

Broadcasters vs MVPDs: economic effects of digital transition on television program supply

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Abstract

Purpose – Although FCC policy has mostly focused on broadcasters, the digital transition of television has involved a number of other players, notably cable television, DBS, and other multi-channel video providers (MVPDs). What have been the economic effects of this transition on these various industry players and on viewers? The paper aims to answer this question.

Design/methodology/approach – This paper assembles an historical database to compare changes over time in consumer spending, television advertising revenue and related economic data extending back to the 1950s.

Findings – The authors show that non-broadcast suppliers of TV programming, especially cable operators, have been able to take much greater economic advantage of the digital television transition than have broadcasters. Cable and DBS systems have used digital technology to greatly expand the amount of programming available and to more efficiently price discriminate on the basis of program quality – including the direct sale to consumers of broadcast and other HD programming. The result has been rapidly rising cable and DBS revenues since the mid-1990s, and a general shift from advertiser to direct payment support for television services. Overall, digital transition has enhanced the economic viability of cable and DBS delivery, and decreased that of broadcasting. It is evident that consumers have much higher quality and variety of programming available as a result, though usually at higher prices.

Research limitations/implications – The statistical analysis of this paper has been broad. Other factors have undoubtedly affected the aggregate trends.

Originality/value – The overall pattern of television industry trends makes evident that FCC digital conversion policies have worked to the disadvantage of the traditional broadcast model.

Keywords Television, Cable television, Television systems

Paper type Research paper

Received: 11 November 2009
Revised: 11 January 2010
Accepted: 26 January 2010

The authors are grateful to Jim Alleman, Eli Noam, and to other participants in the “Economics of the Digital TV Transition Conference”, Columbia Institute for Tele-Information, Columbia University, December 12, 2008, and to participants in the 37th TPRC Research Conference on Communication, Information and Internet Policy, September 25-27, 2009, Arlington, VA, for comments on preliminary versions of this analysis. Statistical data generating the graphs presented in this paper are available from the authors.

1. Introduction

The phrase “digital transition” typically brings to mind the FCC-mandated conversion of local broadcast TV stations from analog to digital transmission, a process that was essentially completed in the US by June 2009. The digital conversion of television in the US since the mid-1990s, however, has involved a much broader array of players – notably cable, DBS, telcos, and other multichannel video program distributors (MVPDs). Emerging internet video services like YouTube are themselves products of the digital television transition.

In the article to follow, we investigate the broad economic effects of digital transition on the viability of broadcasting and alternative television delivery systems, on their sources of revenue (advertising vs direct payment support), and on the quality and variety of television programming they supply. Basically, digital television transmission is cheaper and better than analog; it offers MVPDs as well as broadcasters smooth tradeoffs between higher quality transmission (HDTV) and higher program variety. How have these television suppliers used those opportunities to their competitive advantage, and to what effect?

We assemble an historical data set that includes industry revenue and consumer spending on advertiser vs direct payment television media since the 1950s, and indicators of television programming quality and variety. We compare broad trends in these variables with measures of digital television technology diffusion, and offer comparison with the effects of color television diffusion in the 1950s and 1960s. We abstract from the shorter term, direct effects of the digital broadcast signal transition of 2009, such as reduction of broadcast audiences due to the blanking of some broadcast station signals, or incentives for TV viewers to shift to cable or DBS due to these events or consumer concerns about them.

Using these data, we show that non-broadcast suppliers, especially cable operators, have been able to take far greater economic advantage of the digital transition than have ad-supported broadcasters. Cable systems have used digital tiers not only to greatly expand the amount of programming they offer, including HDTV channels, but as devices to more efficiently segment their consumers and price discriminate. Most HD programming, for example, has been sold by cable operators on higher priced digital tiers or with extra equipment charges. DBS has followed similar pricing strategies. The result has been steadily rising cable and DBS revenues since the mid-1990s, and a general shift from advertiser to direct payment support for television services. It is evident that digital television technology has in economic terms improved the variety and the quality (both transmission and production) of programming, but that improvement has been at the expense of higher prices to most consumers. We also consider impacts of the FCC's Digital Must Carry rules as they apply to cable and DBS exhibition of HD broadcast programming.

We continue in section 2 below by briefly discussing economic effects of the long ago completed transition to color television broadcasting in the US. That simpler world sets the stage for detailed consideration in section 3 of the wider variety of industry players involved in the US transition to digital television since the mid-1990s. Conclusions follow in section 4.

Our focus in this article is on standard television delivery systems. The recent migration of television viewers to YouTube, hulu.com and other websites for television services opens an array of questions comparable to those we address about standard TV services in this article, but those effects are just beginning to unfold[1].

2. A color TV analogy

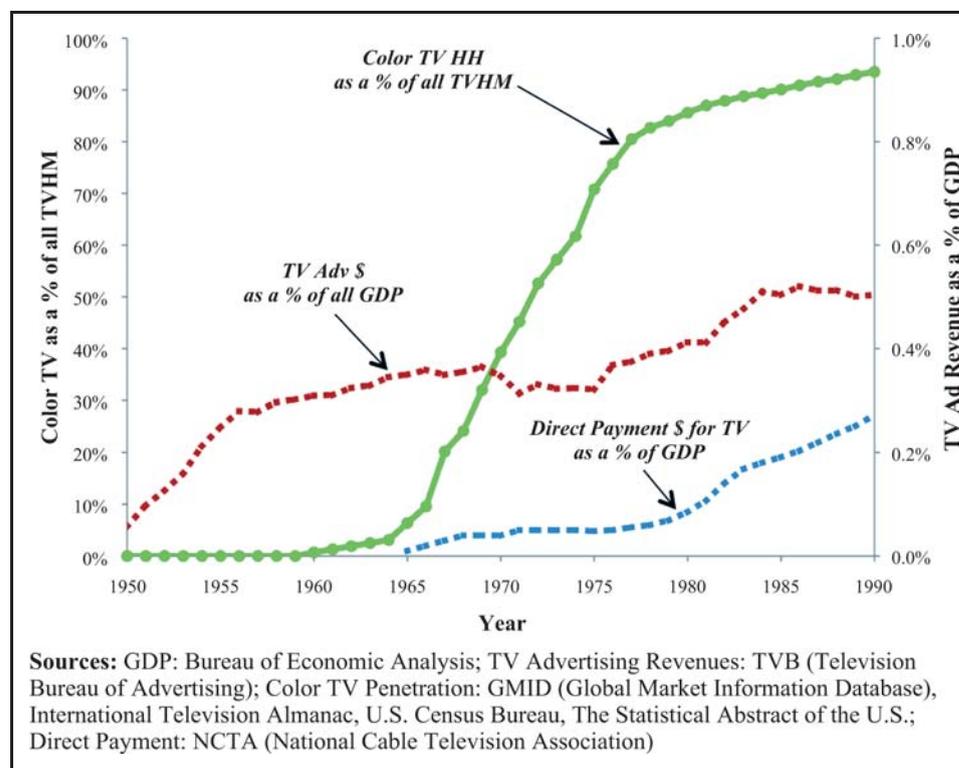
Past studies of digital TV or other media have often drawn analogies with color TV set diffusion, or have focused on government policy effectiveness (Besen and Johnson, 1986; Rohlf, 2001; Hart, 2004; Adda and Ottaviani, 2005; Leiva *et al.*, 2006). Here, we consider economic effects of the diffusion itself[2].

Figure 1 shows the broad relationship between the diffusion of color TV sets in the US (indexed on the left axis) and the growth of television industry ad revenues and of direct consumer payment (subscription) television revenues, both measured as a proportion of all economic activity, or GDP (indexed on the right axis).

During most of the color transition, advertising was by far the dominant means of TV programming support. Much of the early rise in TV advertising shown in Figure 1, especially from 1950 to about 1960 (during which overall TV HH penetration exploded from about 9 to 87 percent[3]) reflects a period in which TV won market share from radio, newspapers, magazines, and other established media. In the latter part of the period, beginning about 1980, development of basic cable networking began contributing to TV ad growth, and cable accounted for 9 percent of all TV advertising by 1990[4].

There is no evident relationship, however, between color set diffusion and the rate of TV advertising growth. The interval of most rapid color set diffusion from 1964 to 1978, in fact, corresponds with the period of slowest TV ad growth over the 1950-1990 time span[5]. Indeed, a lack of much correlation between TV advertising growth and color diffusion should not be surprising. On the one hand, color surely encouraged TV viewing as an alternative to other media (notably movie theaters which offered color) because it improved the quality of the TV option. Available data show that TV watching per individual viewer increased from 24.0 to 26.5 hours per week between the "early-60s to early-80s" (the main period of color set diffusion) (*TV Dimensions*, 2008). Perhaps a more powerful driver of this increase in

Figure 1 Diffusion of color TV vs TV industry revenues by source, 1950-1990



viewing, however, was a rise in the variety of available channels (from an average of 5.7 channels per HH in 1960 to 10.2 in 1980) (*TV Dimensions*, 2008). Another positive force was that TV networks could probably charge somewhat more for the higher impact of color vs black and white commercials, but the basic value to advertisers of a households reached was clearly limiting[6].

The economic effects of color TV technology were undoubtedly complex; it may have contributed, for example, to the growth of independent broadcast stations, in turn affecting the advertising market, etc. Undoubtedly, however, most of the channel growth from the 1960s to the 1980s was due to cable television, which during that time converted from being primarily a re-transmitter of nearby broadcast signals to a standalone provider of premium movie channels like HBO and of basic networks like CNN and MTV. As shown in Figure 1, the direct payment component of TV industry support steadily increased in significance after the mid-1970s as a result. Presumably, color enhanced the value to consumers of cable subscriptions by improving their quality, in turn encouraging infrastructure investment, etc. Most of the growth in direct payments, however, came after color set diffusion was essentially complete.

In sum, color technology obviously improved the transmission quality of television programming, but its effects on TV industry revenues – and thus on industry investments into the quality and variety of TV programming – were fundamentally constrained during this era by dominance of the advertiser supported broadcast model.

3. The digital transition

The US transition to digital television began in the mid-1990s. The centerpiece of FCC policy was that in 1997 commercial stations in the largest 30 markets were required to build digital transmission facilities within two years; smaller commercial stations and non-commercial stations were required to do so within five or six years. By 2003, the great majority of these conversions had taken place (FCC, 2003).

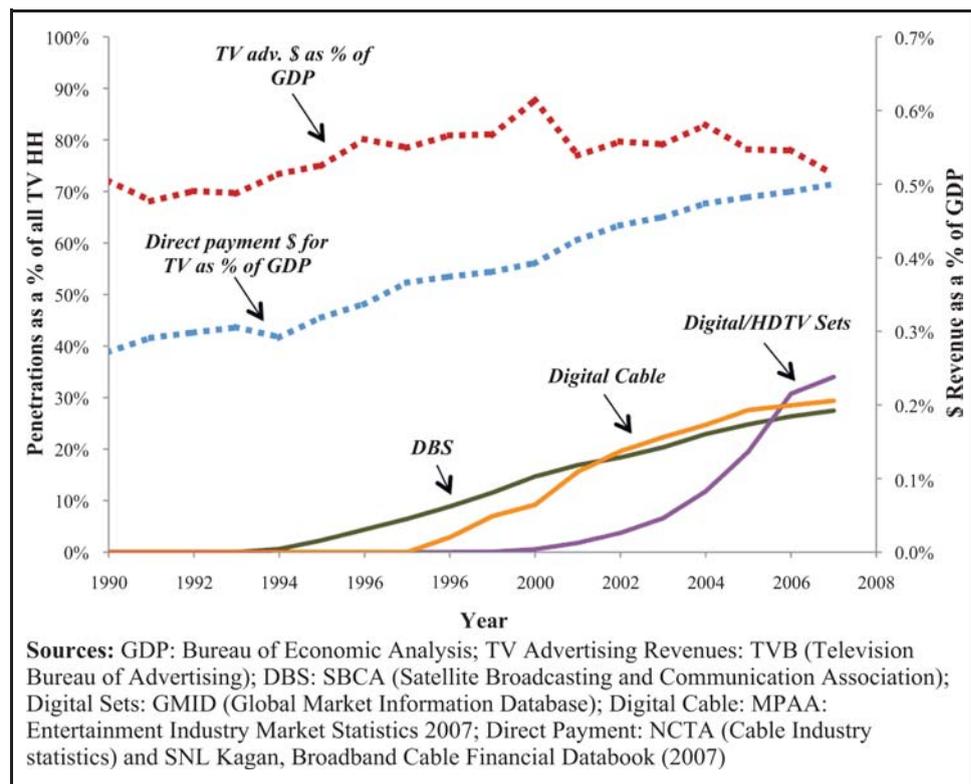
As Figure 2 shows, digital conversion started for MVPDs at about the same time. DBS, which began with the launch of DirecTV in 1994 and has been all digital from the beginning, was by 2007 subscribed by over a quarter of all TV HH (indexed on right hand axis). With their infrastructure already in place, cable operators began in about 1997 to convert some of their analog channels to digital programming tiers, which were offered to subscribers for extra monthly charges. By 2007, approximately 48 percent of cable TV households subscribed to at least one digital cable tier, which as Figure 2 shows amounted to 29 percent of all US TV homes. According to the NCTA, nearly two-thirds (63 percent) of cable homes purchased some kind of “digital video service” by March 2008[7]. Virtually all cable households (96 percent by 2005) are now passed by systems having digital video capability (FCC, 2009).

Numerous national TV networks have since the mid-1990s begun offering HDTV versions of their program menus. Among the first to do so were the four main commercial broadcast networks. The majority of the major basic and premium cable networks, plus some newly created HD cable networks, have now joined them[8]. Meanwhile, US HH penetration of digital TV sets (the large majority of which can receive HD programming), turned upward after a period of slow growth to reach nearly 33 percent by 2007.

Also shown in Figure 2 are trends in TV advertising vs direct payment revenue as a fraction of GDP after 1990. The direct payment fraction has continued to grow steadily, while the advertising component has leveled off, or has declined since about 2000. We will further consider the possible relationship between digital conversion and the growing reliance on direct payment after a closer look at the characteristics of digital TV technology and how it has been applied by cable and satellite delivery systems. The ongoing conversion from analog to digital TV in the US has interesting contrasts with the black-and-white to color transition that we also draw upon below.

Like color, of course, digital television technology permits higher quality television pictures in the form of HDTV. One important contrast with color vs black and white, however, is that digital TV transmission is, other things equal, far cheaper than analog delivery on a per

Figure 2 Digital diffusion vs TV revenue by source, 1990-2007



channel basis. A fundamental attribute of digital encoding is that it offers TV suppliers a more or less continuous tradeoff between picture quality and programming variety. Roughly, a single 6 MHz analog television channel can be converted into a single HDTV quality digital signal (increasingly, with space left over). Alternatively, digital compression allows 8 to 12 channels of digital TV programming having standard definition picture quality (i.e. like standard NTSC analog) to be transmitted within the same spectrum space. These cost/quality advantages of digital over analog television technology were not present in the early days of TV, but over a number of years they have now reached an overwhelming level.

A second contrast with the color transition era is that the great majority of television providers now have cost-effective technology available to charge consumers directly. By 2008, about 89 percent of US TV households received their TV, including broadcast stations, via subscriptions to cable, DBS or other MVPDs (SNL Kagan, 2007). Also, of course, these MVPDs have vastly greater amounts of programming to offer. Beginning from the 10.2 channels in 1980, the average number of channels receivable by a US TV household exploded from 27.2 to 117.2 between 1990 and 2008 (*TV Dimensions*, 2009). Much of that change has been due to fiber optics and related system equipment, and another part is due to the growth of MVPD penetration itself; combined cable and other MVPDs penetration increased from 60 percent in 1991 to 89 percent by the end of 2008[9]. Digital conversion and compression have obviously contributed much to the greater programming availability since the 1990s, however, including well over 100 HD channels that were available for carriage by DBS or cable system operators by 2008. Obviously, both HDTV programs and the much greater quantity of programming that digital conversion has enabled MVPDs to offer, raise the prices that consumers will pay for those programs.

At least potentially, digital broadcast stations can also take advantage of these economic opportunities on their own via "multicasting." The FCC did not require broadcast stations to transmit HDTV, only to convert to digital signal transmission. While after conversion broadcasters have ended up with basically the same amount of spectrum space they started with, they have had the regulatory freedom to use that space to broadcast 6 or more standard definition channels (or whatever digital compression permits), and to charge consumers money for at least some of those channels if they choose to. While a number of stations have taken advantage of multi-casting, doing so with more than one or two standard definition channels generally precludes their HD option (except if varied by day part). The economic viability of such multi-casting business models for broadcasters, however, has generally not been well demonstrated.

A third, related contrast to the color era is market segmentation and price discrimination opportunities that digital technology makes possible. In particular, HDTV set owners surely have higher willingness to pay for programming and evidently stronger preferences for programming quality and variety. MVPDs have used digital technology to more effectively segment high and low value markets, charging more for the higher variety that digital tiers provide, and also to charge more for HD programs, including HD broadcast channels. Comparable opportunities to charge more for color programming than for black and white never existed.

To illustrate how cable operators have used digital technology to their economic advantage in these ways, Table I describes the progressive conversion of the Bloomington, Indiana cable system to digital tiering. In 1997, the Bloomington system (then owned by TCI) offered to most homes a 35 channel basic + expanded basic analog package, and also five premium analog movie channels (HBO, Showtime, etc.) for extra a la carte charges, or one price for the full bundle of 40 networks. For some other Bloomington homes already being served by a system upgrade in progress, TCI offered the same analog menu, but for an extra monthly access charge, an additional 36 TV channel digital tier it had converted from three of its other analog channels. The digital tier included access to nine channels of PPV programming, which could be had for extra per-program charges. By January 2009, the Bloomington system (now owned by Comcast) had moved all of its premium channels to digital tiers. At least five different digital tiers at various prices were available, although by July 2009, subscribers could choose to buy a digital package including all the channels available on the analog basic/expanded basic tier for only \$1.99 more than the analog basic/expanded basic price. PPV/VOD channels were available from any of the digital tiers.

Table I Cable TV channel offerings at Bloomington, IN

		November 1997		January 2009
		Analog access only	Digital access	
Analog	Basic	35	35	62
	Premium	5	5	–
Digital	Basic*	–	28	93**
	Premium*	–	28	23
	HD	–	0	45
	PPV/VOD	–	8	36

Notes: *Standard definition signals; **Includes Sports Entertainment Package (14); Digital Starter (16); and Digital Classic (63)
Source: "Channel Guide: Bloomington Headend, 11/24/97," TCI Cable; (www.comcast.com/Customers/Clu/ChannelLineup.aspx?print=1&CGID=5569), Program Lineup by Zip code: 47401, Information accessed January 12, 2009

The 45 HD signals offered by Comcast, including those of local broadcast channels, also could be had from any of the digital tiers, but to receive them required a set-top box available for \$7 per month (or \$15.95 per month for both the HD tier and DVR service).

Meanwhile, DBS, though all digital from the beginning, has taken advantage of improvements in digital compression and the proliferation of available programming to expand the quality and variety of services it offers. DirecTV, for example, offers a wide variety of package options at various prices, including specialized sports packages, totaling hundreds of channels. As of December 2008, DirecTV's menu included 130 HD channels, accessible to subscribers from any DirecTV tier, but with an additional \$10 HD access fee.

Figure 3 uses FCC data to make roughly the same pre- and post-digital comparison at a national level in terms of cable system revenues. In CPI-deflated terms, total cable system revenues for TV services (excluding internet access, telephone or related products) increased by approximately 40 percent from 1998 to 2006. The role of digital conversion in that revenue growth is strongly suggested by these data. In 1998, only 2 percent of all revenue came from digitally based services, but that proportion had essentially grown to 30 percent by 2006, while the contribution of analog basic revenues has fallen substantially (from 81 percent to 70 percent). In addition to the 11 percent of revenues for digital tier access itself, most US cable systems have apparently followed Comcast's Bloomington model of moving all a la carte premium networks (accounting for 14 percent) from analog to digital tiers, where they typically require an additional a la carte or package charge. The revenue contribution of VOD/PPV to TV services has continued to be disappointing to the industry at 4 percent, but for practical purposes, any reasonably efficient provision of VOD/PPV services requires digital tier placement, as do the DVR services (2 percent).

To fill out the historical picture, Figure 4 shows trends in cable and DBS revenues per subscriber, again in CPI-deflated terms, since 1980. Cable operator revenues per sub from all services (line graph 1) has steadily risen over most of the period, with the sharp uptick since about 1997 clearly due to the development of broadband internet access (cable modem) services, and to a lesser extent, telephone and related new businesses. As shown, however, revenue per subscriber only from cable television services (line 2) has also increased, notably continuing to grow after the advent of digital tiers in 1997. For the ten-year period from 1997-2007, total CPI-deflated revenue per subscriber from cable television services increased by 43.3 percent, compared to 10.8 percent growth over the previous 1987-1997 period.

Also as shown, one component of that recent increase in revenues per subscriber from all TV services has been higher income from analog basic cable service (line 3). As members of Congress and advocacy groups have frequently pointed out, and the FCC has itself observed and studied[10], analog basic/expanded rates have been going up faster than general inflation since the mid-1990s (when basic cable rates were essentially deregulated); those rate increases have obviously been the main driver of the rising basic analog revenues. As Figure 4 also shows, however, revenues per capita from non-basic cable TV services (line 4: digital tiers, premium services and PPV/VOD combined) have risen at an

Figure 3 Cable operator revenue for TV services* by type (CPI deflated \$**)

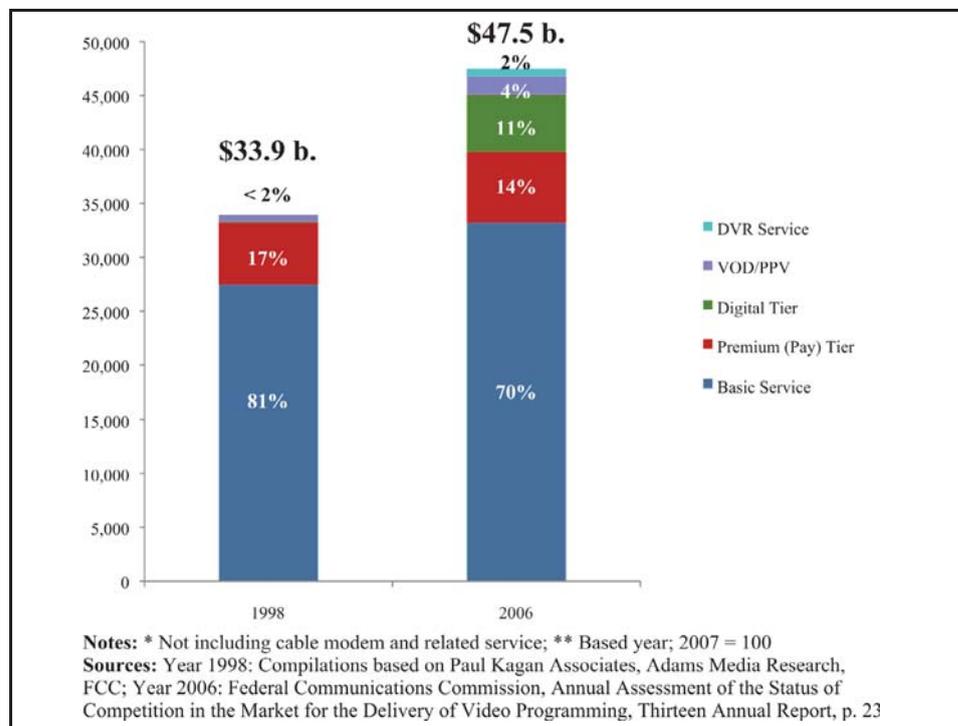
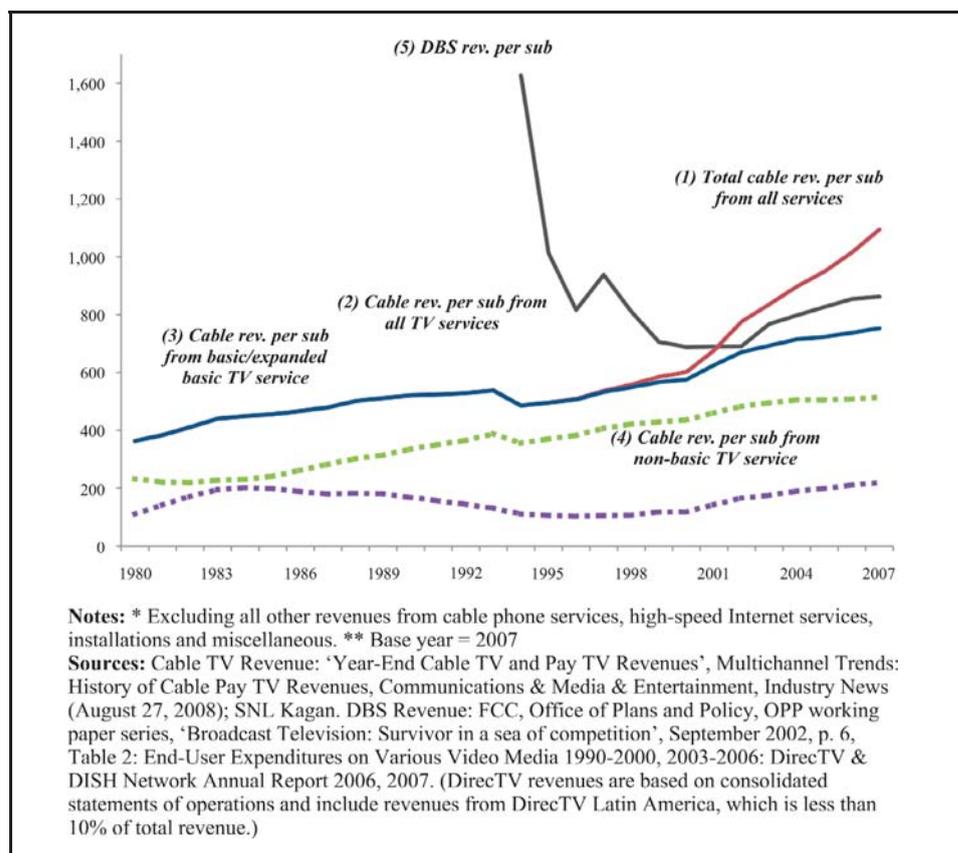


Figure 4 Cable* and DBS revenue per subscriber, CPI deflated**



even more rapid rate than have basic service revenues since the advent of digital tiering in the mid-1990s. Over the ten-year period from 1997-2007 the non-basic component rose by 108.1 percent, compared to a 26.5 percent increase in per capita analog basic cable TV services (CPI-deflated data) over that same period. As apparent from Figure 4, this growth in non-basic cable TV services per sub reversed a generally declining trend over the previous ten-year period.

Figure 4 also shows that DBS systems as well have been able to increase total revenues per subscriber (line 5), although less so than cable, since about 2000. At first, DBS was apparently able to skim the cream from very high value consumers who converted from cable in the mid-1990s. After shifting their appeal to less enthusiastic subscribers, revenue per subscriber fell rapidly. But then the steady addition of channel capacity, including HD channels along with a variety of sports packages, has apparently contributed to the per subscriber revenue increase since that time.

Returning finally to Figure 2, how might the stagnation and decline from about 2000 to 2007 of TV advertising revenues as a proportion of overall economic activity be explained?

A number of factors have undoubtedly contributed to the slowing of advertising growth in the digital era, including remote controls and PVRs, and the siphoning of TV audiences to Internet use. The latter includes viewer migration to internet distributed TV itself, although that is unlikely to account for much of the stagnation since 2000; even as of Fall, 2008, internet viewing was estimated to account for only about 1 percent of all broadcast TV program viewing (Wingfield, 2008). Certain attributes of digital technology would appear to boost TV ad revenues. Similar to color, high definition TV programming probably enhances to some degree the impact of TV ads, and thus their market value. Also, to the extent that digital technology has contributed to program variety, the result is finer market segmentation, which is desirable to some advertisers. Some cable operators, in fact, have been able to mimic the internet's remarkable ability to tailor ads to subscriber households based on demographics or other aspects of viewers' buying behavior.

Overall, however, the trends in direct payment vs advertising support since the advent of digital television shown in Figure 2 demonstrate that the advertising marketplace has not responded as strongly to the advantages of refined audience segmentation as have direct consumer payments. Our evidence thus suggests that digital television technology has favored a direct payment model by creating more programming and higher quality programs (at least in the form of HD), that consumers are willing to pay for, as well as creating new opportunities for television providers to slice and dice viewing households in terms of their willingness to pay.

4. Conclusion

The statistical analysis of this paper has been broad. Other factors, such as competition from other media and the diversification of both cable and telcos into "triple play" service, have undoubtedly affected the aggregate trends. The overall pattern of television industry revenue trends, however, makes evident an ironic consequence of the digital television transition. Though focused on broadcasters, FCC digital television conversion policies since the mid-1990s have in the end worked to the disadvantage of the traditional broadcast TV model. From the broadcasters' perspective, the effects of digital television technology have been mostly analogous to those of color TV – few if any opportunities for direct economic benefit. Multichannel TV providers, however, almost entirely driven by the market forces of consumer demand for higher variety and higher quality programming, as well as by the lower encoding costs and more efficient direct pricing systems that digital technology permits, have so far been able to take great economic advantage of the digital television transition. Undoubtedly reflecting this shifting economic balance, local broadcast television reception had by mid-2009 come to serve as the primary TV delivery system for less than 10 percent of U. S. television households[11].

How the FCC's "Must Carry" rules will eventually affect consumer access to HD or other digital broadcasting services remains unclear. As of early 2009, FCC rules have required that after a local station's conversion, local cable operators are required to carry only one of

that station's digital signals (selected by the broadcaster), including an HD signal. Carriage of other multi-cast programs, therefore, is not required (these provisions were subject, however, to the stations' rights to choose to negotiate carriage with cable operators, in which case Must Carry does not apply). A comparable provision governs DBS carriage of local TV signals (see www.dtvfacts.com for a detailed discussion, see also Frieden, 2006). Individual broadcast networks remain the most popular in terms of ratings, but cable network viewing as a whole has become far greater than for all the broadcast networks combined. The FCC rules thus affect a minority of programming in terms of viewing, and a very small proportion of the total programming available. How the packaging and pricing of HD programming by MVPDs evolves as a result of the broadcast conversion, however, is yet to be seen.

Are television consumers better off for the digital television transition that has so far occurred? In standard economic terms, more valuable products, more efficiently delivered to more households, seem to make that an obvious yes. On the other hand, the welfare consequences of a shift from primarily advertisement toward direct pay support are not necessarily positive (abstracting here any non-economic social effects of television in general) (Waterman, 2006)[12]. Consumers have much more and better (in transmission and production value) television available, but many households pay substantially more to get it.

Notes

1. We address the effects of internet video more fully in Waterman *et al.* (2009).
2. Numerous other studies or law review articles consider the economic benefits or costs of the digital broadcast transition with respect to infrastructure development or spectrum usage. See especially Hazlett (2001) and Benjamin (2004). These issues are generally beyond the scope of this work.
3. Television Bureau of Advertising, Inc, Media Trends Track, TV Basics: Television Households; The Nielsen Company-NTI.
4. Television Bureau of Advertising, Inc, Ad Revenue Track, Gross Domestic Product, Total Ad Volume, and Television Ad Volume; Universal McCann.
5. In the 12 years of cusp-to-cusp color set diffusion between 1964 and 1978 (points where the rate of change of the slope increases or decreases), TV advertising as a fraction of GDP grew from 0.34 to 0.39 (0.05), while in the 12 years before, 1952-1964, it grew from 0.13 to 0.34 (0.21), and in the 12 years after, 1978-1990, from 0.39 to 0.50 (0.11).
6. One can trace more complex economic effects. Entry of new stations was presumably encouraged, which in turn affected advertising pricing, etc., but these effects were limited by the magnitude of the driving forces.
7. Defined to include various digital packages, high-definition services, and interactive digital services such as DVR and video-on-demand. According to the NCTA website (www.ncta.com/StatsGroup/OperatingMetric.aspx), there were 63.7 million Basic Video Customers and 40.4 millions of Digital Video Customers in 2008. Thus, 63.4 percent of cable homes had access to any kind of "Digital Video Service".
8. Screen Digest, January, 2007, p. 5; the four major US broadcast networks and PBS all offered HD networks by 1998; most cable networks did not offer HD versions until about 2003.
9. FCC, 2nd Annual Report, "Annual assessment of the status of competition in the market for the delivery of video programming", Released: December 11, 1995. Appendix G, Table 1 Assessment of Competing Technologies SNL Kagan, Cable Program Investor No. 117, "Economics of premium television, 2007-2017" August 30, 2007, p.8.
10. Section 623(k) of the Communications Act, as amended by the Cable Television Consumer Protection and Competition Act of 1992 requires the FCC to publish annually a statistical report on average rates for the delivery of basic cable service, cable programming service, and equipment (FCC Report, Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment, Released: July 8, 2003).
11. Television Bureau of Advertising, Inc, Market Track, "TVB local broadcast and cable reach" February 2009.
12. The debate traces back to Samuelson (1964) and Minasian (1964).

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