-related control variables.  $\varepsilon_{ij}$  is the random error term. In (2),  $ANALOG_{ij}$  indicates whether network  $j$  is placed in the analog tier by cable system  $i$ . The independent variables in equation (2) are identical to those in (1) and  $u_{ij}$  is the random error term.

Table 4 gives descriptive statistics for the various ownership, demographic and system-specific explanatory variables that we use in our models, for the sample of 561 individual systems. Variables defined as “system” level, such as miles of plant or TV market ranking, are all from the *Factbook* and directly describe the specific local

**Table 4** Variable Definitions and Descriptive Statistics (N = 561)

Variable	Empirical Measure	Level	Mean
Demographic variables	Population density measured by the number of persons per square mile	County	693.2
<i>POP</i>			
<i>INCOME</i>	Median household income	County	38594.5
<i>YOUNG</i>	Younger viewership measured by the percentage of households with individuals under age 18	County	35.1
<i>OLD</i>	Older viewership measured by the percentage of households with individuals over age 65	County	26.0
<i>NONWHITE</i>	Non-white viewership measured by the percentage of population non-white	County	17.1
<i>HHSIZE</i>	Average household size	County	2.5
<i>RENTER</i>	Percentage of households that are renters	County	27.5
Cable system specific variables			
<i>RANK</i>	TV market ranking. Lower numbers indicate larger TV markets. Rankings exceeding 100 are coded as 100	System	67.1
<i>AGE</i>	System age measured by the number of months since franchise began	System	344.3
<i>HPASS</i>	Number of homes passed	System	49594.4
<i>SIZE</i>	MSO's horizontal size measured by the percentage of basic subscribers served nationally	System	8.9
<i>MILES</i>	Miles of cable planted	System	536.8
<i>CAPACITY</i>	Analog channel capacity	System	64.9
<i>COMCAST</i>	Comcast ownership	System	24.6
<i>TW</i>	Time Warner ownership	System	12.7

Notes: In the case of joint ownership, the cable system is treated as owned by Comcast or Time Warner if either of them is one of the owners

system or franchise area. Demand or cost-related demographics are from the U.S. Census Bureau (Census 2000), but at the county level.

The group of independent variables is similar to that used in the previous studies of Chipty (2001) and Waterman and Weiss (1996). In general, we expect that higher channel capacity to be unambiguously associated with greater carriage of any network. Systems that had a higher population density, greater miles of plant, and more homes passed, and that are owned by larger MSOs should also have a higher likelihood of carriage for all networks to the extent that economies of scale lower system costs. These cost-related variables may also proxy for various unknown demand factors. Among direct demand-related variables, higher income and the presence of younger family

members are generally associated with higher cable demand, though it is difficult to predict the effects of other demand variables. Also, substitution effects may affect carriage decisions for particular individual networks in complex, unknown ways. All the independent variables in the model, however, plausibly affect costs and demand in cable markets and thus network carriage. Among the group of independent variables, we express  $AGE_i$ ,  $HPASS_i$ ,  $SIZE_i$ ,  $MILES_i$ ,  $CAPACITY_i$ ,  $POP_i$  and  $INCOME_i$  in natural log form to reflect our expectations that these variables will have diminishing marginal effects. Similarly, we expect that these same variables will affect decisions to offer carried networks on an analog tier, although the direction or magnitude of effects may be different. Notably, however, greater analog channel capacity should unambiguously encourage the carriage of any given network on an analog tier.

Regarding the MSO ownership dummy variables, our working “vertical effects hypothesis” is that, consistent with the economic logic outlined above and with the general findings of previous studies, integrated systems will tend to favor their affiliate networks by more frequent carriage, and will have less frequent carriage of rival networks. Given carriage, integrated systems will tend to position affiliated networks on tiers that are more accessible to subscribers, and rival networks on less accessible tiers. We thus hypothesize the MSO dummies to be positive for affiliated networks, and negative for unaffiliated networks, in both carriage and tier positioning models. Our primary concern is with cable systems’ behaviors toward rival networks.

If we assume that  $\varepsilon_{ij}$  and  $u_{ij}$  are normally distributed, then (1) and (2) can be estimated with probit models. Several complications, however, arise. First, with respect to carriage models, our assumption that programming networks within the four segments are relatively close substitutes implies that estimation within the segments should be simultaneous. For the outdoor entertainment and cartoon network groups, bivariate probits for the pairs of carriage models involved is straightforward, assuming that the random errors follow a joint normal distribution. For the larger basic and premium movie segments, multivariate probits are called for. Unfortunately, regular maximum likelihood procedures for such models are computationally infeasible (Greene 2003, p. 714). Although simulation methods have been developed to compensate for this problem (e.g., Lerman and Manski 1981; Train 2003), generally these methods are very computationally intensive, especially when the number of equations in the system is large, and in some cases cannot be successfully performed due to various peculiarities of the data.

In our case, for basic and premium movie networks, the numbers of equations are respectively four and six.<sup>21</sup> It turned out that the multivariate probit procedure using both STATA and LIMDEP failed to estimate these model systems with our sample. An alternative was a single-equation approach in which the correlations among the error terms are ignored and each carriage model is estimated using standard univariate probit models. We also estimated the basic and premium movie model systems “partially” by using bivariate probits on a pair-wise basis. It turned out that the estimated results from these bivariate and single-equation approaches were virtually identical for all four cable network segments. Although in a few cases we did reject the null

<sup>21</sup> The information of eight premium networks is included in the sample. However, HBO and Cinemax are carried by all cable systems and thus a multivariate Probit model involving these two networks is infeasible.

hypothesis that the error terms were uncorrelated using a Lagrange Multiplier test (Kiefer 1982), such correlation did not seem to affect the magnitude of the coefficient estimates and their standard errors in any significant way. For consistency and simplicity, we therefore report the single-equation carriage model estimates below.<sup>22</sup>

The second complication involves the interdependence between the carriage and the positioning decisions. In our notations, the outcome of interest,  $ANALOG_{ij}$  is observable only if the selection criterion,  $NET_{ij} = 1$ . Hence, a sample selection issue arises. We chose to employ a Heckman-type two-step method. In the first step, a probit model of network carriage was estimated. Then the positioning model as specified in (2) was estimated with the inverse Mills Ratio as an additional independent variable, using the observations for systems that have actually carried the network.<sup>23</sup>

A final issue is parameter identification in the Heckman procedure. Typically, some exclusion restrictions are made in the outcome equation (in our case, tier positioning) to allow parameter identification. Our judgment, however, is that all the independent variables that determine a cable system's carriage decision also play a role in the positioning decision. Technically, at least, the parameters in the models are identifiable due to the nonlinearity of the likelihood function (Wooldridge 2002, p. 564). We therefore made no exclusion restriction. To make sure that our estimates are not misleading, we also tried to exclude a small set of variables that do not appear statistically significant in the selection (carriage) model and the results did not change in any significant way.<sup>24</sup>

## 6 Results: Channel Carriage and Positioning

### A. Basic Outdoor Entertainment

Estimates of carriage and positioning models for OLN and Outdoor Channel are reported in Table 5. Many of the cost- and demand-related variables have weak or no significance, a pattern similar to that produced for similar sets of variables in previous studies. A comparable pattern of results for general demand and cost variables also characterizes other models in this study reported below.

<sup>22</sup> The single-equation approach was also employed by Chipty (2001) and Waterman and Weiss (1996). The bivariate probit results are available from the authors upon request.

<sup>23</sup> Ideally we would employ a full maximum likelihood approach to accommodate the sample selection issue. However, with dichotomous dependent variables in both the selection and the outcome equations, this method has poor convergence properties. When full maximum likelihood was applied, it turned out that in various cases of interest the maximum of the likelihood function could not be achieved, and thus no estimate was obtained. In contrast, the two-step method could be much more easily computed. This method has also been used by Main (1987) and Verbeek and Nijman (1992).

<sup>24</sup> We also report that the significance and signage of all the positioning results are unchanged by using single-equation probit estimates without considering the sample selection. These results are available from the authors upon request. An alternative method is proposed by Sartori (2003), who suggests a full maximum likelihood approach of sample selection that does not require imposing any exclusion restriction. However, her approach is based on the strict assumption that the error terms in the selection model and the outcome model are perfectly correlated. Also, such a full maximum likelihood method is subject to the same convergence problem.

**Table 5** Carriage and Positioning of Outdoor Entertainment Networks

	OLN carriage (1)	Outdoor Channel carriage (2)	OLN in analog tier (3)	Outdoor Channel in analog tier (4)
<i>RANK</i>	-0.001 (0.001)	-0.001 (0.001)	0.002* (0.001)	0.000 (0.001)
<i>SIZE</i>	0.032*** (0.010)	0.013 (0.014)	-0.045 (0.034)	-0.079*** (0.015)
<i>AGE</i>	0.011 (0.049)	-0.274*** (0.073)	0.020 (0.080)	0.157 (0.171)
<i>HPASS</i>	-0.018 (0.028)	-0.030 (0.037)	0.031 (0.045)	-0.017 (0.048)
<i>MILES</i>	0.012 (0.028)	0.017 (0.037)	-0.003 (0.044)	-0.028 (0.044)
<i>CAPACITY</i>	-0.006 (0.052)	-0.056 (0.072)	0.187** (0.082)	0.029 (0.079)
<i>INCOME</i>	0.031 (0.122)	-0.641*** (0.170)	0.421** (0.181)	-0.362 (0.410)
<i>POP</i>	0.003 (0.017)	-0.001 (0.024)	0.036 (0.027)	0.042 (0.029)
<i>YOUNG</i>	0.019*** (0.009)	-0.009 (0.010)	-0.008 (0.012)	-0.031*** (0.013)
<i>OLD</i>	-0.001 (0.005)	-0.005 (0.006)	0.002 (0.007)	-0.022*** (0.007)
<i>NONWHITE</i>	-0.001 (0.002)	-0.003 (0.002)	0.003 (0.002)	0.005* (0.003)
<i>HHSIZE</i>	-0.635*** (0.219)	0.144 (0.256)	0.208 (0.428)	0.572 (0.365)
<i>RENTER</i>	-0.002 (0.003)	-0.003 (0.004)	-0.002 (0.005)	-0.014*** (0.005)
<i>INV. MILLS R.</i>	-	-	-0.778 (0.523)	-0.224 (0.497)
<i>COMCAST</i>	0.120*** (0.039)	-0.312*** (0.064)	-0.132 (0.088)	0.148 (0.328)
<i>N</i>	561	561	457	369
Pseudo R <sup>2</sup>	0.098	0.145	0.063	0.245

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level

The effects of Comcast's ownership of OLN on carriage of outdoor entertainment networks generally confirm patterns observed in the descriptive data. As indicated by the COMCAST dummy, that MSO was about 12% more likely to carry OLN than other MSOs, and about 31% less likely to carry its rival, Outdoor Channel. Unlike the descriptive data, however, neither the OLN nor Outdoor Channel positioning models (3 and 4) indicate significantly different analog versus digital tier placement of these networks on Comcast systems. In this case, then, the vertical effects hypothesis is supported by the carriage results but is not supported by the positioning analysis.

Because Comcast's ownership of OLN occurred through a relatively recent merger, we also tested carriage models that excluded systems of Cox Communications, one of its prior owners. Results were virtually identical and are not reported here. Also not reported are carriage estimates using 2001 data with a dummy variable representing AT&T, the MSO owner of OLN before it was acquired by Comcast. These estimates showed the same basic pattern as the 2004 Comcast results, although the negative marginal effects of AT&T ownership in 2001 were somewhat less in magnitude.

### **B. Basic Cartoon**

Carriage models for the two basic cartoon networks in Table 6 indicate a pattern different from that of the outdoor networks. Corrected for other factors, Models 1 and 2 show that Time Warner was about 12% more likely to carry its affiliate, Cartoon Network, than were other MSOs, but (contrary to the hypothesis) 22% more likely to offer its rival, Toon Disney. As is indicated by Model 3 in Table 6, however, Time Warner systems that carried Toon Disney were about 46% more likely than other cable operators to offer it only on a digital tier, a finding consistent with the vertical effects hypothesis. This result suggests that although Time Warner's carriage of its rival is relatively high, that MSO systematically positions Toon Disney in a way that limits its audience reach. By contrast, virtually all cable systems that carry Cartoon Network offer it on an analog tier, presumably reflecting the earlier launch and rapid growth of this service in the early 1990s. (A statistical model for positioning of Cartoon Network could not be estimated since it has virtually no digital-tier-only carriage.)

### **C. Basic Movie**

As shown in Table 7, Time Warner systems were about 8% more likely to carry their well-established vertical affiliate, TCM, than was the average system (Model 1). Among TCM's three rivals, Time Warner's carriage of AMC was not significantly different from that of other cable systems, but carriage was substantially higher (by 26%) for Fox Movie Channel (FMC), and significantly lower (by 24%) for IFC. While the lower-than-average carriage estimate for IFC on Time Warner systems is consistent with the vertical effects hypothesis, that MSO's much-greater-than-normal carriage of FMC appears contrary to it.<sup>25</sup> In fact, the FMC result seems especially un-conducive to an "exclusion-of-rivals" scenario because its program menu—mostly old movies that were produced from the 1930s to the 1970s—is very similar to that of TCM.

As the descriptive data of Table 3 show, however, TCM and FMC are rarely placed on the same program tier by Time Warner. About 87% of Time Warner systems place

<sup>25</sup> To make sure that results for the Independent Film Channel are not distorted due to its partial ownership by Cablevision, we also estimate the IFC models excluding the observations for the cable systems owned by Cablevision. The results remain virtually unchanged.



**Table 6** Carriage and Positioning of Cartoon Services

	Cartoon Network Carriage	Toon Disney carriage	Toon Disney in analog tier
	(1)	(2)	(3)
<i>RANK</i>	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
<i>SIZE</i>	-0.007 (0.008)	0.018* (0.011)	-0.122*** (0.038)
<i>AGE</i>	-0.033 (0.047)	-0.076 (0.063)	0.307** (0.151)
<i>HPASS</i>	0.072*** (0.027)	0.008 (0.036)	0.023 (0.042)
<i>MILES</i>	-0.011 (0.026)	-0.037 (0.036)	0.024 (0.076)
<i>CAPACITY</i>	0.139*** (0.043)	0.015 (0.063)	-0.043 (0.079)
<i>INCOME</i>	0.013 (0.102)	0.082 (0.143)	-0.290 (0.218)
<i>POP</i>	-0.009 (0.016)	0.023 (0.021)	-0.110** (0.050)
<i>YOUNG</i>	0.014* (0.007)	-0.004 (0.007)	0.018 (0.013)
<i>OLD</i>	0.001 (0.004)	0.000 (0.005)	-0.020*** (0.007)
<i>NONWHITE</i>	0.002 (0.001)	0.000 (0.002)	0.000 (0.002)
<i>HHSIZE</i>	-0.517*** (0.183)	-0.021 (0.203)	-0.085 (0.329)
<i>RENTER</i>	-0.001 (0.003)	0.003 (0.004)	-0.012* (0.007)
<i>INV. MILLS R.</i>	-	-	-2.551** (1.220)
<i>TW</i>	0.116*** (0.024)	0.221*** (0.038)	-0.461*** (0.095)
<i>N</i>	561	561	410
Pseudo $R^2$	0.182	0.063	0.218

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level

TCM on the analog tier, while 93% put FMC on a digital tier. Tier separation of TCM and FMC is also evident on cable systems having no vertical affiliation with TCM, but the data show that tier separation is sharper on Time Warner systems. Regression results confirm this observation. The analog-positioning results for TCM and FMC are reported in Table 8.<sup>26</sup> Although Time Warner systems do not show any significant difference in the positioning of FMC in analog tier, they are statistically much more likely (by 38%) to offer their affiliated network, TCM, on an analog tier than was the average system.

The consideration of another dimension of the tiering decision relevant to basic movie networks also appears to favor the vertical effects hypothesis. Our sample shows that Time Warner was the only cable operator in our sample to offer any of the four networks within the basic movie group as an a-la-carte premium network (Table 9).

<sup>26</sup> The lack of relevant cases did not permit estimation of tier-positioning models for AMC and IFC. In the former case, there was only one cable system, which was owned by Time Warner, that did not include AMC in the analog program package. Due to the lack of data variation, Heckman's method was not feasible. In the latter case, only five cable systems in our sample included IFC in the analog package, and estimation was unsuccessful for the same reason.

**Table 7** Carriage of Basic Movie Channels

	TCM Carriage	AMC Carriage	FMC Carriage	IFC Carriage	FMC Carriage (in basic tier only)	IFC Carriage (in basic tier only)
	(1)	(2)	(3)	(4)	(5)	(6)
<i>RANK</i>	-0.001 (0.000)	0.000 (0.000)	-0.003*** (0.001)	0.001 (0.001)	-0.002** (0.001)	0.001 (0.001)
<i>SIZE</i>	-0.011* (0.006)	0.005 (0.003)	-0.002 (0.013)	0.078*** (0.011)	-0.002 (0.013)	0.081*** (0.011)
<i>AGE</i>	-0.014 (0.033)	0.004 (0.021)	-0.328*** (0.079)	-0.245*** (0.067)	-0.352*** (0.079)	-0.266*** (0.070)
<i>HPASS</i>	0.018 (0.018)	0.019 (0.013)	-0.008 (0.040)	0.052 (0.034)	-0.021 (0.040)	0.060* (0.035)
<i>MILES</i>	-0.013 (0.019)	-0.006 (0.013)	-0.025 (0.040)	-0.040 (0.034)	-0.003 (0.040)	-0.045 (0.035)
<i>CAPACITY</i>	0.078** (0.036)	0.018 (0.020)	0.074 (0.074)	0.056 (0.064)	0.091 (0.074)	0.071 (0.067)
<i>INCOME</i>	-0.042 (0.080)	0.063 (0.049)	-0.640*** (0.175)	-0.247* (0.147)	-0.597*** (0.174)	-0.237 (0.153)
<i>POP</i>	-0.012 (0.012)	0.019*** (0.007)	0.003 (0.026)	-0.041* (0.022)	0.001 (0.026)	-0.039* (0.023)
<i>YOUNG</i>	0.006 (0.006)	0.003 (0.003)	-0.003 (0.009)	0.011 (0.011)	-0.005 (0.010)	0.009 (0.011)
<i>OLD</i>	-0.008** (0.003)	0.002 (0.002)	-0.006 (0.006)	-0.011** (0.006)	-0.007 (0.006)	-0.013** (0.006)
<i>NONWHITE</i>	0.001 (0.001)	0.000 (0.001)	-0.004* (0.002)	-0.002 (0.002)	-0.003 (0.002)	-0.001 (0.002)
<i>HHSIZE</i>	-0.383*** (0.143)	-0.123 (0.085)	0.067 (0.257)	-0.268 (0.270)	0.152 (0.266)	-0.205 (0.277)
<i>RENTER</i>	-0.002 (0.002)	-0.002 (0.001)	0.000 (0.004)	0.005 (0.004)	-0.002 (0.004)	0.004 (0.004)
<i>TW</i>	0.077*** (0.016)	0.017 (0.020)	0.263*** (0.056)	-0.242*** (0.072)	0.073 (0.067)	-0.430*** (0.067)
<i>N</i>	561	561	561	561	561	561
Pseudo <i>R</i> <sup>2</sup>	0.129	0.204	0.091	0.122	0.067	0.144

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level

**Table 8** Positioning of Basic Movie Channels: Analog vs. Digital

	TCM in analog tier	FMC in analog tier
	(1)	(2)
<i>RANK</i>	-0.001 (0.001)	0.002 (0.002)
<i>SIZE</i>	-0.069*** (0.019)	-0.018* (0.010)
<i>AGE</i>	0.168** (0.081)	0.186 (0.205)
<i>HPASS</i>	-0.002 (0.047)	-0.008 (0.029)
<i>MILES</i>	0.010 (0.045)	0.019 (0.032)
<i>CAPACITY</i>	0.114 (0.124)	0.007 (0.073)
<i>INCOME</i>	0.199 (0.194)	0.121 (0.432)
<i>POP</i>	0.047 (0.029)	0.053** (0.022)
<i>YOUNG</i>	-0.019 (0.014)	-0.021** (0.010)
<i>OLD</i>	-0.007 (0.012)	-0.004 (0.006)
<i>NONWHITE</i>	0.000 (0.003)	-0.002 (0.003)
<i>HHSIZE</i>	0.149 (0.538)	0.591** (0.243)
<i>RENTER</i>	0.000 (0.005)	0.000 (0.003)
<i>INV. MILLS R.</i>	-0.008 (0.577)	-0.258 (0.453)
<i>TW</i>	0.375*** (0.069)	-0.094 (0.084)
<i>N</i>	509	313
Pseudo $R^2$	0.122	0.109

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level

**Table 9** Descriptive Data of Basic Movie Channels Positioning: Basic vs. Premium

	Time Warner		Other	
	Basic	Premium	Basic	Premium
<i>Turner Classic Movie</i>	100.00%	0.00%	100.00%	0.00%
<i>American Movie Classics</i>	100.00%	0.00%	100.00%	0.00%
<i>Fox Movie Channel</i>	74.07%	25.93%	100.00%	0.00%
<i>Independent Film Channel</i>	72.92%	27.08%	100.00%	0.00%

Notes: Percentages were calculated given that the networks were carried

**Table 10** Carriage of Premium Networks

	Showtime Carriage	TMC Carriage	STARZ! Carriage	Encore Carriage	Flix Carriage	Sundance Channel Carriage
	(1)	(2)	(3)	(4)	(5)	(6)
<i>RANK</i>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.002** (0.001)	0.001 (0.001)
<i>SIZE</i>	-0.001 (0.001)	0.000 (0.002)	0.009** (0.004)	0.011** (0.005)	0.026** (0.013)	0.060*** (0.014)
<i>AGE</i>	0.003 (0.005)	0.002 (0.012)	-0.027 (0.024)	0.000 (0.026)	-0.017 (0.072)	-0.134* (0.078)
<i>HPASS</i>	0.004 (0.004)	0.020** (0.009)	0.018 (0.013)	0.004 (0.015)	-0.036 (0.041)	0.048 (0.043)
<i>MILES</i>	-0.004 (0.004)	-0.016** (0.008)	-0.024* (0.013)	-0.021 (0.015)	0.083** (0.040)	0.047 (0.042)
<i>CAPACITY</i>	0.010 (0.008)	0.016 (0.011)	0.029 (0.023)	0.042 (0.029)	0.115 (0.076)	0.217*** (0.080)
<i>INCOME</i>	-0.011 (0.012)	-0.015 (0.023)	-0.061 (0.049)	-0.022 (0.062)	0.324* (0.170)	0.458*** (0.176)
<i>POP</i>	0.001 (0.002)	0.000 (0.004)	0.015** (0.007)	0.015* (0.008)	-0.027 (0.026)	-0.024 (0.027)
<i>YOUNG</i>	0.000 (0.000)	0.000 (0.001)	-0.002 (0.002)	-0.002 (0.003)	-0.002 (0.009)	-0.002 (0.008)
<i>OLD</i>	0.000 (0.000)	0.000 (0.001)	-0.002 (0.002)	-0.003 (0.002)	0.013** (0.006)	0.011* (0.006)
<i>NONWHITE</i>	0.000 (0.000)	0.000 (0.000)	-0.001* (0.001)	0.000 (0.001)	0.007*** (0.002)	0.009*** (0.002)
<i>HHSIZE</i>	0.002 (0.012)	0.009 (0.041)	-0.032 (0.066)	-0.082 (0.086)	0.063 (0.258)	0.164 (0.257)
<i>RENTER</i>	0.000 (0.000)	0.001 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.002 (0.004)	-0.003 (0.004)
<i>TW</i>	-0.008 (0.012)	-0.005 (0.016)	-0.024 (0.033)	-0.063 (0.044)	-0.154** (0.068)	-0.209*** (0.069)
<i>N</i>	561	561	561	561	561	561
Pseudo <i>R</i> <sup>2</sup>	0.233	0.183	0.150	0.113	0.092	0.195

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level

**Table 11** Positioning of Premium Networks in Analog Tier

	HBO in analog tier (1)	Cinemax in analog tier (2)	Showtime in analog tier (3)	TMC in analog tier (4)	STARZ! in analog tier (5)	Encore in analog tier (6)	Flix in analog tier (7)	Sundance in analog tier (8)
<i>RANK</i>	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.002** (0.001)	0.002*** (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.000)
<i>SIZE</i>	-0.008 (0.013)	0.007 (0.013)	-0.003 (0.014)	-0.020 (0.012)	0.064*** (0.016)	0.053*** (0.019)	-0.016 (0.012)	-0.012 (0.009)
<i>AGE</i>	0.012 (0.067)	0.026 (0.070)	0.018 (0.071)	0.034 (0.067)	-0.077 (0.060)	0.039 (0.059)	0.028 (0.032)	-0.006 (0.019)
<i>HPASS</i>	0.013 (0.038)	0.047 (0.040)	0.021 (0.043)	0.024 (0.042)	0.097*** (0.035)	0.085** (0.035)	-0.014 (0.022)	0.009 (0.011)
<i>MILES</i>	-0.010 (0.038)	-0.035 (0.040)	-0.032 (0.042)	-0.054 (0.040)	-0.098** (0.039)	-0.127*** (0.042)	-0.006 (0.040)	-0.016 (0.011)
<i>CAPACITY</i>	-0.016 (0.072)	0.050 (0.075)	0.121 (0.084)	0.136* (0.079)	0.282*** (0.071)	0.233*** (0.082)	0.003 (0.056)	-0.023 (0.036)
<i>INCOME</i>	0.022 (0.161)	0.144 (0.169)	0.200 (0.176)	0.222 (0.160)	-0.302* (0.164)	-0.280* (0.150)	-0.066 (0.142)	-0.108 (0.080)
<i>POP</i>	0.055** (0.024)	0.055** (0.026)	0.042 (0.026)	0.024 (0.024)	0.069** (0.031)	0.044 (0.031)	0.008 (0.016)	0.002 (0.008)
<i>YOUNG</i>	0.001 (0.009)	0.007 (0.010)	-0.003 (0.009)	-0.001 (0.009)	0.004 (0.007)	0.006 (0.008)	-0.012** (0.005)	-0.007* (0.004)
<i>OLD</i>	0.003 (0.006)	0.009 (0.006)	0.004 (0.006)	0.007 (0.006)	0.000 (0.005)	-0.009 (0.006)	-0.007 (0.006)	-0.003 (0.002)
<i>NONWHITE</i>	-0.002 (0.002)	-0.004* (0.002)	0.002 (0.002)	0.000 (0.002)	-0.008*** (0.003)	-0.007*** (0.002)	0.000 (0.003)	0.000 (0.001)
<i>HHSIZE</i>	-0.346 (0.245)	-0.375 (0.264)	-0.365 (0.248)	-0.147 (0.245)	-0.036 (0.211)	-0.410 (0.259)	0.207* (0.122)	0.094 (0.088)
<i>RENTER</i>	0.003 (0.004)	0.005 (0.004)	0.000 (0.004)	-0.001 (0.004)	0.007* (0.003)	0.006* (0.004)	-0.002 (0.002)	-0.001 (0.001)
<i>INV. MILLS R.</i>	-	-	-0.490 (0.605)	-0.203 (0.407)	1.477*** (0.459)	1.354** (0.611)	-0.194 (0.295)	-0.051 (0.100)
<i>TW</i>	-0.114* (0.069)	-0.083 (0.069)	-0.026 (0.071)	-0.123** (0.056)	-0.173*** (0.036)	-0.256*** (0.034)	0.230 (0.334)	0.023 (0.072)
<i>N</i>	561	561	554	544	535	529	301	312
Pseudo R <sup>2</sup>	0.036	0.058	0.056	0.067	0.090	0.081	0.156	0.264

Notes: Marginal effects reported with standard errors in brackets. \* indicates significance at a 10% level, \*\* at a 5% level, and \*\*\* at a 1% level.

Time Warner pursued this strategy in the cases of FMC and IFC in 26% and 27% of cases respectively—even though IFC was partially supported by advertising and presumably would especially favor a wider audience exposure for that reason. Moreover, investigation of our data showed that FMC and IFC were placed on digital tiers in virtually all of these a-la-carte pricing cases.<sup>27</sup>

Models 6 and 7 of Table 7 show ad hoc estimates of carriage models for FMC and IFC in which carriage is counted only if the networks of interest are offered on a basic tier. The FMC model indicates a statistically neutral, rather than positive, difference for Time Warner systems and a still more negative (−43%) carriage effect for IFC.

Finally with respect to the carriage analysis, the statistically neutral results for AMC carriage contrast with those obtained by Chipty (2001), who found significant exclusion of AMC by the MSOs that owned premium movie networks, including Time Warner. This contrast is less surprising, however, when one considers that Chipty's study used 1991 data, when AMC was a nascent network with national cable penetration of only 32% (Chipty 2001, p. 439). Judging from our sample, AMC's national penetration had reached about 90% by 2004, likely elevating it to the status of a “must-have” channel, and thus making its menu elimination unprofitable for most systems, integrated or not, by that time.

Marketing of basic movie networks is complex, and the relevant substitution effects are difficult to interpret fully. All of these networks, for example, may also be viewed by cable operators as potential competitors to their premium network offerings. We have advanced above, however, a plausible explanation of how the limited accessibility of rival basic movie networks appears to take place through differential positioning as well as carriage practices of these integrated MSOs.

#### D. Premium Networks

Ubiquitous carriage of HBO and Cinemax by cable systems in our sample prohibits estimation of carriage models for those Time Warner-owned networks. We were able, however, to estimate carriage models for the six rival networks that were unaffiliated with Time Warner (Table 10). As predicted by the vertical effects hypothesis, the signs are negative for the Time Warner ownership dummy variable in all six models, although carriage is significantly negative and of notable magnitude only in two of the “mini-pay” cases of Flix and Sundance (−15% and −21% respectively). In all four of the statistically insignificant cases (Showtime, TMC, Starz! and Encore), however, one would not expect carriage differences to be sharp because of the generally very high national penetration rates of those networks (Table 2).

We were able to estimate tier positioning models for all eight networks in the premium group (Table 11).<sup>28</sup> Contrary to the vertical effects hypothesis, Time Warner

<sup>27</sup> Accurate information on the number of subscribers to these two networks is not available. However, using the national level figures for the penetration rate of digital services (31%) and the proportion of basic cable subscribers that have access to premium networks (53%), we can obtain a rough estimate for the proportion of basic cable subscribers that also subscribe to these two movie services in those local markets, which is about 16%.

<sup>28</sup> Since all systems' carriage rates for HBO and Cinemax were 100%, Heckman's two-step method was not applied. For these two networks, the positioning results were obtained by estimating the positioning equation directly.

carried HBO on an analog tier 11% less frequently than did the average cable system. In three of the six other cases (Encore, Starz and TMC), however, Time Warner is shown to be less likely to include those networks on the analog tier, while results were not significantly different for the other three networks.

Overall, premium network carriage and positioning patterns are consistent in some cases with the vertical effects hypothesis, although results are insignificant in several cases and contrary to the hypothesis in at least the HBO positioning case.

## 7 Discussion and Conclusions

For cable networks in the four groups that we studied—basic outdoor entertainment, basic cartoon, basic movie and premium movie networks—empirical results of network carriage and tier positioning models are consistent in many individual cases with the hypothesis that vertically integrated systems carry their affiliated networks more frequently and carry rival networks less frequently. Further, given carriage, affiliated networks tend to be carried on more accessible analog tiers while rivals tend to be carried on less accessible digital tiers. In a number of other individual network cases, results were statistically insignificant, and in at least a few cases (e.g., Time Warner's relatively high carriage of rival Toon Disney and FMC, and less-frequent-than-average positioning of HBO on analog tiers), results were contrary to the vertical effects hypothesis.

We have confined our study to a series of example network groups, and mainly the behavior of only two MSOs. We did not attempt to systematically measure changes in the extent of vertical integration's effects over time. It appears, however, that in cases such as AMC, or the main premium movie networks, the extent of carriage differences, diminish if a network survives to become well-established in the market. Overall, however, the evidence of this paper is that in significant instances, vertical integration leads to more limited subscriber access to unaffiliated rival programming, either due to more limited carriage or to the positioning of rival networks on digital tiers with more limited subscriber access. This pattern of relatively lower carriage of rival program suppliers remains a persistent phenomenon in the cable industry in spite of great increases in the channel capacity, as well as competition from DBS, that digital technology has made possible.

Our results do not allow us to formally identify causes of the carriage or positioning differences we observe. If cable networking can be characterized as a dynamic industry in which competing firms with high economies of scale wage wars of attrition with winner-take-all outcomes, cost-raising strategies by vertically integrated firms are plausible (Hart et al. 1990). Relatively straightforward efficiency-driven incentives, however, can account for the differences in carriage and positioning we have observed, even in the presence of rising competition at both the upstream programming and downstream system levels.

In the absence of a strategic foreclosure attempt, an integrated cable system will generally find it profitable to carry any rival network at some price, as long as expected revenues from it do not fall below marginal carriage costs. In the case of a-la-carte premium networks, however, side-by-side carriage of an affiliated network at a lower

price might be seen as a negative quality signal. In the case of a basic, ad-supported network, increasing a rival's price to compensate for its negative effect on advertising revenues of the affiliate is not a feasible option. In these cases, it may be that the technological advance of digital tiers serves to provide integrated systems with a new, convenient option to separate rival networks within the same menu, rather than completely exclude them. This explanation might account, for example, for the higher-than-normal carriage of Toon Disney by Cartoon Network's owner, Time Warner, but much more frequent positioning of that rival on a less accessible digital tier. In the case of basic movie networks, a similar interpretation of Time Warner's carriage and positioning behavior can be made.

Whatever the motivation, the effects of vertical integration on carriage and positioning are unlikely to be eliminated by higher channel capacity as long as relevant pairs of networks are close substitutes. Moreover, competition of cable with DBS and other multi-channel providers is imperfect.<sup>29</sup>

Uncertainties remain about cable system carriage and positioning strategies. In particular, cable program suppliers are able to influence the positioning decisions of cable operators by changing their networks' programming designs, or by differential wholesale pricing with respect to digital versus analog carriage. Another dimension of positioning worthy of further study is the system's choice of basic versus premium placement. In anticipation of such investigations, we believe that a unique contribution of this study is our demonstration that the effects of vertical integration in the modern cable industry cannot be understood only in terms of network carriage differentials. Tier positioning has opened a new dimension to the debate.

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<sup>29</sup> Goolsbee and Petrin (2004) find that the competition of DBS has led to a decrease in cable prices and an improvement in cable quality, but that this competition is imperfect.



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