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The economics of online television: Industry development, aggregation, and "TV Everywhere" ☆

David Waterman [a], Ryland Sherman [a,*], Sung Wook Ji [b]

[a] Department of Telecommunications, Indiana University, Bloomington, USA
[b] Department of Telecommunication, Information Studies and Media, Michigan State University, USA

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ABSTRACT

Although still dominated by standard television, the online TV industry is growing rapidly. Entrants employ a range of business models, and we identify a prevalent tendency for leading providers to aggregate programming from a variety of different content owners. We focus on one form of content aggregation by multi-channel programming distributors (MPVDs) widely known as "TV Everywhere (TVE)." Following a brief taxonomy of TVE systems, we develop an economic model to show how this "free-with-authentication" (of MVPD subscribership) bundling practice can be explained as a price discrimination device intended to slow MVPD disconnections. We show that TVE bundling could also deter entry into the online TV market. We discuss the potential roles of horizontal and vertical integration of MVPDs and ISPs in online TV industry development, again focusing on TVE, and conclude with policy implications.

1. Introduction

Since the mid-2000s, as Internet broadband adoption has expanded from a third to two thirds of U.S households and transmission speeds have grown dramatically, online streaming and downloading of TV shows and other video content has blossomed. In this article, we explore the online video industry, focusing on professionally produced television programming. Our purpose is to provide an economic framework for addressing questions about online television's economic future, especially from a policy perspective.

In the first part of the article (Section 2), we discuss economic development of online TV: the emergence of its major players and business models, and contrasts between online and offline TV revenues and viewing. We also offer economic explanations for the prevalent tendency of leading online video providers to aggregate programming content from a variety of different owners.

In the second part (Section 3), we focus on one aspect of the policy debate: the offline/online bundling practice of MVPDs widely known as "TV Everywhere" ("TVE"). TVE is an umbrella model in which a cable operator or other MVPD offers an online aggregation of television programming for free, but only with "authentication" that the online user is also an MVPD

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* Corresponding author. Tel.: +1 219 201 5146.
E-mail address: rysherma@indiana.edu (R. Sherman).

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2005:	***YouTube*** launched; broadcast TV programs were posted for free by users
	iTunes offers TV programs for sale as downloads
2006:	***Amazon*** debuts "Unbox" (digital rental/purchase of TV shows/movies
2007:	Networks issue "takedown" notices to ***YouTube***; ***Viacom*** law suit against ***YouTube*** for copyright infringement. Networks win.
	Netflix launches online streaming of TV shows/movies
2008:	***Fox*** and ***NBC*** launch ***Hulu.com***.
	CBS launches ***TV.com***.
2009:	ABC joins ***Hulu.com***.
2010:	***Comcast*** and a few other MVPDs begin launching TV Everywhere services.
2011:	***Amazon Prime*** program includes online streaming of TV shows and movies in addition to free ***Amazon*** product shipping as bundle
2012:	***YouTube*** finances and distributes its own professional content with a variety of niche partners.

Fig. 1. Online television timeline.

subscriber. It has been alleged that TVE is an anticompetitive device intended to preserve the MVPD's offline market power, or to leverage that market power in order to dominate the online TV market (Scott, 2010). Among the main research questions we ask: what are the economic motives of TVE bundling? Is this practice likely to have anticompetitive effects?

After a brief taxonomy of TVE development by the 25 largest MVPDs and a review of similar bundling by newspapers and magazines, we develop a simple economic model that explains TVE as a price discrimination device by which MVPDs prevent offline "cord cutting." We show that in some plausible circumstances, TVE could also limit entry into the online TV industry, although our model does not itself involve anticompetitive intent. Finally, we discuss the potential roles of horizontal and vertical integration of MVPDs and ISPs, key aspects of the online video policy debate. Although TVE is only one part of the policy concerns about online TV development, it offers a useful window onto the broader range of those issues.

2. The online television industry

2.1. Historical development and programming content

Some watershed events in the history of online commercial TV program distribution are shown in Fig. 1. Although the broader online video industry had its beginnings in the mid-1990s, few if any commercial TV programs were made available before the mid-2000s. With little fanfare, iTunes began offering some recent TV series for direct payment download (usually $1.99/episode) in 2005. Phenomenal consumer response, however, followed YouTube's launch in that year, and full episodes of major network series programs were soon illegally posted by users. After an initial period of tolerance, the networks and program suppliers issued "takedown" orders under the Digital Millennium Copyright Act, and lawsuits against YouTube followed. It was not until 2008 and 2009 that NBC and Fox (later joined by ABC) launched Hulu.com and CBS started tv.com (later CBS Interactive),[1] primarily as online outlets for some of their regular series programs. Then since 2010, amid rapid industry growth, a number of other players have entered the online television market, notably the launch of TVE services by major cable operators and other MVPDs.

Fig. 2 summarizes characteristics of several significant providers of online commercial television programming as of early 2013.[2] A variety of revenue models and levels of program aggregation have emerged, topics to which we return in Section 2.3. Note also from Fig. 2 that there is a broader market of commercial online video suppliers, mostly offering movies and often original programs as well as network TV series. Most of the leading firms are the same; thus our analysis of online TV may often apply to the larger online video industry.

2.2. Revenue and viewing

Both revenue and viewing of online TV providers are dwarfed by offline multichannel and broadcast TV, but online is growing rapidly.

Online TV program revenues from advertising, subscriptions, and VOD accounted for less than 2% of total TV industry revenues in 2010 (Waterman, Sherman, & Ji, 2012, p. 15), but this proportion has clearly grown. One research firm reported a similar ratio, 2.35%, of all online video advertising as a portion of total offline TV plus online video advertising in 2010, and this ratio increased to 4.3% in 2012 (eMarketer, 2012). Another firm reported 59% growth in total TV industry revenues from online consumer direct payments (subscription plus VOD revenues) of $1.8–$3.1 billion between 2010 and 2011 (SNL Kagan, 2012).

[1] CBS Interactive is the umbrella organization for CBS.com, which offers full TV episodes, and tv.com, which offers short form videos.

[2] An FCC report (released July, 2012), on the status of competition in the video industries provides very useful and detailed description of the recent events in the online video industries and discusses the wide variety of revenue models, content, and levels of aggregation in this emerging industry.

Service	Primary Content	Primary Business Model(s)
Hulu	NBC, ABC, & Fox TV series; some cable network content/web-only video	Advertising and subscriptions
CBS	CBS broadcast programs	Advertising
iTunes	Broadcast/ cable programs; movies	Pay to download/rental options
Viacom Digital	Viacom cable networks (MTV, Comedy Central, others)	Advertising
Netflix	Broadcast /cable programs; movies	Subscriptions
Crackle	Sony-owned movie / TV content	Advertising
Amazon	Broadcast/cable programs/ movies	Subscription; pay to download
Comcast Xfinity	Broadcast /cable programs/ movies 'Streampix' premium content	Free to offline subscribers
Verizon FiOS	Broadcast/ cable programs/movies	Free to offline subscribers
HBO-Go	HBO exclusive series and licensed movies	Free to offline subscribers
YouTube	User-generated content; original funded 'channels'	Advertising, subscriptions

Fig. 2. Some major online commercial television suppliers.

Turning to viewing contrasts, Nielsen reports that in the 4th quarter of 2012, the average individual watched 34 h of television per week, compared to 57 min "watching video on the Internet," and 11 min "watching video on a mobile phone," a lopsided offline to online viewing ratio of about 30 to 1 (Nielsen, 2013, p. 9).

The share of online viewing is, however, rising quickly. Online video consumption per week nearly doubled between 2011 and 2012 (Nielsen, 2013, p. 9), and demographic factors hint at its further growth. Eighteen to twenty-four year olds, the most intensive online video user group in the Nielsen study, watched an average of 105 min of Internet video and 14 min of phone video—although they still watched over 23 h of standard television (a ratio of about 13 to 1).

The contrasts between online and offline viewing are reportedly less extreme for broadcast and cable network programming. One analyst estimated that about 5% of all prime time broadcast network program viewing in 2010 was online (Convergence Consulting Group, 2012), and another that 8% of all U.S. TV viewing was online in that year (Screen Digest, 2011, p. 210), and that ratio has surely risen as well.

In spite of the growing competition, standard television has proven remarkably robust. Total U.S. television industry revenues from all offline subscription payments and advertising actually rose between 2005 and 2010 as a percentage of all economic activity (from 1.02% of GDP to 1.11%).[3] Another analyst reports a slight erosion in the percent of U.S. TV households with multichannel subscriptions from 88.0% in 2009 and 86.8% in 2011, yet this figure remains above the 80% level achieved in 1999 (SNL Kagan, 2007, 2011, 2012).

In sum, the online TV industry and its viewership have been expanding rapidly; at least so far, though, offline television dominates and has shown few signs of displacement by online substitutes.

2.3. *Business models and programming content*

Fig. 2 highlights the development of 4 basic online TV business segments: a la carte rentals and purchases, or video-on demand (VOD); subscriptions; advertiser-supported; and authentication-dependent, offline/online bundled content.

iTunes was reported to have a 63% share of the online movie download market in the first half of 2011 (Screen Digest, 2011, p. 294), and it likely has a similar share of the a la carte streaming and downloading of TV programs. In the monthly subscription category, Netflix clearly dominates. The bandwidth demands of its 25 million subscribers as of July of 2012 were 18 times greater than those of Amazon, its main apparent subscription competitor (Sandvine, 2012, p. 20–21). In the ad-supported professional content category, Hulu.com is the leading firm, earning the 4th highest comScore ranking for "total ad minutes viewed" during December, 2012 (Comscore, 2013).[4] In the still nascent authentication-dependent segment, competition is at the local market level, and except for DBS-based services, the mix of competitors generally varies market by market.

Of course, all of these online providers compete with one another, but they have significant differentiating elements, including a growing number of Internet-original programs. Apart from some relatively expensive original programs,[5]

[3] Waterman et al. (2012) primarily attribute standard television's economic growth since 1999 to a growing quality and variety of available programming, including HD channels, and a continuing conversion of U.S. TV households from broadcast to pay TV delivery.

[4] Comscore actually ranks the top 10 sites by the number of video ads viewed. The 4th ranking in terms of ad minutes viewed is the authors' inference.

[5] E.g., House of Cards, an original TV series on Netflix.

however, economically viable entertainment content offered by online video services is overwhelmingly "windowed" TV programs and movies that have already appeared, or appear at about the same time, on offline media (Wildman, 2008).

Many of these programs are the same from service to service, but window periods vary. In the case of movies, online VOD release is about the same time as VOD release by MVPDs and DVD/Blu-ray. In the TV program case, the windowing model is in flux, but most programs on ad-supported Internet services such as Hulu and Viacom Digital appear with a delay of one day to a few weeks. For online VOD (and the advertiser and subscription supported Hulu Plus), delays are often shorter. For most subscription services such as Netflix and Amazon, however, windows are generally several months later for both TV programs and movies, comparable to those of monthly subscription cable networks like HBO and Showtime.[6]

2.4. Content aggregation

At least in the case of the leading online providers, aggregation of commercial television and other programming from multiple creators or copyright owners appears to be a dominant model. iTunes, for example, offers a menu of TV programs and movies from numerous broadcast and cable networks and movie studies. Hulu aggregates mainly programs from the 3 of the 4 major broadcast networks that co-own the site, but also from hundreds of other "content partners." Netflix's subscription service offers a large menu of TV programs and movies from many different owners. At the other end of the spectrum, a number of online video businesses are essentially standalone networks, such as HBO-Go, ESPN3, and several individual basic cable TV networks. Viacom, Digital, Disney, and CBS are intermediate cases, in that they offer numerous broadcast and/or cable programs online, although primarily those produced or distributed by the website's corporate owner.

The efficiencies of online content or product aggregation have been studied by several authors, notably Bakos and Brynjolfsson (1999, 2000). They show that Internet aggregation (essentially product bundling) has the efficiency characteristic of averaging consumers' demands over a great many different products at once, enabling more accurate pricing. Conceptually, their model is similar to the empirically-based explanations by Crawford and Cullen (2007) and Crawford and Yurukoglu (2012) for why cable and other multi-channel TV operators bundle programming into various packages for different prices; Bakos and Brynjolfsson's version depends on the extremely low marginal carriage or capacity costs of Internet distribution. Their model, however, appears to presume a collection of products sold at one price, such as AOL and other ISPs offered in early days of the Internet. While that model potentially applies to modern subscription services such Netflix, a more apparent source of economic efficiencies of online aggregation is analogous to well-known reasons that brick and mortar department stores exist. Consumers have a one stop shop and a way to compare prices of a many different brands directly.

As recognized by Bakos and Brynjolfsson (1999), Shapiro and Varian (1999), Harvard Business School (2000), and others, however, Internet architecture offers unusual efficiencies of aggregation because marginal costs of capacity are very low compared to offline media; links to a virtually unlimited amount of programming content can be offered by a single seller.

On the other hand, the Internet also makes disaggregation of content more efficient. Cable television and other MVPDs evidently realize strong economies of scale with respect to the amount of programming they deliver and the number of subscribers they serve due to high infrastructure costs. However, individual networks can bypass—and thus potentially "unbundle"—MVPDs just by making themselves available online as standalone services. The Internet infrastructure also has large fixed costs, of course, but like a national postal service, those costs are shared among vast numbers of content providers and other businesses.

Whether content aggregation or disaggregation by online video providers dominates is simply an empirical question. An evident advantage of online video aggregators is a strong brand identity among an ocean of websites, clearly one objective of providers such as iTunes and Hulu (Yao, Queiro, & Rozovsky, 2008). A look at online video suppliers at the other end of the spectrum, such as HBO-Go and ESPN3, suggests that suppliers already having well-established names are prominent among successful disaggregators.

On balance, online content aggregation appears to be a compelling model. Other Internet developments also seem to display its economic advantages in the television case. Google TV and Apple TV, for example, partially serve as aggregators of program suppliers who are willing to be sold as part of an online package that can be watched on a TV set. The Microsoft Xbox 360, Sony PlayStation 3, a variety of set-top boxes, tablets, and similar hardware devices essentially function as content aggregators as well.

This leads us to the role that TV Everywhere, at least potentially, plays in aggregation of online video content. As we discuss below, TVE systems currently accomplish only limited levels of aggregation, but they can be viewed as emerging attempts to achieve large scale, MVPD-like levels of online content aggregation. MVPD services are collections not only of a great variety of programming but also of business models, including VOD, and many networks, both advertiser and fee supported and monthly subscription. In that respect, TVE can be seen as a potentially comparable aggregation of the still-

[6] Netflix and Amazon have recently accelerated acquisition of exclusive rights to a few major films and TV programs that have substantially shorter windows.

developing online TV components of subscription (e.g., Netflix), advertiser-support (e.g., Hulu) and VOD services (e.g., iTunes).

Whether large scale MVPD-like aggregation by TVE systems will prove in the end to be a sufficiently differentiated or valuable option for consumers is uncertain, but the history of the television industry indicates that to be a plausible outcome.

3. Offline–online bundling; the economics of TV Everywhere

The TV Everywhere concept was jointly announced by Comcast and Time Warner in 2009 and first rolled out in 2010. The primary online programming available for free with "authentication" is generally a subset of the programming which the subscriber already receives with their MVPD subscription. For example, Xfinity, Comcast's online aggregation service, offers TNT and other Turner Broadcasting System channels to all Comcast subscribers whose subscription includes those channels. Users can either access this programming through the Xfinity portal upon verification of subscription or through the web pages of the specific channels, requiring verification of subscription with one of the currently 14 participating MVPDs that have entered into online video access licensing agreements with the networks. Similarly, the HBO-Go.com website offers the same movies and TV programming that the familiar HBO monthly subscription channel has, for free, but only to users who also subscribe to HBO via one of 23 participating offline cable, DBS, or telco MVPD services.

Claims that TV Everywhere is an anticompetitive device, either to preserve MVPD market power or an attempt to dominate the online TV market, were elaborated in the FCC proceedings leading up to approval of the Comcast–NBCU merger. Some commenters in the FCC proceeding argued that TV Everywhere was anticompetitive in intent, and that the increase in vertical integration between Comcast, a relatively large MVPD and ISP, and NBC-Universal, a major program supplier, would facilitate anticompetitive objectives of Comcast (see especially Cooper, 2010; Singer, 2010). Then in 2012, there were press reports of a broader Department of Justice investigation into potentially anticompetitive practices by MVPDs involving the online video market (Catan & Schatz, 2012).

3.1. The current state of TV Everywhere

Fig. 3 is a brief taxonomy of TV Everywhere-type services offered by the largest 25 MVPDs in the U.S. as of April, 2013. This table shows TVE information we collected from the MVPDs' websites about how the TVE system is operated (col. 5) and our categorization of available TVE programming (col. 6). Indications of "not available (N/A)" in both cols. (4) and (5) indicate that the MVPD presumably does not have a TVE service.

Fig. 3 shows that most large MVPDs, including Comcast, DirecTV, Cox Communications, AT&T and Verizon, offer TVE services, but they are less prevalent among relatively small MVPDs. As indicated in Column 6, however, an intermediary, Snyacor, provides business-to-business services assisting smaller MVPDs to establish and manage TV Everywhere portals.[7] Additionally, smaller MVPDs tend to rely upon individual networks' websites for authentication of MVPD subscribership and the provision of online video service itself.

The available packages of online programming are currently only a small subset of those available with the subscribers' MVPD packages, and differ in the amount of content available (col. 6). We classify their TVE menus as "expansive" if they include programming from at least 10 channels in total, with at least one of these from each of the three following groups: broadcast networks, basic cable networks such as the Turner and Viacom owned networks, and premium subscription channels such as HBO ("Premiums"). In terms of content diversity, the current leaders are Comcast, Verizon, and AT&T, and as of May of 2013, these were the only MVPDs to provide access through Microsoft's Xbox Live service. Within the more prevalent "limited" classification of available content, there is also significant variation; as indicated, some of these systems offer only premium channels for a la carte subscription. A likely reason for these TVE program package differences is that MVPDs have reportedly encountered a maze of contracting problems that prevent comparable online programming from being offered. Note also that the available online offerings vary according to which cable programming networks are already available to subscribers at the local level. Some cable networks, for example, are carried by only some local systems of an MSO, and the online availability of the given network's programming varies accordingly.

3.2. Offline/online bundling in print media

Bundling of offline and online content by media companies is very common among some other media, notably newspapers and magazines. Our review of the 10 largest circulation newspapers and the five local newspapers with the highest print penetration as of October, 2012 indicated that all of them offer offline/online bundles. While several (e.g., The New York Times) offer free online access with a print subscription, many also offer standalone digital services, in some cases

[7] At this time, several Snyacor-served MVPDs have not publicized or provided links for their TV Everywhere portal pages, suggesting beta stage testing, and only provide content already available online through other free sites like Hulu. We have referred to these as "Hidden" within the 5th column. This content is often available through other, more established MVPD TV Everywhere portals, like Comcast's Xfinity, without requiring subscription authentication. This raises interesting questions about how advertising revenue is shared between the ad-based, free content's owners and the MVPDs and what is specified within the licensing contracts between these organizations.

1	2	3	4	5	6
Rank	**Company**	**Subscribers**	**Name**	**Operator**	**Available Content**
1	Comcast Corporation	22,002,000	Xfinity	Self	Expansive
2	DirecTV	19,981,000	DirecTV Everywhere	Networks' sites	Limited
3	Dish Network	14,042,000	Dish Online	Self	Slingbox, Expansive
4	Time Warner Cable	12,344,000	TWC TV	Self	Limited
5	Cox Communications	4,595,000	Cox TV Online	Networks' sites	Limited
6	Verizon Communications	4,592,000	FiOS TV Online	Snyacor	Expansive
7	AT&T	4,344,000	U-verse	Self	Expansive
8	Charter Communications	4,197,000	Charter.net	Synacor	Limited
9	Cablevision Systems Corporation/ Optimum	3,247,000	Optimum TV	Networks' sites	Limited
10	Bright House Network	2,038,000	n/a	Networks' sites	Limited
11	Suddenlink Communications	1,230,000	Suddenlink2GO	Snyacor	Limited
12	Mediacom Communications Corp.	1,019,000	TV Everywhere	Snyacor	Limited
13	WideOpenWest Networks, LLC (WOW!)	710,000	WOW! TV	Snyacor (Hidden)	Limited
14	CableOne, Inc.	601,000	n/a	Snyacor (Hidden)	n/a
15	RCN Corp.	331,000	n/a	n/a	n/a
16	Atlantic Broadband Group (ABB)	251,000	n/a	Snyacor (Hidden)	Limited
17	Armstrong Cable Services	237,000	n/a	Relationship with Snyacor announced	n/a
18	Midcontinent Communications	234,000	n/a	Synacor	Limited
19	Service Electric Cable TV Incorporated	215,000	'TV' Everywhere	Networks' sites	Limited (Premium Channels Only)
20	MetroCast Cablevision	174,000	n/a	Snyacor (Hidden)	N/a
21	Blue Ridge Communications	167,000	n/a	n/a	N/a
22	WaveDivision Holdings	153,000	n/a	n/a	N/a
23	General Communications	143,000	GCITV2Go	Networks' sites	Limited (Premium Channels Only)
24	Buckeye Cable System	132,000	n/a	Snyacor	Limited
25	Insight Communications Company	0	n/a	Acquired by Time Warner Cable in 2011; still listed on NCTA top 25.	

Fig. 3. TV Everywhere Taxonomy, April of 2013. Compiled by the authors from MVPD websites and the National Cable and Telecommunications Association website. (Dish Network's Slingbox is a particularly novel form of online video distribution separate from *TVE*. The "Sling" technology allows subscribers to access their DVR content online to be retransmitted for individual use. By bypassing individual program licensing requirements through implicit utilization of U.S. copyright law's fair use doctrine (17 U.S.C. § 107) and subsequent case law on time-shifting and personal use, the range of programming then able to be remotely transmitted to devices greatly exceeds any of the typical TVE services, but users must have the foresight to record desired programs in advance. The technology also can transfer some recordings from the DVR to a few devices for offline viewing. Other MVPDs often feature apps that allow DVRs to be controlled remotely, but DVR programming can only be accessed away from home with Dish).

for free, but often at different prices for different subscriber reception devices (e.g., iPads, Kindle, etc.). While with little exception MVPDs that have digital services offer online programming for free with authentication, newspapers typically offer mixed bundling (i.e., an offline/online package is not the only option) or free online access, but often restrict online access to archives to subscribers.

Our review of the 10 highest circulation magazines showed a similar pattern, with a variety of bundling and pricing models. In most cases, online access is unconditionally free, but most tablet-formatted content or e-editions (versions that preserve the order and layout of the magazine) require subscriptions or in some instances, can be purchased at a discount without paying for the print subscription. One exception is Time, which offers print and online access to its magazine content as a bundle, but also standalone online access for a separate price. The Time portal also provides free access to other content not printed in its magazine, resembles the business models of cable news channel portals. While not within the top 10 magazines, The Economist offers a notable payment option; its 'digital-only' package is the same price as the 'digital and print' package, essentially throwing in the printed edition for free, rather than the opposite pattern demonstrated by many other media distributors.

An obvious difference between the newspaper and magazine cases and MVPDs is that online distribution of print media began much earlier, so print/online marketing is more mature. Perhaps as a result, it has received more academic attention. In the newspaper case, Nel (2010) compared online business models of British newspapers. Mensing (2007) compared online revenue business models of newspapers over time. Adams (2007) and Bleyen and Van Hove (2010) considered offline and online sales strategies from a bundling perspective and found that higher quality newspapers tended to offer separate print and website subscriptions and a la carte articles for sale, while newspapers with higher print subscription market shares were more likely to offer pdf, or digital newspaper facsimile subscriptions. While these articles document a wide variety of online newspaper business models, they focus on the decision of how the online service is itself priced by the newspaper parent rather than bundling strategies. However, Venkatesh and Chatterjee (2006) investigated circumstances in which it is optimal to bundle offline and online magazine subscriptions. They found that optimal strategies vary depending on relative advertising revenues of the two, the marginal costs of providing online and print versions, and consumer valuations, but concluded that offline/online bundling is generally profitable only as a long term strategy to build demand.

3.3. TV Everywhere models

We proceed below to model TV Everywhere as a price discrimination device by MVPDs basically intended to dissuade subscribers from disconnecting their offline service.

The previous scholars of offline-to-online bundling in print media do not consider these practices from a price discrimination perspective, although it is a well-developed approach to bundling and tying in the general economic literature (Adams & Yellen, 1976; Armstrong, 1999),[8] as well as in the literature on channel bundling by multi-channel operators (Crawford & Cullen, 2007; Crawford & Yurukoglu, 2012).

We also show that under plausible conditions, MVPD price discrimination using TVE could restrict entry into the online TV market. Although cable operators benefit only from the price discrimination in our model, it has similarities to the entry deterrence model of Nalebuff (2004).[9]

Following a base case (Case I) in which no online video market exists, we first demonstrate (Case II) how stated claims by MVPD executives that TV Everywhere is designed to prevent offline subscribers from "cutting the cord," can be interpreted as a simple price discrimination device in which "low value" consumers are offered online video for free to decrease cancellations of MVPD service. We then show (Case III) cost and demand conditions under which the same basic MVPD price discrimination incentive can result in the foreclosure of a competitive online video market. Both model versions are fundamentally driven by an assumption of MVPD market power in the offline TV market, but neither involve anti-competitive intent to leverage that monopoly power.

Case I. Base case: no online video services exist.

Assume that we have a local monopoly cable operator selling only a basic package of channels. Let us say that the cable system has a marginal cost per subscriber of $70. For simplicity, there are no other costs. On the demand side, there are 100 consumers who each value the service at $100/month.[10] The simple result is

$$\text{Optimal price} = \$100$$

$$\text{Profit} = 100(\$100 - \$70) = \$3000$$

[8] See also Varian (1989) and Stole (2007) for surveys of the literature.

[9] Nalebuff (2004) shows demand and cost conditions under which a firm having market power over two goods may gain from price discrimination by bundling them, but the firm gains most by reducing the profitability of another firm that can potentially enter only one of those markets. Other authors, including Whinston (1990), Carbajo, de Meza, & Seidman (1990), and Carlton and Waldman (2002) also show conditions under which a multi-product monopolist in one market can raise barriers to entry or restrict competition in a second market by bundling. These models are strategic in nature and depend on imperfect competition in the second market and other particular assumptions.

[10] We further assume that an indeterminate number of other consumers in the market are willing to pay less than $100 for cable service, but for simplicity we ignore this group by assuming the operator will never have an incentive to serve them.

A key feature of the model is that equilibrium subscriber price is greater than marginal cost, which reflects market power of the cable operator at the local level.

Case II. Online video develops; standalone large scale TV aggregation is unprofitable.

Inspired by the Nielsen online usage data cited above, price demands among the 100 potential subscribers change as follows:

Case II demand and cost conditions.

	Demands of Group I (80)	Demands of Group II (20)	Marginal cost/subscriber
Cable service	$100	$90	$70
Standalone online TV aggregation service	$0	$15	$25
Cable+online TV aggregation service bundle	$100	$100	$95 ($70 + $25)

Now there are two homogeneous groups among the 100: the Group I majority (80 of the 100), whose demand for offline cable service is unaffected by the availability of any online video, and the Group II minority (20 of the 100), who are now willing to pay only $90 for cable due to their access to a variety of online video services (e.g., YouTube or Netflix) or other Internet entertainment.

As indicated by the second line in the Case II table, however, a large scale online TV aggregation service, such as TV Everywhere—or a comparable standalone large scale aggregation of video by a competing firm—would generate $15 in value to Group II as an alternative to cable service. That is, online video aggregation is a free entry, contestable market. A bundle of cable plus an online TV aggregation service would be valued by members of Group II at $100, at an increase of only $10 over the value of cable service. Thus, for Group II consumers, a large scale online TV aggregation either is a potential substitute for, or a complement to, offline cable service.

On the cost side, a standalone (or TVE) online aggregation service has marginal costs (consisting, for example, of administrative process and online rights fees) of $25, and is thus not profitable.[11] The cable operator's marginal costs for offline and online service are assumed to be additive ($70+$25).[12]

Case II results: To illustrate the payoff from offline-online bundling, consider the cable operator's two alternatives.
Alternative (a): cable service only

$$\text{Optimal price} = \$100$$

$$\text{Profit} = 80(\$100 - \$70) = \$2400$$

(If the operator lowered the cable subscription price to $90 to capture all $100 subscribers, profits would fall to $2000.)
Alternative (b): cable service+optional free TV Everywhere with authentication.

$$\text{Optimal price} = \$100$$

$$\text{Profit} = 80(\$100-\$70) + 20(\$100-\$95) = \$2500$$

In the more profitable Alternative (*b*), optimal price for the offline/online bundle again rises to $100, capturing all 100 potential subscribers, but only 20 take advantage of the free TV Everywhere bundle.

Thus, even though providing TV Everywhere reduces its profits from the initial, pre-Internet total of $3000, the cable operator is able to prevent offline disconnections among Group II subscribers. In effect, Group II are "low value" cable consumers who can only be retained profitably by offer of the combined service. Online TV bundling is thus an implicit price discrimination device used by cable operators to sell to both its high and low value consumers.

These demand and cost assumptions, while again simplistic, are intended to reflect stated MVPD claims that a standalone large scale video aggregation service is currently unprofitable, and that the purpose of TV Everywhere is to dissuade current cable subscribers from disconnecting their cable service (e.g., Israel and Katz, 2010, p. 167; FCC Comcast/NBCU Merger Order, 2011, para. 105).

In one respect, the Case II model version is an example of the price discrimination incentive identified for the bundling of channels by cable operators due to inversely correlated consumer demands (Crawford and Yurukoglu, 2012). Demand of Group I for MVPD service is relatively high ($100) compared to standalone TVE service ($0), and vice versa for Group II ($90 v. $15). The novel aspect of our model flows from the relatively large $30 price-marginal cost gap assumed for offline

[11] We thus assume that the marginal costs of the TVE service are realized from only those consumers who would actually use it.

[12] Economies of scope in offering offline+online service are likely to obtain in practice, but additive costs are a stronger assumption. Note further that the cost of operating an online aggregation of broadcast/cable programming should be interpreted as the present value of expected long term costs. That is, its provider is likely to accept short term losses, such as newly launched cable TV networks typically experience, for example, but over time a stream of profits is expected to be realized.

cable service. In effect, the TV Everywhere bundling strategy allows the cable operator to use its offline price-cost margin to subsidize the online service losses up to the point that total costs for both services remain less than Group II's total demand price of $100. All 100 consumers are thus served at a positive per-subscriber profit.

Case III. Online video develops; standalone large scale TV aggregation is profitable.

An interesting variation on the model uses the same cost assumptions as Case II, but a modified demand structure as indicated below. In this case, demand is higher for an online aggregation service, both as a standalone substitute for cable service, or as part of a package with cable service, although Group II demand for the bundle is again less than the sum of separate demands for its components.

Case III demand and cost conditions.

	Demands of Group I (80)	Demands of Group II (20)	Marginal cost/subscriber
Cable service	$100	$90	$70
Standalone online TV aggregation service	$0	$30	$25
Cable+online TV aggregation service bundle	$100	$110	$95 ($70+$25)

Case III results: identical to those of Case II, Alternative (*b*). Optimal prices for cable service only, and for cable service+TV Everywhere = $100; profits = $2500.

The essential feature of Case III is that even though standalone entry into online TV aggregation is potentially profitable, the price discrimination bundling strategy of the monopoly cable operator forecloses independent entry into the online market. The potential surplus earned by a standalone online TV aggregation service is $5 per subscriber ($30–$25); but at a price of $100 for the cable service+Everywhere TV bundle, consumer surplus for group II subscribers is greater, at $10 ($110–$100). Thus, standalone online entry cannot be profitable in the presence of TVE bundling.

Alternatively, the cable operator could attract the 80 Group I subscribers to cable service @ $100/month, and itself enter the online TV market as a standalone provider. In that case, however, its potential $100 profits in the online market ($20 \times \$5$) would be bid to zero by competitive entry, resulting in lower total profits of $2400.[13]

As in Case II, the basic driver of these results is the positive price-marginal cost margin for cable service. As before, Group II consumers value cable service at $20 more than its marginal cost ($90–$70). In this case, however, the effective marginal cost to the cable operator from selling an offline+online bundle instead of just cable service is only $5 ($25–$20). A standalone entrant into online TV aggregation faces the true marginal cost of $25, and thus cannot compete.

Interpreted more broadly, the viability of our model depends on how valuable it is to cable operators to preserve their base of cable subscribers. As the size of Group II rises relative to Group I, the profitability of price discriminating to prevent disconnects falls relative to the profitability of just reducing the retail prices of cable service. In the Case II or Case III versions, if Group II becomes larger than Group I, the price discrimination incentive disappears. Also, as the value of the standalone online aggregation alternative grows relative to that of the offline cable service, the opportunities for cable operators to use such a bundling strategy also vanish. If the value to Group II of the standalone online service were $40 in Case III, for example, the cable operator could not profitably undercut entry by bundling.

As the online television market matures and these services become more valuable to consumers, our model thus suggests that barriers to development of large scale online television aggregation are likely to diminish. Our review above of newspaper and magazine offline/online product marketing suggests, in fact, how offline/online bundling in television may evolve as it matures: a wider variety of packages and pricing options, including standalone online video aggregation services.

3.4. Strategic behavior

The models we advanced do not explicitly involve strategic or potentially anticompetitive behavior by MVPDs. Their results nevertheless suggest the possibility that an MVPD could benefit strategically from offline/online bundling by restricting entry into large scale online TV aggregation. This might occur, for example, if that market has winner-take-all characteristics due to large economies of scale, or has significant first mover advantages. Or, an MVPD might benefit from offline/online bundling if competing standalone television aggregators are otherwise unable to attract enough subscribers to compete effectively.[14]

[13] If the operator were not constrained to offer TV Everywhere for free, the bundle could be offered for as much as $104, and cable service alone for $100. At the $104 price level, consumer surplus for Group II subscribers would be $6, and no online entry would be attempted. Also, we have not made an explicit assumption about price competition in the online market. If, however, the MVPD and the entrant sustained prices at $30 and split the Group II subscribers (similar to the outcome of Nalebuff's 2004 model), the MVPD's profits would still be lower than with bundling.

[14] See Israel & Katz (2012), p. 173.

Unlike threats in the past from DBS and telco TV to cable television system dominance however, entry into online TV appears to be less expensive, and less subject to economies of large scale due to satellite, wireline or other infrastructure investments; the basic Internet infrastructure is shared among many content providers, retailers and other services. Certainly also, there is no shortage of well-capitalized content providers which are potential entrants into the online video industry, and which have a strong incentive to maintain competition among online services. Although one should be very cautious in predicting market structure in such a nascent industry, sustained competition among some number of large scale online program aggregators is thus a plausible long term outcome.

The history of the multichannel television industry suggests that any strategies that may be practiced by established cable operators or other MVPDs in order to limit competition in the online TV market would likely involve restricted access to programming.[15] The alleged withholding of "must have" cable programming networks from cable system overbuilders and DBS in the 1980s and early 1990s inspired the FCC's program access rules (FCC, 1990, 1993).[16] Program access by online video services was also a focus of the FCC's review of the proposed Comcast–NBCU merger in 2010–2011, leading to conditions on the merger that generally require Comcast–NBCU to make their vertically affiliated programming available to online providers on a non-discriminatory basis (FCC, 2011; Baker, 2011).

How TV Everywhere bundling could contribute to such a restricted program access strategy in the online TV case is not clear, but cannot be ruled out without a more empirically based study beyond the scope of this article.

3.5. *The roles of horizontal and vertical integration*

Online video programming is overwhelmingly a national market. Thus for any action by an MVPD to have a significant impact on development of the online television market, that MVPD must have a significant national (as well as local) market share of MVPD subscribers. Similarly for the broadband market. If an ISP, for example, were to somehow give one online TV provider more favorable access to its subscribers than another, this prioritization would of course impact local subscribers, but could not materially affect the online TV industry unless the ISP had a significant national share of broadband subscribers. How large a share of the national market is needed to have a notable impact is debatable, but it is no accident that Comcast, Time Warner, AT&T and some other major industry players attract the lion's share of attention in policy debates involving program access, offline/online program bundling, or potential violations of network neutrality principles.

In this context, there is suggestive evidence to support the price discrimination motivation for TV Everywhere. If offline/online program bundling were intended to restrict entry into online TV aggregation, we might expect to find TVE offered only by larger MVPDs. Some of the larger MVPDs, including Comcast and the Dish Network, were in fact among the first to roll these plans out. As Fig. 3 shows, however, TVE bundling has been adopted by several smaller MVPDs whose shares of the national market are too low to plausibly have any impact on the national online TV market. Although some of the top 25 do not yet offer TVE plans, the slower diffusion among smaller MSOs might be attributed to set up costs. That explanation is suggested by the prominence in col. (6) of Synacor, an operator that essentially serves as a syndicator for TVE services to smaller MSOs. In fact, the National Cable Television Cooperative (NCTC) announced in July, 2012 that it also would assist its 80 independent cable operators with developing TV Everywhere models (NCTC, 2012).

Of course, potential collusion or otherwise parallel action among MVPDs or ISPs, especially the larger industry players, can enhance concerns about any undesirable impacts. Also, some firms, including Time Warner and Comcast, for example, have a substantial national presence in both the MVPD and ISP markets. At least potentially, these firms' positions in both of these markets expand the means by which they could potentially influence development of the online TV market.

Vertical ownership ties to the programming market by firms that may also have significant national market shares in the MVPD or ISP markets are also a concern because anticompetitive strategies can be facilitated by vertical integration. For example, a major MVPD might be able to make a more credible threat to withhold programming from a large scale online TV aggregator if it owns that programming rather than if it were to rely upon pressuring an unaffiliated supplier by threatening to refuse carriage or otherwise disadvantaging that supplier on its MVPD service. Industry history suggests that the ability of large scale online content aggregators to effectively compete may require them to have a complete range of programming offerings—including "must have" networks owned by some major MVPDs and/or ISPs. Vertical ownership ties between an ISP and a large scale online content aggregator itself (such as Comcast's TV Everywhere service, Xfinity) adds a further dimension to concerns about vertical favoritism by the ISP.

Mitigating the concerns about vertical ownership by MVPDs and ISPs is the variety of 2011 FCC merger stipulations intended to limit the strategic behavior of Comcast–NBCU, the most prominent example of a nationally based MVPD and ISP having programming interests. The FCC's Open Internet rules are also designed to prevent discrimination of ISPs against unaffiliated content suppliers. However, both the vertical and horizontal ownership issues involving large scale content aggregation are complex and worthy of policy attention.

[15] Ammori (2010) reviews this history, arguing that such strategies have been pervasive in cable and other media.

[16] The program access rules basically required that program suppliers that are vertically affiliated with cable operators offer their programming on the same conditions to other MVPDs. The FCC voted to sunset the rules in 2012, although the Commission will continue to rule on disputes of alleged anticompetitive exclusive program carriage involving MSO-owned satellite-delivered cable networks on a case by case basis.

4. Summary and policy conclusions

Though still small, the online television industry is growing rapidly, with apparently vibrant entry and competition in its ad-supported, subscription, and VOD segments. To ensure that this state of affairs continues throughout the online TV industry, monitoring by the FCC and antitrust authorities is warranted.

In our focus on the economics of offline/online bundling by MVPDs, widely known as TV Everywhere, we developed a simple economic model to show that this practice can be straightforwardly explained as a price discrimination device intended to slow "cord cutting" by MVPD subscribers. We also showed that under plausible conditions, TVE bundling can have the effect of restricting entry into the large scale aggregation segment of the online TV market.

In themselves, our models do not make a case for policy constraints on TVE bundling by MVPDs. They were advanced to provide illustrations of possible market outcomes. As we have also documented, TVE systems offered by MVPDs are themselves in a nascent and thus uncertain stage of development. We also stopped short of attempting to derive economic welfare results. In general, bundling to achieve price discrimination has ambiguous effects on economic welfare. Consumer surplus usually falls due to price discrimination, but to the extent that total output (e.g., programming diversity, or the number of subscribers) increases as a result, welfare is enhanced (Schmalensee, 1981; Varian, 1985, 1989; Stole, 2007). In practice, welfare outcomes also depend on industry-specific factors such as effects on market entry, and in the multichannel bundling case, outcomes of bargaining between programming suppliers and downstream operators (Stole, 2007; Crawford and Yurukoglu, 2012).

Of course, restricted entry or slower growth of online television that might result from TVE bundling would be contrary to the public interest. More nuanced and empirically-based research, more broadly focused on the online TV industry as a whole, however, would be required to draw a conclusion that TVE has undesirable effects on online video entry.

Our models nevertheless have an unambiguous, though familiar, policy implication: promoting competition with and among MVPDs. Our models are fundamentally driven by the assumption of local market power in MVPD operations. Without that power, and thus a positive per-subscriber price-cost margin, there would be no apparent incentives to bundle TVE with MVPD services, and thus no entry deterrence effects (or price discrimination) could result. Similarly, our research suggests the importance of preventing national market shares of individual MVPDs or ISPs from reaching excessive levels through horizontal mergers and acquisitions. Of course, the benefits of limiting national market shares in the MVPD or ISP markets must be balanced with economies of scale and scope and other efficiency advantages these firms may have. Policy concerns in these industries would be much diminished, however, by the absence of high shares of the national, as well as local, MPVD and ISP markets.

The most productive path for future research to support policy is a flow of empirically-grounded studies that attempt to explain the underlying economic logic of market structure and business practices in the online TV industry. Another useful step is to develop historical analogies with other media industries. In particular, a more detailed study of how offline/online bundling practices have evolved over time in the print and other media industries may provide a better understanding of how offline/online bundling in the television industry is likely to evolve. The eventual economic importance of the online TV industry remains uncertain, but if its recent rate of growth is any indication, the demand for economic studies to inform public policy toward this industry is certain to rise.

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