

Technology and Competition in U.S. Television: Online vs. Offline

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1. Introduction

Over the past decade, as both broadband adoption by consumers and Internet bandwidth capacity have rapidly grown, the online distribution of television and other video programming has emerged as a viable industry. As one sign of its importance, Netflix alone accounted for over a quarter of total peak North American fixed Internet traffic in the second half of 2012 (Sandvine, 2012, p. 7). In other terms, though, the floodgates are yet to open. By various estimates we report, online distribution probably accounted for less than 5% of total television industry revenues in 2012. And in contrast to most other U.S. media, the standard television industry has been remarkably resilient, in terms of both viewing and revenues, as broadband technology has developed and diffused.

It is evident, however, that online video distribution has the potential to be very disruptive to the established offline television industry. In this chapter, we explore, from an economic perspective, the development of the online television industry, its threats to standard television, and its future. Our main focus is on professionally produced television programming which is also exhibited on standard TV by U.S. broadcast or cable TV networks. Most of the firms involved in online and offline television distribution are thus the same or they have direct ownership ties. Many of them also supply theatrical movies and other types of video programming; thus our analysis often overlaps with that of the broader online video industry. Among the central questions we address: What explains the persistence of offline television in the broadband era? How have business models and competition in the online television industry developed? What are the economic advantages and disadvantages of online compared to standard delivery of television programming, and what factors will determine the future of online TV? As we will see, digital technology has played a key role in the recent development of the offline as well as the online TV industry.

There has been understandably little economic research in such a new industry, but a number of scholarly works on the economics of online media provide a foundation for this chapter. Among earlier works, Owen (1999) addressed potential of the Internet for television delivery, and Shapiro & Varian (1999) and HBS (2000) explored ways that online content providers could use the Internet for competitive advantage and create value for consumers. Several authors in Kahin & Varian (eds, 2000) discussed economic and legal aspects of Internet media delivery. Among more recent works, several edited books, notably Noam, Groebel and Gerbarg (eds.,2004), Gerbarg (ed., 2008), and Noam (ed., 2008) have addressed the emerging technology, economics, and content of Internet television and video. A series of Federal Communications Commission Reports (1994-2012) on the television and video industries have provided valuable data and insights. Simon (2012) reports on an IPTS study about the digital transition of media industries in the European Union. Fontaine, et al (2010) provide another European perspective on television's transition. We cite other works as we proceed. (See also Waterman, Sherman and Ji (forthcoming, 2013) for further literature on this topic.)

We begin in section 2 with the standard TV industry and its persistence. In section 3, we turn to online TV: its historical timeline, its main revenues models and programming, and the

phenomenon of content aggregation. We then discuss in Section 4 the competitive advantages of utilizing the Internet for video distribution, and conclude in Section 5 with discussion of economic factors that will affect the future of online television.

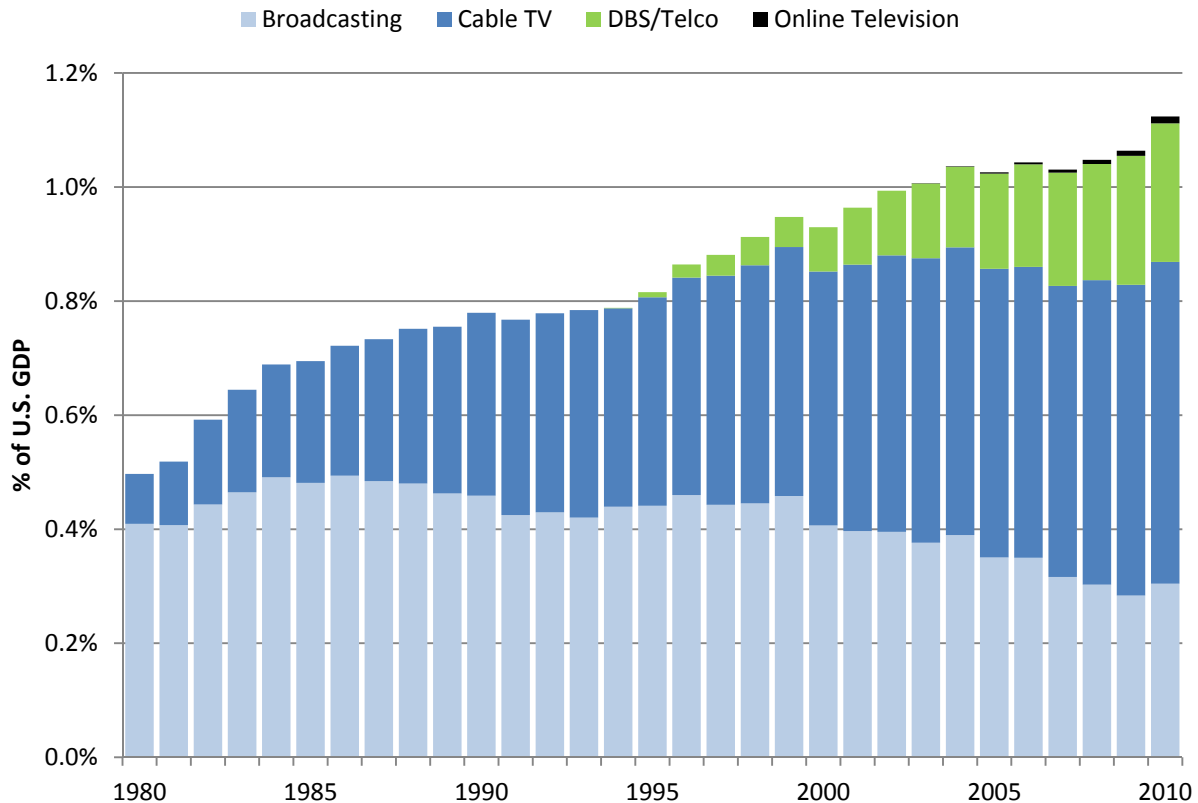
2. Television in historical context

Economic performance of the television industries is illustrated in Figure 1 for the 1980-2010 period as a percentage of all economic activity, as measured by GDP. The “Internet” category includes national TV distribution, such as via Hulu.com and CBS Interactive, and local TV station websites.

Television grew steadily as a proportion of GDP over this period-- including a relative increase of about 20% from 1999-2010 (.93% of GDP to 1.12%), even as U.S. household broadband adoption grew from less than 3% to 67% (Pew, 2011). During the 1999-2010 time frame, in fact, the media industries as a whole, led by newspapers, music, and radio, declined by about 20% as a fraction of GDP (Waterman & Ji, 2012).

Extraordinary technological change--especially digital conversion--has combined with an expanding appetite for TV viewing to fuel this economic growth.

Figure 1: Television industry revenue by category, as % GDP, 1980-2010



Sources: U.S. Bureau of the Census; trade associations; industry analysts; 10-K reports; author estimates (adapted from Waterman & Ji, 2012)

One aspect of TV's economic growth has been a massive conversion from "free" (ad supported) to "pay" TV (i.e., multi-channel subscriptions). When television began in the 1940s, direct payment was awkward and inefficient, but by the 1970s, direct payment systems--first terrestrial cable, then DBS, and most recently telcos--have excavated a consumer willingness to pay for TV that in the aggregate has now exceeded advertiser revenues. In 1980, less than 1 in 5 TV households subscribed to services of these and other multi-channel video programming distributors (MVPDs); by 2010, 86% subscribed. Partly reflecting the secular decline of broadcast television, direct payments as a percent of total television industry revenue increased from about 15% to 56% over this same period. (Waterman & Ji, 2012).

Another aspect to television's growth is its increasing value to consumers due to dramatic expansions in channel capacity, accompanied by much higher financial investments in television programming, and especially since the mid-1990s, the advent of HDTV. Partly responsible were the launch of geostationary satellites for commercial television beginning in the mid-1970s, and steady increases in cable system transmission capacity via fiber optics. The dominating cause, however, was conversion from analog to digital distribution technologies. In early years, analog was cheaper and more efficient than digital. Over time, though, the balance shifted dramatically in favor of digital, which allows for higher quality and quantities of TV at lower cost. Modern DBS, launched in 1994, was entirely digital from the beginning. At about the same time, cable systems began converting to digital tiers, which dramatically expanded their channel capacity, in turn stimulating entry by hundreds of new television networks, especially those catering to niche audiences as MVPD viewers migrated away from broadcast channels. A larger and higher quality set of programming options has probably also contributed to a one-third increase in TV usage from about 43 hours per week per TV household in the early 1970s to nearly 58 hours in the early 2010s (TV Dimensions, 2012, p. 76).

These developments have continued to drive increasing revenues of standard television into the Internet broadband era. From 2000 to 2011, the number of channels available to the average U.S. TV household was reported to rise by over 60%, from 72 to 137 (TV Dimensions, 2012, p. 26), and the number of networks transmitting in HD increased from a handful to hundreds. Consistent with these trends, basic cable network programming investments reportedly rose by 334% just over the 2000-11 period (SNL Kagan, 2012 a). TV viewers have continued to come along for the ride, displaying the formidable competitive advantages of standard TV that online confronts. According to Nielsen, average U.S. individual TV viewing rose from 29 to 34 hours per week from 2000 to 2012 (Nielsen, 2011, p. 16; Nielsen, 2013 p. 9.)

3. Online commercial television

a. Industry development

Although the online video industry dates to the mid-1990s, few of its pioneers survived the 'dot.com' bust of 2000-01. By the mid-2000s, however, broadband household adoption and speeds had become sufficient to usher in a period of vibrant entry and competition that has formed today's online television industry.

In 2005, iTunes began offering some recent TV series episodes for direct payment. Also in that year, YouTube was created to enable Internet users to upload and distribute videos from their digital video recorders. Full episodes of major network series programs, however, were soon being illegally posted by YouTube users. After an initial period of tolerance, the networks

and program suppliers issued “takedown” orders under the Digital Millennium Copyright Act and lawsuits followed. It was not until 2008 and 2009 that NBC and Fox (later joined by ABC) launched Hulu and CBS started tv.com (later CBS Interactive),¹ primarily as online outlets for some of their regular series programming. Since 2010, several others have entered the online television market, notably the launch by MVPDs of “TV Everywhere” services (an umbrella term for the online programming services that a number of cable, DBS and telcos provide).

As Figure 1 above illustrates, the online component of the television industries remains small, accounting for under 2% of revenue from all sources in 2010 (Waterman, Sherman, and Ji, 2013, p.15), although both online advertising and direct payments have clearly grown much faster than have those of standard television since 2010.² These financial contrasts are generally reflected in viewing estimates. Nielsen’s report that the average individual watched 34 hours of television per week in the 4th quarter of 2011 compared to 68 minutes watching Internet video, about a 30 to 1 ratio (Nielsen, 2013, p. 9). Available viewing information shows less extreme contrasts for the more narrowly defined category of 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 a, p.210). These ratios are surely rising as well, but the orders of magnitude continue to reflect economic dominance of offline television at this writing.

b. Revenue models and programming

Figure 2 summarizes characteristics of several significant providers of online commercial television programming as of Spring,2013. While some providers, including Amazon and Hulu, have adopted more than one revenue model, five main business models that define principal economic segments of the online TV industry have emerged: a la carte rentals and purchases, subscriptions, ad-supported professional content, ad-supported user-generated content, and verification-dependent content bundled by MVPDs (TV Everywhere).

In all but the latter category, a leading firm has emerged, but programming content, levels of content aggregation and support of media player devices vary widely within the online industry.

¹ CBS Interactive is the umbrella company for CBS.com, which distributes long form TV programming, and tv.com, which now distributes short form content.

² eMarketer (2012) reported a growth in the ratio of all online video advertising to total offline TV and online video advertising from 2.35% in 2010 to 4.3% in 2012 . SNL Kagan Research (2012 b) reported 59% growth in total TV industry revenues from online consumer direct payments (subscription plus VOD revenues) of \$1.8 bil. to \$3.1 bil. between 2010 and 2011).

Figure 2: Some major online commercial television suppliers.

| Service | Primary Content | Primary Business Model(s) |
|---|---|--|
| iTunes | Broadcast & cable programs; movies | Pay to download/rent |
| Amazon | Broadcast and cable programs; movies | Subscription; pay to download/rent |
| Netflix | Broadcast and cable programs; movies | Subscriptions |
| Hulu | NBC, ABC, & Fox TV series; some cable network content/web-only video | Advertising and subscriptions |
| CBS Interactive | CBS broadcast programs | Advertising |
| Viacom Digital | Viacom cable networks (MTV, Comedy Central, BET, Nickelodeon, etc.) | Advertising |
| Crackle | Sony-owned movie and TV content | Advertising |
| YouTube | User-generated content; funded professionally created 'channels', other professional content | Advertising; subscription |
| Comcast Xfinity (other major cable operators) | Broadcast and cable programs; movies; Netflix-like 'Streampix' premium content service offered beyond MVPD geographic areas | Free to offline cable subscribers by package level; Subscription (Streampix) |
| Verizon FiOS (and other telcos)? | Broadcast and cable programs; movies | Free to offline cable subscribers by package level |
| HBO-Go | HBO exclusive series and licensed movies | Free to offline subscribers |
| TBS | TBS television programs | Free to offline subscribers, with advertising |

With 63% of the total online movie and TV downloads in the first half of 2011 (Screen Digest, 2011 b, p. 294), iTunes is the evident leader in the a la carte rentals (via streaming) and purchases (via download) category. Building on its successful digital music sales market, Apple's popular line of media devices provide seamless interchange among their devices and their own online video and music markets. Other online rental/purchases firms, such as Amazon, generally lack Apple's competitive advantage of design integration into an entire hardware product line, as well as widespread device adoption. Amazon's line of Kindle tablets and Microsoft's recent product developments (such as Windows 8, iPad-like tablet options, and X-Box Live), have sought to capture some of the convenience premium that has helped iTunes to be so successful in both music and video.

In the subscription category, Netflix dominates with its mix of mostly TV programs and movies. The bandwidth demands of its 25 million subscribers as of July of 2012 were 18 times greater than those of Amazon, its main direct competitor, which reportedly had about 10 million subscribers (Sandvine, 2012, p.20-21; Sharma and Bensinger, 2013). Netflix' streaming service is available on computer web browsers, the major three video game consoles, and a long list of other devices. As of 2011, Nielsen found that roughly 50% of users watched Netflix through their game consoles. (Nielsen, 2011 b). Although much of their programming is similar, both Netflix and Amazon have recently announced exclusive programming deals in a heated battle to differentiate themselves for competitive advantage, including some relatively expensive original programming, such as Netflix' \$100 million investment in the "House of Cards" series.

In the ad-supported professional content category, Hulu.com is currently the leading firm, earning the 4th highest comScore ranking for “total ad minutes viewed” and the highest number of average ad minutes per viewer at the end of 2012 (comScore, 2013). Since its origins as a joint venture between owners of three of the four major broadcast networks, Hulu has steadily added more content partners, including the CW Network, AMC Network, Viacom’s cable channels, BBC America, Univision, Sony’s Crackle. Several of these groups, including Viacom channels and Crackle, also distribute their content through their own ad-supported portals. Comedy Central’s “The Daily Show” is an example of an individual program which is distributed through its network’s own portal as well as Hulu.

While competing online VOD suppliers, such as iTunes and Amazon, sell roughly the same menus of more popular TV series and movies (analogous to the offline sale of DVDs in multiple big box stores), the distribution of the same content through competing online ad-based portals does not seem to have a significant offline counterpart. Different ad-supported providers also support different consumer devices. Comedy Central programming, for example, is not directly distributed through any smart phone, tablet, game console, or set-top box systems, while Hulu Plus, that firm’s premium subscription service, supports all these devices, enabling “The Daily Show,” for example, to be distributed to a larger total viewer base.

YouTube remains the dominant ad-based amateur content distributor, and in terms of unique viewers, the number of videos displayed, and minutes per viewer, is the top online video content distributor overall by a large margin. As of the end of 2011, its global share of number of videos watched was 43.8%, 20 times greater than its next biggest competitor, China’s Youku, with 2.3%. (comScore, 2011) To continue expanding, YouTube has shifted toward offering professional content, financing 100 “channels” of niche programming in late 2011 (Bond and Szalai, 2011). YouTube’s limited foray into professionally-produced content is an apparent milestone in top-down creation of “long tail” (Anderson, 2006) programs that are ostensibly narrow in appeal (e.g., professional skateboarder channels, Vice and Instyle magazines)—and also very inexpensively produced. YouTube’s total stated budget for the 100 channels was \$100-150 million, and recently announced that it would invest another \$200 million while adding 60 more channels (Efrati, 2012).

Finally, in the still nascent authentication-dependent TV Everywhere (TVE) segment, competition is at the local geographic market level, so the mix of MVPD competitors (except for DBS-based services) varies market by market. So far, TVE services are available for free, but only with “authentication” that the user is a paid monthly subscriber of an MVPD’s offline services. TVE is thus always bundled with offline MVPD services, obfuscating its contribution to revenues of their parent companies. Generally these portals provide online access to a portion of the content that the subscriber already has access to with their MVPD subscription. For example, Comcast’s TVE service, Xfinity, offers programming from TNT and other Turner Broadcasting System ad-supported channels to all Comcast subscribers whose subscriptions include those channels. In some cases, users access TVE programming through the specific channels’ web pages. For example, HBO-Go.com, a website that offers the same movies and TV programming that the familiar HBO monthly subscription channel provides, is available only to users who also subscribe to HBO via participating offline MVPD services.

Most of the larger MVPDs offer TVE services. Availability becomes less likely among relatively small MVPDs. New intermediaries like Synacor, however, have appeared to provide business-to-business services assisting smaller MVPDs to manage TVE portals. In terms of content diversity, TVE systems of larger MVPDs tend to offer the most programming. So far,

however, even the largest MVPDs offer only a small subset of the programming available with the subscribers' MVPD packages. A likely reason for these contrasts is that MVPDs have reportedly encountered a snare of contracting problems that limit online program distribution rights.

Of course, the providers in all five of these industry segments compete with each other, but they have some other differentiating features in terms of programming content, including a growing number of Internet-original programs. The great majority of these original programs, along with obscure foreign movies and TV shows, are surely part of the long tail of programs too narrow in appeal or too low in quality to be profitably supported offline. Apart from several relatively expensive original programs, (eg, "House of Cards"), however, economically viable television content offered by online video services is overwhelmingly "windowed" programs that have already appeared, or that appear at about the same time, on offline media (Owen & Wildman, 1992; Wildman, 2008).

In the TV program case, the windowing model is in flux, but most programs on ad-supported Internet services such as Hulu, CBS, and Viacom Digital generally appear with a delay of one day to a few weeks, with more complex windowing strategies occasionally used. For online VOD (and the advertiser and subscription supported Hulu Plus), delays are often shorter, and live streaming of major network programming to mobile devices (though with a different set of commercials), is now emerging. For most subscription services such as Netflix and Amazon, however, windows are generally several months later for both TV programs and movies, comparable to the movie release windows of monthly subscription cable networks like HBO and Showtime.³

c. Content aggregation and disaggregation

At least for the leading online providers, aggregation of commercial television and other programming from multiple creators or copyright owners appears to be a dominant business model. As noted above, Hulu aggregates mainly programs from the three major broadcast networks that co-own the site, but also from many other "content partners." Netflix's subscription service offers a large menu of TV programs and movies that come from many different owners. iTunes offers a menu of TV programs from numerous broadcast and cable networks as well as theatrical movies distributors. 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, CBS and Disney are intermediate cases, in that they offer numerous broadcast or cable programs, although mainly 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 showed that the extremely low marginal carriage or capacity costs of Internet distribution allow content aggregators to average consumers' demands over a great many different products at once, enabling more accurate pricing to extract consumer surplus.⁴ Bakos and Brynjolfsson's model, however, appears to

³ Netflix and Amazon have recently accelerated acquisition of exclusive rights to a few major films and TV programs that have substantially shorter windows.

⁴ Conceptually, their model is similar to the empirically-based explanations by Crawford and Cullen (2007) and Crawford and Yurukoglu (2012) for why cable TV systems bundle programming into various packages for different prices.

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 as Netflix and Hulu Plus, a more apparent source of economic efficiencies of online aggregation is analogous to well-established reasons that brick and mortar department stores exist. Consumers have a one stop shop and can compare prices of many different brands directly.

A number of other authors, notably Shapiro and Varian (1999) and Harvard Business School (2000) have also recognized that Internet architecture offers unusual efficiencies of aggregation; links to a virtually unlimited amount of programming content can be offered by a single seller at extremely low marginal costs. 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. Individual networks, however, can potentially bypass--and thus potentially “unbundle”-- MVPDs simply 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 great numbers of content providers and other businesses. Thus, the Internet makes both aggregation and disaggregation of programming content more efficient.

Whether content aggregation or disaggregation by online video providers eventually dominates is simply an empirical question. An evident advantage of online aggregators is a strong brand identity among a vast number of competing websites, clearly one objective of aggregators such as iTunes and Hulu (Yao, Queiro, & Rozovsky, 2008). A look at online video suppliers at the other end of the range, such as HBO-Go and ESPN3, suggests that suppliers which already have well-established names are prominent among successful content 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, for example, partially serves as an aggregator 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, may play in the aggregation of online video content. As we noted above, TVE systems currently accomplish only limited levels of aggregation, but they can be viewed as nascent attempts to achieve large scale, MVPD-like levels of online content aggregation. MVPDs are aggregators not only of a great variety of programming but also of business models, including advertiser and fee support, monthly subscription and VOD. In that respect, TVE can be seen as a potentially comparable large-scale aggregation of the still-developing online TV components of subscription (e.g., Netflix), advertiser-support (e.g., Hulu) and VOD services (e.g., iTunes).

Whether MVPD-level aggregation will prove in the long term 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. Waterman, Sherman & Ji, (forthcoming, 2013) develop economic models that interpret MVPD bundling of offline and TVE services as a price discrimination device by which “low value” consumers are offered online video for free in order to decrease the likelihood of that they will “cut the cord.” It likely that TVE has other strategic advantages to MVPDs in their attempts to enter the online video market.

4. Comparative efficiencies of online television

The massively parallel nature of the Internet is potentially a great boon to both consumers and distributors of television and other video programming. "Appointment television" contrasts fundamentally with the asynchronous on-demand Internet architecture that enables consumers to watch the programming whenever they please. The volume of programming that can be profitably offered is greatly expanded by the long tail made possible by the Internet's extremely low capacity costs. The small but increasing quantities of original programming offered by Hulu, Netflix, YouTube, and other online suppliers parallels the early development of cable television in the late 1970s and early 1980s. Online video's potential is greater, however, as foreshadowed by the range of niche appeal channels created by YouTube and other suppliers. The recent proliferation of tablets and other portable media players is increasingly fulfilling the "anywhere" as well as the "anytime" promise of online video distribution.

Internet technology offers theoretical improvements in both advertising and direct payment business models. On the advertising side, online video portals incentivize the tracking of individuals' consumption patterns in order to target advertisements to individuals directly.⁵ Many portals, such as Hulu, allow consumers to choose between different ads, and often allow feedback about whether ads were relevant or satisfying. The data collected can be used to analyze individuals' overall consumption patterns, and sophisticated suggestion engines can lower consumers' search costs by linking them more directly to products they are likely to view or buy. Online direct payment systems can also be more efficient, such as by use of micropayments and mobile phone applications, and by facilitating price discrimination with dynamic pricing and instantaneous price changes.

Enabling all of these advantages of online television is the remarkably efficient two-way interactivity made possible by personal computers and their communications. Without easy search for content within and among online video websites, neither the vast aggregations nor the disaggregations of online programming would be possible in practice. Similarly for the efficient direct pricing and management of online VOD. Targeted advertising and suggestion engines also depend on interactivity and improved interface options.

Of course, MVPDs have themselves advanced well beyond the rigorous model of appointment television with their own end user computers in the form of set top boxes and the DVR. "Pay-per-view" systems that relied upon staggered start times of the same popular movie on several dedicated channels have been replaced by VOD systems having hundreds or thousands of different movies or TV programs. The versatility and efficiency of computer communication within the open architecture of the Internet, however, is more advanced and shows greater promise.

5. The future of online television

The technological marvels and vibrant entry into online television may seem in sharp contrast to the reality of its small audiences and revenues, and the economic persistence of standard television.

⁵ In addition to earlier works cited above, Evans (2009) and Anderson (2012) offer surveys of a growing economic literature on Internet advertising.

One possible explanation for these contrasts is that at this moment, offline MVPD television is simply more convenient and familiar to the great majority of households. It offers a large selection of content with relatively low search costs, with on-screen program information grouped by familiar channels on a single device specifically designed to be plugged into any TV or home entertainment system. In contrast, online video often requires additional devices to be displayed on a home entertainment system, like a Roku or a game console. Most people have not adopted these devices, and many adopters may be unwilling to switch between different programs across different devices on any regular basis. For most people, changing the cable channel is simply easier than switching from Hulu through a game console to an iTunes library on a personal computer. The very range of different online services available on different devices can lead to a confusing and time-consuming search process that may discourage all but the most price-sensitive or tech-savvy from regular use.

As the speed and quality of online video transmission continues to rise, as broadband diffusion grows, as more efficient and portable media players continue to proliferate, and as the interaction between consumers and video content providers becomes more seamless, the economic viability of the online video entertainment industry seems bound to improve. Perhaps TV Everywhere packages, the online content bundle most similar to offline MVPD video services, will also become unbundled as MVPDs seek to regain a portion of users who will have cancelled their services in favor of online video.

Foreshadowing changes to come are rapid shifts in online video use among a small but growing base. Nielsen reported that the amount of time the average person spends per week watching all online videos nearly doubled between the 4th quarters of 2011 and 2012 (from 38 to 68 minutes per person). (Nielsen, 2013, p. 9). Eighteen to 24 year olds, the most intensive online video user group in the later Nielsen study, watched 129 minutes of Internet video on average. Perhaps most telling, Nielsen decided in 2013 to include “Zero TV” households into its samples (Nielsen, 2013, p. 4). Comprised of roughly 2 million US homes in 2007, this traditional-TV-avoiding group had grown to 5 million households by the start of 2013. (p. 5).⁶

It would be a mistake, however, to view the transition of television purely in terms of any presumed rate of viewer migration from offline to online. Even as technological constraints of online video fall away, and as inevitable demographic shifts occur, the online video entertainment industry faces significant uncertainties and constraints in the reasonably near future. We conclude with mention of four of these.

First, the economic future of online video depends critically on the development of successful online business models, notably advertising, to support greater program quality and variety, especially Internet-original content. To the advantage of television content suppliers, the within-program video ad model transfers directly to online. However, although CPM rates for Hulu are reportedly comparable to or above those of prime-time broadcast TV, the number of commercials sold is much lower, resulting in relatively low advertising income per program online. Convergence Consulting Group (2011) estimated that compared to the above-cited viewing proportion of about 5% in 2010, the broadcast networks earned only 2.7% of their advertising revenues from online exhibition. The viability of video advertising is apparently

⁶ While 3/4ths of “Zero-TV” households own televisions, 2/3s view their content on other devices, and roughly half subscribe to an online video service (p. 5-6). They tend to be younger, with fewer children, and are more likely to live alone (p. 7). A third of them identify cost as the reason they do without MVPD video services, and only 18% of them consider subscribing (p. 8).

increasing, but the rate of improvement will have an important effect, given the 44% of total television industry revenues coming from advertising in 2010.

A second uncertainty is comparative technological improvements in competing offline media. Cable TV technology in particular is a very efficient means for simultaneous downstream delivery as well as pricing of television services to consumers. Though improving rapidly, the Internet is less well-designed for simultaneous real time delivery of television programming, such as sports. The usability of MVPDs' VOD systems, as well as their recent innovations in targeted advertising, are also variables.

A third issue is how video delivery costs, content provider prices, and ISP pricing structures will evolve as consumer bandwidth demands for online video continue to grow. We noted at the outset that online video already is a major part of broadband traffic. As online video demand increases, will ISPs be able to scale up their infrastructure accordingly? For example, more widespread adoption by ISPs of bandwidth-usage sensitive pricing could result in heavy video entertainment users paying effectively higher prices per movie or TV program, reducing demand for online video.

Finally, a major economic constraint on the online television industry could be limits on the availability of programming from content providers. We also noted above that the online exhibitions of most windowed television programs are at this writing usually delayed, at least slightly, from their offline television exhibition. Although windows are still settling, these delays presumably reflect lower returns per viewer from online exhibition. Undoubtedly, these delays have slowed television audience migration to online at least to some extent. How soon, and whether, television premieres will be simultaneous with, or perhaps before, offline exhibition, could be a crucial factor in viewer migration and economic growth of online television.

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