

International policy preferences, technological standard-setting and digital television

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Abstract

This article looks into the case of digital television and international policy preferences for technological standard-setting aiming to contribute to literature on international regulatory competition and cooperation. It argues that the initial development of standards can be understood as the result of an international race to the top with states and companies as key drivers. When the US, Japan and the EU decided to “conquer the world” with their ATSC, ISDB and DVB standards, respectively, and many waves of countries embarked on digital television, the race became global. Many states have been therefore forced to raise technical standards because of external pressure but key domestic actors and motivations are also part of the complete picture. More specifically, policy preferences in Latin America can be explained too as the product of a race fostered by firms and states, though regulatory competition gave place to a cooperative turnaround that led to new and unexpected associations.

Keywords: Competition. Cooperation. Digital switchover. Latin America. Television.

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1. Introduction

Standing at the crossroads of communication, political and legal studies, this article looks into the case of digital television (DTV) and international policy preferences for technological standard-setting aiming to contribute to literature on international regulatory competition and cooperation. The main argument is that companies have been crucial in fostering competition in coordination with states, which were willing to introduce stricter regulations in order to protect their “national champions” and, consequently, resist foreign competitive pressure. States and firms were key drivers of a regulatory race towards higher standards that resulted in the shaping of internationally divergent bloc agendas in the development and selection of technological standards of DTV.

There are two reasons why the focus in the introduction and migration towards DTV is an excellent as well as challenging topic to explore this. Firstly, because the switch from analogue to digital broadcasting is an established global phenomenon, reinforced by international agreements such as those held by the International Telecommunications Union (ITU). Secondly, because the most advanced experiences belong to the United States (US), Europe and Japan and they have each developed its own set of technical standards (being followed later by China).

If regulatory cooperation refers to the tendency towards harmonization, convergence, regulatory competition is here understood as the desire of countries to compete in the field of information and communication technologies (ICTs), more specifically in the segment of digital broadcasting, in order to attract or retain businesses and investment within their jurisdiction. Precisely, by the beginning of the nineties such competition led to the emergence of three different sets of DTV technical standards. Once they were in place, the rest of the world was compelled to choose between one of the existing options to migrate to DTV and switch-off analogue signals at some point during the following ten years.

The paper analyzes the case of DTV within international policy preferences for technological standard-setting to argue, in short, that the initial development of DTV standards in the early nineties can be perfectly understood as the result of movements towards more stringent regulations, an international regulatory race to the top, where states and companies were key drivers. In so far as the resulting three competing standards decided to "conquer the world" and many waves of countries embarked on switchover, the race became global by the turn of the century and a pattern of regional blocs emerged.

So, in the processes of standard-adoption by newcomers, it can be said that Southern states were (and are being) forced to raise technical standards because of pressure from Northern most advanced experiences. Nevertheless, once international pressure was established, key domestic actors and motivations also became part of the picture. Furthermore, external influence was not necessarily exerted by other states but also by pressure groups and the ITU. National and international, downward and upward influences played their part. Policy preferences in more recent Latin American¹ experiences can be explained too as the product of a race fostered by firms and states, though international regulatory competition resulted eventually in regulatory cooperation. As some countries illustrate from 2004 on, final outcomes must be understood as the consequence of complex webs of key relationships, national, regional and international, where competition and cooperation took place alternatively between governments (and governmental and non-governmental actors).

After clarifying theoretical concepts, the discussion is introduced with a reference to the switch from analogue to digital TV to explain the emergence of different standards and the implications of the

¹ Latin America is here understood as the parts of the American continent where Spanish or Portuguese is the main national language.

agreement over the necessity to switch-off analogue broadcasting. The article then refers to the status of switchover across the globe to show advanced economies lead the way and newcomers are compelled to join. The paper then turns to its case study on Latin American experiences, looking into differences in the selection of DTV standards among national decisions. The main objective is to analyze the role of international regulatory competition and cooperation in the development and/or selection of DTV standards, as well as the conditions and mechanisms that allowed for such convergence or divergence, through key actors and the relationships underpinning them to end up presenting some conclusions.

The importance of the topic and the approach presented to deal with it are believed to be justified because the development and selection of technological standards is an overwhelming example of the continuing relevance of the North-South divide and the complex processes and logics it implies. The worldwide struggle for technological leadership in order to stimulate growth is of course not new in the history of ICTs development and diffusion. So, apart from television, other relevant examples would be mobile telephony and digital radio.²

2. Digital television and the concepts of regulatory competition and cooperation

Industrial as well as economic forces are in the origin of the push to the transition to DTV. The audiovisual sector is facing the end of traditional business models based, in the case of broadcasting, in a small number of operators financed by advertising and/or public money (license fee or budget); and such a change is combined with the emergence of new (convergent) industrial and (digital) technological ways of producing and distributing contents and services. At the same time broadcasting is at the centre of communication and cultural policies as well as subjected to interests internationally displayed through organizations like the ITU or the World Intellectual Property Organization, and embodied in bilateral, regional and even multilateral international trade agreements.

The above mentioned forces emerged out of complex processes where domestic and international political interests also played out. The replacement of existing analogue TV infrastructure with a new digital one was far from being a simple technological migration and soon turned an industrial interest into a socio-political issue. So, if the transition to DTV has been a preoccupation of the advanced economies of the world since at least the eighties, the major markets have undoubtedly been the US, Japan and Europe, and three were the forces that combined, chronologically, to catapult it (Galperin 2004): the decline of the

² Many have reminded that a similar concern for protecting national champions led to the failure to produce agreement on color TV standards, conditioning the fragmentation of world markets into three incompatible analog color TV systems: the American NTSC, the French SECAM and PAL developed in Germany. Fragmentation also happened in Latin American: whereas Argentina, Paraguay and Uruguay opted for a unique standard that was an adaptation of the PAL system to the 6 MHz channel scheme established by the ITU for the region (PAL-N), most other countries chose NTSC (already designed for 6 MHz) and Brazil created yet another PAL adaptation (PAL-M).

American and European consumer electronics sector, the spectrum shortage created by the growth of wireless telecommunications services and the international diffusion of the information society agenda.

Since then, the debate has been much absorbed by the development and selection of technical standards and the advantages and disadvantages of supporting competitive or cooperative approaches, informed by what Radaelli (2004) calls conventional though limited regulatory competition theories that concentrate on the so called races to the top or to the bottom. These terms, as linguistic constructions, can be overused dangerously simplifying regulatory competition issues, though they can also effectively serve as metaphors to explain that political jurisdictions engage in races to preserve or attract investment which can lead them to either relax or make stringent regulatory policies. In such sense is that these terms are used here, trying to understand who did what in the regulatory competition game and under what set of constraints and opportunities so as to better explain why states and firms fostered an international regulatory race in the case of the development and selection of DTV standards.

The term race to the bottom can be traced back to the US and the early 20th century, being widely accepted that it was helped to be coined by Supreme Court Justice Louis Brandeis in 1933 and was updated by William Cary (1974) in the context of corporate law. Cary observed that the state of Delaware was adopting as official policy the creation of a favorable regulatory climate for corporations in order to attract them, contributing therefore to downward pressures on chartering rules. As Vogel and Kagan explain (2004), the concept of "Delaware effect" was subsequently employed to refer to other examples of devolution within federal systems and, as trade liberalization made competition among countries more similar to that among US states, the Delaware effect became a model for a hypothesized international race to the bottom.

Nevertheless, as was demonstrated by Vogel (1995) with his research on consumer and environmental regulation, regulatory competition can also lead to push the level of regulation upwards. In that case what was observed was a race to the top and what he called the "California effect", especially through the example of California as a pacesetter in the history of American automobile emission standards. Following on from this debate, and as suggested also by Vogel (1997), the terms race to the bottom and race to the top, and even the Delaware versus the California effect, have evolved to name, respectively, the broader phenomenon of downward or upward ratcheting of regulatory standards; to illustrate, in other words, the fact that when competition takes place between equivalent political jurisdictions, governments can find market or political incentives to either dismantle or top up existing regulation.

Following Radaelli (2004) it is here understood that when and how each of these is expected to emerge is still a matter of debate as regards empirical evidence though Vogel's model and its generalizations provide a point of departure for analysis since its usefulness is all about shedding light on the economic and

political interactions at work. Precisely, this article aims to outline which have been the conditions and mechanisms that allowed for regulatory competition and/or cooperation in the international definition and selection of DTV standards by states and firms as key actors, connecting with a tradition in the field of communication and culture that has tended to study regulatory competition, generally speaking, in relation to audiovisual markets and as the consequence of the actions of states or the preferences of companies (and tending to omit other intervening variables; Harcourt 2007).

The analysis will take into consideration that competition among jurisdictions may generate races to the bottom (competition in laxity) or races to the top (more stringent outcomes), but also diverse regulations (heterogeneity; Murphy 2004); and that any can produce either increased convergence or divergence (Vogel and Kagan 2004). This is due to the fact that competition has multiple dimensions, playing out at different levels and involving several types of actors, which, in turn, combine with mechanisms of cooperation (Esty & Geradin 2000). Races to the bottom or to the top may not only result from the dynamics of the competitive process itself but also from international cooperation. As suggested by Genschel and Plumper (1997), given a certain level of interest heterogeneity, the feasibility of such a cooperative turnaround depends on two structural factors: the size of the smallest possible coalition that can gain from cooperation all by itself and the external effects of cooperation on non cooperators. A turnaround is relatively easy if the coalition that can gain from cooperation all by itself is small (relative to the largest group of like-minded actors favoring cooperation) and if cooperation reduces the temptation to defect. On the contrary, it is difficult if the coalition is large and cooperation is self-limiting.

Inter-governmental and extra-governmental competition and cooperation will be taken into account, bearing in mind that governmental regulatory cooperation, bilateral or multilateral, may be formal or informal. In other words, dynamics taking place between governmental and non-governmental actors and among governments, both horizontally and vertically, will be considered. To do so the focus will be on:

- States; through power exercised by governments and specific agencies
- Companies; main interest groups with a stake in the migration towards DTV (broadcasters, consumer electronics companies and telecommunications firms)
- Pressure groups; industry-led consortiums and organizations involved in the development of DTV standards and the expansion of the service (mainly the Digital Video Broadcasting consortium, DVB; the Advanced Television Systems Committee, ATSC; and the Digital Broadcasting Experts Group, DiBEG³)
- Political and/or economic partnerships; the European Union (EU), the *Mercado Común del Sur* (Mercosur) and the North American Free Trade Agreement (NAFTA)

³ See www.dvb.org, www.atsc.org and www.dibeg.org

For updated info on the worldwide penetration of digital broadcasting systems visit <http://en.dtvstatus.net>

- And the international agency that coordinates spectrum issues, the ITU.

Due to space constraints detailed evidence won't be provided to back the analysis but the research about the introduction and development of DTV across the globe upon which it is build will be mostly acknowledged throughout the text.

3. Digital television and (pursued) competition

The switch from analogue to DTV is currently an established global phenomenon that has not, though, proved financially or politically simple. Several of the pioneering countries faced crises at some point whereas newcomers are influenced not only by domestic dilemmas and disputes but also by regional and international forces. The first European analogue terrestrial switch-off was achieved in Berlin in 2003 but the first national one was accomplished in the Netherlands at the end of 2006. As regards the completion of analogue switch-off the target had already been met by twelve countries by November 2010 and most of those with services on air had begun switching-off analogue frequencies in one or more areas. Whereas the US committed to a nationwide switch-off in 2006 that was postponed until June 2009, before the 2011 earthquake Japan had a plan to switch-off in June of that year.

Further waves of countries – in Europe, the Americas, Australasia and South Africa – have been embarking on digital switchover policies during the last four years in a process heterogeneously displayed. Before looking into switchover policies and international preferences in the selection of DTV standards, a reference to the emergence of existing standards and the implications of ceasing analogue broadcasting has to be made in order to outline main interest groups and understand their relationships with states and the way in which they articulated to produce an international regulatory race to the top legitimized, in the end, by the ITU.

In the early days of the development of DTV standards, in a context where rich countries were eager to promote high-technology and export-oriented industrial policies to protect their “national champions” from newly industrializing countries identified then as the Asian Tigers, the business strategies of electronics firms – such as Sony or Philips – in combination with national broadcasters' worries about future survival were crucial in fostering a race that ended up fragmenting the international market of DTV standards in three different families of technical specifications. As these fed the emergence of regional blocs by the end of the nineties, revolving around the major poles of industrial activity in the world, the role of broadcasters and telecommunications operators grew in importance and visibility because standard-setting decisions were inextricably linked to the complete transition from analogue to DTV and, consequently, the end of

analogue transmissions (and the demands for a more efficient use of spectrum it allowed). The former has been known since then as digital switchover whereas the short-hand reference to the latter is switch-off.

The description offered in this section reveals that the conditions that boosted competition in the development of DTV standards in the US, Japan and the EU were intertwined and related mainly to both economic and political dimensions. If the former referred to the existence of strong industrial and market capabilities that raised concerns about market access, the later was linked to relatively important roles in terms of influence in the international field of ICTs, which fed desires of retaining or regaining leadership. In other words, domestic firms supported the development of new TV standards as a source of competitive advantage, which would hinder market access to foreign competitors, promoted by governments that wanted, besides, to preserve or strengthen their position in the global information and communication arena.

Mechanisms that made such competition come true were, on the one hand, further technological developments (the creation of new DTV standards) and, on the other, an increasingly fierce expansionist policy to have them adopted by other jurisdictions (directly, via bilateral negotiations, or indirectly by exerting pressure via integration agreements like the NAFTA or international bodies like the ITU). But this race doesn't currently seem to be confined to the US, Europe and Japan because Digital Multimedia Broadcasting (DMB), a fourth alternative of technical specifications with some similarities to DVB, has been under development in China since 2006 and, ironically, some national adaptations of existing technologies have also been under way as the Brazilian version of ISDB, SBTVD, illustrates.

3.1. The broadcasting and consumer electronics industries and the development of standards

In a scenario in which consumer electronics markets experienced rapid growth and technological change in the eighties and nineties, Japan's development of – analogue – HD, high-definition technology was a response to the shift of high-volume consumer electronics production from Japan to other East Asian countries (Hart 2004). Interestingly, pressure came not only from national manufacturers but also from Japan's public broadcaster, Nippon Hōsō Kyōkai (NHK), which supported research on next-generation TV technologies to shore up its position. Sony and Ikegami, the two main competitors, were eager to assist NHK because they were strongly dependent on its orders; but other manufacturers also joined (Toshiba, Hitachi, Matsushita, Sharp, Sanyo and Mitsubishi).

In a very good example of national regulatory cooperation, the government and NHK avoided internal competition by boosting formal institutional collaboration through a NHK subsidiary called NHK Engineering Services. This coalition, supported for the sake of Japanese competitiveness, was translated to international forums into the Japanese government's discourse in favor of the need to overcome the heterogeneous

existing standards of color TV with a new unified global standard based on the Japanese HD system developed by 1986 and called Hi-vision.

European opposition was strong from the very beginning because of the concerns raised by consumer electronics firms, crucially Philips and Thomson, and the European Commission, who were supporting migration in the region from both PAL and SECAM to a new set of satellite broadcasting standards, also HD and analogue, called MAC. European public broadcasters joined the alliance, trying a similar strategy to NHK's approach, but were less successful in having a leading role because of the greater political power of commercial audiovisual operators in Europe (Hart 2004). The European institutions understood that to achieve regional regulatory cooperation legally mandatory harmonization was needed and MAC was approved by a European Directive (Council Directive 86/529/EEC). But this top-down regulatory attempt of cooperation via more stringent regulations failed and had to wait, in fact, to be achieved a few years later via what Harcourt (2008) calls soft governance procedures.

MAC proved technically over-ambitious and commercially disastrous and it was de facto abandoned when platforms such as Sky Television were launched using simpler and cheaper technology, and was officially dropped to keep up with the American decision to adopt an all-digital standard. So, even though Western European countries engaged in an intergovernmental program to develop the European HDTV system under the EUREKA framework, in the case of the Union regulatory pressure was clearly driven by European institutions, rather than by states or firms, because the Community was still concerned with achieving coordination through mandatory harmonization. Nevertheless, difficulties had already been most directly felt in relation to technical standards and, indeed, the problems of Euro-harmonization contributed to the growing counter-tendency within many Member States towards deregulation (McCahery *et al.* 1996, p. 31). After MAC's failure not only did the European Commission become reluctant to impose technical standards but European broadcasters and manufacturers reacted also against politically-driven technology strategies. Everybody seemed to be in favor of implementing what the market would support. That is why consensus was reached within the DVB consortium and a new set of open standards for cable, satellite and terrestrial television was supported. The DVB Project was born in 1993. The EU then decided to favor a market-driven approach to the digital transition, endorsing the commercially-based and collectively developed standards, deciding not to be prescriptive in detail.

The European rejection of Hi-Vision as an international standard triggered American debates. Electronics companies such as Zenith but also "the networks", represented by the National Broadcasters Association (NAB), reacted by lobbying for a national version of terrestrial HD television. The Federal Communications Commission (FCC) opened a proceeding in HDTV in 1987 and established an Advisory Committee on Advanced Television Service (ACATS). National competition between firms was not avoided from scratch

though success was not foreseen until the government managed to merge competing electronics firms into a "grand alliance" for digital HDTV and the NAB understood its implementation as a way of securing future market positions (expanding towards HDTV would rule out new entrants in the terrestrial market offering an enhanced option to face cable competition; Galperin 2004).

The "pretty picture" that had motivated the initial investment in Japan was no longer the issue in television standards debates but the digital delivery of quality images on widescreen receivers (Hart 2004). The ACATS recommended an all-digital system which, after much testing, established the Advanced Television Systems Committee (ATSC) standards for DTV in 1993. In the end, the US government policy was defined by decisions taken by the FCC which were guided by the efforts made to reconcile, initially, the interests of broadcasters and the electronics industry and, afterwards, these with the information technology industry (mainly computer firms). The regulation of DTV standard-setting in the USA can be explained as the result of both domestic competition and cooperation. Japan had to catch up and it certainly did adopting its own set of digital technical standards, named Integrated Services Digital Broadcasting (ISDB), designed, along with spectrum allocation policy, to support digital terrestrial (DTT), cable and satellite television, also in mobility.

3.2. The telecommunications sector and switch-off

Once the international regulatory competition was in place, the telecommunications sector began to push explicitly for the complete transition from analogue to DTV, especially in the terrestrial platform. This has to do with the fact that the introduction and deployment of digital broadcasting and, eventually, the end of analogue transmission, results in a more efficient use of the spectrum and, in turn, the potential availability of more frequencies for other uses. The most precious frequencies because of their characteristics, those from Bands IV/V (470-862 MHz), exclusively reserved up to now to broadcasting, have been subjected to an incredible pressure during the last twenty years to be destined to other uses and users. Analogue TV switch-off worldwide was foreseen as a unique opportunity to free-up frequencies which might well be destined to wireless telecommunications services.

Further analysis and evidence are needed in this respect, but soft governance seems to have played its part in articulating firms and powerful states within the ITU which has officially embraced the aim of ceasing the analogue exploitation of radio-frequency spectrum. The 2006 Regional Radiocommunication Conference for Europe, Africa and the Middle East (technically defined as Region 1), for instance, set the date of 17 June 2015 for completing the transition to digital broadcasting in this zone. In practical terms this means that from that date on analogue broadcasting will not be protected from interferences because digital signals will have priority. Therefore, even though this is understood as the outcome of a process of international

regulatory cooperation and provision has been made for a longer transition period for developing countries, 2015 can be perfectly considered as an internationally mandated switch-off date, at least along national borders. Furthermore, this timetable is pushing agreements to take place for ITU Regions 2 (the Americas) and 3 (Asia and Australasia) to make analogue broadcasting switch-off worldwide come true.⁴

It can be argued then that the already described international race to the top in the development of DTV standards was reinforced by the telecommunications sector strategy when, in fact, it helped to expand it globally transforming such race into the complete transition to DTV and having it legitimized by the ITU. Section 5 illustrates how competing strategies to have new standards adopted by other jurisdictions turned to bilateral negotiations – and/or integration agreements where existed – but also relied on indirect pressure exerted by consortiums involved in the development of DTV standards and the ITU's switch-off agenda.

4. Digital television and (imposed) cooperation

As a consequence of the international regulatory competition that took place between Japan, the US and Europe and the transformation of this race into the deployment of the service with the objective, in the case of terrestrial television, to switch-off analogue signals, the rest of the world was compelled to design switchover policies that necessarily begin with decisions related to DTV standard-setting. So, even though many countries might have wanted to embark on switchover what should not be forgotten is that most of them were (and are being) forced to. International pressure has been trying to orient them towards cooperation around ATSC, DVB or ISDB. National policy preferences have not been though mere automatic and linear responses to it.

The following pages aim to back these ideas referring to the status of switchover across the globe to show that northern advanced economies lead the way and southern experiences, the newcomers, are obliged to follow suit; but that also national patterns do not necessarily evolve as main international interest groups and states would expect. Since an extensive survey about the situation of the transition to DTT per country cannot be presented, an overview of main policy decisions taken from the pioneers is offered through table 1 and, more detailed and specifically, description focuses on newcomers in Latin America following García Leiva (2010).

⁴ There have already been changes because the World Radiocommunication Conference held in November 2007 approved the introduction of new types of services in some bands traditionally reserved for broadcasting services.

5. Digital television and (encountered) competition and cooperation

Since not every country can sensibly, or practically, design its own digital technical standards, those embarking on digital switchover around the globe have been faced with a choice between the main standards already developed (García Leiva & Starks 2009). Indeed the proponents of these systems have been competing for their business. In Australasia, for example, choosing DVB was straightforward. Russia and some African countries have also followed the same path. And South Korea, Canada and Puerto Rico were early adopters of the ATSC system.

Table 1: Main digital television switchover policy decisions in pioneering countries

	Japan	USA	United Kingdom	Spain	Italy	France	Germany	
<i>Technical aspects privileged</i>	ISDB HD, mobility, interactivity	ATSC HD (SD)	SD (+ HD & interactive services)	SD	DVB SD (+ mobility)		SD&HD, portable and indoor reception	
<i>Distinctiveness/ Peculiarity</i>	-Spectrum scarcity -Integral planning	-Spectrum auctions	-Freeview creation -BBC role -Highly elaborated planning; consensus	-National, regional, local channels	-ASO postponed twice (initially no agreed frequency plan)	-MPEG-2 FTA, -MPEG-4 pay- TV	-Launch region- by-region -High cable penetration, DTT second sets	
<i>DTT model</i>	FTA	FTA	Pay-TV → FTA with appealing content → Hybrid model (on demand pay-TV)	Pay-TV → FTA → Hybrid model (pay channels)	FTA → Hybrid model (pay channels + pay per view)	Hybrid model (pay channels)	FTA → Hybrid model (pay channels/ regional segmentation of market)	
<i>Universal access</i>	Satellite + terrestrial	Terrestrial	Terrestrial (cuasi universal) + FTA satellite					Satellite + terrestrial
<i>Role public service broadcasting</i>	Leading	Secondary	Freesat	(Hispasat)	Tivù	FranSat	Important	
<i>Regulation</i>	Updated to introduce new digital services (bills, acts, decrees); transposition of European rules & regulations							
<i>Switchover approach</i>	Regional ASO June 2011	National (full power stations 2009; low power 2011)	Regional ASO December 2012	Regional ASO April 2010 achieved	Regional ASO 2012	Regional ASO December 2011	Regional (by "islands") ASO 2008 achieved	
<i>Coordination</i>	DPA (Association for Promotion of Digital Broadcasting)	FCC/ DTV Coalition	Digital UK	Government/ Impulsa TDT	Government/ Agcom/ DGTVi	CSA/ France Télé Numérique	Regulators (BNetza + regional e.g. MAAB)	
<i>Communicati on campaigns</i>	In place	Early led by broadcasters	Early in place	Unsystematic		In place	Early in place	
<i>Subsidies</i>	Provision of STBs to low-income homes; support communal aerial systems	Converter box coupon programme for terrestrial only homes (underfunded)	(Help scheme)	Some regions communal aerials (Madrid)	Grants MHP- ready STBs	STBs to low- income homes	Aid to broadcasters & consumers (ruled illegal EU)	
<i>Equipment</i>	Mandatory digital terrestrial & satellite TV sets ready	Digital terrestrial tuners in TV sets mandatory; labelling requirements	Memorandum understanding , Digital Logo	MHP memorandum (no practical influence)	Digital terrestrial tuners in TV sets mandatory; DTT logo	Digital terrestrial tuners in TV sets mandatory	Memorandum understanding	
<i>Policy outcome (democratizat ion)</i>	No new entrants to the market, <i>status quo</i> preserved		Little/ no progress: changes in the audiovisual landscape though partisan interference					

HD: high-definition/ SD: standard-definition/ FTA: free-to-air/ ASO: analogue switch off/ STB: set-top-box

The following pages analyze the situation in Latin America that seems to be following the path of the US and Brazil in North and South America, respectively. The implications in terms of market development of the deployment of different standards in the region are though unclear. DTT penetration, for example, is higher in regional dominant players and early starters (Brazil and Mexico) but there's yet no clear connection between the adoption of a certain standard and the expansion of the service. Those implementing ATSC are not doing significantly better than those deploying ISDB or even DVB, which proves that the adoption of a standard is an essential but per se insufficient precondition for switchover.

5.1. Latin America embarks on switchover

Most Latin American countries are still laying the foundations for the complete switch to DTV. But the dominant role of the terrestrial platform and the economic and technical constraints on cable and satellite, together with Latin America's peculiar combination of politics and policy traditions, are driving DTT towards the centre of switchover strategies. The opportunities for economic and industrial development provided by the potential release of spectrum and the need to upgrade equipment, as well as the possibility of introducing greater pluralism, have led most Latin American countries to adopt an explicit policy on the transition to DTV.

These motives explain the launch of trials and pilots in most countries of the region. Brazil, Argentina and Mexico represent the oldest experience and have led the way for later starters, such as Chile, Colombia and Uruguay. Focus will be especially on the former as the most relevant case studies, partly because of the size of their internal markets (the largest in the region) and their regional political influence. Besides, Mexico and Brazil lead the regional production of TV sets. These countries took their first steps towards DTT during the nineties discussing firstly which DTV standard to adopt.

The Argentinean initiative to experiment with digital terrestrial transmissions came from the private sector whose request in 1997 led the government to create a committee to study the different standards and give advice about a transition strategy. Argentina was one of the first countries in the world to choose ATSC, but it did so without officially launching a platform of digital services. After allocating a second channel to existing operators for free with which to experiment, President Menem decided unilaterally to adopt ATSC in 1998. Meanwhile, in Mexico, Televisa and Televisión Azteca began DTT trials with ATSC in 1999, and the Secretary of Communications and Transport authorized three national channels to experiment with digital technology.

The Brazilian approach was very different because initial interest in DTT came earlier and from the government, which in June 1991 created a commission to design a HDTV policy. Four years later, the main broadcast industry groups created a joint technical committee to study the implementation of DTV and

evaluate the competing standards. The country's TV receiver manufacturing industry potential could be found behind the rapid official support displayed. As regards Chile, by the end of the 1990s the government had already designed a legal and technical architecture to introduce the service, but the advent of Ricardo Lagos to the Presidency in 2000 put plans on hold. According to Hernández and Postolski (2003), the main reason for this was the lack of consensus between governmental agencies and the broadcasters, who were pro-ATSC. Bachelet re-launched the process.

This first period in the introduction of DTV in Latin America was overcome around the turn of the century when a second phase began with the emergence of a debate that questioned the real consequences of migrating terrestrial networks and a new socio-political context that included some changes among the incumbent audiovisual operators. It was clear by then that Latin America was becoming an arena where the pioneers' international regulatory competition for the development of DTV was transforming into a race. Nevertheless, international pressure encountered national forces that, generally speaking, prevented "automatic" adoption from taking place.

In every country broadcasters supported regulatory races to the top to secure their digital future and, in the case of Brazil and Mexico, their pressure was combined with that of TV receiver manufacturers' that coincided with states' desires to regionally lead the field of ICTs. As had already happened with the development of DTV standards, the introduction of DTV in Latin America resulted in national races to the top fostered by firms and states that initially ruled out international (especially regional) cooperation because it was seen as an opportunity to attract or retain business and investment within their jurisdiction. Concerns about market access and (regional) leadership in the field of ICTs were also the conditions that boosted competition. This is essential to explain why in this phase Argentina abandoned ATSC, Mexico initiated the process that would lead to its adoption and Brazil favored the option of developing a completely new standard (of its own creation).

In Argentina, the stakeholders' consensus around ATSC disappeared when Telefónica entered the television market and decided to support DVB. There followed several years without any important advances until President Kirchner considered in 2005 the idea of adopting the same standard as Brazil, but then said that it would make its own decision independently. In Mexico, the government/industry committee established in 1999 defined the regulatory and technical framework for DTT implementation by 2002. Even though trials with every available standard were supported, its actions and recommendations were criticized as one-sided due to the lack of representatives of civil society in its composition.

In Brazil 1999/2000 tests came out in favor of the Japanese system. The polemic and complexity of the interests at stake made the Cardoso government decide to wait before making any decision. The outcome of the 2002 general elections marked a major shift in the Brazilian position. The idea of creating a national

standard from scratch was supported by Lula before 2004 began. A more strategic approach to transition was taken and DTV was seen as a key tool for achieving two other goals: revitalizing the Brazilian consumer electronics industry and addressing the significant inequalities in access to advanced information and communication services among the population (Galperin 2007).

In short, conditions that fueled competition in the selection of standards among Latin American countries were the same identified in their development in the early nineties, though in this case at a regional scale. On the one hand, concerns about market access had to do with the desire of attracting investment while protecting existing or potential market and industrial capabilities, in the case of bigger, more developed countries, or while making the best out of their weakness, in the case of smaller, less developed ones. On the other hand, preoccupations linked to the strategy of regionally lead the field of ICTs were motivated by the aim of building political influence. Mechanisms that made competition come true in the selection of DTV standards in the region were decisions over technological preferences (the actual adoption or adaptation of existing standards), as well as over political strategies (the configuration of defensive policies to better face competing political jurisdictions and international pressures).

What were the main national outcomes of Latin American competition in the selection of DTV standards will be described not only to illustrate the conditions and mechanisms above mentioned, but also to understand the process by which preferences emerged and ended up turning towards some degree of cooperation. The objective is to explain when and why a cooperative turnaround took place.

5.2. Latin America adopts different standards

5.2.1. ATSC and trade commitments

The adoption of ATSC by Mexico in July 2004 signaled a period in which Latin American countries began to make some decisions. The Mexican outcome was no surprise in the context of the NAFTA, because the complete transition to DTV is potentially favorable for the domestic consumer electronics industry. At the same time, ATSC's efforts were systematically supported by the US since it has always been crucial for its globalized audiovisual industry to achieve a North American market. Emulating its neighbor, Mexico allocated a second channel to incumbent operators to simulcast their analogue signals and a plan to extend DTT by 2021 was approved. Broadcasters will have to offer high or enhanced-definition-quality transmissions and they may also provide telecommunication services. As regards implementation, DTT take-up has been improving slowly.

Mexico witnessed a national competition between broadcasters, who wanted to avoid new entrants as well as offer triple-play services, and telecommunication operators, supported by the electronics manufacturing industry that wanted to take advantage of regional business opportunities. The Mexican adoption of ATSC

can be seen as the product of the combination of a national race to the top with the US influence exerted via the NAFTA that facilitated the articulation between firms and the government. Differently from other Latin American cases, Mexico had incentives for a much close alignment with the transition approach of its northern neighbor (Galperin 2007). The final outcome was one of intergovernmental cooperation in the context of a multilateral regional free trade agreement.

Honduras, El Salvador and Dominican Republic followed Mexico in adopting ATSC between 2007 and 2009.

5.2.2. ISDB and national technological adaptation

In Brazil ATSC was excluded for not being appropriate for mobile TV reception – a key requirement for the government – and, in the end, an alternative consisting of a hybrid system, with Japanese technology specifically adapted for Brazilian requirements, was chosen. Lula turned down plans to develop a separate standard and the Japanese system was established in June 2006 as the basis for an “alternative” standard to be called *Sistema Brasileiro de TV Digital Terrestre* (SBTVD). It was designed to be adapted to existing infrastructure, is based on MPEG-4, supports a Brazilian open middleware called Ginga, and is capable of transmitting low-bit rate video programmes to mobile handheld devices. This was a very important detail that made broadcasters push for this decision since it allows them to deliver content without relying on telecommunication companies. Incumbent operators received free-of charge one additional frequency to simulcast their analogue channels during a transition that will take ten years to be completed. Japan's promises of investment were also decisive for a country whose local manufacturing capacity is critical.

In Siqueira Bolaño and Cruz Brittos' words (2007) the national system was supported by civil society, the European option was mainly of interest to Telefónica, while the Japanese standard was backed by the major broadcaster, Rede Globo. The final selection clearly favored the broadcasters because it will not only exclude new entrants to the market but will also allow operators to expand towards mobile broadcasting. Even though transmissions started in December 2007 and coverage has improved as planned, take-up has been slow and the service is only available in main cities.

As well as in Mexico, the introduction of DTV in Brazil resulted from a regulatory race to the top supported both by the state and the broadcasting and consumer electronics industries. Nevertheless, it had initially more to do with the domestic interest of developing and implementing an independent industrial policy to regionally lead these markets than with the international pressure of competing standards. In fact, Brazil supported for a while one of the few attempts in the world to design an alternative and different DTV standard from scratch. In the end, broadcasters threw their weight behind ISDB and this was reinforced by a Japanese strategy that succeeded in influencing the government. International pressure finally found its

way, surpassing Mercosur's partnership. The Brazilian outcome can thus be seen as one of both international competition (within neighbors) and cooperation (with Japan).

5.2.3. DVB and bilateral agreements

In Uruguay, DTT was introduced in the public agenda in 2005 and, in fact, the Brazilian decision accelerated a process by which the European standard was chosen in August 2007 (Kaplún 2008). Nevertheless, initiatives regarding switchover were then delayed. And even though existing broadcasters had been simulcasting signals in trials in December 2010 an interesting turn took place: DVB was dropped. Colombia adopted DVB in August 2008 after conducting socio-economic and technical tests, which even included the Chinese standard. As in Uruguay, the resolution was influenced by the offer of technological as well as financial cooperation driven by Spain. A soft launch proved possible in September 2008 and official transmissions began in May 2009. The transition strategy has been designed to first affect the largest cities and analogue switch-off is set for 2020. As regards Panama, it became the third country to be influenced by the European alternative when it adopted DVB in May 2009.

Brazilian, Mexican and Argentinean decisions to introduce DTV services by the end of the nineties favored national races to the top that translated into Latin American intergovernmental regulatory competition. Such processes, together with pressure from proponents of the main standards, triggered domestic interest groups' attention in Uruguay, Colombia and Panama and these governments had to articulate with broadcasters to adopt a DTV standard. But in these cases capabilities, such as market size and the strength or inexistence of domestic electronics manufacturers, conditioned outcomes that ended up being the product of European promises.

More specifically, the international harmonization achieved via DVB was possible due to the intergovernmental cooperation facilitated by Spain that influenced EU-national bilateral agreements that led to further international regulatory cooperation around DVB and definitely ruled out the adoption of a regionally-shared DTV standard. Nonetheless, once the Brazilian position was clear Mercosur seemed to have a second chance. As will be argued below, due to Brazil's influence Latin American regulatory competition went on to evolve as cooperation, at least in South America, to the extent that rumors about the fact that Colombia and Uruguay would change their decisions began to unfold. They came true in the case of Uruguay.

5.2.4. SBTVD and persuasion

Since 2007 a number of other countries have started to carry out trials, select technical standards and move towards introducing services. Peru, Bolivia and Venezuela began their debates on migrating to DTV in

2007, with trials in 2008. For ideological reasons Venezuela firmly ruled out ATSC from the start and it finally signed a memorandum of understanding with Japan in October 2009, expecting to outline a ten-year transition strategy that will also promote e-government, e-education and e-health services through DTT. In Peru ISDB was recommended by a special commission to decide on the technical standard and was chosen in April 2009. The government announced a phased approach for the implementation of the standard as well as for the end of analogue transmissions, set between 2020 and 2030. In July 2010 Bolivia announced the adoption of the Japanese-Brazilian standard with trials taking place throughout 2011. In March 2010 Ecuador had also announced that ISDB would be chosen and by the end of that year Costa Rica, Nicaragua and Paraguay had also joined. More interestingly, Uruguay changed its decision to avoid isolation making, in President Mujica's words, a geopolitical decision.

The Argentinean and Chilean experiences have been complicated. In the former a working group was created in June 2006 to advise the government on the standard that the nation should adopt, but no official announcement was made until September 2009 when the *Sistema Argentino de Television Digital Terrestre*, based in ISDB, was adopted. First broadcasts took place by mid-2010 and the whole transition period until the switch-off of the analogue signal will last for ten years. In Chile the Ministry of Transport and Telecommunications announced in May 2006 that before the end of the year the country would choose a standard. But after three years, many public hearings, lots of technical tests and some special official reports, Chile had yet to make a decision. In 2009, finally, falling in line with Brazil, Peru and Argentina, Chile officially adopted ISDB citing better reception capabilities as well as economic reasons. Before the 2010 earthquake it was announced that the migration would cover a period of eight years.

The initial contemporary Argentinean and Chilean decisions to introduce DTV services mirrored the Mexican and Brazilian national races to the top to have a place in the regional competition to attract or retain investment in the field of ICTs. But divergent domestic interest groups and national politics made it difficult to articulate broadcasters and governments to adopt a DTV standard no matter what industrial capabilities were or how strong international pressure was. But once interests aligned the outcome combined with the Brazilian (and Japanese) influence and South American regulatory competition in the selection of DTV standards moved towards harmonization thanks to intergovernmental (especially regional) cooperation.

6. Digital television and international policy preferences for standard-setting: to conclude

6.1. Key relationships and mechanisms

It is evident that there was no room for international cooperation when the time to embark on switchover and select DTV standards arose in Latin America because competition issues that derived from regulatory races were stronger. Policy preferences can be explained too, as with the original development of DTV standards, as the product of races fostered by firms and states; although regional regulatory competition ended up combining with international cooperation. Up to now, Latin American outcomes can be understood as the consequence of intricate webs of interplays – national, regional and international – where competition and cooperation took place alternatively and crucially between governments and governments and firms. A more detailed consideration of relationships underpinning the choices made can help to understand their status of key relationships.

As regards the former, relations to be considered derive from the fact that national choices are influenced by a complex combination of technical aspects (standard performance, interoperability across platforms, characteristics of the analogue TV system), industrial possibilities (size of the domestic TV market and strength of domestic manufacturers, source of imported TV equipment), commercial factors (source of imported content and intellectual property royalty costs) and socio-political issues (pluralism and diversity, universal and affordable access, accessibility). The introduction of DTV was necessarily influenced by those relations developed among governments, specific agencies, existing audiovisual operators (especially incumbent analogue broadcasters), the consumer electronics sector (equipment manufacturers and retailers) and telecommunications companies. Civil society needs also to be mentioned, especially in the case of Brazil.

Nevertheless, countries are influenced not only by domestic conditions, dilemmas and disputes but also by global and regional forces. It is a fact that when governments of the most advanced economies decided to migrate to DTV, pressure groups involved in its expansion and an international agency such as the ITU pushed for the end of analogue broadcasting the rest of the world was obliged to join. For those countries that are part of regional political and/or economic integration partnerships additional coordination issues emerge. So, as regards international relationships underpinning choices made, those outlined above must be mentioned.

Therefore, the structures of the existing broadcasting and electronics industries or trade agreements in place have been among the determining factors when choosing a DTV standard. These, together with the political orientation of those in power and the lobbying of governments by organizations with a stake in competing systems, go a long way towards explaining the different Latin American preferences over standards so far. It is obviously hard to tell to what extent each of these influenced the selection of

standards the most, but states and firms emerge as key drivers from the description contained in previous sections and, interestingly, neither purely market-based nor completely politically driven choices were made.

To sum up, it can be said that these key actors and the relationships underpinning them initially led to a regulatory competition that evolved into cooperation when international pressure and national politics articulated. A cooperative turnaround then took place. A plausible explanation of the process can be offered following Genschel and Plumper (1997): conditions that allowed for international cooperation in the selection of DTV standards in Latin America referred to the size of the coalition that could gain from cooperation by itself and the external effects of cooperation on non cooperators. Mechanisms that made such cooperation come true were, as in the case of competition, decisions over technological preferences and political strategies.

In the case of harmonization towards ATSC it was relatively easy for Mexico to join because the coalition around the standard was fairly small (mainly defined by member states of the NAFTA) and opponents could be excluded, while outsiders were also encouraged to switch to a cooperative strategy (harmonization towards DVB or ISDB). Cooperation reduced any potential temptation for Mexico to defect. Colombian, Uruguayan and Panamanian decisions pro-DVB were not straightforward. The explanation supported here is that in these cases non cooperation was perceived as such a disadvantage – due to European promises and domestic capabilities – that the fact that the size of the coalition around the standard was not small and many neighbors could not be entirely excluded from receiving the same bilateral treatment did matter less.

On the contrary, for the remaining countries cooperation was not an early option because it offered unclear benefits or was conceived as self-limiting. The minimum-sized coalition mainly defined in terms of DVB's adopters or a new regional group to be organized was fairly large, with opponents having to be included. Cooperation itself would not necessarily encourage others to join and incentives for non cooperation could be even higher for some (like the Brazilian attitude proved).

When and why a cooperative turnaround began to take place in South America? When Brazil emerged as a dominant player, a regulatory leader, as its decisions to choose ISDB and lobby for the standard in the region created the beginning of a new coalition: since its size would clearly be smaller than the larger DVB and cooperation stopped being considered as uncertain or self-limiting by many countries to become, in fact, a potential advantage in terms of what could be gained through it (or lost by defection), the feasibility of cooperation improved and convergent decisions began to take place.

6.2. Cooperative turnarounds and regional blocs

If switchover across the globe seems to be giving place to an emerging pattern of regional blocs, albeit with subdivisions and exceptions (García Leiva & Starks, 2009), it has been here explained how states and firms were the key drivers of the regulatory races that ended up shaping divergent international bloc agendas in the development of DTV standards, reinforced by most selection processes displayed by Latin American newcomers. Therefore, even though international regulatory competition prevented the development and selection of a single DTV standard across the world from taking place, cooperation certainly played a role to shape such blocs. A plausible explanation for cooperation turnarounds in Latin America was here presented. What should be noted is that it happened within existing partnerships defined by commercial as well as political common interests, such as the NAFTA, but it also led at the same time to new associations (Japan-Brazil; Spain/EU-Colombia/Uruguay/Panama) that in the end took advantage of regional sympathies (most Mercosur's members and associated states ended up heading in the same direction).

The NAFTA has turned out to be a determining factor as the Mexican example reveals, because its decision over ATSC implied a close alignment with its neighbor but it was also the expected outcome if existing domestic arrangements were to be preserved. Additionally, since Honduras, El Salvador and Dominican Republic have also chosen to adopt ATSC, Mexico's decision may have set the pattern for much of Central America. In that case US lobby, concentrated mainly on pushing for a continentally shared standard through the Inter-American Telecommunication Commission of the Organization of American States, would have achieved influencing a major part of the continent.

The European approach, meant to support DVB, was loosely coordinated by the EU's Information Society and Media Directorate-General through bilateral cooperation agreements that focused on financial support to help fund digital switchover strategies. And even though it certainly benefited from the special role played by Spain, the Brazilian decision has been the one succeeding in leading South American developments. In this specific case, regional partnerships like Mercosur or the Andean Community lacked the official mechanisms to reach consensus when faced with national interests. But the Brazilian persuasion found its way to informally influence many decisions and the Japanese promises did the rest to set the pattern for the south of the continent.

So, as the Latin American experience illustrates, it is essential to understand that DTV standard-setting is affected on the one hand by national policies and audiovisual history and, on the other, by regional and transnational agreements (both formal/explicit and informal). The articulation of international forces and domestic politics helps to explain policy preferences but also why if the DTV blocs were initially three Brazil turned out to be an important player too. As was here described, Brazil tried a totally independent R&D

path although finally opted for a nationally modified Japanese standard. SBTVD may be well defined as the complicated outcome of Japanese concessions, pressure from broadcasters and a relatively autonomous national industrial policy.

It was initially an open question whether other Latin American countries would follow the Brazilian alternative along with Argentina, Bolivia, Chile, Peru, Venezuela and Ecuador. But since Costa Rica, Paraguay, Nicaragua and even Uruguay have also done so, it can already be said that apart from the US, Europe and Japan, Brazil has become an additional and successful external actor lobbying for a particular standards choice. Some kind of regulatory emulation or modeling could have also taken place, though further consideration would be needed to study if there have been races sideways or policy transfer. Further political analysis would also be needed to explain whether the Latin American cooperative turnaround pro-ISDB arose from a desire to finally build a regional approach to the transition of DTV, was agreed upon because of ideological affinities, or simply reflected a shared desire to express independence from the US and the EU in this instance.

The remaining countries will most probably have to limit their decisions to choosing between one of the existing standards as most of them are either too poor or too small to lead a different strategy. The same alternatives apply to most newcomers across the globe. And while many may be adopting DVB, auto-advertised nowadays as the global standard for DTV, the battle is not over. As the Brazilian experience illustrates, the larger, more developed and proactive countries have some capacity to support self-developments. Additionally, it should also be noted that fierce lobbying from those with a stake in the three main DTV standards has increasingly and interestingly had to face "flirting" processes during the last few years. Some South American countries, for example, have realized that even though they might not be able to support an independent development of a separate standard, they can negotiate at least some benefits ranging from free technical support or exemptions from royalty payments to financial aid.

The development and selection of DTV standards is an overwhelming example of the relevance of the North-South divide but it is certainly also an excellent opportunity to look into the intricate relationships it implies. As a consequence of these, regulatory cooperation has been challenged by competition issues at the international (and regional) level. However, its consequence was the shaping of regional blocs – resulting, ultimately, in regulatory races towards the top fostered by firms and states –. Cooperation took advantage of existing agreements (NAFTA) or was obliged by consolidated partnerships (EU), though not necessarily (Mercosur, Andean Community). An unexpected outcome was that regulatory competition also gave place to a cooperative turnaround that led to new associations (Japan-South America).

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