



# Policy Brief

Stanford Institute for Economic Policy Research

## The Broadcast Flag Debate

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### Overview

O rson Welles once captured many consumers' relationship to the most heavily used appliance in the home: *"I hate television. I hate it as much as peanuts. But I can't stop eating peanuts."* Average American adults certainly spend most of their discretionary time watching television, approximately 3.5 hours per day. Despite this central role of television in people's lives, many are unaware that television is about to undergo a major face-lift. In 1997, Congress decreed that broadcast television would switch from using an analog signal to a purely digital approach.

Confusion is the likely immediate impact of this change. Unless they purchase a new digital television set or converter box, the 15 percent of Americans who rely on broadcast signals rather than cable or satellite for their primary television access will not be able to watch their favorite shows. Even in cable households, the extra sets in the bedroom or den relying on broadcast will be unable to pick up the new signals. The Federal Communications Commission (FCC) hopes to smooth this transition from analog to digital with as little impact on average consumers and their existing television equipment as possible.

Broadcasters and Hollywood fear a darker result. The FCC ruled that television must continue to broadcast "in the clear," unencrypted and readily viewable by all with the proper sets. This is in keeping with the tradition of public airwaves maintained by the FCC since its inception. What Hollywood fears is that these digital broadcasts of sitcoms, sporting events, and movies will quickly jump to the Internet. Like the music industry before it, Hollywood fears rampant video piracy and "video Napsters" cutting into their sales and profits.

The FCC, hearing threats from Hollywood about withholding their content if it could be digitally copied, recently responded with the "broadcast flag" proposal. The new FCC broadcast flag policy combines a familiar approach used in the past for other devices, with an expansion of authority and activities that troubles critics. The specific proposal is innocuous enough: a requirement to embed a small additional signal, the broadcast flag, into the digital signals sent by broadcasters. For example, the broadcast flag can be set to permit or prevent copying.

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The new broadcast flag standard is to be included in all digital televisions tuners manufactured after July 1, 2005. Over-the-air broadcasters have the right to flag any of their broadcast material for protection. This creates a variety of new possibilities, merging aspects of digital rights management with broadcast television. The FCC is seeking comments on details of the content protection and encouraging inventors to submit alternatives.

Among the most interested parties submitting comments and concerns are computer manufacturers and the rest of Silicon Valley. Digital television standards established by the FCC and Congress will likely affect video consumers for decades. Effective digital rights management is unlikely to be most important in charging for what was formerly free, but in creating new services that can be rolled out using the digital broadcasting opportunities. However, aspects of the broadcast flag proposal suggest the FCC in their anti-piracy role will assert authority over many more features of computing devices than in the past. This would raise costs, slow innovation, and bring an unwelcome amount of bureaucracy to new product design.

## **Tapping the Digital Resource in the Living Room**

Why force a conversion to digital television when analog television is well established in nearly every household in the country, especially when the change risks consumer and broadcaster backlash, and might render billions of dollars of video equipment obsolete? Part of the answer lies in the highly successful spectrum auctions of the 1990s, which convinced Congress that additional spectrum auctions would provide tens of billions of dollars of government revenue while more efficiently allocating spectrum among competing bidders. A move to more efficient digital television frees up valuable analog spectrum, permitting its auction for other uses. Other countries around the world are transitioning to digital television as well. Berlin, for example, has already made the conversion.

A deeper economic reason supporting the switch is the ongoing phenomenal progress in digital technology, leading to a convergence of technology platforms and industries. William Nordhaus estimates that from the beginning of the computer age until the present day there has been an improvement in computing performance per dollar of more than 500 billion times. Digital storage costs have fallen even faster than computers in recent decades. Hard disks cost over \$100 per megabyte in the 1970s. Computer hard disk prices are now less than \$.005 a megabyte and falling very rapidly.

These improvements create digital technology finally capable of handling high-quality digital video at reasonable prices. Video demands much more digital power than other media. At standard resolution, broadcast television requires approximately 1,000 megabytes of storage per hour of content. In contrast, each hour of MP3 quality audio takes only 50 megabytes of storage. High-definition television requires approximately 8 times more storage than current resolution, or 160 times more capacity than an hour of MP3 audio. Only now has digital progress created sufficient power for this transformation.

Digital cost reductions accelerate convergence, where the same underlying technology is shared across computing, consumer electronics, and telecommunications. The recent Consumer Electronics Show confirmed the vitality of this convergence, with traditional consumer electronics, computing, and cell phone companies entering each other's markets and partnering to provide seamless access to digital content throughout the home.

Convergence, however, greatly complicates policy makers' decisions. Twenty years ago a technical standard or proposal involving television had limited impact outside broadcasting. Now a digital media standard in consumer electronics spills over into telecommunications, computing, and other industries. Digital convergence makes regulation contagious. A poorly designed policy intended to limit television programming piracy may raise costs, slow innovation, and complicate operations in many other sectors of the economy. These indirect costs can easily outweigh the direct benefits to broadcasters.

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<sup>1</sup> See Randal Picker (2002), "From Edison to the Broadcast Flag: Mechanisms of Consent and Refusal and the Propertization of Copyright," working paper, University of Chicago Law School.

## Protecting Digital Television Content

Producers of digital content, such as Hollywood studios or digital television broadcasters, have three different layers of protection for their intellectual property. These “three C’s” of protection are copyright laws, copying cost, and copy protection.<sup>1</sup> Each form of protection reinforces the others. For widespread piracy to occur, all three protections must fail. Within the same standards, the FCC can rely on different balances of these protections at different times and still achieve the goal of protecting digital content.

Copyright law has been significantly strengthened in the United States and many other member countries of WIPO (World Intellectual Property Organization) during the past decade. All original content produced by individuals or corporations is presumed to be copyrighted and protected. Terms of copyright protection have been extended several times by Congress. The Digital Millennium Copyright Act of 1998 (DMCA) reinforced copyright law by making it illegal to circumvent encryption standards in many settings.

For users willing to ignore copyright laws, the hassle and time cost involved in copying may stop them. Even with broadband, the time needed to share video online can be prohibitive. If it takes a potential pirate 10 minutes to download an hour of music, the same connection takes more than 3 hours to download a conventional television show or 26 hours to download in HDTV format. For households without broadband, sharing video online is effectively impossible.

The third barrier to unauthorized use is copy protection. Perhaps the most familiar form of consumer copy protection is the encryption system protecting DVDs. Consumer electronics firms must license the descrambling technology enabling playback. This same technology restricts copying a movie to a computer’s hard disk and duplicating encrypted DVDs, and creates regionalized variants of DVDs playable only on players for that region. The DVD protection system uses encryption at the source, never exposing the video material in unencrypted form.

A flag in the media allows content to be sent in the clear while still restricting widespread copying. The flag signals to any receiving device that the video is protected. Modern

analog VCRs include a flag-based copy protection system mandated by the DMCA. If a VCR detects the flag signaling protected content, the analog output video signal is scrambled. The DMCA permits, but does not require, copy protection for pre-recorded tapes and pay-per-view broadcasts. Importantly, the DMCA explicitly disallows protection for over-the-air television and basic or extended basic cable transmissions by stipulating the flag be set to “unprotected.”

For some commentators, the current FCC broadcast flag rules overturning the congressionally mandated unprotected status is very troubling. The FCC partially addresses this concern by creating an “analog hole.” The new broadcast flag only pertains to digital outputs — analog outputs (say to a VCR) retain whatever protection or lack of protection was included in the original broadcast. Nonetheless, digital free over-the-air and basic cable programs are copy protected for the first time. Currently feasible and legal activities, such as editing a small portion of a show for commentary or other fair use purposes, can be frustrated technologically.

A fourth “C,” consumption behavior, may protect media through consumers’ actions. Media that are consumed repeatedly are more susceptible to piracy than media consumed once. The cost of copying is primarily a fixed cost. Repeated consumption of a song spreads the fixed cost of copying over multiple occasions. Video, on the other hand, is typically watched just once or twice.

The DVD encryption, broadcast flag, and VCR protection systems are all attempts to raise piracy costs sufficiently to deter average citizens from engaging in widespread copyright violations. Professional criminals can easily break any of these digital or analog protections. The only real protection against professional copyright violation is effective police work by law enforcement agencies and consumer unwillingness to purchase fully functional but illegal copies.

The target of the broadcast flag system is the average television viewer willing to illegally share material as long as the cost or risk is not too great. The FCC wishes to create “speed bumps” to copying — a lock to keep (basically) honest citizens honest. With this in mind, the digital transition and piracy histories of pre-recorded compact discs and DVDs provide valuable lessons for the broadcast flag debate.

## A Tale of Two Transitions: The Compact Disc and the DVD

While the current state of the music industry causes nightmares in Hollywood, the actual experience of piracy and music copying for the first 15 years of the compact disc's life tell a different story. The music industry was languishing with stagnant sales in the early 1980s. Introduction of the digital compact disc led to 15 years of rapidly rising sales revenue. As late as 1998, the music industry was relatively unconcerned about piracy, except for the occasional discussion of professional music bootleggers. Only in the last five years has there been significant consumer piracy of music.

The clear deterrent to music copying was the high cost for consumer copying. Changes to copyright protection over this interval have strengthened the protections and raised penalties. No change in copy protection has occurred, as music was always unprotected and "in the clear." The fall in copy cost occurred due to the diffusion of CD-burners, the introduction of broadband Internet, and the rise of MP3 and online music services such as Napster and Kazaa. The first change had relatively little effect beyond an occasional sharing among friends, as it still required access to the source material. Online music services, on the other hand, reduce the cost to access source material and lead to extensive music sharing by normal music consumers.

The commercial success of digital video on DVD was even more glowing than digital music on compact discs. Introduced in 1998, alongside the significant strengthening of copyright in the DMCA, DVD sales of players and content has exceeded the success of any other consumer electronics product in history. At the same time, there has been relatively little online consumer piracy from DVDs.

Evidence suggests the lack of piracy is a combination of copy cost and the signaling power of encryption rather than the strength of encryption. The encryption system of DVDs was broken almost immediately, with code being available online demonstrating how movies could be unlocked. Despite this, there has been limited active sharing of movies. One factor is the relatively low purchase price of DVDs, which limits the costs consumers are willing to incur for an illegal copy. Second, long download times for full-resolution DVD video makes it quite challenging for consumers. Third, the presence of encryption makes it obvious that sharing is unauthorized and illegal. Fourth, transferring movies from the computer to the television has not to date been easy for most households. Finally, video is much more a "consume once" media [hmb1] than music.

Broadcast television is even less likely to be repeatedly viewed than movies on DVD. Most sports, news, and show episodes have a shelf life measured in hours and days. HDTV especially places very high demands on network connections. The history of music CDs and movie DVDs suggests that rampant copying under the current copy cost settings will not be a major concern in the near to mid term.

## The Four "C's" of Protection

	Copyright	Copy Cost	Copy Protection	Consumption Pattern
Music albums • CDs	Yes	High: 1980s-mid-1990s Medium: mid to late 1990s Low: early 2000s	None	Multiple
VCR tapes • DVDs	Yes	High: late 1990s Medium: mid-2000s	Encrypted at source	Few
Analog • Digital TV	Yes	High: mid-2000s (very high for HDTV)	Broadcast flag, protected at destination	Very few

## Achieving Digital Television Diffusion with Minimum Disruption

The FCC must carefully balance its desire to promote digital television conversion, and protect intellectual property of content owners, against negative spillovers to a wide sector of the economy that an intrusive and overly broad standard would impose. Rather, it should craft an implementation strategy lowering the barrier to current adoption of digital television while phasing in digital rights management. The digital broadcast standard will likely be in effect for decades. However, the power of digital technology can be used to gradually activate this new standard and minimize costs imposed on consumers.

It makes economic sense to incorporate a flexible copy protection mechanism into the new digital television standard. The experience of the analog VCR protection system demonstrates that a flag system, targeted at primary digital tuner devices, is capable of working without undue overhead on consumers or electronics manufacturers. Ultimately, this digital rights system may create new services and capabilities beyond what we think of as broadcasting. The FCC may even wish to go beyond simple usage of the flag, by incorporating a video watermarking system within individual receiving units. Relying on copyright law to provide its traditional protection, this would allow law enforcement to track uploaded pirate copies back to the source. A limit on this watermarking system to received broadcast television should not create serious privacy issues.

There is little basis for an insistence by the FCC that it control all possible avenues of digital copies. This would force computer and software makers of a wide range of devices to submit potential architectures to challenge by the FCC. The additional media protection from enforcing the broadcast flag system on all devices potentially capable of carrying video, as opposed to digital tuners, is not worth the costs to the industry or to consumers.

Finally, the FCC should change its announced initial broadcast flag policy and impose a near-term mandate requiring broadcasters to set the broadcast flag status for all over-the-air broadcast content to “unprotected” as mandated by the DMCA for the analog world. For the next few years the risk of piracy from the copying of digital broadcasts is quite low due to slow Internet connection speeds and the difficulties of uploading and downloading video. The risk of incompatibility with existing consumer electronics, however, is very high. Unprotecting content lets millions of consumers have more time to upgrade their home systems, move painlessly into the digital world, and still diffuse the broadcast digital flag standard. If the FCC sees actual, and not just possible, digital piracy occurring, it can free up broadcasters to set the flag as they wish.

## About the Author

**W**ard Hanson analyzes the marketing and economics of new technology. He has been a pioneer in studying the commercialization and impact of the Internet, including a leading textbook on Internet Marketing. Other areas of interest include the impact of competition on technology choices, policy issues surrounding the evolving role of interactivity, and optimal product line pricing. He joined the Center for Research on Employment and Economic Growth at SIEPR in 2003. Hanson received his Ph.D. in Economics from Stanford University, and has been on the faculty of the University of Chicago, Purdue University, and Stanford University Graduate School of Business.



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