PART I

A Political Economy of Digital TV

ONE

Introduction

This book is about change in the television industry. It documents the transition from a world of spectrum scarcity, dumb terminals, and one-way services, to a world of on-demand programming, intelligent terminals, and abundant channels – namely, a transition from analog to digital TV. Heralded as the most important innovation in the history of the industry, digital TV involves the reconfiguration of a sector that, beyond its economic significance, is central to the mechanisms of democratic politics and the evolution of popular culture. This is certainly not the first time that the television industry faces reorganization on a massive scale. But for the most part past technological innovations have spurred evolutionary, not revolutionary change. An old black-and-white TV set would probably be able to pick up several color TV signals. Analog cable and satellite TV largely brought more (today, much more) of the same: branded packages of programming called channels. The transition to digital TV is different. It requires a complete retooling of the existing video production and distribution infrastructure, from studio cameras to transmission towers. It requires new mechanisms to compensate content creators and distributors in a world where conventional ads can be skipped and perfect copies made and distributed with the click of a button. And it requires new tools for viewers to navigate the maze of programming and new services available, much like Internet browsers help us find our way through the World Wide Web.

In a sense, the transition to digital TV is about a revolution long overdue. Compared with related sectors, the pace of technological change in the broadcasting industry during the past three decades has been much slower. Digital technologies have revolutionized the telecommunications industry, the information services industry, and to a large extent the film industry. But until recently, the use of analog equipment in

the transmission and reception of video programming has precluded broadcasters from taking full advantage of fundamental innovations in information processing and distribution. By the same token, analog standards have sheltered the industry from the turmoil that has swept other industry sectors. The transition to digital TV removes this protection. Today, the same forces that over the past years have turned the telecommunications and the information services industries on their head threaten to do the same with an industry that until now had seen relatively little (or, at least, smooth) change. As a longtime industry analyst put it, "after a half-century of glacial creep, television technology has begun to change at the same dizzying pace as the wares of Silicon Valley" (Owen, 1999: 3).

The forces that challenge the broadcasting industry, however, are not only technological. The transition to digital TV is part of a larger process of change in the way information is produced, aggregated, and distributed in contemporary societies. This involves fundamental changes in the economics of the communications industry that has created new competitive advantages, eroded others, and altered the balance of power between different market actors. It also involves new ways of thinking about the implications of information infrastructure for economic growth, for cultural development, and for political participation. Along with the transition, fundamental questions have surfaced about the funding of broadcasting services, the protection of copyright, and the obligations of broadcasters vis-à-vis the electoral process, to mention a few examples, which have led policymakers to rethink the existing rules of the game for television. I suggest that the transition to digital TV is much more than a tale of technological innovation. It is a story about large-scale changes in the normative models as well as the institutions that shape television as an economic and social force – and, ultimately, about the politics of the information society.

This book examines the transition to digital TV in the United States and the United Kingdom. The main argument is that the transition has unfolded differently in ways that reflect each nation's political institutions and their legacies in the organization of the broadcasting sector. As a result, where one would expect to find convergence as domestic industries adapt to new technologies and common international pressures, we instead find that the transition has amplified differences between the American and the British broadcasting systems. Such comparative perspective offers a number of advantages. First, it allows us to evaluate the

implications of the transition in countries with different arrangements for television. Despite a wave of privatization and the growth of commercial operators in the past decades, public broadcasters continue to be a major force in the European media landscape. Questions about the future of public broadcasters, their rights and obligations, and the proper balance between commercial and social goals were the subject of much debate both in the European Union (EU) and at the member state level. By contrast in the United States, where broadcasting has traditionally been organized around local commercial stations, the concerns centered on whether and how to promote "free" (i.e., advertising-supported) local TV in a context of near universal penetration of cable and satellite. In other words, the same innovation presented unique challenges and opportunities for market actors in different nations, resulting in distinct interest coalitions and policy strategies in support of alternative implementations. Digital TV thus offers a particularly rich case to investigate the interplay of domestic, regional, and international forces in shaping the way nations adapt to changes in information and communication technologies.

Second, a comparative perspective allows us to understand why some countries have been more successful than others in moving the transition forward. Take, for example, the introduction of digital terrestrial television (DTT) services. In Britain, within two years of the launch of DTT in the fall of 1998, more than 1 million households were receiving the new service. In the United States, however, despite billions in investments by existing broadcasters and strong government support, DTT was caught in a classic "chicken-and-egg" dilemma. Because the installed base of TV sets capable of receiving DTT signals was negligible, broadcasters lacked incentives to produce (or purchase) and distribute more digital programming. Lack of content gave the American public few incentives to invest in upgrading their receivers, which in turn made these receivers less affordable (because of small manufacturing volumes). As a result, after two years on the air, DTT services were received by less than 100,000 U.S. households. Scholars and industry observers pondered about the delays in the U.S. implementation of DTT. How is it possible that the world's technology pacesetter has fallen behind Britain and other European nations in the digital TV race? Typically, the answers focused on a number of factors affecting the decisions of firms and users to adopt the new technology, among them the presence of highly innovative firms, the availability of capital to finance infrastructure upgrading, the

penetration of alternative platforms (e.g., the Internet), the availability of attractive programming, and the switching costs involved.[1]

In this study I suggest that these market factors are inseparable from the digital TV policies adopted by governments in the United States and Britain. Governments and digital TV have been inseparable from the beginning. The first high-definition television (HDTV) system (a precursor of digital TV) was developed in the early 1980s by Japanese public broadcaster NHK at an estimated cost of U.S.$500 million. Shortly after, several European nations began pouring capital into an ill-fated R&D program to develop a competing system. Although the United States failed to develop a similar initiative, it would later impose a mandatory timetable for the introduction of DTT services and the shutdown of analog TV. Despite much discussion about industry deregulation, the fact is that governments continue to play a key role in allocating resources and shaping market dynamics in the broadcasting industry. For better or worse, they still decide (or at least regulate at length) who can broadcast what, to whom, at what prices, and using which technology, particularly in the terrestrial (also known as "over-the-air") sector. This investigation thus centers on what policymakers in the United States and Britain have done to promote, manage, or, more generally, regulate the transition to digital TV. In doing so, I side with the institutional economists in understanding markets as embedded in political and social institutions that create them and shape their outcomes.[2] I therefore compare American and British digital TV policies not for their own sake but rather for what they tell us about the particular form and the distinct pace that the transition has taken in each nation – and ultimately, for what they reveal about the way television is changing in the industrialized world.

The analysis should also prove valuable for the broader question of how globalization forces have affected the ability of individual nations to manage the evolution of domestic telecommunications and media markets. In fact, it challenges much of the conventional wisdom about the rapid decline in national sovereignty (e.g., Strange, 1996). The case of digital TV reveals that despite the ever increasing internationalization of markets, the development of digital networks on a global scale, and the expanding jurisdiction of intergovernmental bodies, nations

[1] See, for example, Institut de l'Audiovisual et des Telecommunications en Europe (2000).

[2] In particular the early work of Polanyi (1944), followed more recently by Willliamson (1985) and North (1990), among many others.

retain key instruments to direct the evolution of their media sector, whether in terms of market structure, technology, or content. While globalization forces have certainly undermined the effectiveness of certain policy instruments, national authorities have not passively accepted these changes. They have attempted to compensate losses in some areas (e.g., control over market entry) by enhancing control in others (e.g., competition policy), by creating new ways to exercise control, and by cooperating in supranational regulation. Although these attempts have not always been successful, they demonstrate that state authority over media has been more resilient than many have predicted, or preached.

Our findings also challenge a common interpretation of the regulatory reforms undertaken by governments in the United States and Western Europe in the broadcasting sector over the past decades. Throughout this study, I conceive the web of norms and rules that bear on the structure of television markets and on the expected behavior of policy actors and market agents as constituting a "broadcast regime." Generally speaking, a regime for industry governance tends to perpetuate itself as long as the underlying technological base of the industry holds constant and the regulatory agenda remains unchanged (Krasner, 1989; Zysman, 1994). On the other hand, technological innovations and/or changes in the regulatory agenda generate pressure for regime reforms (Pool, 1983). It is often accepted that the combination of rapid technological change in information and communication technologies and the emergence of a free-market agenda for the industry have resulted in significant deregulation of television on both sides of the Atlantic. Deregulation has taken place via the privatization of public stations, the opening of market entry, the relaxation of ownership restrictions, and an overall reduction in the level of state control over firm behavior. Based on the evidence presented in this study, I nonetheless suggest that this is an oversimplified interpretation that fails to account for changes in the manner by which governments regulate television. Consider the following examples: the UK Broadcasting Act of 1996 did relax ownership restrictions in the British media industry, yet, at the same time, the act established complex new rules for the licensing of DTT services and rejected the use of license auctions in favor of a traditional "beauty contest" to select the new licensees. The U.S. Telecom Act of 1996 similarly relaxed ownership limitations for broadcasters, yet, at the same time, it directed the Federal Communications Commission (FCC) to allocate at no cost a large slice of the available broadcast spectrum to the existing licensees and to make rules about when and how those frequencies should be used.

Are these isolated examples of government opportunism? Hardly so. As documented in the following chapters, there is little evidence to support the argument that the broadcasting industry has been by and large deregulated. Throughout the transition, governments in the United States and Britain have picked technology winners, have made rules in favor or against certain market actors, have allocated key resources, and have redesigned bureaucracies to renew their regulatory powers. The deregulatory argument is correct in that national broadcast regimes have experienced fundamental changes over the past two decades. Yet, this study reveals that governments have reorganized their control of the industry without significantly reducing the level of control over firm behavior. This reorganization has involved a gradual transition from a regime based on the idea of broadcasters (both public and private) as trustees of a public resource (the radio spectrum) – and thus under contractual obligation to serve the public interest as defined by the government – toward a regime based on competition law and access principles borrowed from telecom regulation. By blurring the distinctions between broadcasting and telecom services, the transition to digital TV gave critical momentum to these regime changes. However, the role of government in the new broadcast regime seems no less intrusive than in its analog precedent.

A DISRUPTIVE TECHNOLOGY

Ithiel de Sola Pool rightly asserted that "each new advance in the technology of communications disturbs a status quo" (1983: 7). The improvements associated with digital TV have challenged some of the basic technological parameters upon which the analog broadcasting regime rested. Digital TV originally emerged as a solution to the problem of bandwidth conservation in the transmission of HDTV. By translating HDTV signals into the binary language of computers, engineers managed to deliver HDTV over narrower frequency channels. Yet, it soon became clear that the same principles could be used to transmit any kind of video signal (not necessarily HDTV) through different delivery platforms. At its most basic, digital TV consists of sampling and encoding video signals as a stream of zeros and ones and transmitting this data stream through a transport platform (e.g., terrestrial transmitters, satellite, cable, the telephone network) to a receiving device (a digital TV set or a set-top box terminal) where the original video signal is reassembled. Data manipulation techniques (e.g., MPEG) allow the compression of

the digitized video signal to a point where it can be transmitted more efficiently (i.e., utilizing less bandwidth) than analog TV. Therefore, one of the key improvements of digital TV lies in the capacity to squeeze more channels within existing pipes.[3]

By allowing many more channels to be transmitted over the airwaves, digital TV has questioned one of the founding principles of the analog TV regime: radio spectrum scarcity. Government regulation of terrestrial television was generally premised on the notion that the natural limitations of the electromagnetic spectrum required close government scrutiny of broadcasting in order to ensure that this scarce public resource was used to the benefit of all (Mulgan, 1991). In Europe, the solution was to bring operators under the government's wings. In the United States, what emerged was a model based on the concept of commercial broadcasters as public trustees. By eroding transmission bottlenecks, digital TV has renewed old questions about the legitimate role of the state in the regulation of terrestrial broadcasting. Spectrum scarcity, one of the pillars of the analog TV regime, can no longer be taken for granted. The political engineering of broadcasting as a system in which only a handful of stations operate under the tutelage and vigilance of the government is thus laid bare.

Another improvement associated with digital TV is the increased interoperability with equipment and applications used in the telecommunications and information service industries. Digitization of broadcast networks facilitates the provision of services other than one-way video programming such as video-on-demand, as well as a number of information and transaction services. Digital TV therefore accelerates the convergence of the telecom, the computer, and the media industries because common technologies are used in the processing and transmission of data regardless of their nature (a news program, a telephone call, a Web page, etc.). As the boundaries between these industries become blurry, several regulatory problems arise (EC, 1997). New broadcasting services such as interactive TV often escape traditional regulatory categorization and, as such, create overlapping jurisdictions and turf wars between regulators (Galperin and Bar, 2002). Another problem is regulatory asymmetry: similar services provided by telecom and broadcast

[3] The exact efficiency ratio of digital versus analog TV depends on a number of factors such as the configuration of the network, the quality of the video signals, and the transport support (see Owen, 1999). The aggregation of multiple digital signals on a single frequency channel is called multiplexing. The digital equivalent of an analog frequency channel is therefore often referred to as a multiplex.

operators sometimes fall under different legal regimes, which often results in controversy when broadcasters that have been given rights to use the airwaves at no cost enter markets in which wireless operators have made large payments for spectrum licenses. By facilitating broadcasters' entry into nontraditional services, digital TV raises fundamental questions about the regulatory boundaries between media, telecom, and information services and, as a result, about the adequacy of a regime built on the distinction between one-way content delivery and point-to-point transmission services (Blackman, 1998).

An important difference between analog and digital TV lies in the role played by the receiving device or customer terminal. Analog broadcasting networks were engineered in such a way that little intelligence was placed at the network's edges. By contrast, in digital TV the customer terminal (whether an integrated digital TV set or a stand-alone set-top box converter) generally consists of an intelligent device that allows viewers to browse channels and services, store information, and interact with the programming. The digital TV terminal therefore represents a potential residential hub to a number of information, entertainment, and transaction services. Control in the television value chain previously belonged to a select group with property rights over transmission capacity – a handful of terrestrial broadcasters, monopoly cable operators, and the few (often a single) satellite TV licensee(s). As digital TV opens up spectrum capacity, these property rights become less critical. Some of this control has now shifted toward those presiding over the intelligent terminals that sit at the edges of digital broadcasting networks.

There are three basic components of a digital TV terminal: the application program interface (API), the conditional access system (CAS), and a navigation tool called electronic programming guide (EPG). The API is the software layer between the operating system and the different applications running on the terminal. Digital TV applications need to interact with the API in the same way a word processor has to interact with a PC's operating system. Issues of availability, control, and interoperability between different APIs are therefore critical for the new generation of broadcasting services, much like they have been in the computer industry (Pepper and Levy, 1999). The CAS is a means for controlling access to the channels and services offered by the broadcast network operator. Access control is necessary for implementing contracts between the operator, its subscribers, and content suppliers, particularly in pay TV. The CAS presents a classic example of gateway facility as programmers and other service providers wishing to access a certain viewer base

are dependent on interacting with the security functions of the digital TV terminal for tracking usage and providing access keys to authorized customers.

The architecture of CAS thus raises important policy questions (Cave, 1997; Cowie and Marsden, 1999). If a dominant network operator (e.g., a satellite TV firm) deploys digital TV terminals embedded with proprietary CAS technology, it may utilize the CAS to discriminate against third-party programmers in order to favor its content affiliates. Regulators can mitigate such competition concerns by mandating the use of a standard security interface in the terminal to which different CAS modules can be attached. Yet mandated interoperability lowers the incentives for any particular service operator to subsidize customer terminals. Broadcast regulators have thus faced a trade-off well known in the telecom industry: how to create incentives for dominant operators to speed up the roll-out of new services while at the same time safeguarding competition in downstream markets. As we shall see, this has been a matter of much controversy in the British case.

The EPG is a navigation tool designed to assist viewers in choosing video programming and other services. In a world of limited channels, the EPG is a convenient way for locating and selecting services. In a 500-plus-channel universe, however, the EPG becomes a critical means of directing eyeballs and generating revenues (Mansell, 1999). Operating an EPG service is costly. Therefore, it is likely that only one EPG will become available in each digital platform. From a regulatory perspective the concern is about the potential use of the EPG by vertically integrated operators to escort viewers toward affiliated programmers and interactive TV service operators to the detriment of third parties (Graham, 1997). The issues are not unlike those related to other directory services: choices in the overall layout of the EPG, the interface functions, and the presentation of services can have significant impact on program ratings and usage patterns. Subtle differences become important as audiences are increasingly fragmented across an ever growing number of channels and services. The question is the extent to which and the instruments with which policymakers should regulate EPGs to prevent anticompetitive behavior and advance other government goals such as the defense of specific programmers (e.g., public service broadcasters).

In sum, digital TV offers a number of technical advantages over analog TV: increased spectrum efficiency, increased interoperability with telecommunications and computer industry hardware and applications, and increased flexibility for the provision of services other than