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THE WELFARE EFFECTS OF VERTICAL INTEGRATION IN MULTICHANNEL TELEVISION MARKETS

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Abstract

We investigate the welfare effects of vertical integration of regional sports networks (RSNs) with programming distributors in U.S. multichannel television markets. Vertical integration can enhance efficiency by reducing double marginalization and increasing carriage of channels, but can also harm welfare due to foreclosure and raising rivals' costs incentives. We estimate a structural model of viewership, subscription, distributor pricing, and affiliate fee bargaining using a rich dataset on the U.S. cable and satellite television industry (2000-2010). We use these estimates to analyze the impact of simulated vertical mergers and de-mergers of RSNs on competition and welfare, and examine the efficacy of regulatory policies introduced by the U.S. Federal Communications Commission to address competition concerns in this industry.

Keywords: vertical integration, foreclosure, double marginalization, raising rivals' costs, cable television
JEL: L13, L42, L51, L82

1 Introduction

The welfare effects of vertical integration is an important, but controversial, issue. The theoretical literature on the pro- and anti-competitive impacts of vertical integration is vast (c.f. Perry, 1990; Rey and Tirole, 2007; Riordan, 2008; Bresnahan and Levin, 2013), and typically contrasts potential efficiencies related to the elimination of double marginalization (Spengler, 1950) and the alignment of investment incentives (Willamson, 1985; Grossman and Hart, 1986) with the potential for losses arising from incentives to foreclose rivals and raise their costs (Salop and Scheffman, 1983; Krattenmaker and Salop, 1986; Hart and Tirole, 1990; Ordover et al., 1990). Despite a growing literature, empirical evidence on the quantitative magnitudes of these potential effects, and the overall net welfare impact, is still limited.

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This paper quantifies the welfare effects of vertical integration in cable and satellite television in the context of high value regional sports programming in the U.S. Whether the ownership of content by distributors harms welfare has been at the heart of the debate over several recently proposed (e.g., Comcast and Time Warner in 2015) and approved (e.g., Comcast and NBC in 2011) mergers in the television industry. The attention that these mergers attracted is partly due to the industry's overwhelming reach and size: nearly 90% of the 116.4 million television households in the U.S. subscribe to multichannel television, and the mean individual consumes about four hours of television per day.[1] Regional sports programming is a large part of this industry, receiving $4.1 billion out of over $30 billion per year in negotiated affiliate fees paid by distributors to all content providers, and an additional $700 million per year in advertising dollars.[2]

Our focus on the multichannel television industry, and in particular sports programming, is driven by several factors that create empirical leverage to address this question. First, there is significant variation across the industry in terms of ownership of content by cable and satellite operators, also referred to as multichannel video programming distributors (MVPDs). Although this variation is primarily at the national level for most channels, regional sports networks (RSNs) are present in smaller geographic areas, and thus there is useful variation in ownership patterns both across regions and over time. Additionally, the industry is the subject of significant regulatory and antitrust attention in addition to merger review, including the application of "program access rules" and exceptions to this rule, such as the "terrestrial loophole" which exempted certain distributors from supplying integrated content to rivals.

There are two key components of our analysis. The first is the construction of a comprehensive dataset on the U.S. multichannel television industry, collected and synthesized from numerous sources. The dataset comprises aggregate and individual level consumer viewership and subscription patterns, channel ownership and integration status, and prices, quantities, and channel carriage "lineups" for cable and satellite bundles at the local market level for the years 2000 to 2010.

The second component is the specification and estimation of a structural model of the multichannel television industry that captures consumer viewership and subscription decisions, MVPD pricing and carriage decisions, and bargaining between MVPDs and content providers. We significantly extend the model of Crawford and Yurukoglu (2012) to construct an empirical framework suitable for the analysis of vertical integration and mergers. Our model incorporates integrated firm incentives to foreclose rivals' access to inputs, the potential for double marginalization, and the possibility of imperfect coordination and internalization within an integrated firm. This last feature is one of the novel aspects of our approach, as we are able to estimate the degree to which firms internalize the profits of integrated units when distributors make pricing and channel carriage decisions, and channels decide to supply or foreclose rival distributors.

An important input into identifying these effects is our estimates of the change in distributor

[1] `http://www.nielsen.com/us/en/insights/news/2015/nielsen-estimates-116-4-million-tv-homes-in-the-us-for-the-2015-16-tv-season.html`, `http://ir.nielsen.com/files/doc_presentations/2015/total-audience-report-q4-2014.pdf`, accessed on November 3, 2015.

[2] SNL Kagan.

profits from the addition or removal of an RSN from its bundle. Here, we use the relationship between distributor market shares and channel carriage to provide information about consumer's valuations for content provided by an MVPD, as well as variation in observed viewership patterns and negotiated affiliate fees across channels to infer the relative values consumers place on different channels. With the estimated profit effects in hand, the pro-competitive effects of vertical integration are largely identified from the degree to which RSN carriage is higher for integrated distributors; the anti-competitive foreclosure effects are identified by lower RSN supply to downstream rivals of integrated RSNs.

Using these sources of identification, we cannot reject the possibility that integrated distributors completely internalize the effects of their pricing and carriage decisions on their upstream channels' profits. We also find that integrated RSNs fully (and perhaps more than fully) take into account the benefits their downstream divisions reap when a rival distributor is denied access to the RSN's programming, or is supplied it at a higher price.

After estimating our model, we leverage our structural model and estimates to examine the mechanisms through which pro-competitive and anti-competitive effects of vertical integration might occur by simulating vertical mergers and de-mergers for 27 RSNs that were active in 2007, and recomputing equilibrium firm (carriage, pricing, affiliate fee bargaining) and consumer (subscription, viewership) decisions. We examine integration scenarios when program access rules—which ensure that non-integrated rival distributors have access to integrated content—are effectively enforced, and when they are not. When program access rules are enforced, our counterfactual simulations capture integration effects arising from improved internalization of pricing and carriage decisions within the integrated firm. When program access rules are not enforced, our simulations instead allow for integrated (typically cable) distributors to engage in foreclosure, denying access to or charging higher prices for an integrated RSN to non-integrated rival (typically satellite) distributors.

Our results demonstrate the importance of program access rules in determining the effects of vertical integration. In counterfactual simulations that enforce program access rules, we find that vertical integration leads to significant gains in both consumer and aggregate welfare. These benefits arise both due to lower cable prices (through the reduction of double marginalization) and greater carriage of the RSN. Averaging results across channels, we find that integration of a *single* RSN absent foreclosure incentives would reduce average cable prices by approximately 1.5% ($0.83) per subscriber per month in that RSN's market, and increase overall carriage of the RSN by approximately 18%. Combined, these effects would yield, on average, approximately a 2% increase in consumer surplus from all television services, representing approximately 19% of the consumer surplus created by a single RSN. We also predict that total welfare would increase.

When program access rules are not enforced, we find instead that consumers can be significantly harmed. For example, for three cable-integrated RSNs using the estimated lower bound for our "raising rivals' cost" parameter, we predict that complete exclusion of satellite distribution would occur, and consumer welfare would fall by as much as $0.59 per household per month compared to a scenario in which the RSNs are not integrated (representing approximately 9% of the consumer surplus created by this RSN). The foreclosure of satellite distributors tends to occur when the RSN is owned by a cable distributor whose market share is large in the geographic region served by the RSN. Our counterfactual results suggest that satellite providers are excluded from carrying the RSN when the integrated cable provider's share of households that it could serve exceeds approximately 85%. Furthermore, when we do not predict foreclosure, we document a significant raising rivals' costs effect: on average, integration would lead an RSN to increase the prices charged to rivals of its integrated distributor by 36%.

We find that the net effect of vertical integration—allowing for both efficiency and foreclosure incentives—would increase consumer and total surplus on average, resulting in gains in each of approximately \$0.57 and \$0.62 per household per month, representing 18% of the consumer surplus created by an RSN. However, as noted above, the effects are also heterogeneous: e.g., for those RSNs that are integrated and predicted to exclude satellite distributors in our setting, consumers can be harmed. Furthermore, stemming from the foreclosure and raising rivals' costs effects discussed above, rival distributors are predicted to be worse off.

Despite the richness of our empirical model, the effects that we document are only partial. Our model and analysis does not allow vertical integration to influence investments made by RSNs and MVPDs (both those that integrate and their rivals).[3] In principle, these investment effects on consumer and aggregate surplus could go either way, as emphasized in the literature on investment effects of vertical integration (Bolton and Whinston (1991), Hart (1995)). Furthermore, in our current analysis, we assume that national satellite prices are unchanged in counterfactual scenarios (motivated by our consideration of integration changes for a single RSN at a time); if satellite prices were to increase as a result of higher negotiated affiliate fees, then our estimates of the adverse effects of exclusion and raising rivals' costs may be understated.

Related Literature. Previous work studying the cable industry, including Waterman and Weiss (1996), Chipty (2001), and Chen and Waterman (2007), have primarily relied on reduced form cross-sectional analyses for a limited subset of channels and found that integrated cable systems are more likely to carry their own, as opposed to rival, content. An exception is Suzuki (2009) who studies the 1996 merger between Time Warner and Turner broadcasting. His analysis uses time series variation in ownership, finding that vertically integrated channels were more likely to be carried post merger and rival non-integrated channels were less likely to be carried.[4] These studies cannot, however, separate efficiency from foreclosure incentives, nor can they provide estimates of welfare effects. We complement this literature on vertical integration in the cable industry in two ways. First, building a structural model allows us to make welfare statements about the impact of vertical integration and highlight the mechanisms through which the effects work. Second, we

[3] For example, we predict that cable-integration of an RSN always has a negative impact on satellite distributors; this raises the possibility that widespread integration by cable distributors of RSNs might impact satellite distributors' effectiveness as a competitor to cable to a greater extent than admitted in our analysis.

[4] See also Caves et al. (2013) who provide evidence that RSN affiliate fees are correlated with downstream MVPD footprints.

leverage a richer, panel dataset on consumer viewership and bundle subscription, and the pricing, carriage, and bargaining decisions of channels and distributors.

This paper also adds to the growing empirical literature on the effects of vertical integration and other vertical arrangements (e.g. Shepard, 1993; Asker, 2004; Hastings, 2004; Hastings and Gilbert, 2005; Hortacsu and Syverson, 2007; Villas-Boas, 2007; Mortimer, 2008; Houde, 2012; Lee, 2013; Conlon and Mortimer, 2013). We build on existing approaches by estimating a model that explicitly incorporates avenues for vertical integration to improve the efficiency of pricing and channel carriage decisions, and to generate foreclosure or raise costs of rival distributors; and by providing estimates of the degree to which integrated firms, in practice, act on each of these incentives.[5] Using these estimates, we are then able to provide estimates of the net welfare impacts of vertical integration which weigh these pro- and anti-competitive effects. Finally, we develop methods for the estimation and simulation of counterfactual scenarios in vertical markets characterized by bilateral oligopoly and negotiated prices that can be applied in other related settings.[6]

2 Institutional Detail and Data

Our study analyzes the U.S. cable and satellite industry for the years 2000 to 2010 and focuses on the ownership of "Regional Sports Networks" (RSNs) by cable and satellite distributors. In this section, we describe the industry structure, RSNs, and regulatory policy during this period. We then discuss the data that we use to estimate the model. The tables referenced in this section are contained in Appendix C.

In the time period that we study, the vast majority of households in the U.S. were able to subscribe to a multichannel television bundle from one of three downstream multichannel video programming distributors (MVPDs): a local cable company (e.g., Comcast, Time Warner Cable, or Cablevision) or one of two nationwide satellite companies (DirecTV and Dish Network).[7] Cable companies transmit their video signals through a physical wire whereas satellite companies distribute video wirelessly through a south-facing satellite dish attached to a household's dwelling. The majority of distributors' revenue comes from subscription to three different bundles of programming: a limited basic bundle which retransmits over-the-air broadcast stations, an expanded basic bundle containing 40-60 of the most popular channels available on cable (e.g., AMC, CNN, Comedy Central, ESPN, MTV, etc.), and a digital bundle containing between 10 to 50 more, smaller, niche channels.

Downstream distributors negotiate with content producers over the terms at which the distributors can offer the content producers' channels to consumers. These negotiations usually center on a monthly per subscriber "affiliate fee" that the downstream distributor pays the channel for every

[5]See also Michel (2013), who examines whether firms jointly maximize profits following a horizontal merger.

[6]E.g., Ho and Lee (2015) adapt techniques developed in this paper to examine hospital and insurance competition in health care markets.

[7]In our analysis, we focus only on markets where there is a single cable provider. Telephone MVPD providers (primarily consisting of AT&T and Verizon) did not enter a significant number of markets until 2007; by the end of 2010, all telephone MVPD providers had 6.9 million out of 100.8 million total MVPD subscribers (FCC, 2013).

subscriber who has access to the channel, whether the subscriber watches it or not. According to industry estimates, RSNs command the second-highest per subscriber affiliate fees after ESPN. For example, Comcast SportsNet (CSN) Philadelphia is reported to have per subscriber monthly fees that averaged $2.85 per month in 2010 whereas highly-rated national channels such as Fox News, TNT, and USA hover around $1 per subscriber per month (and ESPN over $4 per subscriber per month).[8]

2.1 Vertical Affiliation of RSNs in Multichannel Television Markets

RSNs carry professional and college sports programming in a particular geographic region. For example, the New England Sports Network (NESN) carries televised games of the Boston Red Sox and the Boston Bruins that aren't concurrently being televised nationally. Metropolitan areas can have multiple RSNs. For example, in the New York City metropolitan area, there are four different RSNs: Madison Square Garden (MSG), MSG Plus, SportsNet NY, and Yankees Entertainment and Sports (YES). Some RSNs also serve multiple metropolitan areas. For example, the Sun Sports network holds the rights to the Miami Heat and the Tampa Bay Rays, amongst others. Table 6 provides a variety of information about the largest RSNs in the US, including their number of subscribers, average affiliate fees, and average viewership.

Figure 1 shows each RSN's years of operation between 2000 and 2010 and ownership affiliation with a downstream distributor. Many RSNs are owned, to some degree, by a downstream distributor. For example, in 2007, downstream distributors had ownership interests in 16 out of the 30 active RSNs. The cable MVPDs that owned RSNs are Comcast, Cablevision, Cox, and Time Warner. DirecTV, the largest satellite operator (and second-largest U.S. MVPD), indirectly had stakes in numerous RSNs through its partial owners News Corporation and Liberty Media Corporation.[9]

Regulatory Policy. There are several key features of the regulatory environment for RSNs, and vertically integrated content more generally, that are relevant during our sample period. During our sample period, vertically integrated firms were subject to the "Program Access Rules" (PARs), which required that vertically integrated content be made available to rival distributors at non-discriminatory prices (subject to final-offer arbitration if necessary). The PARs only applied to content that was transmitted to the MVPD via satellite. This covered all national cable channels that need satellite transmission to cost-effectively reach cable systems around the country and most RSNs. However, a handful of RSNs transmitted their signal terrestrially (usually via microwave), thereby avoiding the jurisdiction of the PARs. This was called the "terrestrial loophole" in the Program Access regulation. In 2007, only two cable-integrated RSNs were able to leverage the

[8]As discussed in Crawford and Yurukoglu (2012), payments between distributors and content providers are primarily in the form of linear fees; fixed fee monetary transfers are rare, and if they exist, are typically neglible with respect to the total payment that is made.

[9]News Corporation and Liberty Media both had a partial ownership stake in DirecTV since 2003; News Corporation sold its DirecTV stake in 2006.

Figure 1: RSN Ownership

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Comcast	Liberty/News		Liberty/Cablevision/News		Comcast		Comcast/Charter		Comcast/Cablevision		Comcast/News		
Comcast SportsNet Bay Area	35/23/35	6/23/64	13/23/57	13/23/57	13/23/57	13/30/57	7/60/33	7/60/33	7/60/33	60/34	60/40	60/40	67/30
Comcast SportsNet California							100	100	100	100	100	100	100
Comcast SportsNet Chicago								30	30	30	30	30	30
Comcast SportsNet Mid-Atlantic	17/17	3/31	3/31	100	100	100	100	100	100	100	100	100	100
Comcast SportsNet New England	10/10/23	2/23/18	4/23/16	4/23/16	4/23/16	4/30/16	4/30/16	50/50	50/50	100	100	100	100
Comcast SportsNet Northwest										100	100	100	100
Comcast SportsNet Philadelphia	46	46	53	53	78	78	78	78	84	85	85	85	85
Comcast/Charter Sports Southeast		100	72	72	72	72	77/23	69/23	70/24	74/26	74/26	74/26	75/19
News Corp	Liberty/News		Liberty/Cablevision/News		Liberty/Comcast/Cox/News		Liberty/Cox/News		News				
Fox Sports Detroit	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	18/82	100	100	100
Fox Sports Florida	10/10/23	1/14/6	7/45/33	7/45/33	7/60/33	7/60/33	7/60/33	18/82	18/82	16/84	100	100	100
Fox Sports Midwest	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Fox Sports North	-	-	-	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Fox Sports Ohio	20/45/20	3/45/37	7/45/33	7/45/33	7/60/33	7/60/33	7/60/33	18/82	18/82	16/84	100	100	100
Fox Sports South	44/44	7/81	8/80	10/78	11/77	13/75	14/74	15/73	17/71	17/71	88	88	88
Fox Sports Southwest	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Fox Sports West	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Prime Ticket	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Sun Sports	28/13/5/28	5/16/5/52	19/16/5/49	19/16/5/49	11/5/49	11/6/49	11/49	11/49	11/49	11/50	60	60	60
Liberty	Liberty/News		Liberty										
Root Sports Northwest	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Root Sports Pittsburgh	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Root Sports Rocky Mountain	50/50	08/92	18/82	18/82	18/82	18/82	18/82	18/82	18/82	16/84	100	100	100
Cablevision	Cablevision		Liberty/Cablevision/News										
Madison Square Garden Network (MSG	20/45/40	3/45/37	7/45/33	7/45/33	7/45/33	7/60/33	7/60/33	100	100	100	100	100	100
MSG Plus	20/45/40	3/45/37	7/45/33	7/45/33	7/45/33	7/60/33	7/60/33	100	100	100	100	100	100
Cox	Cox												
Channel 4 San Diego	100	100	100	100	100	100	100	100	100	100	100	100	100
Cox Sports Television					100	100	100	100	100	100	100	100	100
Time Warner	Comcast/TimeWarner												
SportsNet New York									8/27	8/27	8/27	8/27	8/27
Independents / Other													
Altitude Sports & Entertainment							-	-	-	-	-	-	-
Mid-Atlantic Sports Network (MASN)								-	-	-	-	-	-
New England Sports Network (NESN)	-	-	-	-	-	-	-	-	-	-	-	-	-
Yankees Entertainment & Sports (YES)					-	-	-	-	-	-	-	-	-

Notes: Reported are the vertical ownership stakes held by major distributors of cable and satellite television service for the 30 Regional Sports Networks (RSNs) in our data that are active in 2007. Ownership data was collected by hand from company stock filings and industry sources. The ownership share for each distributor is reported and individual owners (or combinations of owners) are shaded according to the channel-specific legend located in the first line of each potential owner. Black bars correspond to a year in which the given RSN is not active (i.e., has not yet entered or has exited the market). Hyphens correspond to years of active operation for an RSN without a vertical ownership affiliation.

terrestrial loophole: Comcast SportsNet in Philadelphia and SD4 in San Diego (owned by Cox Cable); in both cases, the channel was not provided to satellite providers.[10] As a result, Major League Baseball (MLB), National Basketball Association (NBA), and National Hockey League (NHL) games in Philadelphia were only available through cable and not through DirecTV or Dish Network. Similarly in San Diego, MLB games were available only through cable. This accident of regulatory history will be an important source of identifying variation in our econometric estimation.

The PARs were introduced in 1992 and required renewal by the FCC every five years. They were allowed to lapse in 2012 and replaced by rules giving the Commission the right to review *any* programming agreement for anti-competitive effects on a case-by-case basis under the "unfair acts" rules the Commission established in 2010 (FCC, 2012). The new case-by-case rules explicitly include a (rebuttable) presumption that exclusive deals between RSNs and their affiliated distributors are unfair.[11]

During our sample period (2000-2010), most integrated RSNs outside of loophole markets had agreements to be carried by all MVPDs. However, even though PARs were in effect, there were instances in which a cable-owned RSN was not carried by satellite providers. For example, in 2007, Comcast Sports Northwest, Comcast/Charter Sports Southeast, and Cox Sports Television were not broadcast on satellite distributors. There were also cases where non-integrated channels were not provided to all MVPDs. For example, in 2007, YES was not carried by Dish Network.

2.2 Data

We collect a wide variety of data to analyze the effects of vertical integration. We have three categories of data: (1) downstream prices, quantities, and characteristics of cable and satellite bundles, (2) channel viewership data, and (3) channel affiliate fees and advertising revenues. We briefly describe each in turn.

2.2.1 Downstream Prices, Quantities, and Characteristics

We combine data from multiple databases to construct downstream prices, quantities, and characteristics. Our foundation dataset is the Nielsen FOCUS database. For each cable system, it provides the set of channels offered (i.e., the channel "lineup"), the number of homes passed, the total number of subscribers (i.e., to any bundle), the owner of the system, and the zip codes served. We use the years 2000 to 2010. We restrict our analysis to system-years in which the system faced no direct wire-based competition.[12] We construct market shares by combining the number of subscribers reported by FOCUS (divided by the number of households in a market obtained from 2000

[10] Time Warner Cable also employed the terrestrial loophole from 2006 to 2008 for the (then relatively new) Charlotte Bobcats NBA franchise by placing some their games on News 14, a terrestrially delivered regional news channel.

[11] There are situations in which integrated RSNs are not available on rival MVPDs; one high profile example is Time Warner Cable SportsNet LA, with rights to air Los Angeles Dodger Games, not being carried on DirecTV.

[12] We do so because when a system faces competition from another cable operator we do not know the number of subscribers in the areas where the system faced competition relative to the areas where it did not.

and 2010 Census data) with individual-level survey data from household survey firms Mediamark Research & Intelligence (MRI) and Simmons, using MRI data for 2000 to 2007, and Simmons for 2008-2010. Specifically, if a system-year had at least 40 survey respondents, we use the average of the market share from the FOCUS data and the cable market share among the survey respondents; otherwise we use only the FOCUS data. We eliminate any system-year for which we had less than 40 individual-level survey respondents in the MRI/Simmons data and the FOCUS subscriber data was not updated from the previous year. We use the remaining system-years to construct our markets.

For our analysis, we define a market for each year to be a set of zip codes served by a single cable system and, by construction, both satellite providers. For cable systems, we aggregate over bundles within a system, focusing on total system subscribers. Our demand model is therefore a distributor choice model, rather than a bundle choice model.[13] We construct satellite shares within each of our markets for DirecTV and Dish Network from the MRI/Simmons survey data.[14] We use historical channel offerings and prices for DirecTV and Dish Network collected via the Internet Archive (archive.org). Satellite bundles are assumed to vary across markets only in the set of RSNs carried. We assume that an RSN is carried by a satellite provider in a given market if we observe that the satellite provider carries that channel in any market, and the RSN is "relevant" in that market. We define an RSN to be relevant in a DMA (and hence in all markets within that DMA) if, across all cable systems within that DMA, at least 30 percent of the teams carried by the RSN in some market are not "blacked out" (i.e., can be seen by local viewers due to restrictions imposed by the team's league).

We combine multiple sources of information on cable television prices. Systems regularly post prices for their tiers of service on their websites and these websites are often saved in the Internet Archive.[15] We use the price of Expanded Basic Service, the most popular bundle chosen by households and the bundle which typically contains all of the channels in our analysis. In addition, we utilize newspaper reports of price changes which provide price information at the local cable system level. Some newspapers report this information every time cable prices change (typically yearly), providing valuable information about the history of price changes for a single (often large) system or geographic family of systems owned by the same provider. Finally, cable systems typically have "rate cards" describing their current tiers, channels, and prices which they use for marketing or to inform customers of changes in these offerings; they were used when able to be found online. We

[13] While we would prefer a bundle demand model, our subscriber data was not rich enough to estimate bundle-specific quantities. This isn't overly limiting, as our focus is on the impact of vertical integration on inter-distributor demand.

[14] We use satellite state market shares (estimated by Nielsen) unless we have at least 5 respondents in the individual-level data, in which case we take the average of the satellite state market shares and within-market market shares, placing greater weight on the market-level survey data the greater the number of observations. We dropped any constructed market whose total market share exceeded one or which, in the survey data, had a zero market share for one of the satellite providers (which happens naturally due to sampling error).

[15] Following industry practice, we refer to the set of channels offered at a given (incremental) price as a tier of service and the combination of tiers chosen by households as the bundle that they buy. Thus the expanded basic bundle (service) consists of the limited basic tier and the expanded basic tier.

searched the Internet for all such information about cable prices and linked by hand the information obtained to FOCUS systems based on the provider, principal geographic region served, and other regions served as reported in the newspaper or listed on the rate card. For system-years where we do not find a price from websites, rate sheets, or newspapers, we link to the TNS Bill Harvesting database. These data are individual-level bills for cable service which report the company providing the service, the household's expenditure, and their zip code. For a given system-year, we use the mean expenditure for subscribers to that system if the data contain at least 5 respondents.[16] These data also provide the level of a tax on satellite television service in states where it exists, which we use as an instrumental variable for price in demand estimation.

Table 7 reports the average price, market share, and number of RSN, cable, and total channels offered across markets and years in our estimation dataset. We use 11 years of data, comprising over 6,000 market-years, with an average coverage of 31.5 million (roughly 30% of) U.S. households per year.[17] Average prices are quite similar across providers, whether on an unweighted basis or weighted by the number of households in the market. The satellite companies generally offer more channels on their Expanded Basic service than the local cable system, but a similar number of RSNs.

Finally, we derive MVPD margins for Comcast, DirecTV, and Dish from their 2007 10K reports.[18]

2.2.2 Viewership

We estimate demand using both bundle purchase and viewing data. We have two types of viewing data. One type provides information at the individual household level, and the other reports aggregate viewing decisions at the level of the Designated Market Area (DMA "ratings").[19] Average viewership for various RSNs is reported in Table 6 and average viewership for other cable networks is reported in Table 8.

Individual household viewing data comes from the MRI and Simmons datasets described in the previous subsection. Our MRI data reports the number of hours watched for each of the sampled households of 96 national channels from 2000 to 2007, while our Simmons data reports the same

[16] We only use bills which clearly delineate video programming costs (i.e., that separate it out from other bundled services such as internet and phone), and use the average of a system's revenue (excluding pay-per-view or one-time charges) to construct prices.

[17] While we observe the complete population of channel lineups, incomplete reporting of subscriber information in the FOCUS dataset and the inability to collect cable prices in some markets prevents us from constructing the information we need in every U.S. cable market.

[18] We compute Comcast margins using video, advertising, and franchise fee revenues; programming expenses; and sales, general, and administrative (SG&A) expenses multiplied by both the video revenue share of total revenues (to proportionately allocate expenses across Comcast's other businesses) and the share of SG&A expenses that are subscriber acquisition and retention related (computed from DirecTV's reports). We compute DirecTV margins using total revenues; and programming, subscriber acquisition, upgrade, and retention expenses. For Dish, we use total revenues; subscriber acquisition costs; and the share of subscriber related expenses multiplied by the share of non-SG&A costs (programming and service expenses) that are programming related (computed from DirecTV's reports). The computed values are $\{.539, .396, .413\}$.

[19] DMAs are mutually exclusive and exhaustive definitions of television markets created by Nielsen and used for the purchase of advertising time.

information for 99 national channels between 2008 and 2010. Our aggregate ratings data come from Nielsen. Reported is the average rating for each of between 63 and 100 channels, of which 18 to 29 are RSNs, depending on the year, in each of the 44 to 56 largest DMAs between 2000 and 2010.

Tables 6 and 8 report summary statistics for our viewing data. Table 8 reports, for each of our sources of viewing data, the mean rating for each of the 38 non-RSNs in either dataset, as well as additional information from our household data. For example, the average rating for the ABC Family Channel in the Nielsen data across the 747 DMA-years for which the information was recorded is 0.418 percentage points. This suggests that a household selected at random in one of these years and DMAs would be watching the ABC Family Channel with probability 0.418 percent. While small, this is above average for cable networks. Similarly, the average rating for the Yankees Entertainment & Sports (YES) RSN, reported in Table 6, is 0.27 percent. For RSN viewership, we have additional information about the average RSN rating by platform chosen by households (i.e., cable or each satellite operator), which we report there.

Our household-level data provide further details about viewing which are summarized in the remaining columns of Table 8. The last column reports the share of households on average across DMAs and years that report *any* viewing of that channel. As noted in Crawford and Yurukoglu (2012), this provides valuable information about whether a household has any interest in a channel that we will use to inform the estimated distribution of preferences for channels across households.[20]

2.2.3 Average Affiliate Fees and Advertising Rates

As described earlier, affiliate fees are the monthly per subscriber charges paid by distributors to content providers for the ability to distribute the channel. SNL Kagan maintains a database with aggregate information about individual cable television networks, both nationally-distributed networks like CNN and ESPN as well as RSNs like the family of Comcast and Fox networks. For many networks, we use information about the average affiliate fee paid by cable and satellite MVPDs to each such network. For cable channels, we have information about affiliate fees paid to between 120 and 210 channels per year between 2000 and 2010. For RSNs, we also have information about the total national subscribers served by each of 88 content providers between 2000 and 2010. These are also reported in Tables 6 and 8. The average affiliate fee in our data for the national channels included in our demand analysis is $0.30 per subscriber per month for a nationally distributed channel and $1.45 for an RSN.

Per subscriber advertising rates are determined for each channel by dividing total advertising revenues (provided by Kagan) by total subscribers.

[20]The MRI/Simmons data allows us to estimate the probability that a given channel is never watched for national channels; we regress this probability on viewership to impute this probability for RSNs.

3 Model

In this section, we present an industry model that predicts: (i) household viewership of channels; (ii) household demand for multichannel television services; (iii) prices and bundles that are offered by distributors; and (iv) negotiated distributor-channel specific affiliate fees. One key output from the specification and estimation of our model is the impact on viewership and demand of adding or removing channels from a bundle. This in turn informs the degree to which firms internalize the profits of integrated units when making strategic decisions, and the incentives of an RSN to provide or withold access of its content to distributors.

3.1 Overview

We index consumer households by i, markets by m, and time periods by t. There are a set of "downstream" multichannel video programming distributors (MVPDs) $\mathcal{F}_t$ and "upstream" channels $\mathcal{C}_t$ active in each period t. MVPDs create and maintain a distribution network and perform retail activities such as billing, packaging, and technical support. Examples include Comcast, Time Warner Cable, Cox, Cablevision, DirecTV, and municipal cable companies.

Let the set of MVPDs active in a given market-period be denoted $\mathcal{F}_{mt}$. We will assume that each such MVPD $f \in \mathcal{F}_{mt}$ in each period offers a single "bundle" in market m, where a household subscribing to this bundle pays a price p_{fmt} and has access to a set of channels $\mathcal{B}_{fmt} \subseteq \mathcal{C}_t$.[21] By assuming that distributors offer only one bundle, f denotes both the distributor and the bundle it offers.

We assume that in each year t, decisions are made according to the following timing: in **stage 1** channels and distributors bargain bilaterally to decide affiliate fees, and distributors simultaneously set prices and make carriage decisions for each market in which they operate; in **stage 2** households choose which MVPD, if any, to subscribe to in their market; and in **stage 3** households view television channels. We now provide details of each stage and further assumptions, proceeding in reverse order of timing.

3.2 Stage 3: Household Viewing

We assume that households solve a time allocation problem to determine viewership. In particular, household i in market m and period t subscribing to MVPD $f \in \mathcal{F}_{mt}$ allocates its time $\boldsymbol{w}_{ift} \equiv \{w_{ifct}\}_{c \in \mathcal{B}_{fmt} \cup \{0\}}$, where w_{ifct} is the time spent watching channel c (or devoted to non-television activities if $c = 0$), to solve:

[21] In the previous section, we explained why the data only permit us to look at demand for the most popular (Expanded Basic) bundle offered by each distributor in each market.

$$\max_{\boldsymbol{w}_{ift}} \; v_{ift}(\boldsymbol{w}_{ift}) \;=\; \sum_{c\in\mathcal{B}_{fmt}\cup\{0\}} \frac{\gamma_{ict}}{1-\nu_c}(w_{ifct})^{1-\nu_c} \tag{1}$$
$$s.t.: \quad w_{ifct} \geq 0 \;\forall\, c$$
$$\sum_{c\in\mathcal{B}_{fmt}\cup\{0\}} w_{ifct} \leq T$$

Parameters γ_{ict} and $\nu_c \in [0,1)$ govern consumer tastes for each channel c, where γ_{ict} sets the level of marginal utility of household i from the first instant of watching the channel, and ν_c controls how fast this marginal utility decays over time. The parameter T represents a time constraint. We restrict ν_c to be equal for all non-sport channels and the outside-option, and equal for all sports channels (which include RSNs); i.e., $\nu_c = \nu^S$ if c is a sports channel, and $\nu_c = \nu^{NS}$ otherwise.[22] We parameterize γ_{ict} as a function of channel-specific parameters $\boldsymbol{\rho}_c \equiv \{\rho_c, \rho_c^0\}$ as follows:

$$\gamma_{ict} = \begin{cases} \tilde{\gamma}_{ict} & \text{with probability } \rho_c^0 \text{, where } \tilde{\gamma}_{ict} \sim \text{Exponential}(\rho_c) \\ 0 & \text{with probability } 1-\rho_c^0 \end{cases} \qquad \forall\, c, t\,.$$

For RSNs, we scale $\tilde{\gamma}_{ict}$ by $\exp(\gamma^b b_{ict} + \gamma^d d_{ic})$, where $b_{ict} \in [0,1]$ represents the fraction of teams carried on RSN c that are "blacked-out" (i.e., unable to have games televised in household i's market), and d_{ic} is the average distance from household i to the stadiums for the teams shown on RSN c (measured in thousands of miles).[23] These terms allow for households to value an RSN differentially if the household cannot watch some of the carried sport teams, or if the household lives further away from the carried teams' stadiums.

3.3 Stage 2: Household Bundle Choice

Each period, household i considers characteristics of each bundle—including the utility obtained from watching channels in the bundle and its price—when determining which MVPD, if any, to subscribe to. We specify household i's indirect utility conditional on subscribing to f as:

$$u_{ift} \;=\; \beta^v v^*_{ift} + \boldsymbol{\beta}^x \boldsymbol{x}_{ft} + \beta^{sat}_{if} + \alpha p_{ft} + \xi_{ft} + \varepsilon_{ift}\,, \tag{2}$$

where v^*_{ift} is the indirect utility from the time allocation problem in (1), $\boldsymbol{x}_{ft}$ are firm-state and year dummy variables, p_{ft} is the per month subscription fee for bundle f, and ξ_{ft} is a scalar unobservable demand shock for bundle f. Each consumer has a random preference for each satellite provider,

[22] Allowing for this parameter to differ between sports and non-sports channels is motivated by the observation that sports channels receive higher affiliate fees than national channels for the same viewership ratings; we discuss this further in Section 4.1.2. Our viewership model is equivalent to the Cobb-Douglas model used in Crawford and Yurukoglu (2012) if $\nu_c \to 1$ for all c.

[23] We focus only on blackout restrictions for MLB, NBA, and NHL teams. We ignore the NFL in our analysis since its games have only been aired by national channels since the 1960s (CBS, NBC, Fox, and ESPN currently own its television rights).

β_{if}^{sat}, that is drawn from an independent exponential distribution with parameter ρ_f^{sat}; we assume that $\beta_{if}^{sat} = 0$ if f is a cable provider.[24] We assume that the outside option of no bundle is normalized to $u_{i0t} = \varepsilon_{i0t}$, $\boldsymbol{\varepsilon}_{it} \equiv \{\epsilon_{ift}\}_{\forall f}$ is distributed Type I extreme value, and each household chooses the bundle with the highest value of u_{ift}.

The probability that household i subscribes to bundle f in market m is obtained by integrating over $\boldsymbol{\varepsilon}_{it}$ for each household:

$$s_{ifmt} = \frac{\exp(\beta^v v_{ift}^* + \boldsymbol{\beta}^x \boldsymbol{x}_{ft} + \beta_{if}^{sat} + \alpha p_{ft} + \xi_{ft})}{1 + \sum_{k \in \mathcal{F}_{mt}} \exp(\beta^v v_{ikt}^* + \boldsymbol{\beta}^x \boldsymbol{x}_{kt} + \beta_{ik}^{sat} + \alpha p_{kt} + \xi_{kt})} \,. \tag{3}$$

The total market share of each bundle f (in market m at time t) is then $s_{fmt} \equiv \int s_{ifmt} dH_{mt}(i)$, where $H_{mt}(i)$ is the joint distribution of household random coefficients $(\boldsymbol{\gamma}, \boldsymbol{\beta})$ in the market, and the demand for the bundle is $D_{fmt} \equiv N_{mt} s_{fmt}$, where N_{mt} is the number of television households in the market.

3.4 Stage 1: Affiliate Fee Bargaining, Distributor Pricing, and Bundling

In Stage 1, all MVPDs and channels bargain over affiliate fees $\boldsymbol{\tau}_t \equiv \{\tau_{fct}\}_{\forall f,c}$, where τ_{fct} represents the affiliate fee that distributor f pays the owner of channel c for each of f's household subscribers that receives c. Simultaneously, all distributors choose the prices and composition of its bundles in every market in which it operates.[25] That is, we assume that bargaining occurs simultaneously with distributor pricing and bundling.[26] We assume that affiliate fees, bundle prices, and bundle compositions are optimal with respect to one another in equilibrium.[27]

[24] As we discuss in the next section, allowing for heterogeneity in preferences for satellite bundles assists our model in matching observed distributor price-cost margins.

[25] A given cable distributor f often operates in many markets, and is choosing prices and bundle composition in each of these markets. Satellite distributors choose a single national price and channel bundle, with the only potential variation across DMAs being the set of RSNs that are carried.

[26] See also Nocke and White (2007), Draganska et al. (2010), and Ho and Lee (2015) who use a similar timing assumption. Formally, one can think of separate agents of the distributor bargaining and making the pricing and bundle composition decisions. This sort of timing is also implicit in the analysis described in Rogerson (2014).

An alternative timing assumption would be to assume that affiliate fees are first negotiated, and then distributor prices and bundles are chosen. This would adjust firms' perceptions of off-equilibrium actions: e.g., when bargaining, firms would anticipate different bundle prices to immediately be set if off-equilibrium affiliate fees or disagreement were realized. However, there may be reasons to believe that such a rapid response is unrealistic. Absent a fully specified dynamic model of firm bargaining and pricing, which is outside the scope of the current analysis, we believe the approach taken here to be a reasonable approximation. We leverage this assumption to simplify the computation and estimation of our model.

[27] A distributor's optimal carriage decision for an RSN is indeterminate when no deal is reached between the distributor and that RSN: i.e., whether or not the distributor would carry the RSN on a subset of its systems in the event the RSN were available is irrelevant when the RSN is not available to the distributor at all. In our estimation, we assume that satellite providers, who offer only a single national bundle, adopt the strategy of carrying any channel for which it has negotiated a deal (intuitively, since any deal that is reached should make carriage profitable).

3.4.1 Stage 1a. Distributor Pricing and Bundling

Each period, every MVPD $f \in \mathcal{F}_t$ chooses prices and bundles $\{p_{fmt}, \mathcal{B}_{fmt}\}_{\forall m: f \in \mathcal{F}_{mt}}$ to maximize its profits given negotiated affiliate fees $\boldsymbol{\tau}_t$. Profits for f across all markets are:

$$\Pi^M_{ft}(\{\mathcal{B}_{mt}\}_m, \{\boldsymbol{p}_{mt}\}_m, \boldsymbol{\tau}_t; \mu) = \sum_{m: f \in \mathcal{F}_{mt}} \Pi^M_{fmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t; \mu) \ ,$$

where:

$$\Pi^M_{fmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t; \mu) = D_{fmt}\Big(p^{\text{pre-tax}}_{fmt} - mc_{fmt}\Big) + \mu\Big(\sum_{g \in \mathcal{F}_{mt}} \sum_{c \in \mathcal{B}_{gmt}} O_{fct} \times D_{gmt}(\tau_{gct} + a_{ct})\Big) \ . \quad (4)$$

In expression (4), we denote by $\mathcal{B}_{mt} \equiv \{\mathcal{B}_{fmt}\}_{f \in \mathcal{F}_{mt}}$ and $\boldsymbol{p}_{mt} \equiv \{p_{fmt}\}_{f \in \mathcal{F}_{mt}}$ the set of bundles and associated prices offered in the market, and by a_{ct} the expected advertising revenue obtained by channel c per subscriber to a bundle containing c. Firm revenues are derived from pre-tax prices, $p^{\text{pre-tax}}_{fmt} \equiv p_{fmt}/(1 + \text{tax}_{fmt})$, which are a function of market-specific cable or satellite tax rates that are known and assumed to be determined exogenously. The term O_{fct} represents MVPD f's ownership share of channel c at time t; we refer to f and c as being integrated if $O_{fct} > 0$.[28] The parameter $\mu \in [0, 1]$ represents the extent to which a downstream MVPD f internalizes upstream affiliate fees and advertising revenues from its integrated channels.

The first component of (4), an MVPD's profit function in a given market m, is standard: each bundle has a price and a marginal cost (mc_{fmt}) that determine margins, and this is multipled by demand. We assume that each MVPDs' marginal cost in market m can be decomposed into the sum of the per subscriber fees that f must pay to the various channels in its market-bundle, and a bundle-specific cost shock that is the sum of non-channel related marginal costs, denoted by ω_{fmt}: i.e., $mc_{fmt} \equiv \sum_{c \in \mathcal{B}_{fmt}} \tau_{fct} + \omega_{fmt}$.[29] The second component of the profit function is non-standard, and represents the degree to which a vertically integrated downstream unit values the profits that accrue to its upstream (i.e., channel) units. These terms include per subscriber fees (τ_{gct}) and advertising revenues (a_{ct}) that accrue to integrated upstream channels from its own viewers as well as from viewers of other distributors, and are multiplied by the ownership share and parameter μ.[30] In the absence of any frictions, μ would equal one, implying that the downstream firm perfectly internalizes integrated upstream unit profits, and its strategic decisions maximize total firm profit. The parameter μ could also be less than one, potentially representing divisionalization that could arise from ignorance, poor management, optimal compensation under informational frictions, or

[28] For our analysis, we only allow for $O_{fct} > 0$ if c is an RSN, and do not consider the bargaining decisions of vertically integrated national channels. In the case that a third party has an x% stake in MVPD f and y% stake in channel c at time t, we assume that $O_{fct} = x\% \times y\%$. This can be interpreted as the third party having an x% probability of making strategic decisions on behalf of the MVPD.

[29] Cost shocks include changes in variable costs such as technical service, labor, gasoline, and equipment costs that are incurred on a per subscriber basis.

[30] We omit portions of integrated channels' profits which are not affected by f's pricing and carriage decisions, as they do not affect the analysis. We also assume that channel c's per subscriber advertising revenues in market m do not vary across MVPDs, and that channel c's marginal costs per subscriber are zero.

any other conflict between managers of different divisions within the same firm.

Optimal Pricing and Bundling. We will leverage necessary conditions on the optimality of MVPD pricing and bundling decisions in our estimation. Differentiating (4) with respect to p_{fmt} (and dividing by market size) yields the following pricing first-order condition:

$$\frac{\partial \Pi^M_{fmt}}{\partial p_{fmt}} = \frac{s_{fmt}}{1+\text{tax}_{fmt}} + \Big(p^{\text{pre-tax}}_{fmt} - mc_{fmt}\Big)\frac{\partial s_{fmt}}{\partial p_{fmt}} + \mu\Big(\sum_{g\in\mathcal{F}_{mt}}\sum_{c\in\mathcal{B}_{gmt}} O_{fct}\frac{\partial s_{gmt}}{\partial p_{fmt}}(\tau_{gct}+a_{ct})\Big)\ . \quad (5)$$

In addition, we assume that the set of channels that are offered by each MVPD f in each market m satisfies:

$$\mathcal{B}_{fmt} = \arg\max_{\mathcal{B}_f\subseteq\mathcal{A}_{ft}} \Pi^M_{fmt}(\{\mathcal{B}_f, \mathcal{B}_{-f,mt}\}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t; \mu)\ , \quad (6)$$

where $\mathcal{A}_{ft} \subseteq \mathcal{C}_t$ is the set of channels available to MVPD f: i.e., the set of channels for which f has reached an agreement.[31]

Satellite Pricing and Bundling. If distributor f is a satellite MVPD (DirecTV or Dish), we assume that the distributor sets a single national price and bundle. We assume that the bundle offered by a satellite MVPD in any given market may differ from the national bundle only in the set of RSN channels that are offered.

3.4.2 Stage 1b: Bargaining over affiliate fees

Before describing how affiliate fees are determined, we specify the profits in market m that each channel c contemplates when bargaining with MVPD f. We assume that if f and c are integrated (i.e., $O_{fct} > 0$), channel c's profits are:

$$\begin{aligned}\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t;\mu) = &\sum_{g\in\mathcal{F}_{mt}:c\in\mathcal{B}_{gmt}} D_{gmt}\Big(\tau_{gct}+a_{ct}\Big)\ \dots \\ &+\mu\sum_{g\in\mathcal{F}_{mt}} D_{gmt}\Big(O_{gct}(p^{\text{pre-tax}}_{gmt}-mc_{gmt}) + \sum_{d\in\mathcal{B}_{gmt}\setminus c} O^C_{cdt}(\tau_{gdt}+a_{gdt})\Big)\ .\end{aligned} \quad (7)$$

However, if f and c are not integrated, channel c's profits are:

$$\begin{aligned}\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t;\mu,\lambda_R) = &\sum_{g\in\mathcal{F}_{mt}:c\in\mathcal{B}_{gmt}} D_{gmt}\Big(\tau_{gct}+a_{ct}\Big)\ \dots \\ &+\mu\times\lambda_R\sum_{g\in\mathcal{F}_{mt}} D_{gmt}\Big(O_{gct}(p^{\text{pre-tax}}_{gmt}-mc_{gmt}) + \sum_{d\in\mathcal{B}_{gmt}\setminus c} O^C_{cdt}(\tau_{gdt}+a_{gdt})\Big)\ .\end{aligned} \quad (8)$$

[31] See footnote 27 regarding our treatment of channels not contained in $\mathcal{A}_{ft}$.

$\Pi^C_{cmt} = \pi_{cmt} + \mu(\pi_{fmt} + \pi_{dmt})$

(a) Internal Bargaining.

$\Pi^C_{cmt} = \pi_{cmt} + \mu \times \lambda_R(\pi_{gmt} + \pi_{dmt})$

(b) Bargaining with Rival MVPD.

Figure 2: Examples of Π^C_{cmt} when c bargains with MVPD f.

In both (7) and (8), the first lines represent affiliate fees and advertising revenues obtained from each bundle the channel is available on, and the second lines incorporate potential profits of an integrated downstream MVPD, as well as profits from other channels also owned by the same owner of channel c. We denote by O^C_{cdt} the common ownership percentage of two channels c and d by a third-party.[32]

The only difference between (7) and (8) is that when f and c are integrated, the second line is multiplied by μ (implying that the integrated units place equal weight μ on each other's profits when bargaining with each other); when f and c are not integrated, the second line is multiplied by $\mu \times \lambda_R$. The parameter $\lambda_R \geq 0$ governs the extent to which an integrated upstream unit recognizes and internalizes the effects of foreclosing access to the RSN from a rival distributor on the profits of its other integrated units. As it may provide incentives for an integrated RSN to lower the rivals' bundle quality and shift demand to the integrated distributor—an effect analogous to the "raising rivals' cost" effect (Salop and Scheffman, 1983; Krattenmaker and Salop, 1986)—we refer to λ_R as our "rival foreclosure" or "raising rivals' costs" (RRC) parameter.[33]

In Figure 2, we provide an illustration of how channel c's perceived profits when bargaining with MVPD f may change depending on whether or not it is integrated with f. In Figure 2a, the dashed square represents the fact that channel c is integrated with MVPD f and another channel d; in this case, when bargaining with f, channel c will consider its own profits (denoted by π_{cmt}), consisting of affiliate fees and advertising revenues, as well as profits of its integrated distributor f and integrated channel d (denoted by π_f and π_d), weighted by μ: i.e., $\Pi^C_{cmt} = \pi_{cmt} + \mu(\pi_{fmt} + \pi_{dmt})$. We assume that π_{fmt} includes f's subscription revenues net of its costs; profits π_{dmt} include d's affiliate fees and advertising revenues. In Figure 2b, channel c is integrated with another MVPD g and channel d; in this case, channel c will consider its own profits π_{cmt} when bargaining with f (a rival MVPD), as well as those of its integrated units π_{fmt} and π_{dmt}, weighted by $\mu \times \lambda_R$: i.e., $\Pi^C_{cmt} = \pi_{cmt} + \mu \times \lambda_R(\pi_{gmt} + \pi_{dmt})$.

The parameter λ_R (multiplied by μ) thus captures the internalization of an integrated down-

[32] Specifically, if each owner $j \in \mathcal{J}$ of channel c owns shares x_j of c and y_j of channel d, then $O^C_{cdt} \equiv \sum_{j \in \mathcal{J}} x_j y_j$.

[33] Our approach differs from that in Salop and Scheffman (1983) and Krattenmaker and Salop (1986) in one respect: in those papers, the supplier considers the effect that raising its input price has on downstream prices to consumers. With our simultaneous timing, consumer prices are instead fixed but the supplier's concern for its downstream division's profit leads (as we will see below) to a higher input price or even total foreclosure; in equilibrium, this effect then leads to higher downstream prices to consumers.

stream MVPD's profits when an integrated channel bargains with another non-integrated distributor. In the case considered in Figure 2b, a higher value of λ_R increases channel c's desire to raise downstream profits of integrated distributor g, and lowers c's gains from trade when bargaining with the non-integrated rival MVPD f. This may lead to an increased affiliate fee (τ_{fct}) for the rival distributor f, which in equilibrium may then lead f to increase the price of its bundles to consumers. If the overall gains from trade are eliminated instead, this may lead to non-supply by c to f altogether.

Bargaining. We assume that, given channel c is carried on some of MVPD f's systems, the affiliate fee τ_{fct} between distributor f and channel c maximizes their respective bilateral Nash products *given the expected negotiated affiliate fees of all other pairs and the expected prices and bundles for all distributors.* In other words, affiliate fees $\boldsymbol{\tau}_t$ satisfy:

$$\tau_{fct}(\boldsymbol{\tau}_{-fc,t}, \mathcal{B}_t, \boldsymbol{p}_t) = \arg\max_{\tau_{fct}} \Bigg[\underbrace{\sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc}\Pi^M_{fmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\tau_{fct}, \boldsymbol{\tau}_{-fc,t}\}; \mu)]}_{GFT^M_{fct}(\tau_{fct},\cdot)} \Bigg]^{\zeta_{fct}} \times \Bigg[\underbrace{\sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc}\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\tau_{fct}, \boldsymbol{\tau}_{-fc,t}\}; \mu, \lambda_R)]}_{GFT^C_{fct}(\tau_{fct},\cdot)} \Bigg]^{1-\zeta_{fct}} \quad \forall f, c \in \mathcal{A}_{ft} , \tag{9}$$

where $\mathcal{M}_{fct} \equiv \{m : c \in \mathcal{B}_{fmt}\}$ denotes the set of markets where c is on f's bundle, $\zeta_{fct} \in [0, 1]$ represents a firm-channel-time specific Nash bargaining parameter, and:

$$[\Delta_{fc}\Pi^M_{fmt}(\mathcal{B}_{mt}, \cdot)] \equiv \Big(\Pi^M_{fmt}(\mathcal{B}_{mt}, \cdot) - \Pi^M_{fmt}(\mathcal{B}_{mt} \setminus fc, \cdot) \Big) ,$$
$$[\Delta_{fc}\Pi^C_{cmt}(\mathcal{B}_{mt}, \cdot)] \equiv \Big(\Pi^C_{cmt}(\mathcal{B}_{mt}, \cdot) - \Pi^C_{cmt}(\mathcal{B}_{mt} \setminus fc, \cdot) \Big) ,$$

where we denote by $\mathcal{B}_{mt} \setminus fc$ the set of all bundles in $\mathcal{B}_{mt}$ with channel c removed from bundle f. These last two terms represent the difference in either MVPD or channel profits in market m if f no longer carries channel c. We will refer to $GFT^M_{fct}(\tau_{fct}, \cdot)$ and $GFT^C_{fct}(\tau_{fct}, \cdot)$, which are the sums of these terms across all markets, as the *gains from trade* for MVPD f and channel c coming to an agreement with affiliate fee τ_{fct}. We assume that each MVPD and channel negotiate a single affiliate fee that applies to all markets.

We can write the first-order condition of (9) for each channel c bargaining with MVPD f as:

$$(1 - \zeta_{fct}) \times GFT^M_{fct}(\tau_{fct}, \cdot) = \zeta_{fct} \times GFT^C_{fct}(\tau_{fct}, \cdot) \qquad \forall f, c \in \mathcal{A}_{ft} , \tag{10}$$

which states that the equilibrium negotiated input fee τ_{fct} between channel c and distributor f

equalizes their (weighted) gains-from-trade.[34] Alternatively, by observing that $GFT^M_{fct}(\tau_{fct},\cdot) = GFT^M_{fct}(0,\cdot) - \sum_{m\in\mathcal{M}_{fct}} D_{fmt}\tau_{fct}$ and $GFT^C_{fct}(\tau_{fct},\cdot) = GFT^C_{fct}(0,\cdot) + \sum_{m\in\mathcal{M}_{fct}} D_{fmt}\tau_{fct}$ (where we omit the arguments for D_{fmt} for convenience), we can rewrite (10) as:

$$\sum_{m\in\mathcal{M}_{fct}} D_{fmt}\tau_{fct} = (1-\zeta_{fct})GFT^M_{fct}(0,\cdot) - \zeta_{fct}GFT^C_{fct}(0,\cdot)\ , \tag{11}$$

which relates *the total payments made by distributor f to channel* c, given by the left hand side of (11), to a weighted sum of the gains from trade due to agreement, given by the right hand side. Intuitively, the more that f gains from the relationship, the higher the total payment that is made; the more that c gains from the relationship, the lower the total payment. If f and c's Nash bargaining parameters were equal, then $\zeta_{fct} = 1/2$ and these gains from trade would be split in half.

Bargaining Example. Consider the case in which MVPD f and channel c are both non-integrated entities that bargain with one another in period t. The negotiated affiliate fee τ_{fct} that satisfies the Nash bargaining solution given by (11) solves:

$$\begin{aligned}\sum_{m\in\mathcal{M}_{fct}} D_{fmt}\tau_{fct} = (1-\zeta_{fct}) &\underbrace{\sum_{m\in\mathcal{M}_{fct}}\Big([\Delta_{fc}D_{fmt}](p^{\text{pre-tax}}_{fmt} - mc_{fmt\setminus fc})\Big)}_{GFT^M_{fct}(0,\cdot)} \\ -(\zeta_{fct}) &\underbrace{\sum_{m\in\mathcal{M}_{fct}}\Big(D_{fmt}a_{ct} + \sum_{g\neq f: c\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}]\big(\tau_{gct}+a_{ct}\big)\Big)}_{GFT^C_{fct}(0,\cdot)}\ ,\end{aligned} \tag{12}$$

where $[\Delta_{fc}D_{gmt}] \equiv D_{gmt}(\mathcal{B}_{mt},\cdot) - D_{gmt}(\mathcal{B}_{mt}\setminus fc,\cdot)$ denotes the change in firm g's demand in market m and time t if channel c was removed from firm f's bundle, and $mc_{fmt\setminus fc} \equiv \sum_{d\in\mathcal{B}_{fmt}\setminus c}\tau_{fdt} + \omega_{fmt}$. As before, the left hand side of (12) represents the total payment made by distributor f to channel c. It is increasing in the additional profits (net of payments to c) that f receives from the additional subscribers induced by the carriage of channel c (given by the first line of the right hand side), decreasing in c's advertising revenues from f (represented by the terms $D_{fmt}a_{ct}$), and increasing in c's loss in profits from *other* distributors as a result of being carried on f (as $[\Delta_{fc}D_{gmt}] < 0$ for $g \neq f$). This last term, given by $[\Delta_{fc}D_{gmt}]\big(\tau_{gct}+a_{ct}\big)$ summed across other distributors g, can be interpreted as an opportunity cost borne by channel c from supplying distributor f, and relates the

[34] Note that when f and c are bargaining with one another:

$$\frac{\partial GFT^M_{fct}(\cdot)}{\partial\tau_{fct}} = \sum_m \frac{\partial\Pi^M_{fmt}}{\partial\tau_{fct}} = (-1 + (\mu\times O_{fct}))\sum_{m\in\mathcal{M}_{fct}} D_{fmt}\ ,$$
$$\frac{\partial GFT^C_{fct}(\cdot)}{\partial\tau_{fct}} = \sum_m \frac{\partial\Pi^C_{cmt}}{\partial\tau_{fct}} = (1 - (\mu\times O_{fct}))\sum_{m\in\mathcal{M}_{fct}} D_{fmt}\ ;$$

thus $\partial GFT^M_{fct}/\partial\tau_{fct} = -\partial GFT^C_{fct}/\partial\tau_{fct}$ and (10) follows.

equilibrium affiliate fees that channel c receives from all distributors to each other.

Remarks. This bargaining solution in which each pair of distributors and channels agree upon a set of affiliate fees that maximize the Nash product of their gains from trade is motivated by the model put forth in Horn and Wolinsky (1988), and used by Crawford and Yurukoglu (2012) to model negotiations between MVPDs and channels.[35]

Note that the bargaining solution given by (10) is not defined if $\mu \times O_{fct} = 1$; in this case, f and c would perfectly internalize each other's profits when bargaining with one another, and the negotiated τ_{fct} would be indeterminate. Also, in deriving (10), we are leveraging the assumption that distributor bundle prices are set simultaneously with affiliate fees, and there is no anticipated change in p_{fmt} if τ_{fct} changes.[36] Nonetheless, in equilibrium, both bundle prices and affiliate fees will satisfy the pricing first-order conditions given by (5) and the bargaining first-order conditions in (10).

For estimation and our simulations, we assume that Nash bargaining parameters $\zeta_{fct} = \zeta^I$ or $\zeta_{fct} = \zeta^E$ depending on whether c and f are integrated ($O_{fct} > 0$) and bargain internally (I) or non-integrated ($O_{fct} = 0$) and bargain externally (E).

4 Estimation and Identification

In this section, we discuss the estimation of our model's parameters and how they are identified (given our modeling assumptions) from patterns in the data. Our estimation procedure follows two stages:

1. In the first stage, we estimate $\boldsymbol{\theta} \equiv \{\boldsymbol{\theta}_1, \boldsymbol{\theta}_2, \boldsymbol{\theta}_3\}$, where:

   (a) $\boldsymbol{\theta}_1 \equiv \{\boldsymbol{\rho}, \boldsymbol{\nu}, \gamma^d, \gamma^b\}$, where $\boldsymbol{\rho} \equiv \{\rho_c, \rho_c^0\}_{\forall c}$ and $\boldsymbol{\nu} \equiv \{\nu^S, \nu^{NS}\}$, determines household viewership decisions by governing the distribution of $\boldsymbol{\gamma}$ and how fast marginal utilities from viewership decay;

   (b) $\boldsymbol{\theta}_2 \equiv \{\beta^v, \boldsymbol{\beta}^x, \boldsymbol{\rho}^{sat}, \alpha\}$, where $\boldsymbol{\rho}^{sat} \equiv \{\rho^{sat}_{DirecTV}, \rho^{sat}_{Dish}\}$, determines household bundle choice;

   (c) $\boldsymbol{\theta}_3 \equiv \{\mu, \zeta^I, \zeta^E, \sigma^2_\omega\}$ are parameters that affect firm incentives when pricing, bargaining, and bundling channels. Recall that the parameter μ governs the extent to which integrated channels and distributors internalize profits across upstream and downstream units. Finally, σ^2_ω is the variance of an error term that influences MVPDs' bundling decisions in a manner that we discuss below.

[35] Other empirical papers that employ this bargaining solution include Grennan (2013), Gowrisankaran et al. (2015), and Ho and Lee (2015). Collard-Wexler et al. (2015) provide a non-cooperative foundation for this particular bargaining solution in settings where agents negotiate fixed fee transfers. Our model differs from Collard-Wexler et al. in that agents negotiate over linear fees, τ. However, as (11) makes clear, the total equilibrium payment that is made between a channel and distributor in our setting is equivalent to that when bargaining is over fixed fees.

[36] Recall the discussion in footnote 26.

2. In the second stage, we estimate (a lower bound for) our raising rivals' costs (RRC) parameter, λ_R.

To capture the impact of program access rules, we will assume that $\lambda_R = 0$ in non-loophole markets and estimate our first stage parameters using only these markets. That is, we assume that the program access rules effectively require integrated firms to ignore any foreclosure incentives in dealing with non-integrated rivals.[37] We then estimate λ_R using only the markets in our data in which RSNs took advantage of the terrestrial loophole (i.e., Philadelphia and San Diego).

4.1 First Stage Estimation

4.1.1 Moments used in Estimation

We estimate the model parameters via GMM, using the following moments derived from the model described in the previous section.

Household Viewership. For every RSN and 38 national channels in each year, we use the difference between the following viewership moments observed in the data and predicted by the model:

1. Summing across markets, the mean viewership for each channel-year;
2. Summing across markets, the number of households with zero viewership for each (non-RSN) channel-year.

To avoid re-solving the viewership problem for every household for every evaluation of a candidate parameter vector, we follow the importance sampling approach of Ackerberg (2009).

Household Bundle Choice. For every year and bundle, we assume that each bundle's unobservable characteristic is orthogonal to a vector of instruments: i.e., $E[\xi_{fmt}(\boldsymbol{\theta})\boldsymbol{Z}^{\xi}_{mt}] = 0$, where the expectation is taken across all markets, firms, and years. For $\boldsymbol{Z}^{\xi}_{mt}$, we include bundle observable characteristics $\boldsymbol{x}_{fmt}$ and predicted indirect utility of channel viewing v^*_{fmt} (averaged across consumers within the market); we also include the satellite tax within the market to instrument for bundle prices p_{fmt}. We recover $\xi_{fmt}(\boldsymbol{\theta})$ using the standard Berry et al. (1995) inversion.

Distributor Bargaining, Pricing, and Carriage. First, for any $\boldsymbol{\theta}$, the vector of affiliate fees $\{\tau_{fct}\}$ and bundle-specific marginal costs $\{mc_{fmt}\}$ can be directly computed using the optimal pricing and bargaining conditions given by (5) and (10) (see Appendix for further details). We use

[37] There is uncertainty surrounding the appropriate bargaining protocol to use if we instead assume that $\lambda_R > 0$ when PARs are enforced: e.g., it is not clear whether an integrated channel can deny access to a rival distributor in this situation, and whether there would be a binding arbitration process upon "disagreement" (in which case the negotiated affiliate fees with other distributors may be used to determine the arbitration price). Explicitly modeling this process is beyond the scope of the current analysis, and we leverage the assumption that $\lambda_R = 0$ under PARs for tractability.

these predicted values of $\{mc_{fmt}(\boldsymbol{\theta})\}$ and $\{\tau_{fct}(\boldsymbol{\theta})\}$ in constructing the next set of moments which we form using only 2007 data and values:

1. **Average affiliate fees**: For each RSN active in 2007 and four national channels (ABC Family, ESPN, TNT, and USA), we minimize the difference between the model's predicted average affiliate fees across MVPDs and observed average affiliate fees (τ_{ct}^o):

$$E_f[\tau_{fct}(\boldsymbol{\theta})] - \tau_{ct}^o = \omega_{ct}^C \ ,$$

   where deviations, denoted by ω_{ct}^C, reflect measurement error in τ_c. We weight estimated affiliate fees by national MVPD market shares conditional on carriage of the channel to approximate expectations across MVPDs.

2. **Implied markups**: The model's predicted MVPD price-cost markups should match those observed in the data:

$$E_m[(p_{fmt}^o - mc_{fmt}(\boldsymbol{\theta}))/p_{fmt}^o] = markup_{ft}^o \qquad \forall f \in \{Comcast, DirecTV, Dish\} \ .$$

3. **Bundle Optimality and Carriage**: Equation (6) implies that every distributor f chooses the optimal set of channels to include in each bundle in each market m. We assume that distributor f's true per household profits (not per subscriber) in market m are given by $\tilde{\pi}_{fmt}^M(\cdot)$, where:

$$\tilde{\pi}_{fmt}^M(\mathcal{B}_{mt}, \cdot) \equiv [\pi_{fmt}^M(\mathcal{B}_{mt}, \cdot) - \omega_{fmt}(\mathcal{B}_{fmt})] \ , \tag{13}$$

   and $\pi_{fmt}^M(\mathcal{B}_{mt}, \cdot)$ represents our (the econometrician's) estimate of a firm's per household profits. The term $\omega_{fmt}(\mathcal{B}_{fmt})$ represents a mean-zero i.i.d. bundle-distributor-market-time specific disturbance; we assume that $\omega_{fmt}(\cdot) \sim N(0, \sigma_\omega)$.[38]

   Now consider a channel c that has negotiated an agreement with some firm f: i.e., f carries c on its bundles in some non-empty set of markets. A firm's optimal bundling decision given by (6) implies that:

$$\begin{aligned} \Big([\Delta_{fc}\pi_{fmt}^M(\mathcal{B}_{mt} \cup fc, \cdot)] - [\Delta_{fc}\omega_{fmt}(\mathcal{B}_{fmt} \cup fc, \cdot)]\Big) &\geq 0 \qquad \forall m : c \in \mathcal{B}_{fmt} \ , \\ \Big([\Delta_{fc}\pi_{fmt}^M(\mathcal{B}_{mt} \cup fc, \cdot)] - [\Delta_{fc}\omega_{fmt}(\mathcal{B}_{fmt} \cup fc, \cdot)]\Big) &\leq 0 \qquad \forall m : c \notin \mathcal{B}_{fmt} \ , \end{aligned} \tag{14}$$

   where $[\Delta_{fc}\pi_{fmt}^M(\mathcal{B}_{mt}, \cdot)] \equiv \pi_{fmt}^M(\mathcal{B}_{mt}, \cdot) - \pi_{fmt}^M(\mathcal{B}_{mt} \setminus fc, \cdot)$, $[\Delta_{fc}\omega_{fmt}(\mathcal{B}_{fmt})] \equiv \omega_{fmt}(\mathcal{B}_{fmt}) - \omega_{fmt}(\mathcal{B}_{fmt} \setminus fc)$, and $\mathcal{B}_{mt} \cup fc$ denotes the set of all bundles $\mathcal{B}_{mt}$ where c is added to bundle f.[39] That is, these inequalities imply that in any market in which c is carried by f, f obtains higher profits from carrying than by dropping c (holding fixed prices and carriage decisions

[38] We interpret $\omega_{fmt}(\cdot)$ as the difference in our estimated profits and those used by a local system operator when determining carriage decisions; we assume that these disturbances are not accounted for by a distributor when pricing or bargaining with channels.

[39] In cases where $c \in \mathcal{B}_{fmt}$, this definition implies that $\mathcal{B}_{mt} \cup fc = \mathcal{B}_{mt}$.

Table 1: Regression of RSN Carriage on Integration Status, Distance, and Blackout Percentage

	(1)	(2)	(3)	(4)
VI Ownership Share	0.404***	0.435***	0.250**	0.138*
	(0.0674)	(0.0837)	(0.104)	(0.0814)
% Teams not Blacked Out	0.412***	0.399***	0.377***	0.416***
	(0.0494)	(0.0586)	(0.106)	(0.107)
Avg Distance to RSN's Stadiums	-0.559***	-0.630***	-0.877***	-0.828***
(10^3 mi)	(0.100)	(0.117)	(0.235)	(0.268)
Years	2000-10	2007	2007	2007
Systems	All Systems	All Systems	Has P Q	Has P Q
Has Deal	No	No	No	Yes
Observations	154,121	12,246	1,163	1,082
R-squared	0.615	0.616	0.663	0.632

Notes: Linear probability regression where the dependent variable is whether a cable system carries an RSN in 2007. Specifications differ by sample used, where "Has P Q" restricts attention to systems for which price and quantity data is available, and "Has Deal" restricts attention to system-RSN pairs where the MVPD has a deal with the RSN (i.e., carries the RSN on at least one other system). All specifications use DMA, RSN and (when appropriate) year fixed effects. Inclusion of system demographic controls (race, population density, average income, household ownership) did not change point estimates. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standards errors are reported in parenthesis, and are clustered by DMA.

of other firms); similarly, in any market where c is not carried, f obtains higher profits from not carrying than by carrying c.

Given our assumptions on the distribution of $\omega_{fmt}(\cdot)$, it follows that:

$$\Pr(c \in \mathcal{B}_{fmt}) = \Phi([\Delta_{fc}\pi^M_{fmt}(\mathcal{B}_{mt} \cup fc, \cdot)]/(2\sigma_\omega)) \ ,$$

where Φ is the standard normal cumulative distribution function.

We construct several moments based on the model's predicted carriage probabilities. First, we construct moments based on indirect inference (c.f. Gouriéroux and Monfort (1996)) that match the predicted to observed relationship between carriage of an RSN by a system and: the ownership share of the RSN by the system's MVPD, the distance of the system to the RSN's teams' stadiums, and the fraction of teams on the RSN that are not blacked out. Table 1 presents the results of a linear probability regression of a cable system carrying an RSN in our data. We find that carriage of an RSN by a cable system is increasing with the share of the RSN owned by the system's MVPD, and decreasing in the distance between the system and the RSN's teams' stadiums and in the fraction of teams that are blacked out. We perform the same regression using the predicted carriage probabilities from our model, and match the coefficients for vertical integration, distance, and fraction of teams not blacked out from the regression to specification (4) in Table 1.[40]

Second, we match the overall RSN-system carriage probabilities predicted by our model to

[40] We focus on the "Has Deal" specification as our model does not predict the probability of carriage for a system if the MSO and channel do not have a deal.

those observed in the data. Third, we set $\partial\mathcal{L}_{carriage}/\partial\sigma_\omega = 0$, where $\mathcal{L}_{carriage}$ is the predicted log-likelihood of the observed carriage decisions for each system-RSN pair, given by: $\mathcal{L}_{carriage} = \sum_{c\in\mathcal{C}_t^R}\left(\sum_{fm:c\in\mathcal{B}_{fmt}}\log\Pr(c\in\mathcal{B}_{fmt}) + \sum_{fm:c\notin\mathcal{B}_{fmt}}\log\Pr(c\notin\mathcal{B}_{fmt})\right)$, where $\mathcal{C}_t^R$ denotes the set of RSNs.

4.1.2 Identification

We now provide an informal discussion of how the parameters of the model are identified from these moments.

Viewership and Bundle Choice Parameters ($\boldsymbol{\theta}_1, \boldsymbol{\theta}_2$). The main parameters governing the distribution of channel taste parameters γ_{ict} (i.e., $\boldsymbol{\rho}$) are primarily identified from viewing behavior: e.g., channels watched more often have higher values of ρ_c (the mean of the distribution) and lower values of ρ_c^0 (the probability that $\gamma_{ict} > 0$). However, since we do not possess ratings for channels at the system level, we identify the black-out and distance parameters (γ^b and γ^d) primarily from the Bundle Optimality and Carriage moments; we defer discussion of these parameters until the end of this subsection when discussing identification of μ.

Parameters governing household bundle choice ($\boldsymbol{\beta}^x$ and $\boldsymbol{\beta}^v$) are identified from variation in bundle market shares as observed bundle characteristics and channel utility changes: i.e., across firms and years, and as channels are added and dropped from bundles. The satellite tax is an instrument for price, and is used to identify the price sensitivity coefficient α. Information contained in cable and satellite pricing margins helps identify the heterogeneity in preferences for satellite. In particular, the relationship between satellite and cable market shares has strict implications for predicted price elasticities (and hence implied markups) under a standard logit demand system without preference heterogeneity; inclusion of a random preference for satellite (parameterized by $\boldsymbol{\rho}^{sat}$) assists with rationalizing observed markups for a given satellite market share.

In addition to observing how bundle market shares vary based on channel composition (which has limited variation for some channels across markets), matching observed average affiliate fees negotiated for each channel $\{\tau_{ct}^o\}$ to those predicted by the model $\{\tau_{fct}(\boldsymbol{\theta})\}$ is crucial for identifying the values that consumers place on channels. First, our model relates $\tau_{fct}(\boldsymbol{\theta})$ to the gains from trade created when channel c contracts with firm f: i.e., differences in f and c's profits (primarily realized from subscription and advertising revenues) when f drops c. Thus, our model attempts to rationalize a channel with higher observed affiliate fees τ_{ct}^o by predicting that this channel creates greater surplus from carriage: this is partly through the term $\beta^v v_{ift}^*$ in a household's bundle utility equation given by (2), which in turn is also a function of parameters governing the distribution of γ_{ict}, and how γ_{ict} is scaled to enter into utility by ν_c—i.e., a channel with a higher γ_{ic} and lower decay parameter ν_c than another will contribute more to a viewer's utility from the same amount of time the channel is watched.[41]

[41] See also the discussion in the appendix of Crawford and Yurukoglu (2012) which examines a variant of this model using monte carlo simulation.

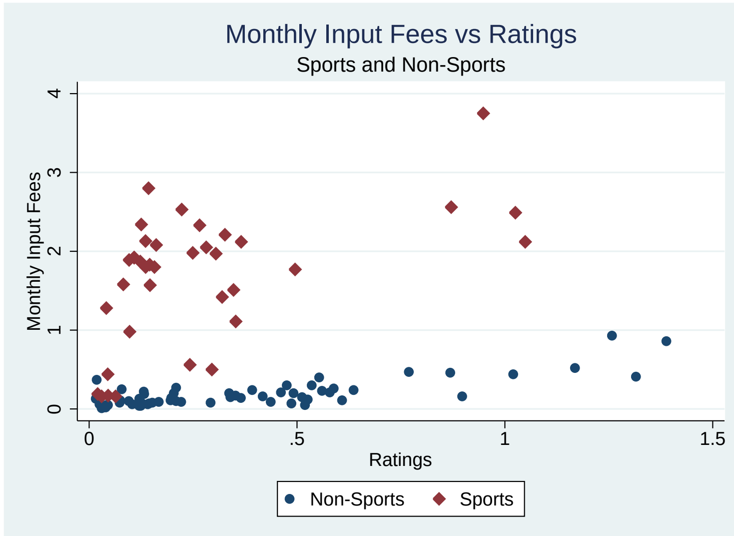
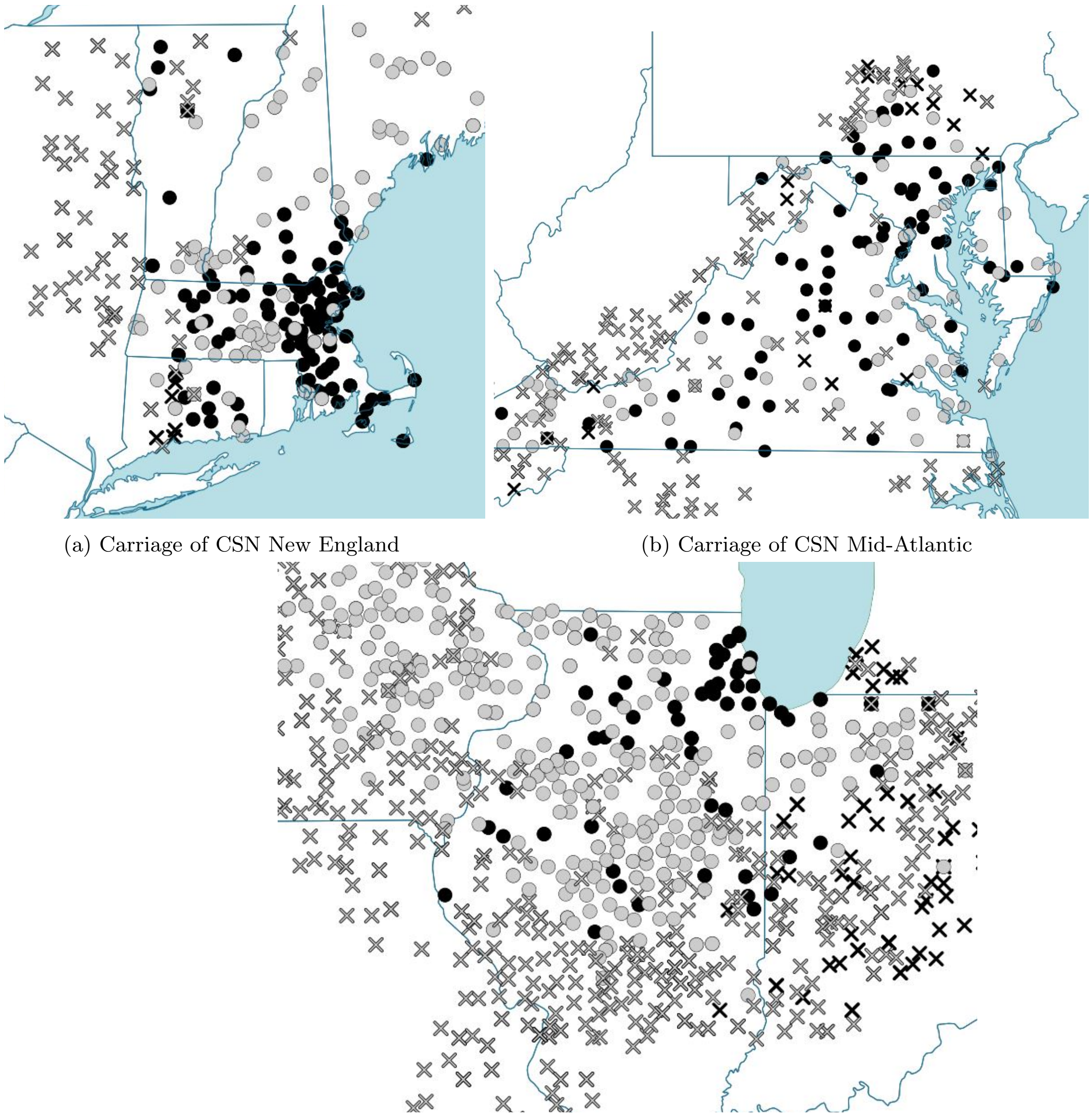


Figure 3: Negotiated monthly affiliate fees and viewership ratings.

To anchor this in an example, consider a single market and bundle with two channels c and d, and a single household i; ignore the time index t. Assume that the household watches d more than c. This could be induced by many potential combinations of $(\gamma_{ic}, \nu_c, \gamma_{id}, \nu_d)$. For example, γ_{id} could be higher than γ_{ic} and $\nu_c = \nu_d$. If this were true, however, then d should obtain higher negotiated affiliate fees as it would be predicted to generate a higher surplus for a viewer, and hence there would be higher gains from trade from carriage of d than c. However, if affiliate fees are observed to be the same for the two channels despite the difference in viewership, then the model would predict that the rate of "decay" (ν_c) and initial utility (γ_c) for channel c were in fact higher than for channel d, thereby allowing c to generate the same utility for consumers—and hence the same negotiated affiliate fees—for the shorter amount of time watched. Suppose now that over time, one of these channels is no longer carried on the bundle. Then variation in market shares for the bundle over time would inform the value of β^v.

The reason that we allow for consumers to possess two different "decay" parameters $\{\nu^S, \nu^{NS}\}$ for sports and non-sports channels is motivated by the data, illustrated in Figure 3. Sports channels have consistently higher negotiated affiliate fees than non-sports channels with similar viewership patterns (ratings), often receiving payments an order of a magnitude higher. Our model rationalizes this fact by assigning a higher decay rate to sports channels, which predicts higher utility delivered to consumers for a given amount of time the channel is watched, and leads to higher affiliate fees due to the greater gains from trade. For computational reasons, we fix $\nu^S = .95$, and estimate only ν^{NS}.

Pricing, Bargaining, and Bundling Parameters ($\boldsymbol{\theta}_3$). Although the internalization parameter μ and Nash bargaining parameters enter into the computation of several moments (including any moment based off of recovered values of $\tau_{fct}(\boldsymbol{\theta})$ and $mc_{fmt}(\boldsymbol{\theta})$), they will primarily be identified



(a) Carriage of CSN New England

(b) Carriage of CSN Mid-Atlantic

(c) Carriage of CSN Chicago

Figure 4: Carriage by Comcast and non-integrated cable MVPDs of three Comcast-integrated RSNs across cable systems in 2007. Circles represent carriage by a system, X's represent no carriage. Black markers represent Comcast systems, grey markers represent non-Comcast cable systems.

off of the Bundle Optimality and Carriage moments.

First, different values for Nash bargaining parameters $\{\zeta^I, \zeta^E\}$ affects the model's ability to match the relationship between factors influencing MVPD and channel "gains from trade" with negotiated input fees. For example, consider a non-integrated MVPD f and RSN c. Note that if $\zeta^E = 0$ (so that the Nash bargaining parameter for distributors is equal to 0 when bargaining with a non-integrated channel), by the bargaining first-order conditions given by (10), input fees

τ_{fct} will be determined solely by MVPD f's gains from trade from carrying channel c (GFT^M_{fct}), and not by the channel c's gains from trade (GFT^C_{fct}). This implies that channel c's advertising revenues a_{ct} enter only into GFT^C_{fct}, and do not affect negotiated input fees. Thus, the extent to which observed channel affiliate fees vary with advertising revenues identifies ζ^E.

Second, as μ increases, distributors have a greater incentive to carry an integrated channel for a fixed value $\tau_{fct}(\cdot)$; hence, the model will help to rationalize higher carriage rates between integrated distributors and channels observed in the data and captured in the regression coefficients reported in Table 1. Black-out and distance parameters, γ^b, γ^d, are identified in a similar fashion. An example of the variation in the data that we leverage is illustrated in Figure 4, which presents the integrated and non-integrated carriage of a Comcast integrated RSN in three different regions of the U.S. In these three settings, cable systems in markets close to the RSN's teams' stadiums almost always carry the RSN; systems far away most often do not. However, in markets located a moderate distance away from these stadiums, these RSNs are much more likely to be carried on systems owned by Comcast than on non-integrated systems. For example, in Figure 4a, all Comcast systems in northern Vermont carry CSN NE (denoted by black circles) whereas most non-Comcast systems do not (denoted by grey X's); and in Figure 4b and in Figure 4c, non-carriage by non-Comcast systems occurs much closer to the RSN's teams' stadiums than for Comcast systems (as there are more grey X's near Washington DC and Chicago than black X's, which denote non-carriage by Comcast systems). These maps also indicate that non-carriage is much more likely in areas where the teams on the RSN are blacked out (as in New York for CSN NE, Pennsylvania for CSN Mid-Atlantic, and Michigan for CSN Chicago).

Finally, we identify the variance of the carriage disturbances, given by σ_ω, primarily from the moment constructed from the predicted likelihood of observing the carriage decisions in the data. In particular, a higher variance is implied by observed carriage decisions that are predicted to be suboptimal by the model.

4.2 Second Stage Estimation: Recovery of λ_R

To recover our RRC parameter λ_R, we will use information provided by markets in which distributors are able to exclude competitors from carrying an integrated RSN channel—i.e., terrestrial loophole markets. The markets we focus on will be Philadelphia and San Diego, the channels in question CSN Philadelphia (owned by Comcast) and 4SD (owned by Cox), and the competitors excluded from carriage are satellite providers DirecTV and Dish.

Unilateral Deviations. Consider a channel c that is integrated with cable distributor f and that is "relevant" in markets $\mathcal{M}_c$.[42] If we observe that channel c does not contract with satellite distributor $g \neq f$, we will assume that λ_R must have been sufficiently large for it to be an equilibrium

[42] We use the definition for "relevant" that is provided in Section 2.2: i.e., all markets where, across all cable systems within that market's DMA, the average fraction of teams carried by the RSN that are not blacked out is greater than or equal to 30 percent.

outcome that c and g not contract with one another. A *necessary* condition for this is that there is no affiliate fee $\tilde{\tau}_{gct}$ such that c and g would both find it profitable to contract with one another:

$$\sum_{m\in\mathcal{M}_c}\Bigg[\underbrace{[\Delta_{gc}\Pi^M_{gmt}(\{\mathcal{B}^o_{mt}\cup gc\},\boldsymbol{p}^o_{mt},\tilde{\boldsymbol{\tau}};\hat{\mu})]}_{GFT^M_{gcmt}(\tilde{\tau}_{gct},\cdot)}+\underbrace{[\Delta_{gc}\Pi^C_{cmt}(\{\mathcal{B}^o_{mt}\cup gc\},\boldsymbol{p}^o_{mt},\tilde{\boldsymbol{\tau}};\hat{\mu},\lambda_R)]}_{GFT^C_{gcmt}(\tilde{\tau}_{gct},\cdot)}\Bigg]\leq 0\ \forall\ \tilde{\tau}_{gct}\ , \quad (15)$$

where the o superscript denotes variables that are observed, $\{\mathcal{B}^o_{mt}\cup gc\}$ denotes the set of observed bundles with the modification that g carries c in all (relevant) markets,[43] $\hat{}$ are estimated values from the first-stage estimation, $\tilde{\boldsymbol{\tau}}\equiv\{\tilde{\tau}_{gct},\hat{\boldsymbol{\tau}}_{-gct}\}$, $\hat{\boldsymbol{\tau}}_{-gct}$ represents all affiliate fees except those between g and c, and $GFT^M_{gcmt}(\tilde{\tau}_{gct},\cdot)$ and $GFT^C_{gcmt}(\tilde{\tau}_{gct},\cdot)$ represent g and c's respective gains from trade from agreement in market m with affiliate fee $\tilde{\tau}_{gct}$.[44]

Since we are evaluating a deviation in a model in which bundle composition, bundle prices, and affiliate fees are simultaneously determined, when computing "counterfactual" profits from agreement between channel c and distributor g (the terms with underbraces in (15)), we hold fixed bundle prices and carriage decisions for all other channels and all other distributors.[45] In that case, condition (15) holds at all $\tilde{\tau}_{gct}$ if and only if the joint profit of the two parties is larger with non-supply. Under our bargaining assumptions, the change in joint profit with satellite distributor g is calculated assuming that satellite distributor $g\neq g'$ does not have access to the RSN.

Multilateral Deviations. In the event of being offered a deviating deal for RSN c, satellite distributor g might instead believe that the other satellite distributor g' has also been offered a deal. With such a belief, a deal may be less likely between g and c, leading non-carriage to be sustained at a lower level of λ_R. As we will be estimating a lower bound for λ_R, we take a conservative approach by making use of a necessary condition for non-supply of both satellite distributors to be an equilibrium regardless of the satellite distributors' beliefs. Specifically, we will determine whether, at the observed set of bundles, affiliate fees, and bundle prices, there are no gains from trade between c and *both* satellite providers g and g' (thereby ruling out the presence of this profitable deviation):

$$\sum_{m\in\mathcal{M}_c}\Bigg[[\Delta_{gc,g'c}\Pi^M_{gmt}(\{\mathcal{B}^o_{mt}\cup\{gc,g'c\}\},\boldsymbol{p}^o_{mt},\tilde{\boldsymbol{\tau}};\hat{\mu})]+[\Delta_{gc,g'c}\Pi^M_{g'mt}(\{\mathcal{B}^o_{mt}\cup\{gc,g'c\}\},\boldsymbol{p}^o_{mt},\tilde{\boldsymbol{\tau}};\hat{\mu})]\ldots$$
$$+[\Delta_{gc,g'c}\Pi^C_{cmt}(\{\mathcal{B}^o_{mt}\cup\{gc,g'c\}\},\boldsymbol{p}^o_{mt},\tilde{\boldsymbol{\tau}};\hat{\mu},\lambda_R)]\Bigg]\leq 0\ , \quad (16)$$

[43]Recall that a satellite distributor offers the same bundle in all markets, and that we assume that it carries any channel with which it has negotiated an agreement.

[44]To be precise, affiliate fees are not directly estimated; instead, we compute their implied values at the estimated parameters $\hat{\boldsymbol{\theta}}$: i.e., $\hat{\boldsymbol{\tau}}\equiv\boldsymbol{\tau}(\hat{\boldsymbol{\theta}})$, where $\boldsymbol{\tau}(\cdot)$ is the solution to the Nash bargaining first-order condition given by (10).

[45]The condition that there does not exist a deviation to carriage is not the same as testing whether carriage of c by g would comprise an equilibrium outcome, as the latter would require (among other things) computing equilibrium prices and affiliate fees conditional on carriage of c by g.

where the three terms on the left-hand side of the inequality represent g, g', and c's gains from trade from both g and g' being supplied with channel c and carrying the channel in all of g's relevant markets, and $\tilde{\boldsymbol{\tau}}$ is equal to $\hat{\boldsymbol{\tau}}$ except that $\tilde{\tau}_{gct} = \tilde{\tau}_{g'ct} = 0$. We refer to the sum of these terms as the *three-party-surplus* from carriage of c by satellite providers.[46]

We estimate a lower bound of λ_R, denoted $\hat{\underline{\lambda}}_R$, by finding the lowest value that ensures that (16) holds for both of the cable-integrated RSNs that do not contract with satellite providers in the loophole markets (CSN Philadelphia and 4SD).

Incentives for Exclusion. It is instructive at this point to discuss the competing forces that would induce a cable provider to withhold its integrated RSN from a satellite provider. This is equivalent to understanding why the gains created by satellite provider being supplied with the RSN may be offset by the losses incurred by the integrated cable provider.

The primary gains created when a satellite provider g is supplied with the RSN are through potential market expansion effects from carriage: i.e., if consumers who previously did not subscribe to an MVPD now would if satellite were to carry the RSN. Each household that substitutes from the outside good to g would generate additional industry profit equal to the level of g's margins plus any additional advertising revenues generated by those households watching the RSN.

The primary losses generated by supplying g with the RSN would be incurred by the RSN's integrated cable owner if households substituted away from the integrated cable provider to g. Although these consumers would generate profit for g, insofar as cable margins are higher than those of satellite providers (by 10+ percentage points in our data), any household that switched from cable to satellite as a result of supplying satellite with the RSN would reduce industry profit by this difference in margins.

Consequently, factors that would make exclusion of satellite by an integrated cable owner (for $\lambda_R > 0$) more likely would include: a smaller share of consumers that are not subscribers to any MVPD and lower advertising rates (thereby reducing the potential gains generated by market expansion); and a larger cable "footprint" (market share) in the RSN's relevant market area, closer substitutability between satellite and cable distribution, and a larger differential between cable and satellite margins (all of which would exacerbate the losses from business stealing by satellite from cable). However, for lower values of λ_R (closer to 0), any losses that would be incurred by the RSN's integrated owner would be internalized less by the RSN when bargaining with g, reducing the likelihood of exclusion occurring.

[46] Specifically, if the three-party-surplus is positive, then RSN c has a deviating pair of offers $\{\tilde{\tau}_{gc}, \tilde{\tau}_{g'c}\}$ to both satellite distributors that both will accept regardless of their beliefs over whether their rival is supplied, and will increase c's profits. We prove this in Appendix A.

Table 2: Estimates of Key Parameters

		Estimate	SE
Viewership Parameters	ν^{NS}	0.60	0.00
$\boldsymbol{\theta}_1$	ν^{S}	0.95	-
	γ^{d}	-2.83	0.24
	γ^{b}	-3.34	0.16
Bundle Choice Parameters	α	-1.01	0.23
$\boldsymbol{\theta}_2$	β^{v}	0.15	0.05
	$\rho^{sat}_{DirecTV}$ (10^2)	0.36	0.12
	ρ^{sat}_{Dish} (10^2)	0.43	0.15
Pricing, Bargaining, and	σ^2_{ω}	0.03	0.03
Bundling Parameters	ζ^{E}	0.39	0.04
$\boldsymbol{\theta}_3$	ζ^{I}	0.49	0.02
	μ	0.97	0.05
	$\mu \times \underline{\lambda}_R$	1.07	0.30

Notes: Selected key parameters from the first and second stage estimation of the full model, where parameter ν^S is held fixed in estimation. Additional viewership parameters contained in $\boldsymbol{\theta}_1$ are reported in Appendix; state-firm and year fixed effects in $\boldsymbol{\theta}_2$ are not reported. Asymptotic GMM standard errors (for all parameters except $\mu \times \underline{\lambda}_R$) are computed using numerical derivatives and 225 bootstrap draws of markets and simulated households to estimate the variance-covariance matrix of the moments. We report the standard error for $\mu \times \underline{\lambda}_R$ by holding fixed other parameter estimates and re-estimating across 225 bootstrap draws of markets and simulated households.

5 Parameter Estimates

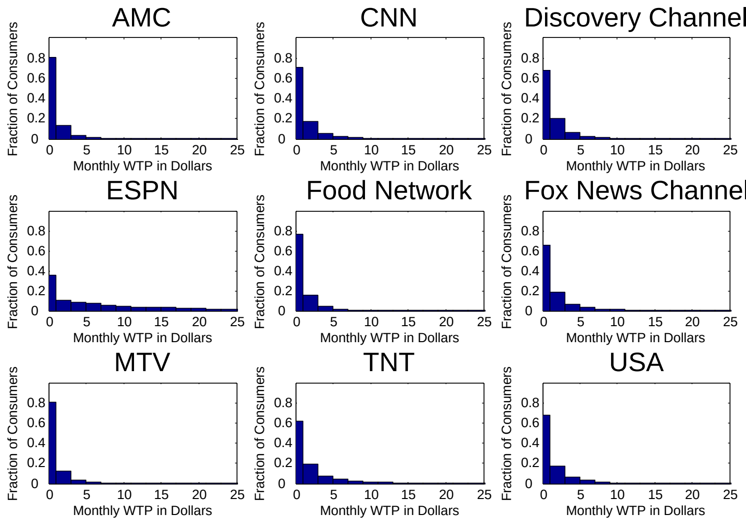
Estimates of selected key parameters of our model are reported in Table 2. We discuss our estimates primarily through how they influence predicted moments relating to consumer viewership and subscription patterns, firm pricing and carriage decisions, and negotiated agreements.

5.1 Channel Valuations and Viewership

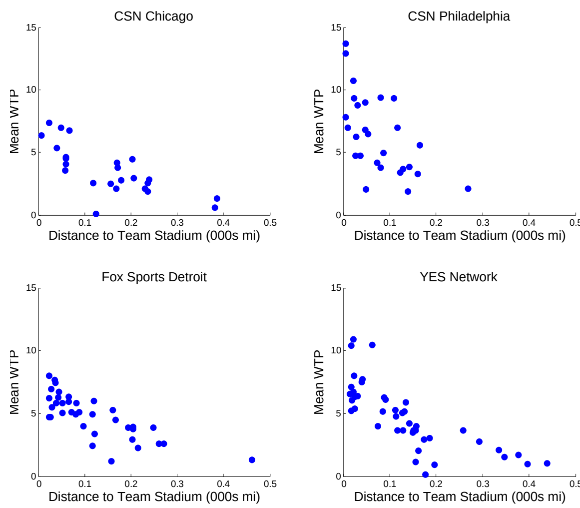
Our model predicts the willingness-to-pay (WTP) for each channel by computing the contribution of a given channel to bundle utility for each household (v^*_{ijt} in (2)), multiplying it by our estimates of β^v/α to convert it into dollars, and averaging across households (as households have different tastes (γ_{ict}) for each channel, which are distributed according to parameters $\boldsymbol{\rho}$).[47] We report estimated values of these parameters and WTPs for all channels in Appendix C, Table 9. We also depict the distribution of household WTPs for nine national channels in Figure 5a. Although most national channels have average WTP values below \$1 per month (and other than sports channel ESPN, none exceed \$2), the pattern is very different for RSNs: only 3 out of 30 are predicted to have average WTP values less than \$1 per month, and over 75% are greater than \$2.

Our estimates of the RSN distance-decay parameter γ^d and blackout parameter γ^b are negative, and imply that consumers derive less utility from watching an RSN both (i) the further they are from the teams carried on the RSN, and (ii) the greater the fraction of teams that are blacked out.

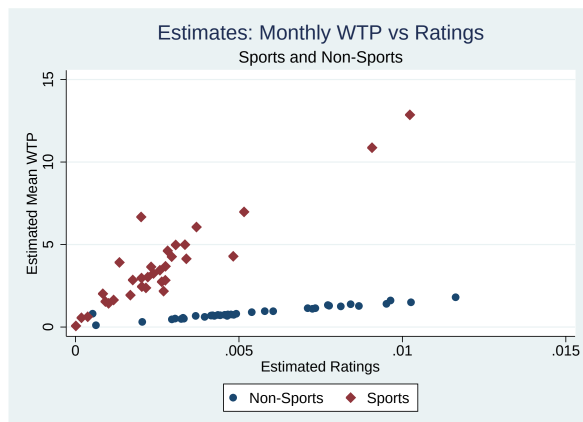
[47] We compute the average WTP for channels relative to a synthetic bundle that includes every national channel carried by at least 60% of bundles in 2007, and by using 20,000 simulated households. When computing the WTP for an RSN c, we add the RSN to the bundle and use the average values of b_{ict} and d_{ic} across all markets that carry the RSN.



(a) Histograms of monthly WTP for selected national channels.



(b) Mean WTP in a market versus distance to RSN's teams' stadiums, for four RSNs.



(c) Estimated monthly WTP versus estimated ratings for sports and non-sports channels

Figure 5: Predicted willingness-to-pay (WTP) for channels (2007 values).

We predict that increasing the average distance of a household from an RSN's teams' stadiums from 0 to 100 miles reduces that household's value of the channel by 25%.[48] Figure 5b illustrates this pattern, and plots the predicted average WTP for four different RSNs as the distance from a household to an RSN's teams' stadiums increases.[49] Similarly, we predict that subjecting half of the teams that an RSN normally broadcasts to blackout restrictions reduces consumers' valuation of the channel by 80%.

[48] As distance is measured in thousands of miles, being further away by 100 miles scales utility by $\exp(-2.83 \times 0.1)$.

[49] Each point in Figure 5b corresponds to a market in which the RSN is carried in 2007, and the WTP for each market is computed by averaging over 160 simulated households per market using that market's value of b_{ict} and d_{ic}.

Table 3: Elasticities and Margins

Elasticity of row with respect to price of column:	Cable	DirecTV	Dish
Cable	-2.347	0.445	0.285
DirecTV	3.001	-4.259	0.240
Dish	4.160	0.480	-6.355
Mean Cable Margin	0.628		
Mean DirecTV Margin	0.410		
Mean Dish Margin	0.422		
OLS Logit Price Coefficient	-0.0046**	(t: -2.40)	
IV Logit Price Coefficient	-0.0987***	(t: -6.17)	

Notes: This table reports predicted mean price elasticities and margins by cable and the two satellite distributors, as well as the effect of the satellite tax instrument on the price coefficient in a logit demand system.

Finally, we estimate ν^{NS} to be different than ν_S (which we fix at 0.95); the lower estimated value of ν^{NS} implies that consumers' marginal utility from watching non-sports channels falls slower than for sports channels; in turn, this implies that consumers derive higher utility from sports channels than non-sports channels if they choose to spend the same amount of time spent watching each. Our model thus predicts that sports channels receive higher negotiated affiliate fees for the same viewership ratings, as depicted in Figure 5c.

5.2 Subscription and Bundle Choice

All reported coefficients in $\boldsymbol{\theta}_2$ are statistically significant, and have the expected sign: consumers negatively respond to price (α), and positively respond to the indirect utility they receive from a bundle's channels (β^v).

In Table 3, we report average predicted own and cross price elasticities and implied margins for cable and satellite MVPDs predicted by our model. Demand for the average cable system is more inelastic (-2.3) than for satellite (-4.3 and -6.4), which is consistent with higher cable market shares and margins. The bottom panel of Table 3 reports the effect of instrumenting for bundle prices using the satellite tax instrument that was discussed in the previous section. In a logit demand system, instrumenting for price yields a 20 times larger estimated price coefficient, consistent with the presence of a positive correlation between price changes and unobservable bundle characteristics.

Estimated values of $\rho^{sat}_{DirecTV}$ and ρ^{sat}_{Dish} indicate consumers have substantial heterogeneity in their valuation for satellite bundles (a standard deviation of approximately $40 per month); as discussed earlier, such heterogeneity assists the model in matching observed Comcast, DirecTV, and Dish price-cost margins.

5.3 Bargaining and Bundling

We now discuss the parameters contained in $\boldsymbol{\theta}_3$ which govern a firm's bundling and bargaining decisions, both within and external to the firm.

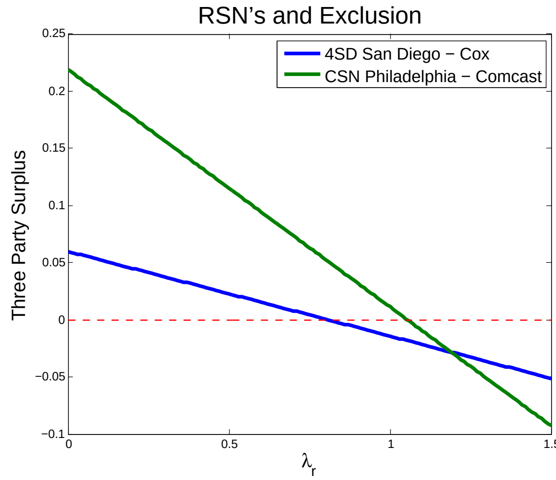


Figure 6: Three-party surplus between the integrated cable MVPD, DirecTV, and Dish as a function of $\mu \times \lambda_R$ in Philadelphia and San Diego.

First, we estimate that the variance of firms' bundle-market-time specific profit shocks (σ^2_ω) is \$0.03 per subscriber, but is not statistically significant. We estimate that channels tend to equally split gains from trade when bargaining with integrated distributors ($\hat{\zeta}^I = .49$), but capture slightly more of the surplus when bargaining externally with non-integrated distributors ($\hat{\zeta}^E = .39$).

Our estimated value of μ indicates that firms do internalize the profits of other integrated units when making decisions. Indeed, we cannot reject the hypothesis that when determining pricing and carriage on its bundles, an MVPD fully internalizes potential effects on affiliate fees and advertising revenues accruing to integrated channels; and when bargaining internally, an integrated MVPD and channel face no double marginalization incentives.

Our estimated lower bound for $\mu \times \underline{\lambda}_R$ is 1.07, which indicates that integrated channels' supply decisions vis-à-vis non-integrated rival distributors are significantly affected by foreclosure incentives. Figure 6 graphs the total three party surplus between the integrated channel and the two satellite distributors in the two loophole markets we examine (Philadelphia and San Diego). We see that for values of lower than .81, it is not an equilibrium for either channel to exclude both satellite distributors as there would be a profitable deviation (for some negotiated set of affiliate fees) for the channel to be supplied. However, for values between approximately .81 and our estimate, we can rationalize exclusion in San Diego but not Philadelphia. Only for values of $\mu \times \underline{\lambda}_R \geq 1.07$ does our model rationalize exclusion in both of these loophole markets.

Indeed, given $\hat{\mu} = .97$, our estimate implies that $\underline{\lambda}_R$ is at least 1.1, which corresponds to integrated MVPDs putting more than full weight on the benefits from foreclosure. However, we cannot reject the hypothesis that $\underline{\lambda}_R = 1$.

6 The Welfare Effects of Vertical Integration

In this section we use our model's estimates to examine how vertical integration affects affiliate fee negotiations, distributors' pricing and carriage decisions, and—ultimately—firm and consumer welfare. We focus on 27 RSNs that were active in 2007, 13 of which were (at least partially) integrated with a downstream distributor (11 with a cable MVPD, 3 with DirecTV).[50] Of these integrated RSNs, two—CSN Philadelphia and 4SD—were owned by cable distributors in "loophole" markets, and were not provided to satellite. Consequently, there is variation in both integration and ownership as well as whether or not the RSN is subject to program access rules (PARs) during this time period. For every RSN, we simulate counterfactual market outcomes if the RSN is or is not integrated, and if it is integrated, whether or not PARs are enforced.

6.1 Potential Effects

Before proceeding, it is instructive to highlight the effects of vertical integration that are captured by our model and that we attempt to quantify. Our model emphasizes three main supply side decisions: (i) negotiations over affiliate fees and supply between channels and distributors, and both (ii) bundle pricing and (iii) channel carriage (conditional on supply) by distributors. When an MVPD and a channel are integrated, our estimated value for $\hat{\mu} > 0$ implies that integrated downstream and upstream units (partially) internalize joint profits when making these decisions; furthermore, our estimated value for $\hat{\underline{\lambda}}_R > 0$ implies that an integrated channel may have incentives to foreclosure a rival downstream distributor. (Note that we perform our counterfactuals when PARs are not in force using our lower-bound estimate, $\hat{\lambda}_R$. If $\lambda_R > \hat{\lambda}_R$, incentives to foreclosure would be larger than those considered in our counterfactuals.)

For discussion, assume that MVPD f integrates with channel c, and that there is a rival MVPD g and another channel d. The following effects of vertical integration are admitted in our setting:

1. **Bargaining Effects and Foreclosure:** When c bargains with a rival MVPD g (since $\hat{\underline{\lambda}}_R > 0$), c internalizes lost revenues to its integrated downstream distributor f if g is supplied; the gains-from-trade that accrue to c by supplying g are thus reduced, potentially leading to a higher negotiated affiliate fee τ_{gct} or—if gains-from-trade are eliminated altogether—non-supply.

2. **Pricing Effects:**

   (a) MVPD f faces a lower "perceived" marginal cost as it (nearly fully) internalizes affiliate fee payments made to c, thereby mitigating double marginalization incentives;

   (b) MVPD f internalizes affiliate fees paid by any rival MVPD g to integrated channel c, thereby partly alleviating bundle pricing pressure across MVPDs (by increasing f's "effective" marginal cost) as f now partly benefits from customers lost to g (Chen, 2001).

[50] We exclude from our analysis 3 cable-integrated RSNs (CSN NW, CSS, and Cox Sports TV) that did not supply either satellite provider in markets where PARs were in effect as our model does not explain this exclusion. This leaves us with 27 RSNs.

3. **Carriage Effects:** MVPD f may be more likely to carry c in markets where the gains-to-carriage are low as, again, f internalizes payments made to c and faces a lower perceived marginal cost of carriage.

The welfare effects of some of these incentives may be straightforward to sign ex ante; for others, it is not clear. Downstream foreclosure, for instance, may likely lead to consumer welfare losses: if g loses access to c or pays a higher affiliate fee τ_{gct}, g's subscribers may receive less utility from their bundle of channels (from reduced choice or higher prices); f's price may also increase in response to facing a weaker competitor. However, the two pricing effects have potentially opposite effects: whereas effect 2(a) would favor lower bundle prices, 2(b) may mitigate price competition and push prices higher. Finally, increased carriage of channels may raise consumer welfare.

There are also other potential effects of vertical integration that are not accounted for in our model. Most importantly, we have not modeled investment in channel, programming, and distribution service quality, which may change upon integration (Grossman and Hart, 1986; Bolton and Whinston, 1991; Hart, 1995). Consequently, although our counterfactuals are indeed rich, they are still only partial equilibrium results, and any interpretation of our findings must be made with this in mind.

6.2 Implementation

For each RSN that is active in 2007, we simulate market outcomes for that year in the RSN's relevant DMAs under the following three scenarios:

1. **Integration and no-PARs:** In this environment, for any non-integrated RSN in the data, we assign full ownership of the channel to the largest cable MVPD in that RSN's relevant DMAs; for any integrated RSN in the data, we do not change its ownership structure. In this environment, we use our estimated values of μ and $\mu \times \underline{\lambda}_R$ so that all RSNs are allowed to potentially exclude and not supply rival MVPDs.

   For each cable-integrated RSN, we determine whether or not each satellite distributor is supplied with the channel by re-computing affiliate fees, bundle prices, and carriage decisions that satisfy the necessary conditions given by equations (5), (6), and (10) for each potential supply outcome (supply both satellite distributors, supply only Dish or only DirecTV, or supply neither satellite distributor), and test which are robust to supply deviations by the RSN or satellite providers.[51]

[51] At the set of affiliate fees, prices, and carriage decisions which satisfy the necessary conditions under each potential supply outcome, we test: whether supplying both satellite providers is an equilibrium by examining if there are positive bilateral gains from trade between the RSN and each satellite provider; whether supplying only one satellite distributor is an equilibrium by examining if there are positive gains from trade between the RSN and the supplied satellite distributor, and if there are no bilateral gains from trade between the RSN and the non-supplied satellite distributor; and whether supplying neither satellite distributor is an equilibrium by examining if the *three-party-surplus* given by (16) is negative. For all RSNs but four, exactly one supply outcome was robust to these tests. For four RSNs, exactly two supply outcomes were robust: for 4SD, CSN NE, and CSN Philadelphia, they were the non-supply of both satellite distributors and the supply of only one satellite distributor (Dish in the case of 4SD,

For each of the three RSNs owned by DirecTV, we use the bilateral surplus given by (15) (computed at the updated affiliate fees, bundle prices, and carriage decisions) to determine whether or not each cable MVPD in the RSN's relevant markets and Dish Network is provided with the channel.

2. **Integration and PARs:** We follow the same setup as in the Integration and no-PARs case, except that we assume that: $\lambda_R = 0$, the two integrated loophole RSNs—CSN Philadelphia and 4SD—are supplied to both satellite distributors, and the supply decisions of all other RSNs are unchanged.[52]

3. **Non-Integration:** We follow the same setup as in the Integration and PARs case, except that we assume that $\mu = 0$ so that all RSNs are effectively non-integrated (i.e., no MVPD or channel internalizes the profits of any other unit). This is equivalent to assuming that ownership shares $O_{fct} = 0$ for all MVPDs and RSNs.

To account for potential carriage changes as integration status varies, we adopt the following procedure for the RSN c that is being examined: we first draw a vector of carriage disturbances $\{\Delta_{fc}\omega_{fmt}\}_{f,m}$ for all MVPDs and markets that are contained in RSN c's relevant DMAs, where each element $\Delta_{fc}\omega_{fmt}$ is drawn from a truncated normal distribution with variance $4\hat{\sigma}_{\omega}^2$ to rationalize observed carriage decisions in the data given by (14).[53] We then update carriage decisions for each cable distributor and market according to (14) using updated counterfactual profits and this vector of carriage disturbances.

In all scenarios for the RSN in question, we solve for a set of supply decisions, negotiated affiliate fees, bundle prices, and carriage decisions that satisfy the necessary conditions discussed above, and take an average of outcomes over 10 sets of carriage disturbance draws. In our counterfactuals, we assume that changes in ownership for single RSNs do not cause national satellite prices to adjust, and thus hold satellite prices fixed at observed levels. Further details are provided in Appendix B.3.

6.3 Results

Table 4 reports market shares, prices, firm profits, and consumer welfare across three different integration scenarios ("(i) VI, no PARs," "(ii) VI, PARs," and "(iii) No VI") for six selected RSNs. Panel I contains the two cable-integrated RSNs that operate in terrestrial loophole markets; Panel II contains two selected cable-integrated RSNs located in non-loophole markets; and panel

DirecTV for CSN NE and CSN Philadelphia); for NESN, they were the supply of only one satellite distributor (Dish) and the supply of both satellite distributors. We report results in the main text assuming that the outcome with the least supply is chosen (motivated by the exclusion of both satellite providers in the data for the two loophole RSNs). In Appendix Table 14, we report results for these four channels under the alternative supply outcome.

[52] Aside from the loophole RSNs, all RSNs are provided to all distributors in 2007 except in four cases: integrated RSNs CSN Northwest, Comcast/Charter Sports Southeast, and Cox Sports TV supply neither satellite provider; YES Network is independent and does not supply Dish. We exclude from our analysis the first three channels, and hold fixed YES's supply decisions when it is integrated.

[53] I.e., for every market m where $c \in \mathcal{B}_{fmt}$, we draw $\Delta_{fc}\omega_{fmt}$ conditional on it being less than $\Delta_{fc}\pi^M_{fmt}(\mathcal{B}_{mt}, \cdot)$; and for every market m where $c \notin \mathcal{B}_{fmt}$, we draw $\Delta_{fc}\omega_{fmt}$ conditional on it being greater than $\Delta_{fc}\pi^M_{fmt}(\mathcal{B}_{mt} \cup fc, \cdot)$.

III contains two selected non-integrated RSNs that are assigned a cable owner in the integrated scenarios. For each panel, one of the scenarios corresponds to what is observed in the data: e.g., scenario (i) corresponds to the actual environment for the terrestrial loophole RSNs. All reported figures except for market shares are in $ per household per month, and all percentage changes denoted $\%\Delta_{lvl}$ are relative to the non-integration scenario (iii). We also report the level change from scenario (iii) in surplus and welfare calculations as a percentage of the channel's estimated consumer WTP (denoted $\%\Delta_{WTP}$).

Below each RSN name is the MVPD that either owns the channel or is assigned ownership of the RSN, the number of households in the RSN's relevant DMAs, the MVPD owner's footprint (which is the percentage of households that the MVPD "passes" or plausibly could serve) in the RSN's relevant DMAs, and the average estimated WTP for the channel. A missing value for "Aff Fees to Sat" indicates that the RSN is predicted to be withheld from the two satellite distributors. Outcomes for all RSNs that are not contained in Table 4 are reported in Appendix Tables 10-13.

Table 5 reports market outcomes across all scenarios averaged across RSNs and weighted by the number of households in each RSN's relevant DMAs. Average outcomes are reported across four panels: the first three panels are the same as used in Table 4, and the last is for all RSNs in our sample. "Aff Fees to Rival" represents the affiliate fees charged to the integrated MVPD's rival distributors (i.e., both satellite MVPDs if the channel is cable-integrated, and each cable MVPD in the RSN's relevant markets and Dish if the channel is DirecTV-integrated) *conditional on the channel being supplied*. "# Foreclosed to Sat" represents the number of RSNs in each panel that are not provided to satellite distributors (as we predict that DirecTV-integrated RSNs are never withheld from cable distributors).

Efficiency Effects: Reduction of Double Marginalization and Increased Carriage. We first focus on the potential efficiency gains from vertical integration, which are highlighted by examining the difference between scenario (ii), representing integration with PARs in effect, and scenario (iii), representing non-integration.

Across all RSNs (bottom panel of Table 5), we predict that integration of a single RSN with PARs in effect yields on average a 1.5% ($0.83) decrease in cable prices. Though integration of most RSNs yields less than a $1 decrease in cable prices, there are notable exceptions: e.g., integrating NESN with Comcast, reported in the bottom panel of Table 4, results in average cable prices falling by nearly $5 (8%) due to NESN's high estimated affiliate fees to Comcast (over $5.6 per month in scenario (i)). As discussed in Section 6.1, pricing reductions arise primarily from the reduction of double marginalization. However, there are offsetting effects that may mitigate downward pricing incentives: integrated distributors now internalize affiliate fees paid by rival MVPDs, and carriage by all cable providers increases on average by approximately 18% when the channel is integrated (thereby increasing the utility delivered by bundles in certain markets). Even so, average cable prices are predicted to increase in only two cases (and by no more than $0.30).

Although it appears in the results that cable providers are occasionally made worse off when

Table 4: Simulated Market Outcomes for Selected RSNs

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
I. VI, LOOPHOLE								
4SD	Avg Cable Mkt Share	0.74	2.2%		0.76	4.6%		0.73
Cox	Avg Sat Mkt Share	0.15	-10.1%		0.16	-4.6%		0.17
#HHs 2.81M	Avg Cable Carriage	0.50	0.0%		0.85	70.5%		0.50
Footprint 100%	Avg Cable Prices	51.78	-0.3%		49.83	-4.1%		51.95
WTP $6.67	Aff Fees to Sat	-			1.47	-16.5%		1.76
	Cable Surplus	29.75	1.9%	8.2%	27.82	-4.7%	-20.7%	29.20
	Satellite Surplus	3.71	-4.6%	-2.7%	3.77	-3.2%	-1.9%	3.89
	RSN Surplus	1.40	-19.2%	-5.0%	3.39	95.3%	24.8%	1.74
	Consumer Welfare	35.06	-1.7%	-8.9%	38.06	6.7%	36.1%	35.65
	Total Welfare	69.93	-0.8%	-8.4%	73.04	3.6%	38.3%	70.49
CSN PHIL	Avg Cable Mkt Share	0.66	6.7%		0.64	3.8%		0.62
Comcast	Avg Sat Mkt Share	0.16	-15.6%		0.18	-4.0%		0.18
#HHs 4.25M	Avg Cable Carriage	0.97	19.7%		0.96	18.5%		0.81
Footprint 90%	Avg Cable Prices	53.61	-0.9%		52.93	-2.2%		54.10
WTP $6.98	Aff Fees to Sat	-			2.78	7.3%		2.59
	Cable Surplus	30.83	5.3%	22.1%	29.50	0.7%	3.1%	29.29
	Satellite Surplus	4.42	-7.7%	-5.3%	4.56	-4.7%	-3.3%	4.79
	RSN Surplus	2.04	-21.3%	-7.9%	2.81	8.4%	3.1%	2.60
	Consumer Welfare	34.33	-0.5%	-2.4%	35.79	3.7%	18.5%	34.50
	Total Welfare	71.62	0.6%	6.4%	72.66	2.1%	21.4%	71.17
II. VI, NON-LOOPHOLE								
CSN NE	Avg Cable Mkt Share	0.62	0.1%		0.63	1.3%		0.62
Comcast	Avg Sat Mkt Share	0.11	-8.1%		0.12	-3.1%		0.12
#HHs 5.2M	Avg Cable Carriage	0.88	99.4%		0.89	99.6%		0.45
Footprint 85%	Avg Cable Prices	56.55	2.7%		55.38	0.5%		55.09
WTP $3.25	Aff Fees to Sat	-			1.12	-10.1%		1.25
	Cable Surplus	28.20	-1.8%	-15.5%	27.76	-3.3%	-29.3%	28.71
	Satellite Surplus	2.99	-3.6%	-3.5%	3.03	-2.7%	-2.6%	3.11
	RSN Surplus	2.13	161.2%	40.3%	2.37	190.3%	47.7%	0.82
	Consumer Welfare	35.63	-0.7%	-7.4%	36.55	1.9%	20.9%	35.87
	Total Welfare	68.97	0.7%	13.9%	69.71	1.7%	36.8%	68.51
MSG	Avg Cable Mkt Share	0.68	2.2%		0.68	2.3%		0.66
Cablevision	Avg Sat Mkt Share	0.15	-2.4%		0.15	-2.4%		0.15
#HHs 11.7M	Avg Cable Carriage	0.89	29.3%		0.89	29.3%		0.72
Footprint 42%	Avg Cable Prices	56.70	-1.4%		56.69	-1.4%		57.48
WTP $1.64	Aff Fees to Sat	0.93	57.9%		0.62	5.3%		0.59
	Cable Surplus	32.93	-1.1%	-21.9%	32.93	-1.1%	-21.9%	33.29
	Satellite Surplus	3.77	-3.8%	-9.2%	3.82	-2.6%	-6.2%	3.92
	RSN Surplus	1.37	77.3%	35.4%	1.32	70.7%	32.3%	0.79
	Consumer Welfare	34.66	1.8%	36.9%	34.67	1.8%	37.5%	34.05
	Total Welfare	72.73	0.9%	41.2%	72.74	0.9%	41.6%	72.06
III. NON-INTEGRATED								
FS DETROIT	Avg Cable Mkt Share	0.58	3.1%		0.58	3.2%		0.56
*Comcast	Avg Sat Mkt Share	0.17	-1.7%		0.16	-1.8%		0.17
#HHs 4.84M	Avg Cable Carriage	0.96	16.6%		0.96	16.6%		0.82
Footprint 82%	Avg Cable Prices	49.16	-1.8%		49.13	-1.9%		50.06
WTP $4.14	Aff Fees to Sat	2.40	42.8%		1.71	1.6%		1.68
	Cable Surplus	20.38	-6.6%	-34.6%	20.38	-6.6%	-34.6%	21.81
	Satellite Surplus	4.63	-4.1%	-4.8%	4.74	-1.9%	-2.2%	4.83
	RSN Surplus	3.61	87.6%	40.7%	3.50	81.7%	38.0%	1.93
	Consumer Welfare	28.90	2.1%	14.6%	28.92	2.2%	15.0%	28.29
	Total Welfare	57.53	1.2%	15.9%	57.54	1.2%	16.2%	56.87
NESN[(a)]	Avg Cable Mkt Share	0.66	12.2%		0.67	13.0%		0.59
*Comcast	Avg Sat Mkt Share	0.10	-19.3%		0.11	-13.1%		0.13
#HHs 5.20M	Avg Cable Carriage	0.97	18.5%		0.98	19.3%		0.82
Footprint 85%	Avg Cable Prices	53.87	-6.5%		52.85	-8.2%		57.59
WTP $12.86	Aff Fees to Sat	4.37	41.4%		2.88	-6.6%		3.09
	Cable Surplus	26.48	-3.5%	-7.4%	25.37	-7.5%	-16.0%	27.43
	Satellite Surplus	2.79	-13.4%	-3.4%	2.83	-12.1%	-3.0%	3.22
	RSN Surplus	4.87	53.7%	13.2%	5.67	78.9%	19.4%	3.17
	Consumer Welfare	36.98	7.3%	19.6%	38.09	10.5%	28.2%	34.47
	Total Welfare	71.12	4.1%	22.0%	71.96	5.4%	28.6%	68.29

Notes: This table presents observed and simulated market outcomes for six individual RSNs. Panel I shows the two cable-integrated RSNs located in terrestrial loophole markets; Panel II shows two selected cable-integrated RSNs located in non-loophole markets; Panel III shows two selected non-integrated RSNs. Scenario (i) (VI, no PARs) corresponds to assuming that $\lambda_R = \hat{\underline{\lambda}}_R$ and $\mu = \hat{\mu}$, and allowing the owner of the RSN to exclude rivals; scenario (ii) (VI, PARs) corresponds to setting $\lambda_R = 0$ and prohibiting the RSN owner from excluding rivals; scenario (iii) (No VI) sets $\mu = 0$ and disintegrates (or keeps non-integrated) the RSNs. All reported levels except for market shares are in $/household/month, and $\%\Delta_{lvl}$ ($\%\Delta_{WTP}$) represents level changes from scenario (iii) divided by the baseline level (or the estimated mean consumer willingness-to-pay (WTP) for the channel). Beneath the channel name is the name of the MVPD that owns (or is assigned ownership in scenarios (i) and (ii) for non-integrated RSNs) the channel, the number of television households in the RSN's relevant DMAs, the MVPD owner's footprint (% of households passed) in the RSN's relevant DMAs, and the estimated mean consumer WTP for the channel.
[(a)] NESN is predicted to exclude DirecTV (but supply Dish) in scenario (i).

Table 5: Average of Simulated Market Outcomes Across All RSNs

	(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
I. VI, LOOPHOLE (2)							
Avg Cable Mkt Share	0.69	4.9%		0.69	4.1%		0.66
Avg Sat Mkt Share	0.15	-13.4%		0.17	-4.2%		0.18
Avg Cable Carriage	0.78	11.8%		0.92	39.2%		0.69
Avg Cable Prices	52.88	-0.7%		51.70	-2.9%		53.24
Aff Fees to Sat	-			2.26	-2.2%		2.26
Cable Surplus	30.40	3.9%	16.6%	28.83	-1.4%	-6.4%	29.25
Satellite Surplus	4.14	-6.5%	-4.3%	4.25	-4.1%	-2.7%	4.43
RSN Surplus	1.79	-20.4%	-6.8%	3.04	43.0%	11.8%	2.25
Consumer Welfare	34.62	-1.0%	-5.0%	36.69	4.9%	25.5%	34.96
Total Welfare	70.95	0.1%	0.5%	72.81	2.7%	28.1%	70.90
# Foreclosed to Sat	2/2						
II. VI, NON-LOOPHOLE (11)							
Avg Cable Mkt Share	0.65	2.0%		0.65	1.9%		0.63
Avg Sat Mkt Share	0.18	-2.2%		0.18	-1.9%		0.18
Avg Cable Carriage	0.75	20.2%		0.77	24.4%		0.64
Avg Cable Prices	55.97	-1.0%		55.97	-1.0%		56.53
Aff Fees to Rivals	1.51	26.1%		1.31	-0.1%		1.31
Cable Surplus	27.47	-0.6%	-7.4%	27.41	-0.8%	-9.7%	27.67
Satellite Surplus	4.85	-3.5%	-6.8%	4.91	-2.3%	-4.5%	5.02
RSN Surplus	1.81	43.1%	15.7%	1.83	42.6%	17.1%	1.36
Consumer Welfare	34.34	1.5%	21.1%	34.36	1.6%	21.0%	33.83
Total Welfare	68.47	0.9%	22.7%	68.51	0.9%	23.9%	67.88
# Foreclosed to Sat	1/8						
III. NON-INTEGRATED (14)							
Avg Cable Mkt Share	0.61	2.9%		0.61	3.1%		0.59
Avg Sat Mkt Share	0.20	-2.5%		0.20	-2.7%		0.20
Avg Cable Carriage	0.85	11.8%		0.86	12.4%		0.78
Avg Cable Prices	53.50	-1.7%		53.48	-1.8%		54.47
Aff Fees to Sat	2.27	43.1%		1.68	1.9%		1.65
Cable Surplus	21.70	-3.7%	-21.7%	21.68	-3.7%	-21.3%	22.52
Satellite Surplus	5.46	-4.1%	-5.8%	5.53	-2.7%	-3.5%	5.67
RSN Surplus	2.78	59.6%	27.1%	2.72	54.7%	24.6%	1.75
Consumer Welfare	33.14	2.1%	16.5%	33.16	2.1%	16.3%	32.48
Total Welfare	63.08	1.1%	16.1%	63.10	1.1%	16.1%	62.41
# Foreclosed to Sat[(a)]	0.5/14						
ALL RSNS (27)							
Avg Cable Mkt Share	0.63	2.6%		0.63	2.6%		0.61
Avg Sat Mkt Share	0.19	-2.8%		0.19	-2.4%		0.19
Avg Cable Carriage	0.81	15.3%		0.82	18.2%		0.72
Avg Cable Prices	54.49	-1.4%		54.43	-1.5%		55.26
Aff Fees to Rivals	1.96	36.2%		1.55	1.0%		1.53
Cable Surplus	24.35	-2.1%	-14.6%	24.27	-2.5%	-16.0%	24.85
Satellite Surplus	5.16	-3.9%	-6.1%	5.24	-2.6%	-3.9%	5.36
RSN Surplus	2.35	50.1%	21.3%	2.37	49.4%	21.1%	1.60
Consumer Welfare	33.68	1.7%	17.6%	33.77	2.0%	18.5%	33.11
Total Welfare	65.55	0.9%	18.2%	65.64	1.1%	19.7%	64.93
# Foreclosed to Sat	3.5/24						

Notes: This table presents the average across the simulated market outcomes for the RSNs located in each panel, weighted by the number of households in each RSN's relevant DMAs. All reported levels except for market shares are in \$/household/month, and $\%\Delta_{lvl}$ ($\%\Delta_{WTP}$) represents level changes from scenario (iii) divided by the baseline level (or the estimated mean consumer willingness-to-pay (WTP) for the channel). "Avg Fees to Rival" represents average affilliate fees (to the satellite MVPDs for cable-integrated RSNs, and to cable MVPDs for satellite-integrated RSNs) conditional on supply, "# Foreclosed to Sat" reports the number of RSNs in each panel that are not provided to satellite MVPDs (in the case of a cable-integrated RSN; satellite-owned RSNs are never predicted to not supply cable MVPDs), and "Carriage Increase" is the % increase in the number of the integrated MVPD's households that can access the channel upon integration.
[(a)] NESN is predicted to exclude DirecTV (but supply Dish) in scenario (i).

integrated, this is only because the reported cable surplus counts downstream (distributor) profits alone; when a cable MVPD is integrated (and since $\hat{\mu}$ is near 1), its pricing decisions will be optimal with respect to joint RSN and distributor profits. We thus find that joint RSN and integrated cable surplus increases when moving from non-integration to integration with PARs. Satellite surplus, on average, falls by nearly 3% when RSNs are integrated with PARs in effect.[54] The net gain in total welfare across all RSNs from integrating each RSN but enforcing PARs is approximately \$0.71 per household per month, representing a 1.1% increase from the total welfare created by all of cable television and 20% of the average WTP generated by an individual RSN; nearly all of this is from an increase in consumer surplus, suggesting that the benefits from both reduced double marginalization and increased carriage incentives are substantial.

Foreclosure Effects: Raising Rivals' Costs and Exclusion. Comparing scenarios (i) and (ii) across Tables 4-5 provides the impact of removing PARs: i.e., letting $\lambda_R = \hat{\lambda}_R$ so that integrated RSNs internalize the profits of their downstream units when bargaining with rival MVPDs. In all but two cases, we find that allowing for foreclosure weakly reduces consumer and total welfare from the case in which integration was allowed but PARs were enforced.

The reduction in welfare stems primarily from the following effects. The first occurs when an RSN is foreclosed to rival MVPDs. Though we predict that none of the three DirecTV-owned RSNs would choose to exclude cable providers, we predict that 3 out of the 13 RSNs integrated with a cable provider in the data (the two loophole RSNs and CSN New England) would exclude both satellite distributors, and one previously non-integrated RSN (NESN) would exclude only DirecTV. As shown in Table 4, satellite markets shares and profits fall from the no-VI baseline when these four particular channels are integrated and PARs are not enforced. Furthermore, we find that all RSNs that exclude at least one satellite distributor have integrated distributors with at least an 85% footprint, consistent with the discussion in Section 4.2 (i.e., larger cable footprints increase the potential losses incurred by a cable provider upon supply of satellite).

The second effect arises when rival MVPDs are still supplied by an integrated RSN. Table 5 column (i) reports affiliate fees charged to rivals *conditional on supply*; we find that affiliate fees, upon agreement, increase by approximately 36% on average across all RSNs from the baseline of non-integration; focusing only on previously non-integrated RSNs, this figure is higher at 43%. In some cases this increase is a \$1 per month per subscriber or more, as with FS Ohio and YES; in all cases, affiliate fees increase for rival distributors (when they are still supplied) when PARs are not enforced. The impact of an increase in affiliate fees on a rival results in a meaningful reduction in rival and consumer surplus (though not as large as with exclusion).

Even though we have assumed that satellite distributors do not adjust their prices in our counterfactuals, higher satellite affiliate fees can negatively harm consumer welfare if this induces the

[54] In Table 10, we report market outcomes for the three satellite integrated RSNs. Although we assume that satellite MVPDs set national prices and do not adjust them in our counterfactuals, the satellite RSNs negotiate different affiliate fees depending on whether $\mu = 0$ or $\mu > 0$, which in turn implies that cable prices and hence market outcomes can change.

integrated cable owner to subsequently increase its own downstream prices. Intuitively, if a cable-integrated RSN increases its affiliate fees with satellite distributors, then the RSN's downstream cable MVPD is facing a higher effective marginal cost when pricing its cable bundle since it now internalizes lost affiliate fee revenues to the RSN from satellite. This effect, discussed in Chen (2001), can be seen clearly when comparing scenarios (i) and (ii) when a channel is not excluded from its rivals: e.g., Comcast, the assigned owner of FS Detroit in Table 4, increases its own price of a bundle by \$0.03 as a result of negotiating a 43% higher affiliate fee for FS Detroit from satellite distributors.

Net Effects. By comparing scenario (i) to (iii), we can estimate the net impact of integration of RSNs without PARs from a non-integrated baseline case. On average across all RSNs, the efficiency effects dominate the foreclosure effects when examining total and consumer welfare—consumer and total welfare increase by approximately \$0.57 and \$0.62 per household per month, representing 18% of the total WTP generated by an RSN.[55]

These averages mask considerable heterogeneity, as noted in prior discussion. For instance, we find that foreclosure effects dominate for consumer welfare when examining the cases in which the RSN is excluded from both satellite distributors upon integration with a cable MVPD; e.g., in terrestrial loophole markets, disintegrating CSN Philadelphia and 4SD would be predicted on average to increase consumer welfare by 5% of the average WTP generated by the channel (\$0.34). On the other hand, overall net consumer welfare gains from integration (without PARs being enforced) exceed \$1 per household per month in several circumstances, reaching as high as \$2.50 per household per month in the case of NESN.

We caveat these findings along the three main dimensions. First, the consideration of investment effects, both on the part of content providers and distributors, is absent from the current analysis; as noted in the introduction, the impact of such effects on welfare is ambiguous, and is the subject of future work. Second, our consideration of one vertical (de-)merger at a time motivated our holding satellite distributors' (national) prices fixed. Were integration to increase nationally and lead to foreclosure or higher affiliate fees charged to satellite distributors in many markets, we may expect satellite prices to increase in response, thereby altering our predicted welfare effects. Lastly, our model has focused exclusively on comparing the efficiency effects of vertical integration to potential foreclosure of downstream distributors by integrated channels. Our analysis does not consider the potential for foreclosure of rival channels by an integrated distributor.[56]

[55] The average standard deviation across channels in the predicted change in total welfare from scenario (i) to (iii) (resulting from the use of different carriage disturbance draws) is \$0.075; for all but one channel (Root Sports Rocky Mountain), the sign of the total welfare change is not affected across carriage draws. Different carriage draws did not affect predicted supply outcomes.

[56] See for example Waterman and Weiss (1996) who show reduced form evidence that integration reduces carriage of rival channels. This finding could be due to foreclosure, but could also arise simply because the increased carriage of the integrated channel makes carriage of the rival channel less attractive. Our model does include the possibility of the latter effect, but does not incorporate any mechanism that might cause foreclosure of rival channels, such as an impact on the integrated channel's advertising revenues.

7 Concluding Remarks

In this paper, we have developed a framework for the analysis of vertical integration and mergers, and applied it to examine the welfare effects of—and regulatory policy regarding—vertical integration of high value sports content in the U.S. cable and satellite television industry. The framework accounts for consumer viewership and subscription decisions, distributor pricing and carriage decisions, and channel-distributor bargaining over affiliate fees. Most importantly, it allows for vertical integration that may reduce double marginalization and increase carriage, foreclose rivals from carrying integrated content or to raise their costs of carriage, and that does not necessarily lead to perfect internalization of incentives across divisions within an integrated firm.

We cannot reject the hypothesis that firms perfectly internalize the profits of integrated units when making pricing and bargaining decisions, and we find that integration in the presence of effective program access rules leads to significant welfare increases that primarily accrue to consumers. Furthermore, removing program access rules and admitting foreclosure incentives would result in foreclosure of cable integrated RSNs to satellite distributors in certain large markets, and enforcing these regulations in "loophole" markets would prevent existing exclusion. Even in cases in which exclusion does not occur, we find that foreclosure incentives would lead to significant increases in the affiliate fees charged to rival distributors. Finally, we find that the net effect of vertical integration—accounting for both foreclosure and efficiency effects—is heterogeneous: it is positive for both consumer and total welfare when averaged across our entire sample of channels (on the order of approximately $0.60 per household per month), but can be negative for consumers when integrated channels are predicted to foreclose rival distributors.

As we have noted previously, this analysis is partial and can be extended in a number of directions. Incorporating additional responses to vertical integration—e.g., investment effects—and examining how predictions might be impacted by weakened information sharing or misalignment of incentives within the firm are important extensions. Furthermore, documenting and measuring the strength of these vertical integration effects in other industries remains a promising area for future research.

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A Negative Three-Party-Surplus as a Necessary Condition for Non-Supply

Consider an environment where neiter satellite distributor is supplied with channel c for a set of "observed" bundles $\mathcal{B}^o$, bundle prices $\boldsymbol{p}^o$, affiliate fees $\boldsymbol{\tau}^o$, and implied bundle marginal costs $\boldsymbol{mc}^o$. We omit the time subscript for this section, and focus on a single time period. Assume that there exists positive "three-party-surplus" between c and the two satellite distributors, g and g', and the condition given by (16) does not hold.

We prove in this section that if three-party-surplus is positive, then channel c can simultaneously make an affiliate fee offer $\tilde{\tau}_{gc}$ to distributor g and an offer $\tilde{\tau}_{g'c}$ to distributor g' such that (i) both satellite distributors will accept their offer, regardless of whether the offers are public (and observed) or private (and, when private, regardless of each satellite distributor's beliefs regarding whether the other satellite distributor will be supplied); and (ii) channel c's profits increase from this deviation. This motivates our test of there being negative three-party-surplus as a necessary condition for non-supply of both satellite distributors g and g' to be an equilibrium, as otherwise c would find it profitable to make such offers.

Notation. Define

$$D_g(\mathcal{A}) = \sum_m D_{gm}(\mathcal{B}^o_m \cup \mathcal{A}, \boldsymbol{p}^o_m, \cdot) \ ,$$
$$\pi_g(\mathcal{A}) = \sum_m D_{gm}(\mathcal{B}^o_m \cup \mathcal{A}, \boldsymbol{p}^o_m, \cdot) \times \underbrace{(p^{o,\text{pre-tax}}_{gm} - mc^o_{gm})}_{marg^o_{gm}} \ ,$$

to be distributor g's demand and profits when the distributor-channel pairs contained in $\mathcal{A}$ are added to all bundles; e.g., $D_g(gc, \emptyset) = \sum_m D_{gm}(\mathcal{B}^o_m \cup \{gc\}, \cdot)$ and $D_g(gc, g'c) = \sum_m D_{gm}(\mathcal{B}^o_m \cup \{gc, g'c\}, \cdot)$. Define

$$[\Delta_{\mathcal{B}} D_g(\mathcal{A})] = \sum_m \underbrace{D_{gm}(\mathcal{B}^o_m \cup \mathcal{A}, \cdot) - D_{gm}(\mathcal{B}^o_m \cup \{\mathcal{A} \setminus \mathcal{B}\}, \cdot)}_{\Delta_{\mathcal{B}} D_{gm}(\mathcal{A})} \ ,$$
$$[\Delta_{\mathcal{B}} \pi_g(\mathcal{A})] = \sum_m (D_{gm}(\mathcal{B}^o_m \cup \mathcal{A}, \cdot) - D_{gm}(\mathcal{B}^o_m \cup \{\mathcal{A} \setminus \mathcal{B}\}, \cdot)) \times (p^{o,\text{pre-tax}}_{gm} - mc^o_{gm}) \ ,$$

for $\mathcal{B} \subseteq \mathcal{A}$ to be distributor g's change in demand and profits when the distributor-channel pairs contained in $\mathcal{B}$ are removed from $\mathcal{A}$: e.g., $\Delta_{gc}\pi_g(gc, g'c)$ represents the difference in distributor g's profits from when both g and g' carry channel c versus when only g' carries c.

Acceptable Offers. Satellite distributor g will accept an affiliate fee offer $\tilde{\tau}_{gc}$ from channel c and carry the channel if its expected increase in profits from doing so exceeds the expected payments; i.e., if the following inequality holds:

$$\Big(\phi_g \times [\Delta_{gc}\pi_g(gc, g'c)] + (1 - \phi_g) \times [\Delta_{gc}\pi_g(gc, \emptyset)]\Big) > \tilde{\tau}_{gc}\Big(\phi_g \times D_g(gc, g'c) + (1 - \phi_g) \times D_g(gc, \emptyset)\Big) \ ,$$

where $\phi_g \in [0, 1]$ represents distributor g's belief that upon receiving deviant offer $\tilde{\tau}_{gc}$ from channel c, the other distributor g' is also supplied.[57] This condition is equivalent to:

$$\tilde{\tau}_{gc} < \frac{\Big(\phi_g \times [\Delta_{gc}\pi_g(gc, g'c)] + (1 - \phi_g) \times [\Delta_{gc}\pi_g(gc, \emptyset)]\Big)}{\Big(\phi_g \times D_g(gc, g'c) + (1 - \phi_g) \times D_g(gc, \emptyset)\Big)} \ . \tag{17}$$

[57] E.g., if channel c makes a set of public offers and g anticipates g' will accept its received offer $\tilde{\tau}_{g'c}$, then $\phi_g = 1$. We do not place restrictions on the value of ϕ_g (e.g., as offers may be private and not observed by the other distributor).

Define

$$A_g \equiv \frac{[\Delta_{gc}\pi_g(gc, g'c)]}{D_g(gc, g'c)} \ , \qquad B_g \equiv \frac{[\Delta_{gc}\pi_g(gc, \emptyset)]}{D_g(gc, \emptyset)} \ .$$

Note that the numerators of both A_g and B_g are positive: i.e., the change in g's profits from carrying channel c equals the increase in g's demand due to carrying channel c multiplied by strictly positive margins in every market (which is the case in the data for both satellite distributors at estimated marginal costs). The derivative of the right-hand side of (17) with respect to ϕ_g is weakly positive if $A_g \geq B_g$, and strictly negative otherwise. Thus, if:

$$\tilde{\tau}_{gc}(\varepsilon) = \min\Big(\underbrace{\frac{[\Delta_{gc}\pi_g(gc, g'c)]}{D_g(gc, g'c)}}_{A_g}, \underbrace{\frac{[\Delta_{gc}\pi_g(gc, \emptyset)]}{D_g(gc, \emptyset)}}_{B_g}\Big) - \varepsilon \ , \tag{18}$$

for $\varepsilon > 0$, then (17) is satisfied for any $\phi_g \in [0, 1]$, and g will accept $\tilde{\tau}_{gc}(\varepsilon)$. Define $\tilde{\tau}_{g'c}(\varepsilon)$ similarly.

Profitable for Channel c to Make Offers. Consider now the decision by channel c to offer both satellite distributors the set of affiliate fees $\{\tilde{\tau}_{gc}(\varepsilon), \tilde{\tau}_{g'c}(\varepsilon)\}$ as defined in (18), where $\varepsilon > 0$. We now establish that if three-party-surplus is positive, then c wishes to make such offers; i.e.,:

$$\sum_m \Big[[\Delta_{gc,g'c}\Pi^M_{gm}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)] + [\Delta_{gc,g'c}\Pi^M_{g'mt}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)] \dots \tag{19}$$
$$+ [\Delta_{gc,g'c}\Pi^C_{cm}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)]\Big] \equiv E > 0$$

implies that, for sufficiently small $\varepsilon > 0$,

$$\underbrace{\sum_m [\Delta_{gc,g'c}\Pi^C_{cm}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)] + D_g(gc, g'c)\tilde{\tau}_{gc}(\varepsilon) + D_{g'}(gc, g'c)\tilde{\tau}_{g'c}(\varepsilon)}_{\tilde{\Pi}^C(\varepsilon)} > 0 \ .$$

Using (19), the left-hand side of the previous equation can be re-written as

$$\tilde{\Pi}^C(\varepsilon) = E - \Big(\sum_m [\Delta_{gc,g'c}\Pi^M_{gmt}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)] - D_g(gc, g'c)\tilde{\tau}_{gc}(\varepsilon)\Big) \tag{20}$$
$$- \Big(\sum_m [\Delta_{gc,g'c}\Pi^M_{g'mt}(\{\mathcal{B}^o_m \cup \{gc, g'c\}\}, \cdot)] - D_{g'}(gc, g'c)\tilde{\tau}_{gc}(\varepsilon)\Big)$$

where the terms subtracted from E on the right-hand side are the realized changes in either g or g''s profits when both satellite distributors are supplied with c at affiliate fees $\{\tilde{\tau}_{gc}(\varepsilon), \tilde{\tau}_{g'c}(\varepsilon)\}$. Consider the following two cases:

- If $A_g \leq B_g$, then

$$\begin{aligned}
&\sum_m [\Delta_{gc,g'c}\Pi^M_{gm}(\mathcal{B}^o_m \cup \{gc, g'c\}, \cdot)] - D_g(gc, g'c)\tilde{\tau}_{gc}(\varepsilon) \\
&\quad = [\Delta_{gc,g'c}\pi_g(gc, g'c)] - D_g(gc, g'c)\tilde{\tau}_{gc}(\varepsilon) \\
&\quad = [\Delta_{gc}\pi_g(gc, g'c)] + [\Delta_{g'c}\pi_g(\emptyset, g'c)] - D_g(gc, g'c)\frac{[\Delta_{gc}\pi_g(gc, g'c)]}{D_g(gc, g'c)} + D_g(gc, g'c)\varepsilon \\
&\quad = [\Delta_{g'c}\pi_g(\emptyset, g'c)] + D_g(gc, g'c)\varepsilon \\
&\quad \leq D_g(gc, g'c)\varepsilon \ ,
\end{aligned} \tag{21}$$

where the third line follows because $\Delta_{gc,g'c}\pi_g(gc,g'c) = \Delta_{gc}\pi_g(gc,g'c) - \Delta_{g'c}\pi(\emptyset,g'c)$ and from substituting for $\tilde{\tau}_{gc}(\varepsilon)$ from (18), using the fact that $A_g \leq B_g$; and the final inequality follows from g obtaining weakly more subscribers when g' doesn't carry c, which implies that $[\Delta_{g'c}\pi_g(\emptyset,g'c)] \leq 0$.

- If $A_g > B_g$, then:

$$
\begin{aligned}
&\sum_m [\Delta_{gc,g'c}\Pi^M_{gm}(\mathcal{B}^o_m \cup \{gc,g'c\},\cdot)] - D_g(gc,g'c)\tilde{\tau}_{gc}(\varepsilon) \\
&\quad = [\Delta_{gc,g'c}\pi_g(gc,g'c)] - D_g(gc,g'c)\tilde{\tau}_{gc}(\varepsilon) \\
&\quad = [\Delta_{g'c}\pi_g(gc,g'c)] + [\Delta_{gc}\pi_g(gc,\emptyset)] - \underbrace{(D_g(gc,g'c) - D_g(gc,\emptyset))}_{[\Delta_{g'c}D_g(gc,g'c)]}\tilde{\tau}_{gc}(\varepsilon) - D_g(gc,\emptyset)\tilde{\tau}_{gc}(\varepsilon) \\
&\quad = [\Delta_{g'c}\pi_g(gc,g'c)] - [\Delta_{g'c}D_g(gc,g'c)]\tilde{\tau}_{gc}(\varepsilon) + \underbrace{[\Delta_{gc}\pi_g(gc,\emptyset)] - D_g(gc,\emptyset)\tilde{\tau}_{gc}(\varepsilon)}_{D_g(gc,\emptyset)\varepsilon} \\
&\quad = \left[\sum_m [\Delta_{g'c}D_{gm}(gc,g'c)] \times (p^{o,\text{pre-tax}}_{gm} - mc^o_{gm})\right] - [\Delta_{g'c}D_g(gc,g'c)]\tilde{\tau}_{gc}(\varepsilon) + D_g(gc,\emptyset)\varepsilon \\
&\quad = \left[\sum_m \underbrace{[\Delta_{g'c}D_{gm}(gc,g'c)]}_{\leq 0\ \forall m} \times \underbrace{(p^{o,\text{pre-tax}}_{gm} - mc^o_{gm} - \tilde{\tau}_{gc}(\varepsilon))}_{>0\ \forall m}\right] + D_g(gc,\emptyset)\varepsilon \\
&\quad \leq D_g(gc,\emptyset)\varepsilon
\end{aligned}
\tag{22}
$$

where the fourth line follows from re-arranging terms, and the last inequality holds provided that $(p^{o,\text{pre-tax}}_{gm} - mc^o_{gm} - \tilde{\tau}_{gc}(0)) > 0$, a condition that we have verified holds for each satellite distributor in every market for every RSN when program access rules are not enforced.

Similar conclusions apply for g' when $A_{g'} \leq B_{g'}$ and when $A_{g'} > B_{g'}$.
Substituting the inequalities in (21) and (22) for both g and g' into (20) implies that:

$$\tilde{\Pi}^C(\varepsilon) \geq E - \varepsilon \times (D_g(gc,\emptyset) + D_{g'}(\emptyset,g'c))\ .$$

Thus, if $\varepsilon > 0$, $\tilde{\Pi}^C(\varepsilon) > 0$ for any $\varepsilon \leq E/(D_g(gc,\emptyset) + D_{g'}(\emptyset,g'c))$, and channel c will find it profitable to make offers to g and g' that will be accepted.

B Further Estimation and Computational Details

B.1 Solving for Negotiated Input Fees and Bundle Marginal Costs

We will omit the subscript on $\Psi_{fct} \equiv (1-\zeta_{fct})/\zeta_{fct}$ for the expressions in this subsection. Let $\mathcal{B}^R_{fmt}$ be the observed set of RSNs carried by f in market m in period t.

Consider MVPD f bargaining with channel c over input fee τ_{fct}. Closed form expressions for MVPD and channel "GFT" terms defined in (9) can be derived as follows:

$$
\begin{aligned}
GFT^M_{fct} = \sum_{m\in\mathcal{M}_{fct}} \Bigg[& \Big[\mu_{fct}D_{fmt} - D^{\setminus fc}_{fmt}\Big]\tau_{fct} + \mu_{fct}(D_{fmt} + \sum_{g\neq f: c\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}])a_{cmt} + \mu_{fct}\sum_{g\neq f: c\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}]\tau_{gct} \\
& + \sum_{d\in\mathcal{V}_{ft}\setminus c}\ \sum_{g\in\mathcal{F}_{mt}: d\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}]\mu_{fdt}(\tau_{gdt} + a_{dmt}) + [\Delta_{fc}D_{fmt}]\Big(p^{\text{pre-tax}}_{fmt} - mc_{fmt}\Big)\Bigg],
\end{aligned}
\tag{23}
$$

$$
\begin{aligned}
GFT^C_{fct} = \sum_{m\in\mathcal{M}_{fct}} \Bigg[& (D_{fmt} - \mu_{fct}D^{\setminus fc}_{fmt})\tau_{fct} + (D_{fmt} + \sum_{g\neq f: c\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}])a_{cmt} + \sum_{g\neq f: c\in\mathcal{B}_{gmt}}[\Delta_{fc}D_{gmt}](\tau_{gct}) \\
& + \sum_{g\in\mathcal{F}_{mt}}\lambda_{R:fct}[\Delta_{fc}D_{gmt}]\sum_{d\in\mathcal{B}_{gmt}\setminus c}\mu^C_{cdt}(\tau_{gdt} + a_{dmt}) + \sum_{g\in\mathcal{F}_{mt}}\mu_{gct}\lambda_{R:fct}[\Delta_{fc}D_{gmt}]\Big(p^{\text{pre-tax}}_{gmt} - mc_{gmt}\Big)\Bigg],
\end{aligned}
\tag{24}
$$

where: $D_{fmt}^{\setminus fc}$ is the demand for f in market m if it dropped channel c; $\lambda_{R:fct} = \lambda_R$ if f and c are not integrated, and $\lambda_{R:fct} = 1$ otherwise; $\mu_{fct} = \mu \times O_{fct}$; $\mu_{cdt}^C = \mu \times O_{cdt}^C$; and $\mathcal{V}_{ft} \equiv \{c : O_{fct} > 0\}$ is the set of channels owned by MVPD f in period t.

Focus on the bargain between an RSN c and MVPD f.[58] Using (23) and (24), the Nash Bargaining first-order condition $\forall f \in \mathcal{F}_{mt}, c \in \mathcal{C}_t^R$ given by (10) ($GFT_{fct}^C = \Psi GFT_{fct}^M$) can be re-written as:

$$\begin{aligned}
&\tau_{fct} \sum_{m \in \mathcal{M}_{fct}} \Big[(1+\Psi)(1-\mu_{fct})D_{fmt}\Big] + \sum_{g \neq f: c \in \mathcal{B}_{gmt}} \tau_{gct} \sum_{m \in \mathcal{M}_{fct}} (1-\Psi\mu_{fct})[\Delta_{fc} D_{gmt}] \\
&+ \sum_{g \in \mathcal{F}_{mt}} \sum_{d \in \mathcal{B}_{gmt} \setminus c} \tau_{gdt}((\Psi - \mu_{fct})\mathbb{1}_{g=f} + \mu_{cdt}^C - \Psi\mu_{fdt}) \sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc} D_{gmt}] + (\Psi - \mu_{fct}) \sum_{m \in \mathcal{M}_{fct}} mc_{fmt}^{\setminus R} [\Delta_{fc} D_{fmt}] = \\
&\quad \sum_{m \in \mathcal{M}_{fct}} \Big[(\Psi - \mu_{fct})[\Delta_{fc} D_{fmt}] p_{fmt}^{\text{pre-tax}}\Big] - \sum_{m \in \mathcal{M}_{fct}} \Big[a_{cmt}\Big((1-\Psi\mu_{fct})D_{fmt} + (1-\Psi\mu_{fct}) \sum_{g \neq f: c \in \mathcal{B}_{gmt}} [\Delta_{fc} D_{gmt}]\Big) \\
&\quad + \sum_{g \in \mathcal{F}_{mt}} \sum_{d \in \mathcal{B}_{gmt} \setminus c} a_{dmt}(\mu_{cdt}^C - \Psi\mu_{fdt})([\Delta_{fc} D_{gmt}])\Big],
\end{aligned} \tag{25}$$

where $mc_{fmt}^{\setminus R}$ represents non-RSN marginal costs: i.e., $mc_{fmt}^{\setminus R} \equiv mc_{fmt} - \sum_{d \in \mathcal{B}_{fmt}^R} \tau_{fdt}$.

We can also re-write the pricing first-order condition in (5), which provides the optimal set of prices for every cable provider f in every market m, as:

$$\begin{aligned}
&\sum_{g \in \mathcal{F}_{mt}} \frac{\partial D_{gmt}}{\partial p_{fmt}} \Big(mc_{gmt}^{\setminus R} \mathbb{1}_{g=f} + \sum_{d \in \mathcal{B}_{gmt}^R} (\mathbb{1}_{g=f} - \mu_{fdt})\tau_{gdt} \Big) = \\
&\qquad \Big[\frac{D_{fmt}}{1+\text{tax}_{fmt}} + \frac{\partial D_{fmt}}{\partial p_{fmt}} p_{fmt}^{\text{pre-tax}} + \sum_{g \in \mathcal{F}_{mt}} \frac{\partial D_{gmt}}{\partial p_{fmt}} \sum_{d \in \mathcal{B}_{gmt}^R} \mu_{fdt} a_{dmt}\Big].
\end{aligned} \tag{26}$$

However, if f is a satellite provider (denoted $f \in \mathcal{F}^{sat}$), we assume that there is a single national price p_{ft} and non-RSN marginal cost $\hat{mc}_{fmt}^{\setminus R}$ that applies across all markets; this implies that there is only a single pricing first-order condition for satellite firms:

$$\begin{aligned}
&\sum_m \sum_{g \in \mathcal{F}_{mt}} \frac{\partial D_{gmt}}{\partial p_{ft}} \Big(mc_{gt}^{\setminus R} \mathbb{1}_{g=f} + \sum_{d \in \mathcal{B}_{gmt}^R} (\mathbb{1}_{g=f} - \mu_{fdt})\tau_{gdt} \Big) = \\
&\qquad \sum_m \Big(\frac{D_{fmt}}{1+\text{tax}_{fmt}} + \frac{\partial D_{fmt}}{\partial p_{ft}} p_{ft}^{\text{pre-tax}} + \sum_{g \in \mathcal{F}_{mt}} \frac{\partial D_{gmt}}{\partial p_{fmt}} \sum_{d \in \mathcal{B}_{gmt}^R} \mu_{fdt} a_{dmt}\Big) \qquad \forall f \in \mathcal{F}^{sat}.
\end{aligned} \tag{27}$$

Equations (25), (26), and (27) express input fees and marginal costs as a function of demand parameters, prices, and advertising rates. We thus solve for the vector of RSN input fees $\{\tau_{fct}\}_{\forall f,t,c \in \mathcal{C}_t^R}$ for all RSNs and non-RSN bundle marginal costs $\{mc_{fmt}^{\setminus R}\}_{\forall fmt}$ via matrix inversion when evaluating the objective for any parameter vector $\boldsymbol{\theta}$.

[58] In estimation, we are assuming that $\lambda_R = 0$ in the "non-loophole" markets, and thus omit terms that would otherwise enter (e.g., if c were integrated with a rival MVPD f'). In the counterfactuals, we re-introduce these terms.

National Channels. We use our estimates of RSN input fees and non-RSN bundle marginal costs to recover $\{\tau_{fct}\}_{\forall ft, c \notin \mathcal{C}_t^R}$ for non-RSN channels via matrix inversion on the following:

$$
\begin{aligned}
&\tau_{fct} \sum_{m \in \mathcal{M}_{fct}} \left[D_{fmt} + \Psi D_{fmt}^{\setminus fc} \right] + \sum_{g \neq f: c \in \mathcal{B}_{gmt}} \tau_{gct} \sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc} D_{gmt}] = \qquad (28) \\
&\quad \sum_{m \in \mathcal{M}_{fct}} \left[(\Psi)[\Delta_{fc} D_{fmt}](p_{fmt}^{\text{pre-tax}} - \hat{mc}_{fmt}) \right] + \sum_{g \in \mathcal{F}_{mt}} \sum_{d \in \mathcal{B}_{gmt} \setminus c} \mu_{fdt} \Psi \hat{\tau}_{gdt} \sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc} D_{gmt}] \\
&\quad - \sum_{m \in \mathcal{M}_{fct}} \left[a_{cmt} \Big(D_{fmt} + \sum_{g \neq f: c \in \mathcal{B}_{gmt}} [\Delta_{fc} D_{gmt}] \Big) + \sum_{g \in \mathcal{F}_{mt}} \sum_{d \in \mathcal{B}_{gmt} \setminus c} a_{dmt} (-\Psi \mu_{fdt}) ([\Delta_{fc} D_{gmt}]) \right],
\end{aligned}
$$

where we construct estimates of each bundle's marginal costs from our recovered non-RSN marginal costs as follows: $\hat{mc}_{fmt} \equiv \hat{mc}_{fmt}^{\setminus R} + \sum_{d \in \mathcal{B}_{fmt}^R} \hat{\tau}_{fdt}$. We assume away integration incentives for non-RSNs so that $\mu_{fct} = 0 \; \forall ft, c \notin \mathcal{C}_t^R$.

B.2 Computation of Disagreement Payoffs

Computation of several moments requires estimating $\Delta_{fc}[\Pi_{fmt}^M(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\hat{\boldsymbol{\tau}}_{fct}, \boldsymbol{\tau}_{-fc,t}\})]$ and $\Delta_{fc}[\Pi_{cmt}^C(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\hat{\boldsymbol{\tau}}_{fct}, \boldsymbol{\tau}_{-fc,t}\}; \lambda_R)]$ for each MVPD f and channel c that contract in each period. These "gains from trade" for each pair are comprised of agreement and disagreement profits.

Profits from agreement (as a function of $\boldsymbol{\theta}$) can be computed from observed prices and bundle composition using MVPD and Channel profits specified by (4) and (7). Profits from disagreement between MVPD f and channel c are recomputed in each market given the following assumptions:

1. Bundle composition does not change for other MVPDs: $\mathcal{B}'_{gmt} = \mathcal{B}_{gmt} \; \forall \; g \neq f$; bundles for MVPD f just drop c, but do not adjust otherwise;
2. Input prices $\hat{\tau}_{-fc,t}$ for all other MVPD-channel pairs do not adjust;
3. Bundle prices for satellite and cable providers do not adjust.

The second and third assumptions are consistent with the timing of our game and the simultaneous determination of input and bundle prices.

B.3 Recomputing Counterfactual Equilibria when Channels are Added or Removed from Satellite

When we explore counterfactuals when a RSN channel c is either added or removed from satellite providers (and potentially un-integrated), we compute market outcomes when input and bundle prices are allowed to re-equilibrate. Note that this is different than in the previous subsection, where we explore the computation of disagreement points which occur off the equilibrium path, since here changes are anticipated by all players (e.g., if the terrestrial loophole were closed). We assume that:

1. satellite distributors either carry or do not carry c in all (relevant) markets, and (with national pricing) do not change the prices of its bundles;
2. cable systems may change their prices (since demand elasticities may be affected by changes in carriage) but do not change any carriage or bundling decisions;
3. input prices of RSNs (but not national channels) are allowed to adjust.

We compute the new counterfactual equilibrium where c is either now supplied or removed from satellite in a given period t as follows:

1. Given new bundles $\{\mathcal{B}_{fmt}^{R,CF}\}$ and potentially new values for $\{\lambda_{R:fct}^{CF}, \mu_{fct}^{CF}\}$, we iterate on the following until we obtain convergence on counterfactual input prices $\{\tau_{fct}^{CF}\}$, bundle prices $\{p_{fmt}^{CF}\}$, bundle demands $\{D_{fmt}^{CF}\}$, and elasticities $\{\partial s_{fmt}^{CF} / \partial p_{gmt}\}$:

(a) Solve for the values of $\{\tau^{CF}_{fct}\}_{c\in\mathcal{C}^R_t}$ given values of $\{D^{CF}_{fmt}\}$, $\{\partial s^{CF}_{fmt}/\partial p_{gmt}\}$, $\{\hat{mc}^{\setminus R}_{fmt}\}$, μ, λ_R, Ψ using the following system of equations:

$$\begin{aligned}
&\tau^{CF}_{fct}\sum_{m\in\mathcal{M}_{fct}}\Big[(1+\Psi)(1-\mu_{fct})D^{CF}_{fmt}\Big]+\sum_{g\neq f:c\in\mathcal{B}^{R,CF}_{gmt}}\tau^{CF}_{gct}\sum_{m\in\mathcal{M}_{fct}}(1-\Psi\mu_{fct}-\mu_{gct}\lambda_R)[\Delta_{fc}D^{CF}_{gmt}]\\
&+\sum_{g\in\mathcal{F}_{mt}}\sum_{d\in\mathcal{B}^{R,CF}_{gmt}\setminus c}\tau^{CF}_{gdt}((\Psi-\mu_{fct})\mathbb{1}_{g=f}+\mu^C_{cdt}-\Psi\mu_{fdt}-\mu_{gct}\lambda_R)\sum_{m\in\mathcal{M}_{fct}}[\Delta_{fc}D^{CF}_{gmt}]=\\
&\sum_{m\in\mathcal{M}_{fct}}\Big[(\Psi-\mu_{fct})(p^{\text{pre-tax},CF}_{fmt}-\hat{mc}^{\setminus R}_{fmt})[\Delta_{fc}D^{CF}_{fmt}]-\mu_{f'ct}\lambda_R(p^{\text{pre-tax},CF}_{f'mt}-\hat{mc}^{\setminus R}_{f'mt})[\Delta_{fc}D^{CF}_{f'mt}]\Big]\\
&-\sum_{m\in\mathcal{M}_{fct}}\Bigg[a_{cmt}\Big((1-\Psi\mu_{fct})D^{CF}_{fmt}+(1-\Psi\mu_{fct})\sum_{g\neq f:c\in\mathcal{B}^{R,CF}_{gmt}}[\Delta_{fc}D^{CF}_{gmt}]\Big)\\
&+\sum_{g\in\mathcal{F}_{mt}}\sum_{d\in\mathcal{B}^{R,CF}_{gmt}\setminus c}a_{dmt}(\mu^C_{cdt}-\Psi\mu_{fdt})([\Delta_{fc}D^{CF}_{gmt}])\Bigg]\qquad\forall f,c\,, \qquad (29)
\end{aligned}$$

where f and f' represent the MVPDs with which c is potentially integrated. Equation (29) differs from (25) insofar that we now allow for the possibility that $\lambda_R > 0$, and that c may be integrated with a rival MVPD f' when bargaining with f.

(b) Market by market, update bundle prices $\{p^{CF}_{fmt}\}$ for all cable distributors to maximize profits given new values of $\{\tau^{CF}_{fct}\}$. Update bundle demands $\{D^{CF}_{fmt}\}$ and elasticities $\{\partial s^{CF}_{fmt}/\partial p_{gmt}\}$ at the new computed prices.

Currently we only update $\{\tau_{fct}\}_{\forall f}$ for the given channel c that is being examined, and not for other channels d that may be active in c's relevant markets.

C Additional Figures and Tables

Table 6: Regional Sports Networks Availability, Affiliate Fees, and Viewership

	Kagan Availability		Kagan Affiliate Fees					Nielsen Viewing			
	Systems Served	HH Served	Years	Mean	StDev	Min	Max	# Obs	All HH	Has DTV	Has Dish
Comcast RSNs											
CSN Bay Area	137	4.7	11	$1.70	$0.53	$1.01	$2.52	720	0.41	0.45	0.33
CSN California	135	10.0	7	$0.91	$0.14	$0.75	$1.10	720	0.17	0.17	0.17
CSN Chicago	335	5.7	7	$2.02	$0.18	$1.90	$2.37	360	0.54	0.59	0.36
CSN Mid-Atlantic	194	6.2	11	$2.03	$0.74	$0.85	$3.10	1,440	0.13	0.09	0.03
CSN New England	222	4.8	11	$1.26	$0.32	$0.90	$1.89	1,080	0.27	0.30	0.17
CSN Northwest	25	1.3	4	$1.93	$0.09	$1.81	$2.04	—	—	—	—
CSN Philadelphia	102	4.6	11	$1.94	$0.61	$1.05	$2.85	360	0.91	0.06	0.05
CSN Southwest	82	4.0	—	—	—	—	—	—	—	—	—
CSS	378	8.9	11	$0.36	$0.09	$0.20	$0.50	3,600	0.04	0.00	0.00
The mtn	195	7.0	5	$0.20	$0.02	$0.19	$0.23	720	0.04	0.05	0.00
News Corp RSNs											
Fox Sports Arizona	106	3.7	11	$1.58	$0.50	$0.82	$2.28	—	—	—	—
Fox Sports Chicago	342	4.8	7	$1.45	$0.44	$1.08	$2.13	—	—	—	—
Fox Sports Detroit	284	5.3	11	$1.75	$0.45	$1.05	$2.34	360	1.02	0.94	0.68
Fox Sports Florida	152	6.7	11	$1.34	$0.33	$0.90	$1.95	2,160	0.14	0.12	0.12
Fox Sports Houston	48	3.3	—	—	—	—	—	—	—	—	—
Fox Sports Midwest	695	7.4	11	$1.42	$0.44	$0.57	$2.01	1,800	0.31	0.31	0.26
Fox Sports North	620	4.5	11	$1.97	$0.60	$1.15	$2.88	720	0.79	1.04	0.70
Fox Sports Ohio	306	7.0	11	$1.61	$0.49	$0.75	$2.42	2,160	0.34	0.31	0.29
Fox Sports South	905	15.3	17	$1.63	$0.52	$0.52	$2.17	3,600	0.13	0.08	0.07
Fox Sports Southwest	924	12.7	11	$1.68	$0.50	$0.80	$2.43	5,040	0.14	0.15	0.12
Fox Sports West	167	9.2	11	$1.80	$0.44	$0.87	$2.35	1,080	0.16	0.12	0.07
Fox Sports Wisconsin	136	2.2	—	—	—	—	—	—	—	—	—
Big Ten Network	1,960	59.4	—	—	—	—	—	—	—	—	—
Prime Ticket (New)	132	8.2	11	$1.52	$0.46	$0.60	$2.07	720	0.16	0.12	0.09
SportSouth (New)	532	11.3	11	$0.31	$0.13	$0.15	$0.52	—	—	—	—
Sun Sports	234	8.3	11	$1.36	$0.54	$0.55	$2.27	2,160	0.20	0.16	0.12
Liberty RSNs											
Root NW	281	5.4	11	$1.73	$0.52	$0.70	$2.54	—	—	—	—
Root Pitts	316	4.5	11	$1.81	$0.53	$1.05	$2.55	—	—	—	—
Root Rocky Mtn	479	5.4	11	$1.58	$0.42	$0.75	$2.06	—	—	—	—
Cablevision RSNs											
MSG	219	9.9	11	$1.82	$0.30	$1.45	$2.44	1,080	0.23	0.24	0.17
MSG Plus	165	7.5	11	$1.24	$0.15	$1.01	$1.61	360	0.07	0.05	0.06
Cox RSNs											
Channel 4 San Diego	15	1.0	11	$0.87	$0.26	$0.53	$1.32	360	0.48	0.03	0.00
Cox Sports Television	70	2.1	9	$0.55	$0.05	$0.50	$0.64	360	0.22	0.01	0.08
Time Warner RSNs											
Metro Sports Network	8	0.6	—	—	—	—	—	—	—	—	—
SportsNet New York	314	20.1	5	$1.91	$0.18	$1.71	$2.20	1,080	0.13	0.13	0.09
Independent/Other RSNs											
Altitude Sports	130	2.8	7	$1.99	$0.29	$1.70	$2.47	360	0.24	0.21	0.22
Bright House Sports	—	—	—	—	—	—	—	360	0.02	0.00	0.00
Empire Sports	87	1.9	—	—	—	—	—	—	—	—	—
MASN	109	5.2	6	$1.58	$0.12	$1.45	$1.77	1,440	0.13	0.10	0.13
NESN	213	4.5	11	$1.99	$0.49	$1.30	$2.72	1,080	0.95	1.00	0.48
Royals Sports	18	0.2	6	$0.19	$0.02	$0.16	$0.21	—	—	—	—
SportsTime Ohio	196	9.0	5	$1.51	$0.17	$1.30	$1.73	720	0.33	0.40	0.20
YES	304	15.8	9	$2.13	$0.41	$1.18	$2.62	1,440	0.27	0.30	0.00

Notes: Reported are average availability, affiliate fees, and viewing of the major Regional Sports Networks (RSNs) in the United States. The averages are over years for availability and affiliate fees and over DMA-years in the top 56 DMAs for which within-DMA rating is greater than 0.03 for viewing (the condition ensuring we don't count DMAs where the RSN content can't be seen by local viewers). "Systems served" is the number of systems carrying the RSN, and "HH served" is the number of households subscribing to the RSN. Affiliate fees are the monthly per-subscriber fees paid by cable and satellite distributors to television networks for the right to distribute the network's programming to subscribers, averaged across distributors. Availability and affiliate fee information is provided by SNL Kagan as part of its Media & Communications Package. RSN viewership is provided by Nielsen. See viewership definitions in the notes to Table 8.

Table 7: Sample Statistics - Prices, Market Shares, and Channels

		Unweighted				Weighted by HHs			
	# Obs	Mean	StdDev	Min	Max	Mean	StdDev	Min	Max
Total Markets	6,138	6,138							
Average Households (M)	6,138					31.5			
Cable									
Year	6,138	2004	2.9	2000	2010	2004	2.8	2000	2010
Price	6,138	$51.40	$10.33	$8.67	$130.96	$53.02	$8.84	$8.67	$130.96
Market Share	6,138	0.624	0.161	0.005	0.965	0.630	0.137	0.005	0.965
Cable Networks	6,138	42.6	15.4	0	87	44.9	14.0	0	87
RSNs	6,138	1.6	0.9	0	5	1.8	0.9	0	5
Total Channels	6,138	44.2	15.9	1	90	46.6	14.5	1	90
DirecTV									
Year	6,138	2004	2.9	2000	2010	2004	2.8	2000	2010
Price	6,138	$53.25	$6.57	$46.05	$76.73	$53.27	$6.34	$46.05	$76.73
Market Share	6,138	0.092	0.062	0.002	0.499	0.094	0.064	0.002	0.499
Cable Networks	6,138	80.5	10.3	66	97	81.2	10.1	66	97
RSNs	6,138	1.7	0.9	0	6	1.9	0.9	0	6
Total Channels	6,138	82.2	10.5	66	103	83.0	10.3	66	103
Dish									
Year	6,138	2004	2.9	2000	2010	2004	2.8	2000	2010
Price	6,138	$53.89	$4.75	$44.28	$68.33	$53.96	$4.53	$44.28	$68.33
Market Share	6,138	0.064	0.055	0.000	0.406	0.059	0.052	0.000	0.406
Cable Networks	6,138	70.8	13.2	54	91	71.8	12.9	54	91
RSNs	6,138	1.6	0.8	0	5	1.7	0.7	0	5
Total Channels	6,138	72.4	13.3	54	96	73.5	13.0	54	96

Notes: Reported are the price, market share, and cable, Regional Sport Network (RSN), and total channels for each of the local cable operators and two national satellite providers serving each of our markets. Markets are defined as the set of continuous zip codes within a cable system facing the same portfolio of competitors. We exclude (the relatively few) markets facing competition between cable operators. All the data cover the years 2000-2010. To be included, we required information on each of price, market share, and channels. Cable system subscriber and channel information is from the Nielsen FOCUS dataset. Cable system price information is drawn from the Internet Archive, newspaper reports, and the TNS Bill Harvesting database. Satellite system channel and price information is drawn from the Internet Archive. Cable and satellite subscriber market shares are estimated from the MRI (2000-2007) and Simmons (2008-2010) household surveys. We restrict attention to those markets with at least 5 observations in any year. See the text for more details.

Table 8: Sample Statistics: National Cable Channel Affiliate Fees and Viewership

	Affiliate Fees					Viewership					
	Kagan					Nielsen Ratings		Combined MRI / Simmons			
	Years	Mean	StDev	Min	Max	Obs	Mean	Obs	Mean	SDev	Frac > 0
ABC Family Channel	11	$0.19	$0.02	$0.16	$0.22	747	0.418	277,535	0.344	1.149	0.176
AMC	11	$0.22	$0.02	$0.20	$0.25	747	0.491	277,535	0.351	1.183	0.156
Animal Planet	11	$0.07	$0.01	$0.06	$0.09	747	0.275	277,535	0.344	1.108	0.203
A&E	11	$0.21	$0.03	$0.16	$0.26	747	0.664	277,535	0.472	1.373	0.230
BET	11	$0.14	$0.02	$0.11	$0.17	747	0.382	277,535	0.184	1.017	0.070
Bravo	11	$0.15	$0.03	$0.11	$0.20	747	0.277	277,535	0.169	0.804	0.092
Cartoon Network	11	$0.14	$0.03	$0.08	$0.18	747	0.989	277,535	0.231	1.098	0.106
CMT	11	$0.06	$0.02	$0.01	$0.08	747	0.142	277,535	0.120	0.732	0.067
CNBC	11	$0.24	$0.04	$0.16	$0.30	747	0.217	277,535	0.313	1.185	0.170
CNN	11	$0.43	$0.05	$0.35	$0.52	747	0.550	277,535	0.701	1.744	0.319
Comedy Central	11	$0.11	$0.02	$0.08	$0.14	747	0.449	277,535	0.280	0.997	0.162
Discovery Channel	11	$0.27	$0.04	$0.22	$0.35	747	0.535	277,535	0.628	1.462	0.327
Disney Channel	11	$0.81	$0.06	$0.75	$0.91	747	1.171	277,535	0.246	1.074	0.116
E! Entertainment TV	11	$0.19	$0.02	$0.15	$0.21	747	0.315	277,535	0.201	0.788	0.137
ESPN	11	$2.81	$1.12	$1.14	$4.34	747	0.836	277,535	0.675	1.767	0.257
ESPN 2	11	$0.37	$0.14	$0.17	$0.58	747	0.262	277,535	0.334	1.220	0.151
ESPN Classic Sports	11	$0.14	$0.03	$0.10	$0.18	636	0.037	277,535	0.072	0.521	0.047
Food Network	11	$0.06	$0.03	$0.03	$0.14	747	0.411	277,535	0.396	1.364	0.175
Fox News Channel	11	$0.32	$0.18	$0.17	$0.70	747	0.785	277,535	0.697	1.961	0.267
FX	11	$0.34	$0.06	$0.27	$0.43	747	0.463	277,535	0.258	0.976	0.137
Golf Channel	11	$0.20	$0.05	$0.13	$0.26	580	0.065	277,535	0.084	0.633	0.041
Hallmark Channel	11	$0.04	$0.02	$0.01	$0.06	699	0.307	225,618	0.301	1.268	0.088
Headline News	—	—	—	—	—	747	0.214	277,535	0.278	0.983	0.173
HGTV	11	$0.08	$0.04	$0.03	$0.14	747	0.500	277,535	0.397	1.446	0.162
History Channel	11	$0.18	$0.04	$0.13	$0.23	747	0.531	277,535	0.531	1.462	0.251
Lifetime	11	$0.21	$0.06	$0.13	$0.29	747	0.679	277,535	0.554	1.650	0.199
MSNBC	11	$0.14	$0.02	$0.12	$0.17	747	0.343	277,535	0.330	1.181	0.182
MTV	11	$0.27	$0.05	$0.20	$0.35	747	0.568	277,535	0.235	0.983	0.127
Nickelodeon	11	$0.37	$0.05	$0.29	$0.47	747	1.555	277,535	0.200	0.991	0.096
SyFy	11	$0.17	$0.04	$0.12	$0.22	747	0.427	277,535	0.301	1.207	0.126
TBS	11	$0.37	$0.12	$0.19	$0.54	747	0.905	277,535	0.497	1.345	0.243
TLC	11	$0.16	$0.01	$0.14	$0.17	747	0.422	277,535	0.342	1.151	0.173
truTV	11	$0.09	$0.01	$0.08	$0.10	747	0.384	277,535	0.233	1.081	0.101
Turner Classic Movies	11	$0.22	$0.03	$0.16	$0.27	580	0.286	277,535	0.268	1.142	0.105
TNT	11	$0.83	$0.16	$0.55	$1.10	747	1.219	277,535	0.592	1.553	0.263
USA	11	$0.46	$0.07	$0.36	$0.57	747	1.081	277,535	0.503	1.442	0.230
VH1	11	$0.12	$0.02	$0.09	$0.16	747	0.336	277,535	0.151	0.717	0.101
Weather Channel	11	$0.10	$0.01	$0.08	$0.12	747	0.234	204,189	0.380	0.879	0.266

Notes: Reported are average affiliate fees and viewing of the 38 cable television networks included in our demand system. The averages are over years for SNL Kagan affiliate fees, over DMA-years for the Nielsen (DMA-level) viewership data, and over households and years for the MRI (2000-2007) and Simmons (2008-2010) household-level viewership data. Affiliate fees are the monthly per-subscriber fees paid by cable and satellite distributors to television networks for the right to distribute the network's programming to subscribers, averaged across distributors. The Nielsen "rating" is the percentage of US households watching a given program on a given channel at a given time. We average program-level ratings across programs within a channel-DMA-year, and report the across-DMA-year average here. MRI/Simmons viewing is reported as the average number of hours watching that channel in a typical week. It is converted to a Nielsen-equivalent "rating" by dividing by the number of hours in a week and rescaling it to lie between 0 and 100. The average fraction of households viewing a channel at all is simply whether or not reported viewing in a typical week is greater than zero.

Table 9: Estimates of Additional Viewership Parameters and Channel WTPs

	Viewership Parameters				WTP			Viewership Parameters				WTP	
	ρ_c		ρ_c^0		Mean			ρ_c		ρ_c^0		Mean	
National Channels	Est	SE	Est	SE	All	> 0	**RSNs**	Est	SE	Est	SE	All	> 0
ABC Family Channel	1.69	0.00	0.37	0.01	0.54	1.15	Altitude Sports	2.67	0.96	0.73	0.15	1.55	2.21
AMC	1.91	0.00	0.36	0.01	0.63	1.85	4SD	19.14	2.11	0.15	0.07	6.67	55.18
Animal Planet	1.38	0.00	0.47	0.01	0.31	0.53	CSN Bay Area	3.08	0.59	0.75	0.17	4.62	6.32
Arts Entertainment AE	1.92	0.03	0.44	0.01	0.81	1.74	CSN CA	1.69	0.87	0.52	0.21	0.56	1.12
BET	2.25	0.05	0.18	0.01	0.38	1.83	CSN Chicago	3.44	0.54	0.52	0.10	2.74	5.45
Bravo	1.62	0.04	0.27	0.01	0.37	1.25	CSN Mid-Atl	2.55	0.17	0.97	0.08	4.27	4.40
Cartoon Network	2.66	0.07	0.26	0.01	0.82	2.19	CSN NE	4.44	1.34	0.29	0.11	3.25	11.97
CMT	1.66	0.07	0.16	0.01	0.18	1.31	CSN NW	0.86	0.65	0.89	0.22	2.02	2.27
CNBC	1.50	0.01	0.37	0.01	0.41	1.18	CSN Phil	6.55	1.08	0.40	0.09	6.98	17.62
CNN	1.75	0.01	0.64	0.01	0.96	1.43	CSS	3.90	1.04	0.19	0.06	0.07	0.36
Comedy Central	1.78	0.04	0.34	0.01	0.54	1.41	Cox Sports	0.57	0.50	0.80	0.24	0.62	0.69
Discovery Channel	1.64	0.02	0.65	0.01	0.94	1.33	FS Detroit	3.53	0.59	0.58	0.10	4.14	7.22
Disney Channel	2.47	0.07	0.34	0.02	0.89	2.64	FS Florida	15.35	1.67	0.98	0.08	3.03	3.08
E Entertainment TV	1.53	0.05	0.31	0.02	0.37	1.28	FS Midwest	17.07	2.88	0.89	0.08	3.92	4.39
ESPN	6.91	0.10	0.45	0.01	7.66	16.41	FS North	11.28	1.01	1.00	0.06	4.99	5.00
ESPN 2	2.65	0.00	0.39	0.01	1.63	3.57	FS Ohio	5.08	0.41	0.99	0.00	6.06	6.10
ESPN Classic	1.02	0.06	0.25	0.03	0.65	2.21	FS South	4.13	0.50	0.97	0.08	2.45	2.53
Food Network	1.63	0.03	0.51	0.01	0.68	1.16	FS Southwest	14.28	1.54	0.72	0.07	3.68	5.24
Fox News Channel	2.14	0.03	0.52	0.01	1.14	1.98	FS West	2.48	0.69	0.74	0.17	4.98	6.75
FX	1.63	0.04	0.38	0.01	0.52	1.42	MSG Plus	1.28	0.20	0.71	0.09	1.64	2.54
Golf Channel	0.80	0.06	0.20	0.02	0.09	0.46	MSG	4.27	0.57	0.63	0.08	1.93	2.71
Hallmark Channel	2.20	0.07	0.22	0.01	0.45	1.92	MASN	14.21	2.59	0.81	0.11	2.85	3.54
Headline News	1.37	0.05	0.36	0.01	0.37	0.96	NESN	16.91	2.55	0.25	0.04	12.86	51.58
HGTV	1.96	0.04	0.38	0.01	0.73	1.50	Prime Ticket	1.74	0.18	0.88	0.08	3.65	4.14
History Channel	1.64	0.03	0.62	0.02	0.83	1.18	Root NW	20.99	3.31	0.84	0.16	1.44	1.64
Lifetime	2.08	0.04	0.45	0.01	0.92	2.01	Root Pitts	1.97	0.36	0.80	0.18	2.97	3.73
MSNBC	1.55	0.03	0.44	0.01	0.52	1.23	Root Rocky Mth	15.54	3.33	0.38	0.10	2.18	5.44
MTV	1.86	0.06	0.31	0.02	0.52	1.38	SNY	1.92	0.24	0.72	0.08	2.84	4.00
Nickelodeon	3.00	0.08	0.28	0.01	1.07	3.06	Sun Sports	18.49	4.31	0.68	0.17	2.37	3.68
SyFy, Sci-Fi	1.75	0.04	0.34	0.01	0.54	1.56	YES	2.85	0.24	0.79	0.08	4.29	5.34
TBS	2.20	0.04	0.42	0.02	0.99	1.88							
TLC	1.81	0.05	0.34	0.01	0.58	1.79							
truTV, Court TV	2.17	0.06	0.23	0.01	0.46	1.91							
Turner Classic Movies	1.76	0.04	0.32	0.01	0.48	1.54							
TNT	2.14	0.04	0.62	0.02	1.36	2.14							
USA	2.13	0.04	0.51	0.02	1.07	1.82							
VH1	1.35	0.04	0.34	0.01	0.34	0.82							
Weather Channel	1.17	0.02	0.63	0.02	0.48	0.79							

Notes: This table reports estimated viewership parameters $\boldsymbol{\rho}$ and implied willingness-to-pay (WTP) amounts (in dollars per household per month) for national channels and RSNs. Parameter ρ_c^0 is the probability that a household has positive marginal utilty from channel c, and parameter ρ_c is the exponential parameter governing the distribution of marginal utility. Mean WTP amounts are computed for all households ("All"), and for households conditional on deriving positive utility from the channel ("> 0"). Asymptotic GMM standard errors are computed using numerical derivatives and 225 bootstrap draws of markets to estimate the variance-covariance matrix of the moments.

Table 10: Simulated Market Outcomes for Integrated, Non-Loophole RSNs (1/2)

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
CABLE OWNED NON-LOOPHOLE RSNs (1/2)								
CSN BAY AREA	Avg Cable Mkt Share	0.65	1.8%		0.65	1.8%		0.63
Comcast	Avg Sat Mkt Share	0.21	-1.3%		0.21	-1.3%		0.22
#HHs 6.03M	Avg Cable Carriage	0.58	8.9%		0.58	9.1%		0.53
Footprint 54%	Avg Cable Prices	53.94	-1.3%		53.92	-1.3%		54.64
WTP $4.62	Aff Fees to Sat	1.88	30.3%		1.38	-3.9%		1.44
	Cable Surplus	19.68	1.2%	4.9%	19.69	1.2%	5.1%	19.46
	Satellite Surplus	5.89	-2.8%	-3.7%	5.99	-1.2%	-1.5%	6.06
	RSN Surplus	1.83	-2.2%	-0.9%	1.72	-8.0%	-3.2%	1.87
	Consumer Welfare	34.29	1.1%	8.1%	34.30	1.1%	8.3%	33.91
	Total Welfare	61.69	0.6%	8.5%	61.70	0.7%	8.6%	61.30
CSN CA	Avg Cable Mkt Share	0.70	0.2%		0.70	0.2%		0.69
Comcast	Avg Sat Mkt Share	0.18	-0.1%		0.18	-0.1%		0.18
#HHs 3.86M	Avg Cable Carriage	0.08	0.0%		0.08	0.0%		0.08
Footprint 10%	Avg Cable Prices	51.63	-0.1%		51.63	-0.1%		51.69
WTP $0.56	Aff Fees to Sat	1.20	-1.5%		1.19	-2.0%		1.21
	Cable Surplus	18.35	-0.1%	-3.2%	18.35	-0.1%	-3.2%	18.37
	Satellite Surplus	4.71	-0.1%	-0.5%	4.71	0.0%	-0.3%	4.72
	RSN Surplus	0.34	3.7%	2.2%	0.34	3.4%	2.0%	0.33
	Consumer Welfare	32.03	0.1%	6.7%	32.03	0.1%	6.7%	31.99
	Total Welfare	55.44	0.1%	5.1%	55.44	0.1%	5.1%	55.41
CSN CHICAGO	Avg Cable Mkt Share	0.58	2.9%		0.58	3.0%		0.57
Comcast	Avg Sat Mkt Share	0.23	-1.6%		0.23	-1.6%		0.23
#HHs 9.62M	Avg Cable Carriage	0.71	14.6%		0.71	14.6%		0.62
Footprint 76%	Avg Cable Prices	58.67	-1.2%		58.66	-1.2%		59.40
WTP $2.74	Aff Fees to Sat	1.31	13.3%		1.11	-4.4%		1.16
	Cable Surplus	22.46	1.4%	11.2%	22.47	1.4%	11.3%	22.16
	Satellite Surplus	6.58	-2.1%	-5.2%	6.63	-1.4%	-3.5%	6.72
	RSN Surplus	1.39	-5.6%	-3.1%	1.34	-9.0%	-4.9%	1.47
	Consumer Welfare	34.57	1.7%	21.1%	34.58	1.7%	21.4%	33.99
	Total Welfare	65.00	1.0%	24.1%	65.01	1.0%	24.3%	64.34
CSN MID-ATL	Avg Cable Mkt Share	0.65	2.0%		0.65	2.2%		0.63
Comcast	Avg Sat Mkt Share	0.18	-2.0%		0.18	-2.2%		0.18
#HHs 6.55M	Avg Cable Carriage	0.82	71.6%		0.82	71.6%		0.48
Footprint 70%	Avg Cable Prices	55.67	0.0%		55.58	-0.1%		55.65
WTP $4.27	Aff Fees to Sat	2.38	53.7%		1.57	1.5%		1.55
	Cable Surplus	24.01	-4.0%	-23.7%	24.03	-4.0%	-23.3%	25.02
	Satellite Surplus	4.66	-5.2%	-6.0%	4.81	-2.2%	-2.5%	4.91
	RSN Surplus	3.44	113.4%	42.8%	3.26	102.3%	38.7%	1.61
	Consumer Welfare	31.90	1.9%	13.6%	31.95	2.0%	14.8%	31.32
	Total Welfare	64.01	1.8%	26.7%	64.05	1.9%	27.7%	62.87

Notes: This table presents simulated market outcomes for RSNs that are not located in loophole markets and not included in Table 4, and is continued in Table 11. Scenario (i) (VI, no PARs) corresponds to assuming that $\lambda_R = \hat{\underline{\lambda}}_R$ and $\mu = \hat{\mu}$, and allowing the owner of the RSN to exclude rivals; scenario (ii) (VI, PARs) corresponds to setting $\lambda_R = 0$ and prohibiting the RSN owner from excluding rivals; scenario (iii) (No VI) sets $\mu = 0$ and disintegrates the RSNs. All reported levels except for market shares are in \$/household/month, and $\%\Delta_{lvl}$ ($\%\Delta_{WTP}$) represents level changes from scenario (iii) divided by the baseline level (or the estimated mean consumer willingness-to-pay (WTP) for the channel). Beneath the channel name is the name of the MVPD that owns the channel, the number of television households in the RSN's relevant DMAs, the MVPD owner's footprint (% of households passed) in the RSN's relevant DMAs, and the estimated mean consumer WTP for the channel.

Table 11: Simulated Market Outcomes for Integrated, Non-Loophole RSNs (2/2)

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
CABLE OWNED NON-LOOPHOLE RSNs (2/2)								
MSG PLUS	Avg Cable Mkt Share	0.70	1.7%		0.70	1.8%		0.69
Cablevision	Avg Sat Mkt Share	0.15	-2.0%		0.15	-2.0%		0.15
#HHs 9.46M	Avg Cable Carriage	1.00	5.5%		1.00	5.5%		0.95
Footprint 49%	Avg Cable Prices	57.01	-1.4%		56.99	-1.4%		57.80
WTP $1.93	Aff Fees to Sat	1.27	53.3%		0.85	2.4%		0.83
	Cable Surplus	35.38	-1.6%	-30.5%	35.38	-1.6%	-30.4%	35.97
	Satellite Surplus	3.82	-3.8%	-7.7%	3.88	-2.1%	-4.2%	3.97
	RSN Surplus	1.97	56.5%	36.6%	1.90	50.8%	32.9%	1.26
	Consumer Welfare	35.34	1.7%	30.6%	35.36	1.7%	31.3%	34.75
	Total Welfare	76.51	0.7%	29.0%	76.52	0.8%	29.6%	75.95
SNY	Avg Cable Mkt Share	0.68	2.5%		0.68	2.5%		0.66
Comcast, TWC	Avg Sat Mkt Share	0.15	-2.7%		0.15	-2.7%		0.15
#HHs 11.7M	Avg Cable Carriage	0.88	6.5%		0.88	6.5%		0.82
Footprint 35%	Avg Cable Prices	56.67	-1.9%		56.67	-1.9%		57.79
WTP $2.84	Aff Fees to Sat	1.56	-0.5%		1.56	-0.1%		1.57
	Cable Surplus	32.78	0.4%	4.1%	32.78	0.4%	4.1%	32.66
	Satellite Surplus	3.85	-2.7%	-3.8%	3.85	-2.7%	-3.8%	3.96
	RSN Surplus	1.71	-3.8%	-2.4%	1.71	-3.7%	-2.3%	1.78
	Consumer Welfare	34.75	2.1%	25.5%	34.75	2.1%	25.5%	34.03
	Total Welfare	73.09	0.9%	23.5%	73.09	0.9%	23.5%	72.42
SATELLITE OWNED RSNs								
ROOT NW	Avg Cable Mkt Share	0.59	1.0%		0.59	1.1%		0.59
DirecTV	Avg Sat Mkt Share	0.23	-0.6%		0.23	-0.6%		0.23
#HHs 4.15M	Avg Cable Carriage	0.94	0.4%		0.94	0.9%		0.94
WTP $1.44	Avg Cable Prices	53.50	-0.8%		53.50	-0.8%		53.91
	Aff Fees to Rivals	0.63	6.5%		0.59	1.0%		0.59
	Cable Surplus	24.70	-0.2%	-3.2%	24.74	-0.1%	-1.1%	24.75
	Satellite Surplus	7.16	-1.7%	-8.5%	7.16	-1.7%	-8.4%	7.28
	RSN Surplus	0.91	15.3%	8.4%	0.88	11.8%	6.4%	0.79
	Consumer Welfare	33.69	0.7%	16.3%	33.69	0.7%	16.8%	33.45
	Total Welfare	66.46	0.3%	13.1%	66.47	0.3%	13.7%	66.27
ROOT PITT	Avg Cable Mkt Share	0.65	1.3%		0.65	1.7%		0.64
DirecTV	Avg Sat Mkt Share	0.16	-0.8%		0.16	-1.3%		0.16
#HHs 5.09M	Avg Cable Carriage	0.55	-6.4%		0.58	-2.1%		0.59
WTP $2.97	Avg Cable Prices	55.12	-1.0%		54.99	-1.2%		55.67
	Aff Fees to Rivals	1.94	12.1%		1.77	2.0%		1.74
	Cable Surplus	29.24	-0.4%	-3.7%	29.33	-0.1%	-0.6%	29.35
	Satellite Surplus	4.24	-5.2%	-7.8%	4.22	-5.6%	-8.4%	4.47
	RSN Surplus	1.54	20.6%	8.9%	1.47	15.3%	6.6%	1.28
	Consumer Welfare	31.85	1.0%	10.3%	31.96	1.3%	14.0%	31.55
	Total Welfare	66.87	0.3%	7.6%	66.99	0.5%	11.6%	66.65
ROOT ROCKY MTN	Avg Cable Mkt Share	0.54	4.1%		0.51	0.0%		0.51
DirecTV	Avg Sat Mkt Share	0.31	-2.4%		0.31	0.0%		0.31
#HHs 4.19M	Avg Cable Carriage	0.10	-75.0%		0.40	0.0%		0.40
WTP $2.18	Avg Cable Prices	53.94	-3.5%		55.91	0.0%		55.90
	Aff Fees to Rivals[a]	1.72	-42.2%		3.65	0.8%		3.62
	Cable Surplus	20.06	4.2%	36.7%	19.24	-0.1%	-0.7%	19.26
	Satellite Surplus	8.87	-5.5%	-24.0%	9.15	-2.7%	-11.4%	9.40
	RSN Surplus	1.47	-26.6%	-46.8%	2.76	16.1%	12.1%	2.49
	Consumer Welfare	40.54	2.7%	48.9%	39.47	0.0%	-0.2%	39.48
	Total Welfare	70.95	0.5%	14.8%	70.62	0.0%	-0.1%	70.63

Notes: This table presents simulated market outcomes for RSNs not located in loophole markets and not included in Table 4, and is continued from Table 10. See Table 10 for further discussion.

[a] Conditional on carriage, affiliate fees for each cable provider and for Dish increase from scenario (ii) to (i). The reported average affiliate fees conditional on carriage are lower under scenario (i) than (ii) because: under scenario (i), Root Rocky Mountain is not carried by cable across more sets of carriage disturbance draws than under scenarios (ii) and (iii), and Dish has lower predicted affiliate fees than cable.

Table 12: Simulated Market Outcomes for Non-Integrated RSNs (1/2)

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
NON-INTEGRATED RSNs (1/2)								
ALTITUDE SPORTS	Avg Cable Mkt Share	0.57	3.5%		0.57	3.6%		0.55
*Comcast	Avg Sat Mkt Share	0.27	-1.7%		0.27	-1.8%		0.28
#HHs 7.12M	Avg Cable Carriage	0.70	52.0%		0.70	52.0%		0.46
Footprint 74%	Avg Cable Prices	55.28	-2.1%		55.24	-2.1%		56.45
WTP $1.55	Aff Fees to Sat	1.03	88.7%		0.55	0.3%		0.55
	Cable Surplus	18.07	-3.9%	-47.9%	18.08	-3.9%	-47.6%	18.82
	Satellite Surplus	7.93	-3.3%	-17.3%	8.05	-1.8%	-9.4%	8.19
	RSN Surplus	1.86	110.8%	63.1%	1.72	95.7%	54.5%	0.88
	Consumer Welfare	36.82	1.8%	42.4%	36.84	1.9%	43.9%	36.16
	Total Welfare	64.67	1.0%	40.3%	64.69	1.0%	41.5%	64.05
FS FLORIDA	Avg Cable Mkt Share	0.63	1.7%		0.63	1.9%		0.62
*Comcast	Avg Sat Mkt Share	0.23	-1.4%		0.23	-1.5%		0.23
#HHs 6.20M	Avg Cable Carriage	0.86	0.9%		0.86	0.9%		0.85
Footprint 67%	Avg Cable Prices	54.79	-1.0%		54.74	-1.1%		55.35
WTP $3.03	Aff Fees to Sat	2.54	40.2%		1.88	3.8%		1.81
	Cable Surplus	20.73	-4.0%	-28.2%	20.73	-3.9%	-28.0%	21.58
	Satellite Surplus	6.15	-4.1%	-8.7%	6.29	-1.8%	-3.9%	6.41
	RSN Surplus	2.45	74.7%	34.6%	2.29	63.3%	29.3%	1.40
	Consumer Welfare	34.49	1.1%	12.9%	34.52	1.2%	14.0%	34.10
	Total Welfare	63.81	0.5%	10.6%	63.84	0.5%	11.3%	63.49
FS MIDWEST	Avg Cable Mkt Share	0.61	1.0%		0.61	1.1%		0.60
*Comcast	Avg Sat Mkt Share	0.21	-0.7%		0.21	-0.7%		0.21
#HHs 10.40M	Avg Cable Carriage	0.48	8.3%		0.48	8.3%		0.45
Footprint 26%	Avg Cable Prices	52.26	-0.5%		52.25	-0.5%		52.50
WTP $3.92	Aff Fees to Sat	2.18	29.1%		1.70	0.9%		1.68
	Cable Surplus	20.63	-1.9%	-10.2%	20.63	-1.9%	-10.2%	21.03
	Satellite Surplus	5.97	-2.3%	-3.6%	6.07	-0.7%	-1.1%	6.11
	RSN Surplus	1.58	55.4%	14.4%	1.48	45.2%	11.7%	1.02
	Consumer Welfare	33.18	0.6%	5.4%	33.19	0.7%	5.6%	32.97
	Total Welfare	61.36	0.4%	5.9%	61.36	0.4%	6.1%	61.13
FS NORTH	Avg Cable Mkt Share	0.61	0.4%		0.61	0.5%		0.60
*Charter	Avg Sat Mkt Share	0.15	-0.8%		0.15	-0.8%		0.15
#HHs 5.77M	Avg Cable Carriage	0.86	16.2%		0.86	16.2%		0.74
Footprint 12%	Avg Cable Prices	51.98	0.4%		51.98	0.4%		51.79
WTP $4.99	Aff Fees to Sat	2.96	18.3%		2.59	3.7%		2.50
	Cable Surplus	22.86	-2.9%	-13.9%	22.86	-2.9%	-13.9%	23.55
	Satellite Surplus	4.24	-2.4%	-2.1%	4.29	-1.2%	-1.0%	4.34
	RSN Surplus	2.89	55.0%	20.6%	2.84	52.0%	19.4%	1.87
	Consumer Welfare	29.31	0.6%	3.3%	29.31	0.6%	3.3%	29.15
	Total Welfare	59.30	0.7%	7.8%	59.30	0.7%	7.9%	58.90
FS OHIO	Avg Cable Mkt Share	0.63	5.3%		0.63	5.5%		0.60
*TWC	Avg Sat Mkt Share	0.16	-3.0%		0.16	-3.2%		0.16
#HHs 8.16M	Avg Cable Carriage	0.82	20.7%		0.82	20.7%		0.68
Footprint 51%	Avg Cable Prices	51.00	-3.3%		50.93	-3.4%		52.72
WTP $6.06	Aff Fees to Sat	3.91	34.5%		3.02	3.9%		2.91
	Cable Surplus	18.16	-9.7%	-32.3%	18.19	-9.6%	-31.8%	20.12
	Satellite Surplus	4.01	-6.8%	-4.8%	4.14	-3.7%	-2.6%	4.30
	RSN Surplus	5.61	80.2%	41.2%	5.43	74.6%	38.3%	3.11
	Consumer Welfare	28.43	4.7%	20.9%	28.47	4.8%	21.6%	27.16
	Total Welfare	56.20	2.8%	24.9%	56.24	2.8%	25.5%	54.69
FS SOUTH	Avg Cable Mkt Share	0.60	0.1%		0.60	0.1%		0.60
*TWC	Avg Sat Mkt Share	0.23	-0.1%		0.23	-0.1%		0.23
#HHs 13.20M	Avg Cable Carriage	0.90	0.5%		0.90	0.5%		0.90
Footprint 33%	Avg Cable Prices	56.23	-0.1%		56.23	-0.1%		56.26
WTP $2.45	Aff Fees to Sat	1.31	4.7%		1.26	0.1%		1.25
	Cable Surplus	22.88	-0.5%	-5.0%	22.88	-0.5%	-4.9%	23.00
	Satellite Surplus	6.62	-0.2%	-0.7%	6.63	-0.1%	-0.2%	6.64
	RSN Surplus	1.31	11.6%	5.6%	1.30	10.5%	5.0%	1.18
	Consumer Welfare	34.35	0.1%	0.8%	34.35	0.1%	0.8%	34.33
	Total Welfare	65.16	0.0%	0.7%	65.17	0.0%	0.7%	65.15

Notes: This table presents simulated market outcomes for non-integrated RSNs that are not included in Table 4, and is continued in Table 13. Scenario (i) (VI, no PARs) corresponds to assuming that $\lambda_R = \hat{\lambda}_R$ and $\mu = \hat{\mu}$, and allowing the owner of the RSN to exclude rivals; scenario (ii) (VI, PARs) corresponds to setting $\lambda_R = 0$ and prohibiting the RSN owner from excluding rivals; scenario (iii) (No VI) sets $\mu = 0$ and keeps the RSNs non-integrated. All reported levels except for market shares are in \$/household/month, and $\%\Delta_{lvl}$ ($\%\Delta_{WTP}$) represents level changes from scenario (iii) divided by the baseline level (or the estimated mean consumer willingness-to-pay (WTP) for the channel). Beneath the channel name is the name of the MVPD that is assigned ownership of the channel in scenarios (i) and (ii), the number of television households and the MVPD owner's footprint (% of households passed) in the RSN's relevant DMAs, and the estimated mean consumer WTP for the channel.

Table 13: Simulated Market Outcomes for Non-Integrated RSNs (2/2)

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
NON-INTEGRATED RSNs (2/2)								
FS SOUTHWEST	Avg Cable Mkt Share	0.57	0.8%		0.57	0.8%		0.57
*Cox	Avg Sat Mkt Share	0.22	-0.8%		0.22	-0.8%		0.22
#HHs 12.70M	Avg Cable Carriage	0.98	3.3%		0.98	3.3%		0.95
Footprint 37%	Avg Cable Prices	50.62	-0.5%		50.61	-0.5%		50.88
WTP $3.68	Aff Fees to Sat	1.60	11.1%		1.45	0.8%		1.44
	Cable Surplus	18.17	-1.8%	-8.9%	18.17	-1.8%	-8.8%	18.50
	Satellite Surplus	6.56	-1.3%	-2.4%	6.59	-0.8%	-1.5%	6.64
	RSN Surplus	1.98	23.9%	10.4%	1.95	21.7%	9.4%	1.60
	Consumer Welfare	32.09	0.6%	4.9%	32.09	0.6%	5.0%	31.91
	Total Welfare	58.80	0.3%	4.0%	58.80	0.3%	4.1%	58.65
FS WEST	Avg Cable Mkt Share	0.57	4.6%		0.57	4.8%		0.54
*TWC	Avg Sat Mkt Share	0.24	-3.8%		0.24	-3.9%		0.25
#HHs 8.43M	Avg Cable Carriage	0.96	1.5%		0.96	1.5%		0.94
Footprint 53%	Avg Cable Prices	52.65	-2.6%		52.62	-2.7%		54.05
WTP $4.98	Aff Fees to Sat	2.49	33.2%		1.96	4.6%		1.87
	Cable Surplus	17.44	-5.1%	-19.0%	17.44	-5.1%	-18.9%	18.38
	Satellite Surplus	6.18	-6.0%	-7.9%	6.30	-4.2%	-5.6%	6.57
	RSN Surplus	3.12	58.7%	23.2%	2.99	52.3%	20.6%	1.97
	Consumer Welfare	33.90	1.8%	12.1%	33.91	1.9%	12.4%	33.29
	Total Welfare	60.63	0.7%	8.4%	60.64	0.7%	8.6%	60.21
MASN	Avg Cable Mkt Share	0.68	5.3%		0.68	5.4%		0.64
*Comcast	Avg Sat Mkt Share	0.16	-5.6%		0.16	-5.7%		0.17
#HHs 8.25M	Avg Cable Carriage	0.74	44.3%		0.74	44.3%		0.52
Footprint 52%	Avg Cable Prices	55.02	-2.7%		55.00	-2.8%		56.57
WTP $2.85	Aff Fees to Sat	1.83	30.9%		1.40	-0.4%		1.40
	Cable Surplus	24.70	-3.7%	-33.4%	24.70	-3.7%	-33.4%	25.65
	Satellite Surplus	4.35	-6.9%	-11.3%	4.43	-5.3%	-8.7%	4.68
	RSN Surplus	2.69	108.5%	48.9%	2.61	102.5%	46.2%	1.30
	Consumer Welfare	32.60	4.3%	47.2%	32.62	4.3%	47.6%	31.26
	Total Welfare	64.35	2.3%	51.4%	64.36	2.3%	51.7%	62.88
PRIME TICKET	Avg Cable Mkt Share	0.57	3.8%		0.57	3.9%		0.55
*TWC	Avg Sat Mkt Share	0.24	-3.2%		0.24	-3.4%		0.25
#HHs 8.32M	Avg Cable Carriage	0.98	2.9%		0.98	2.9%		0.95
Footprint 53%	Avg Cable Prices	52.90	-2.1%		52.86	-2.1%		54.02
WTP $3.65	Aff Fees to Sat	2.23	39.9%		1.75	9.7%		1.60
	Cable Surplus	17.72	-3.7%	-18.9%	17.72	-3.8%	-18.9%	18.41
	Satellite Surplus	6.23	-5.6%	-10.1%	6.33	-4.0%	-7.2%	6.59
	RSN Surplus	2.32	63.2%	24.7%	2.21	55.1%	21.5%	1.42
	Consumer Welfare	33.82	1.4%	13.0%	33.84	1.5%	13.5%	33.34
	Total Welfare	60.09	0.5%	8.7%	60.09	0.5%	8.8%	59.77
SUN SPORTS	Avg Cable Mkt Share	0.66	1.1%		0.66	1.2%		0.66
*TWC	Avg Sat Mkt Share	0.16	-1.2%		0.16	-1.3%		0.16
#HHs 3.41M	Avg Cable Carriage	0.88	0.1%		0.88	0.1%		0.88
Footprint 65%	Avg Cable Prices	56.99	-0.6%		56.96	-0.6%		57.32
WTP $2.37	Aff Fees to Sat	1.73	35.8%		1.22	-4.1%		1.28
	Cable Surplus	24.62	-4.0%	-42.8%	24.62	-4.0%	-42.7%	25.64
	Satellite Surplus	4.33	-3.1%	-5.8%	4.41	-1.2%	-2.2%	4.47
	RSN Surplus	2.35	92.1%	47.5%	2.26	84.6%	43.6%	1.22
	Consumer Welfare	30.96	0.9%	11.3%	30.97	0.9%	12.1%	30.69
	Total Welfare	62.26	0.4%	10.2%	62.27	0.4%	10.7%	62.02
YES	Avg Cable Mkt Share	0.68	2.9%		0.68	3.3%		0.66
*TWC	Avg Sat Mkt Share	0.15	0.0%		0.15	-3.6%		0.15
#HHs 11.40M	Avg Cable Carriage	0.91	-0.8%		0.96	4.4%		0.92
Footprint 35%	Avg Cable Prices	56.06	-3.0%		56.45	-2.3%		57.76
WTP $4.29	Aff Fees to Sat	2.61	149.4%		1.08	3.6%		1.05
	Cable Surplus	31.35	-4.3%	-32.9%	31.69	-3.3%	-25.0%	32.77
	Satellite Surplus	3.78	-4.1%	-3.8%	3.80	-3.8%	-3.5%	3.95
	RSN Surplus	4.13	50.0%	32.1%	3.95	43.4%	27.8%	2.75
	Consumer Welfare	35.22	4.0%	31.7%	34.81	2.8%	22.1%	33.86
	Total Welfare	74.48	1.6%	27.0%	74.24	1.3%	21.4%	73.32

Notes: This table presents simulated market outcomes for non-integrated RSNs not included in Table 4, and is continued from Table 12. See Table 12 for further discussion.

Table 14: Alternative Supply Outcomes

		(i) VI, no PARs			(ii) VI, PARs			(iii) No VI
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	Level
4SD	Avg Cable Mkt Share	0.74	2.0%		0.76	4.6%		0.73
Cox	Avg Sat Mkt Share	0.16	-5.9%		0.16	-4.6%		0.17
#HHs 2.81M	Avg Cable Carriage	0.85	70.5%		0.85	70.5%		0.50
Footprint 100%	Avg Cable Prices	51.79	-0.3%		49.83	-4.1%		51.95
WTP $6.67	Aff Fees to Sat	0.89	-49.2%		1.47	-16.5%		1.76
	Cable Surplus	27.78	-4.9%	-21.3%	27.82	-4.7%	-20.7%	29.20
Supply DirecTV	Satellite Surplus	3.75	-3.7%	-2.2%	3.77	-3.2%	-1.9%	3.89
	RSN Surplus	3.61	107.9%	28.1%	3.39	95.3%	24.8%	1.74
	Consumer Welfare	36.03	1.1%	5.7%	38.06	6.7%	36.1%	35.65
	Total Welfare	71.17	1.0%	10.3%	73.04	3.6%	38.3%	70.49
CSN NE	Avg Cable Mkt Share	0.63	1.2%		0.63	1.3%		0.62
Comcast	Avg Sat Mkt Share	0.11	-7.3%		0.12	-3.1%		0.12
#HHs 5.2M	Avg Cable Carriage	0.89	100.5%		0.89	99.6%		0.45
Footprint 85%	Avg Cable Prices	55.74	1.2%		55.38	0.5%		55.09
WTP $3.25	Aff Fees to Sat	1.97	57.7%		1.12	-10.1%		1.25
	Cable Surplus	28.11	-2.1%	-18.3%	27.76	-3.3%	-29.3%	28.71
Supply Dish	Satellite Surplus	2.96	-4.9%	-4.6%	3.03	-2.7%	-2.6%	3.11
	RSN Surplus	2.19	167.9%	42.0%	2.37	190.3%	47.6%	0.82
	Consumer Welfare	36.14	0.7%	8.1%	36.55	1.9%	20.9%	35.87
	Total Welfare	69.39	1.3%	27.1%	69.71	1.7%	36.7%	68.51
CSN PHIL	Avg Cable Mkt Share	0.64	3.9%		0.64	3.8%		0.62
Comcast	Avg Sat Mkt Share	0.17	-9.4%		0.18	-4.0%		0.18
#HHs 4.25M	Avg Cable Carriage	0.96	17.7%		0.96	18.5%		0.81
Footprint 90%	Avg Cable Prices	54.25	0.3%		52.93	-2.2%		54.10
WTP $6.98	Aff Fees to Sat	5.47	111.3%		2.78	7.3%		2.59
	Cable Surplus	30.22	3.2%	13.3%	29.50	0.7%	3.1%	29.29
Supply DirecTV	Satellite Surplus	4.49	-6.2%	-4.2%	4.56	-4.7%	-3.3%	4.79
	RSN Surplus	2.56	-1.2%	-0.5%	2.81	8.4%	3.1%	2.60
	Consumer Welfare	34.58	0.2%	1.2%	35.79	3.7%	18.5%	34.50
	Total Welfare	71.86	1.0%	9.8%	72.66	2.1%	21.4%	71.17
NESN	Avg Cable Mkt Share	0.67	12.8%		0.67	13.0%		0.59
*Comcast	Avg Sat Mkt Share	0.11	-12.9%		0.11	-13.1%		0.13
#HHs 5.20M	Avg Cable Carriage	0.98	19.3%		0.98	19.3%		0.82
Footprint 85%	Avg Cable Prices	52.91	-8.1%		52.85	-8.2%		57.59
WTP $12.86	Aff Fees to Sat	4.37	41.5%		2.88	-6.6%		3.09
	Cable Surplus	25.39	-7.4%	-15.9%	25.37	-7.5%	-16.0%	27.43
Supply Both	Satellite Surplus	2.66	-17.3%	-4.3%	2.83	-12.1%	-3.0%	3.22
	RSN Surplus	5.83	83.9%	20.7%	5.67	78.9%	19.4%	3.17
	Consumer Welfare	38.05	10.4%	27.9%	38.09	10.5%	28.2%	34.47
	Total Welfare	71.93	5.3%	28.4%	71.96	5.4%	28.6%	68.29

Notes: This table presents simulated market outcomes for RSNs for which there are two supply outcome equilibria under scenario (i) (see footnote 51). Beneath each channel name represents the satellite provider(s) that is/are supplied under the alternative supply outcome than reported in the main results (see Table 4). See Table 12 for further discussion.