DIGITAL TV POLICIES IN THE UK, US, AUSTRALIA AND ITALY

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Introduction

Many countries are in the process of converting their terrestrial television services from analog to digital transmission. Several different approaches have been adopted for the switch-over with different apparent results. Spectrum is a scarce resource and delays in the switch-off can have major effects on economic welfare as the spectrum tied up in analog transmission cannot be released for other uses.

In this paper we examine the digital TV conversion policies and progress in the UK, USA, Australia and Italy, which have adopted different processes to achieve the desired switch-off. Each of the four countries decided to mandate the conversion of terrestrial television services from analog to digital transmission late in the last decade adopting policies with similar planned periods of transition and similar targets to complete the process. We look at the policies of each and the progress achieved to date to see what features appear to be enhancing or slowing down the achievement of the switch-over target.

Digital broadcasting

Digital broadcasting has several significant advantages over traditional analog transmission making its adoption a desirable policy choice by governments. For consumers, the technology allows improved audiovisual reception free of many quality defects common to analog transmission such as picture ghosting and interference between different signals. Digital transmission is also a much more efficient user of spectrum. Picture compression means that a single analog channel can accommodate at least 3-4 different television services. Furthermore, because the properties of digital transmission compensate for distortion between channels, greater intensity of reuse of channels is possible. Because of these attributes, after digital conversion is completed, a considerable amount of spectrum will be available for use by additional new television services or for allocation to other uses.

To convert their operations to digital format, broadcasters need to invest in new digital studio and transmission infrastructure as well as face increased operational costs for simulcasting during the conversion period. Initially, because of these costs, broadcasters have a considerable incentive to delay adoption of digital technology. However, once they are equipped to transmit in digital format, broadcasters have an incentive to promote the earliest possible analog switch-off and thus avoid the cost of simulcasting. To counteract cost disincentives for broadcasters, conversion policies are generally backed-up by mandated requirements to introduce digital transmission technology by a specified date together with free allocation of the spectrum required for digital transmission. In some cases, broadcasters

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may also receive additional spectrum to broadcast new ‘revenue-earning’ services that may help in recouping costs or are given actual financial incentives to defray some of their costs.

For consumers digital reception imposes an additional cost to acquire the equipment needed to access digital signals. For some consumers the additional cost may not be justified by the improved picture quality and other technical attributes of digital television. Consequently, in the absence of significant additional benefits such as desirable 'digital only' programming, those consumers will tend to delay their investment in digital receiving equipment until their existing analog equipment needs updating or replacing.

The four countries under review were among the early movers towards digitisation of terrestrial television and initially set themselves what proved to be over-ambitious targets to complete the digital conversion. The US, which launched digital transmissions in 1998, and Italy with a December 2003 launch had both aimed to achieve analog switch-off by the end of 2006. Australia with a January 2001 launch and the UK with November 1998 launch had aimed to commence their planned progressive switch-off of analog services before the end of 2008. These target dates were all subsequently revised. The new US target for switch-off is February 2009. Both Italy and the UK have now adopted a sequential regional switch-off plan commencing in 2008 (Sardinia and Valle d'Aosta in Italy, and the Border region in the UK) with a target completion date by 2012. Australia's new target is for switch-off in the period 2010-2012. The digital transition timetable for each country is summarised in Table 1.

Table 1

Digital transition time table

	Australia	Italy	UK	US
Launch date	January 2001	December 2003	Nov. 1998-ITV July 2002-Freeview	April 1998
High Definition	1040 hrs per year since August 2003	No	Trial in London Jun-Dec 2006	April 1998, optional
Supply side incentives	Yes	Yes	Yes	Yes
Demand side incentives	No	2004-2005-2006	2008-2012	2008-2009
Regional switch-off	Metropolitan end 2010 (target) Non-metropolitan end 2012 (target)	Sardinia: 1 Mar 2008 Valle d’Aosta:1 Oct 2008	2008	Full national
Switch-off date	Target end 2012 (previously 2008)	30 Nov 2012 (previously initially 2006 then 2008)	2012	17 Feb 2009 (previously Dec.2006)
Population	20.2 m	58.1m	60.4m	295.7 m
TV households	7.6 m	22.1 m	25.5 m	111.5 m
Digital penetration	28% (Mar. 2007)	44,9% (Apr. 2007)	80.5% (Q1 2007)	38.7% (Q4 2006)

Details of the digital conversion processes and results for each of the four countries follow.

United Kingdom

In 1998, almost two thirds of households in the UK (65 per cent of 24.2 millions TV households) were dependent on terrestrial distribution for television services. Cable TV had a reach of 16.5 per cent of households and satellite 18 per cent (Lange, 1999). The free-to-air television industry was dominated by the BBC, the publicly-funded broadcaster, which operated two main channels (BBC1 and BBC2) in competition with licensed commercial operators (advertiser-financed) including Independent Television (ITV) Channel 4, Channel 5 and S4C (the Welsh language service).

The framework for the digital conversion of terrestrial television services was detailed in the *1996 Broadcasting Act.* The act provided for the establishment of six multiplexes of 6MHz each (same capacity as the existing analog channels). Multiplexes 1, 2 and A, those with the highest population reach (see Table 2) were reserved for the main public service broadcasting channels (BBC1, BBC2, ITV1, Channel 4, S4C, Five and Teletext). The remaining three multiplexes (B, C and D) were allocated to a consortium of two ITV companies, *Granada Media Group* and *Carlton Communications*, together with (initially) *BSkyB* for the establishment of a terrestrially-distributed subscription television service *ITV Digital*[1]. Digital terrestrial TV services were launched on 15 November 1998. To encourage operators to promote consumer take-up of digital services, ITV commercial broadcasters were given a rebate of licence fees based on the proportion of households with digital television services.

Table 2

DTT Multiplex Details

Mux	Owner	Initial population coverage	Channels
1	BBC	92%	BBC1, BBC2, BBC News24, BBC Learning, BBC Digital Text, BBC Choice
2	Digital 3& 4	91%	ITV, ITV2, Channel 4, Teletext digital, FilmFour
A	SDN	90%	C5, S4C, SDN
B	OnDgital	88%	Granada Plus, Granada Men & Motors, Sky Premier, Carlton Food Network, UK Horizon, UK Style, Carlton Select, Sky Sports 1
C		77%	UK Gold, Sky One, Sky Movies Max, Granada Breeze, Sky Sports 3, Carlton Cinema
D		69%	Carlton Kids, Carlton World, Shop!, Cartoon Network, Eurosport UK Play, MUTV, First OnDigital

Source: IDATE, 1998 and 1999.

The BBC used its multiplex (as well as some rented space on another multiplex) to introduce several new digital channels including *BBC4* (an up-market cultural channel), *BBC3* (Youth), *CBeebies* and *CBBC* (Children), *BBC Parliament* and *BBC News 24*. ITV started a new digital service *ITV2/You2*, and initially also broadcasted *GMTV2* during early morning periods. Channel 4 used its digital capacity to broadcast *Film4*, a pay-on-demand film service and for the transmission of *S4C Digidol* Welsh-language program in Wales.

ITV Digital (renamed *OnDigital* in 2001), began digital transmissions on 15 November 1998 offering pay-TV services in competition with the services of the incumbent pay-TV satellite

[1] BSkyB subsequently withdrew from the consortium following concerns raised by EC competition authorities.

operator BSkyB, which had launched its new digital satellite service (*Sky Digital)* on 1 October 1998. With an inferior program line-up and significantly higher costs, *OnDigital* was unable to compete effectively with *Sky Digital* and eventually went into receivership and finally off-air in May 2002.

OnDigital's failure was a major setback for the UK's digital policy and led to a shift in focus towards the use of DTT for new free-to-air services. The spectrum relinquished by *OnDigital* was allocated to a BBC-led consortium (including Crown Castle and BSkyB) for the establishment of a multi-channel free-to-air service (*Freeview*). The service was launched in October 2002 with some 30 television channels and some 20 radio stations and proved to be popular with viewers. Its take-up also benefited from the increasing availability in the market of modestly-priced digital set-top boxes (boxes sold for less than £100 began to be available in 2002). Also, to avoid substantial reduction to their licence-fee rebate (based on number of digital households) Granada and Carlton reached a settlement with the *OnDigital*'s receivers, which enabled previous *OnDigital* subscribers to retain their set-top boxes[2].

The initial consumer take-up of digital technology was boosted considerably by the offer of free rental decoders by the pay TV operators. Among non-pay TV subscribers, however, the take-up rate was more moderate. Overall, *Freeview* proved to be a formidable incentive for consumer adoption of digital technology. The popularity of the service encouraged the development of another free-to-air initiative with considerable potential to encourage widespread adoption of digital technology. In late 2004 BSkyB launched its free satellite digital television service with some 140 TV channels, 80 radio stations and 13 interactive services. To access the service, customers incurred a one-off cost of £150 for the necessary satellite antenna, set-top box and installation.

The previously low (less than five per cent) digital penetration rates increased steadily after the introduction of *Freeview* and by the end of 2006 had reached 77.2 per cent of households (Ofcom, 2007a). Many homes have multiple television sets capable of receiving DTT. Also by 2006 DTT's share of television viewing (28 per cent) had surpassed that of analog TV (25.8 per cent) (Ofcom, 2007b).

The high and rising DTT penetration in the UK has led to some optimism that the revised analog switch-off target of 2012 (DCMS, 2004) is likely to be attained. Switch-off was to be conditional upon (Digital Television Access Plan, 2002):

- the availability of digital channels main public service broadcasting channels in digital format to everyone who can receive them in analog format;
- switching to digital being affordable the vast majority of households; and
- digital equipment being adopted by 95 per cent of consumers.

According to a 2004 study commissioned by the Department of Trade and Industry (2004) 70 per cent of households anticipated converting to digital reception by 2010 even without analog switch-off. With switch-off, 95 per cent anticipated they would do so. Some 20 per cent of households, however, indicated they would do so only if they had to. These findings highlighted the importance of setting a definite switch-off date as a way of encouraging earlier adoption of digital television. Subsidies for the purchase of digital reception

[2] The receivers had asked subscribers to pay £40 or return the set-top boxes they had been supplied rent-free.

equipment were also seen as an encouragement for earlier take-up (Culture, Media and Sport Committee, 2006).

Several important lessons emerge from the UK experience. First, it is clearly evident that consumers respond to attractive digital programming as an incentive to digital take-up. The initial digital FTA offer did not prove sufficiently attractive to many consumers and did not have a major impact on the take-up rate. However, the considerably larger and more appealing offering following the launch of *Freeview* (together with the availability of low-cost decoders) appears to have been a strong incentive for widespread take-up of digital technology and the take-up rate increased rapidly.

Second, the primary means of digital adoption by consumers has been the acquisition of a decoder (set-top box). The offer of free rental decoders by pay TV operators from the time of the launch of digital services and the declining market price of decoders in subsequent years have provided a low-cost entry to digital reception. Sales of digital TV sets have contributed little to digital penetration. TV sets with integrated digital receivers have been a minority proportion of all new TV sales. Prices of digital sets have been substantially higher than for analog sets with consequential impact on their demand. The purchase of a digital set is a major consideration for those purchasing a new TV set, but the relatively long service life of modern sets means that analog equipment will continue in use for many years. Even in digital homes, in most instances there is a mix of technologies operating side by side with second or additional TV likely to be analog. There are no requirements for television reception equipment sold in the UK to be digitally capable. Such a measure would ensure that new television sets and other equipment capable of receiving broadcast television signals were digitally capable thus limiting the stock of analog only equipment to pre-existing stocks.

Third, there is some evidence in the UK that a sizable (20 per cent) proportion of people have no intention of taking up digital television equipment unless they have to (www.digitaltelevision.gov.uk). This has major implications for analog switch-off which is conditional on a 95 per cent penetration rate. There is a recognition that a greater effort is required to inform consumers that conversion is underway and that digital reception equipment is required to receive new television services or continue receiving current 'analog' programs after the switch-off date. Consumers not predisposed to taking up digital equipment unless they have to will be likely to delay their changeover for as long as possible. In such circumstances, the setting of a definite switch-off date may be an important provide some encouragement for earlier take-up.

Fourth, for a small proportion of consumers, take-up may be constrained by economic factors. Inherent in a 95 per cent threshold digital penetration rate for analog switch-off is the concept of universal service. Affordability of digital equipment becomes an important issue for policy consideration. Because forcing a significant proportion of households to incur a digital policy-induced cost or to lose an existing service is unlikely to be politically tenable, consumer subsidies for the purchase of digital decoders become a useful mechanism for the avoidance of delays to switch-off. The introduction of such a scheme (Digital Switchover Help Scheme) for low-income households was announced recently (4 May, 2007) by UK Government (see, http://www.digitaltelevision.gov.uk/publications/pub_dighelpscheme_cm7118.html).

United States

There are some 1750 commercial and non-commercial terrestrial television broadcasting stations serving the US television market of some 111.5 million households. Cable pay-TV services (mixture of analog and digital) reach approximately 70 per cent of TV households. A digital satellite service is also available and has a subscriber base of around 20 per cent of households. Cable operators are required by regulation (‘must-carry’ rules) to relay the signals of terrestrial broadcasting services operating in their market. Satellite services have no obligation to carry terrestrial signals. Free-to-air broadcast channels have a national audience share of approximately 45 per cent. Up to 20 million households rely solely on free-to-air transmissions (FCC, 2006; NAB, 2005).

The digital conversion framework is governed by the *Telecommunications Act* (1996). Existing terrestrial television stations were each assigned a 6MHz channel for use during the digital transition period. The stations were required to broadcast at least one free digital television program of a quality and geographic coverage equal to that of a standard resolution analog service. High definition transmission was encouraged, but not mandated. At their discretion, stations could use any remaining spectrum capacity to offer additional services. Stations affiliated with the top four networks (ABC, CBS, FOX, and NBC) in the 10 largest markets were required to begin digital transmission May 1, 1999 and those in the next 20 largest markets by 1 November of the same year. All commercial stations were required to begin digital transmission by 1 May, 2002, and all non-commercial educational stations by 1 May, 2003. Initially analog switch-off was to occur by the end of 2006, but the date was subsequently revised to 17 February 2009. Switch-off in individual markets was originally conditional to a minimum digital household penetration of 85 per cent.

According to the FCC (2006a) by October 2005, 'more than 1,537 stations nationwide were on the air with DTV operations, including all 199 stations affiliated with the top-four network affiliates in the top thirty television markets'. There were also indications that the top-four networks were providing 'their most popular programming in high-definition' and that hundreds of local stations 'were using their digital channels for multicast services' including news, weather, sports, children, educational documentaries, drama, and foreign language programs. Digital spectrum was also being used in several cities to provide a subscription service with 30 channels including 12 non-broadcast networks.

There are no official data on consumer take-up of digital services. Various estimates of sales of digital television sets reported to the FCC (2006a) suggest that up to 17 million digital TV sets were sold between 1998 and 2006. Based on shipments of digital receiving equipment to dealers, the Consumer Electronics Association (CEA) estimated that 38.7 per cent of households were 'tuning in' digital broadcasts at the end of 2006. Penetration rates based on shipments to dealers are likely to overstate the actual rate since they do not usually take account of stock held by dealers and multiple purchases of sets by individual households. Results from a first quarter 2007 survey (Goodstadt, 2007) indicate that there were on average 2.8 TV sets per household. They also indicate that digital TV ownership was some 23 per cent for cable/satellite households and only 7 per cent for over the air households. Furthermore, over-the-air households were significantly less likely to purchase a new TV (12-13 per cent per year, compared with 18 per cent per year for cable/satellite households).

A recent survey by the Association of Public Television Stations (APTS, 2007) found that 61 per cent of US adults were not aware that analog broadcasts are anticipated to end on February 17, 2009. To increase public awareness and thus encourage consumers to adopt

digital reception technology, the FCC has proposed a US$5M DTV outreach campaign (FCC, 2006b) and has established a dedicated web portal (www.dtv.gov) to provide information to consumers. Various industry organisations including CEA, the Consumer Electronics Retail Coalition, NAB, and NCTA are also active in providing consumer information.

Another initiative of the FCC has been to mandate digital tuners for TV sets retailed in the US. Introduced in 2002 (modified in 2005[3]), the digital tuner phase-in plan mandates the fitting of digital tuners in TV sets sold to the public starting with wide screen TV sets on 1 July 2005 and extending progressively to smaller sets and other reception equipment by 1 March 2007.

The US Government has announced the introduction of the Digital-To-Analog Converter Box Program that will provide two coupons worth $40 each toward the purchase of digital converters between 1 January 2008 and 31 March 2009.

The main concern in the US, seems to be to ensure that consumers that are exclusively dependent on over the air transmissions can continue to receive FTA services. They are the only portion of the population for whom digital equipment is critical to the reception of services. Although cable companies are required to carry digital signals of existing services after switch-off, it would not be critical to the switch-off if households connected to cable systems are not digitally equipped. Indeed some small cable companies have sought permission from the FCC to continue operating in analog by reconverting the FTA digital signals to analog after stations switch-off analog transmissions.

As noted above, some 20 per cent of households in the US receive television signals exclusively over the air and only some 7 per cent of them are estimated as having digital TV. Also as noted these households are less likely than others to purchase a new TV. Information about an imminent analog switch-off may provide them with a strong encouragement to purchase digital equipment. Targeted information will be particularly important to such households to ensure that they are aware of the implications of the switch-off and of their eligibility for assistance to purchase a digital decoder.

Overall, the assistance measures implemented for the purchase of digital converters should go a long way to making the now firm commitment for a final switch-off in February 2009 achievable. CEA projections of digital television reception in US households indicate a likely penetration rate of 75 per cent in 2008 increasing to 87 per cent by the end of 2009 suggesting that it will be reasonably close the previous conditional penetration rate of 85 per cent for switch-off. The decoder purchase assistance program should minimise the potential for political fallout if digital take-up among 'exclusive' free to air households continues to be slow. Increased efforts to promote digital take-up and warn consumers of the imminent switch-off may be desirable.

Australia

Australian television is dominated by FTA terrestrial broadcasting. Most areas are served by five high power services, including two public (government funded) services and three commercial services (funded by advertising)[4]. Pay-TV is not widespread. The current

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[3] See FCC 05-190.

[4] Only two commercial services are available in Tasmania.

penetration rate is about 25 per cent of households (www.astra.org.au). Development of pay-TV was not allowed until the mid-1990s. Pay-TV services are distributed primarily by satellite.

The Australian digital television plan mandated the introduction of digital transmission by 1 January 2001 in metropolitan areas and 1 January 2004 elsewhere. The plan was widely criticised as being highly restrictive and highly protective of incumbent broadcasters[5]. The main provisions of the digital television plan were:

- Each station received a 'loan' of an additional 7MHz channel without charge to allow for the mandated digital simulcasting of analog transmissions for at least eight years.
- In addition to simulcasting analog programs in standard digital format stations had to transmit a minimum level of high definition programs (set at 20 hours per week in 2003).
- The use of the digital spectrum for multichannelling or subscription television services was prohibited pending a review by 2005. Public broadcasters were permitted to use spectrum for multichannelling subject to extensive genre restrictions.
- Spectrum not required for digital conversion was to have been allocated competitively to new operators for 'datacasting' services (defined to exclude all traditional TV-like programs). The allocation was subsequently abandoned because of lack of commercial interest.
- Licensing of new commercial television was banned at least until 31 December 2006.
- Regional commercial operators received partial waivers of their annual station licence fees to assist them with funding of their new digital infrastructure.

Digital rollout proceeded on schedule and digital transmissions began as planned in major cities on 1 January 2001. At 30 June 2005, there were 526 digital transmitters covering all metropolitan areas, major regional centres and some remote areas.

Extensive genre restrictions on the use of multichannelling by the national broadcasters and insufficient funding have prevented the development of any new significant programming to consumers. The ABC started, but later discontinued, two digital multichannels one for children and the other for youth. Currently it operates a single multichannel digital service, *ABC2* dedicated to new and time-shifted programs from its main channel, including children's programs. The other national broadcaster, SBS, established a digital *World News* channel repeating foreign language news services on its main channel including updates, and a second channel *SBS Essential,* an electronic information guide for SBS programs.

The combined effect of high prices for digital TV sets, the unique converters needed for the Australian system, and the lack of new programming was a very low take-up rate by consumers. In early 2001, to avoid having virtually no audience for their digital transmissions, commercial broadcasters underwrote the manufacture of a few thousand converters because manufacturers faced with little or no demand were reluctant to produce them. Estimated cumulative sales of digital TV sets and converters in the first two years of digital transmissions were less than 50,000. Subsequent growth in sales benefited from the digitisation of subscription services (cable and satellite) which led to increased uptake in

[5] See for example, Papandrea (2001) and *The Australian Financial Review* (1998).

Australian homes. By March 2005, 14 per cent of Australian homes were connected to digital pay TV services (ASTRA, 2005).

Estimates of digital TV take-up presented to the House of Representatives, Standing Committee on Communications, Information Technology and the Arts, inquiry into the uptake of digital television in Australia[6] indicate that at June 2005, 10.8 per cent of Australian homes were able to receive free-to-air DTV and that only five per cent of a total 15.2 million analog TV sets in Australian homes had been converted to digital. Other estimates presented to the Committee suggested that no more than 7 per cent of Australian homes had terrestrial-only digital reception. More recent estimates by Digital Broadcasting Australia (DBA) suggest that digital TV penetration in Australian homes was at around 25 per cent in December 2006 and 28 per cent by the end of March 2007 (http://www.dba.org.au/newsletter/IB-MayJun07-full.asp#PRODUCT1). A recent ACMA survey (2007) reported a much higher digital TV penetration rate of 41 per cent of households, with either a digital TV set-top box or access to digital Pay TV. This was surprisingly high particularly when compared to a household penetration rate of 23 per cent (September 2006) estimated by DBA from deliveries to dealers (which tend to overestimate penetration).

The low consumer take-up of digital TV led the Australian Government to abandon the original end of 2008 analog switch-off target. Following a series of reviews of the digital TV conversion plan, the government has now adopted a new target to begin switch-off sometime in the period 2010-2012. Other tentative changes to the original plan include (DCITA, 2006):

- Removal of genre restrictions on the multichannel services by the national broadcasters;
- Removal of the requirement to simulcast analog programs on the high definition channel.
- From 1 January 2007, commercial broadcasters may provide a high definition multichannel.
- From 1 January 2009, commercial broadcasters may provide one standard multichannel each. Full multichannelling would not be allowed before the end of the simulcast period.
- Two additional television channels are to be allocated to for new digital services sometime in 2007: one for up to eight free-to-air datacasting and narrowcasting channels, and the other for television services to mobile devices such as cellular phones. No date has been set for the actual licensing of new services on these channels.
- Proposal to establish *Digital Australia,* to coordinate and oversee the transition to digital;
- Proposals for consumer and information campaigns to increase awareness of digital switch-off to be undertaken by *Digital Australia* working closely with industry bodies; and
- Introduction of a mandatory consumer products labelling scheme for digital television sets and other devices.

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[6] Report available at http://www.aph.gov.au/house/committee/cita/digitaltv/report/fullreport.pdf.

Faced with high prices for digital television sets, particularly high definition sets, and very little by way of incentives in terms of digital only programming, consumers have been reluctant to adopt the new technology. This experience contrasts with that of pay TV which underwent a change from analog to digital about the same time. In the pay TV case, an increased program offering played a major role in encouraging a relatively rapid migration of subscribers from the analog services. In more recent times, there has been some increase in consumer interest following a substantial decline in the prices of large flat-screen digital TV sets, particularly among those replacing or upgrading existing TV sets. Better picture quality (36.5 per cent) and upgrading/replacing TV (28.4 per cent) were the most often cited reasons for adoption of digital televisions in an October 2006 survey commissioned by the Australian Communications and Media Authority (ACMA, 2007). Only 15.6 per cent cited extra channels as a reason.

With the vast majority of pay TV households already digital, the prospects for continuing rapid growth in the digital penetration rate do not appear promising. Experience from other countries in our group, suggest that the recent policy changes allowing some increases in digital only programming, including digital only high definition programming, may not be a sufficient incentive for widespread consumer adoption of digital technology.

Italy

Terrestrial free-to-air distribution dominates in the Italian television market with 77 per cent of the 22.5 million households being dependent on it for their television signals; the remainder receive their signal via satellite (DATAXIS, 2006). Each of the two dominant FTA operators broadcasts on three national channels: RAI 1, RAI 2 and RAI 3 run by the public service broadcaster RAI, and Canale5, Italia1 and Rete4 run by the commercial operator Mediaset. Since 1997, RAI also operates three FTA satellite channels. A third operator Telecom Italia recently entered the FTA television market and controls two minor national networks, the news-oriented channel La 7 and the music channel MTV Italia. Some 600 local television station dispersed throughout Italy provide additional local services.

First introduced in the early 1990s, pay television has a small market. Services were initially offered by two independent operators, Telepiù (satellite service) and Stream (cable service in a few of the larger cities). Both pay TV operators converted their distribution to digital transmission in 1996. By the end of 1988 only 1.5 million households (approximately 7.9 per cent) subscribed to pay TV. Both operators were acquired by Sky in 2003 and an upsurge in subscriptions followed the subsequent launch of premium channels, including pay per view premium soccer games. It is estimated that by the end of 2005 some 3.6 million households subscribed to pay TV (DGTVi, 2006).

Italy was the last of the countries in our group to implement digital conversion (starting in December 2003)[7]. Italian policy makers and regulators saw digital conversion as an opportunity to resolve overcrowding problems in broadcasting spectrum as well as increase plurality in a television market dominated by the RAI-Mediaset duopoly. Rapid conversion to digital delivery was seen as a key to the realisation of both of these objectives and a very ambitious end of 2006 analog switch-off target was set (that is, three years after the start). A major constraint faced by Italian regulators was that in many regions the spectrum needed for digital conversion was already in use for other services.

[7] Italy, however, was ahead of most EU countries (other than the UK, Spain and Finland).

Legislation governing digital conversion (Law n. 66/2001) and the related regulation (431/01/CONS) were introduced in 2001. The Communications Authority was charged with implementing the National Frequency Plan and the allocation of digital frequencies by the end of 2002. Frequency trading, exclusively for digital terrestrial transmissions, was introduced to enable operators to acquire the necessary spectrum to establish digital multiplexes.

To promote pluralism, part of the available spectrum on each multiplex was reserved for new operators and services. However, only incumbent terrestrial analog operators were allowed to acquire spectrum licences for digital transmissions. Each multiplex was required to carry a minimum of three television programs, but could carry up to six depending on the chosen signal modulation method. At least 40 per cent of the transmission capacity on each multiplex acquired by incumbent broadcasters holding more than one analog television licence was to be reserved for use by independent third party operators. In addition, RAI was to be provided with a 'reserved' multiplex for exclusive use in the transmission of its own programs. Additional restrictions designed to promote plurality prevented individual organisations from controlling more than 20 per cent of digital programs broadcast nationally and from using more than one multiplex to transmit programs in any one area (RAI's use of the 'reserved' multiplex was excluded from these restrictions). Another objective of the introduction of digital terrestrial television was the promotion of interactive services including the use of television for accessing government (*T-Government)*, health (*T-Health)*, education, banking and other public utility and commercial services (*T-Commerce)*.

Some of the plurality provisions of the plan were subsequently amended in 2003 by the 'Gasparri law'. The amendments were controversial as they overturned some of the provisions including those requiring Mediaset (owned by the Prime Minister Berlusconi) and RAI to divest themselves of one of their three analog channels. The amendments also attracted scrutiny from the European Commission for likely incompatibility with competition rules.

The government and RAI, which was to lead the conversion to digital, agreed on a rollout plan to reach 50 per cent national population coverage by 1 January 2004 and 70 per cent a year later. After coming to power in 2006, the *Prodi Government* increased the resources provided to RAI to enable it to play a greater role (along the lines of the BBC in the UK) in driving the digital conversion. The 2007 Financial Law (Art. 122) gave RAI an additional €40 million a year for the triennium 2007-2009 to assist its investment effort in digital television.

Digital terrestrial transmissions started in December 2003 when Mediaset began broadcasting its services over a multiplex with five channels. RAI followed soon after on 3 January 2004 with transmission over two multiplex. The combined digital program offer of the two main operators at the beginning of digital transmissions was made up of the simulcasting of 9 existing channels plus 11 additional channels. Two other national multiplexes began operating in 2004 bringing the total number of national multiplexes to five distributing 25 channels carrying national and local programs. In 2005 the number of national multiplexes in use grew to seven (*Elettronica e Telecomunicazioni* 2005) and a substantial number of local multiplexes were also in operation. Digital terrestrial pay TV (pay per view) services began operating in January 2005.

In addition to new programming choices, consumer switch-over to digital was encouraged with subsidies for the purchase of interactive set top boxes (STBs). Initially, the subsidy was

set at €150, and the government allocated €110 million for the purpose in 2004. The same amount was allocated in 2005 but for that year the subsidy was reduced to €70 (partly in recognition of the decline in the market price of interactive STBs). The subsidy was confined to STBs for digital terrestrial technology and, following complaints from satellite operators, the European Commission ruled the subsidies to be incompatible with technological neutrality rules for state aid and uncompetitive.[8] New neutral incentives were recently approved by the European Commission — the Financial Law 2007 (and Law 296, 27 Dec. 2006) set aside €40 million to provide a personal income tax (IRPEF) deduction (up to 200 euro) for those purchasing a digital television set with an integrated digital tuner/decoder before to 31 Dec. 2007.

Consumers responded positively to the incentives to convert to digital television reception. By the end of 2004 (one year after the start of digital transmission) more than 1.2 million households had switched to digital terrestrial TV. The number of digital households increased to 3.6 million by the end of 2005 and 4 million by the end of July 2006 (18 per cent of total) of which a little less than 2 million had received a subsidy (DGTVi 2006). More recent GfK (2007) estimates commissioned by DGTVi indicate that by the end of April 2007 the number of digital households had increased to more than 5.2 million. Digital take-up was boosted by the introduction of premium pay-per view sports programs (primarily Serie A soccer games) using a pre-paid card in 2005[9] (subsequently extended to cover other popular events, concerts and movies). Although impressive, take-up rates were well-short of those needed for analog switch-off by the target date of 31 December 2006 and switch-off was postponed, initially to 31 December 2008 and subsequently to 2012.

Italy has adopted a regional switch-off plan. The first two regions, Sardinia and Valle d'Aosta are due to switch-off analog transmissions respectively by 1 March and 1 October 2008. Switch-off has already occurred (end of February 2007) in Cagliari (Sardinia) where 93.6 per cent of households were equipped for digital TV reception[10] and could access a digital free-to-air line-up currently of 37 channels and a variety of interactive services. In Valle d'Aosta partial switch-off (Rai 2, Rete 4 and QOOB) commenced on 16 April 2007. Other regions designated for early switch-offs include Trento and Bolzano followed by Veneto, Tuscany and Sicily.

Notwithstanding these significant steps in the transition to digital television, further changes are thought to be necessary to complete the transition within the designated timetable. The legacy of overcrowding and chaotic use of the television spectrum is still awaiting an effective resolution. A census of frequency use is underway as a precursor to an orderly distribution of frequencies. This is not an easy task and will necessarily take some considerable time to complete with consequential potential delays to digital conversion.

Adoption of digital technology is anticipated to slow down without additional incentives to consumers. Consumer subsidies alone are thought to be insufficient to encourage a high take-

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8 The Commssion ruled new subsidies (€50) for the purchase of open interface interactive STBs by consumers in Sardinia and Valle d'Aosta (where analog switch-off was set o occur in 2008) to be consistent with State-aid rules.

9 Approval of the Telepiù-Stream merger following their acquisition by Sky was conditional on relinquishing exclusivity of rights over football games thus making some games accessible to terrestrial distributors.

10 See http://www.dgtvi.it/stat/News_e_Eventi/Notizie_DTT/NELL_AREA_DI_CAGLIARI_93_6_COLLEGATI_A_TV_DIGITALE.html.

up rate. More channels and more appealing programs available only in digital format are considered essential to increased demand. In part this is seen as a consequence of the relatively large number of channels on offer in free to air analog format (nine national channels plus a multitude of local channels). To attract consumers, therefore, digital only content needs to be significantly more attractive than what is already on offer in analog format. The positive response of consumers to the pay-per-view initiatives has demonstrated a readiness to adopt digital technology when appealing programs are on offer. But the pay-TV/pay-per-view model has only limited appeal, particularly in a country such as Italy where pay TV has always had minority appeal. At the time of the Second National Conference on Digital Television[11] in July 2006, there seemed to be a consensus among policy makers (Gentiloni, Minister of Communications) and industry stakeholders that a new initiative styled on the UK *Freeview* model was required to keep up with progress on transition to digital TV elsewhere in Europe (De Chiara, 2006; Key4biz, 2006).

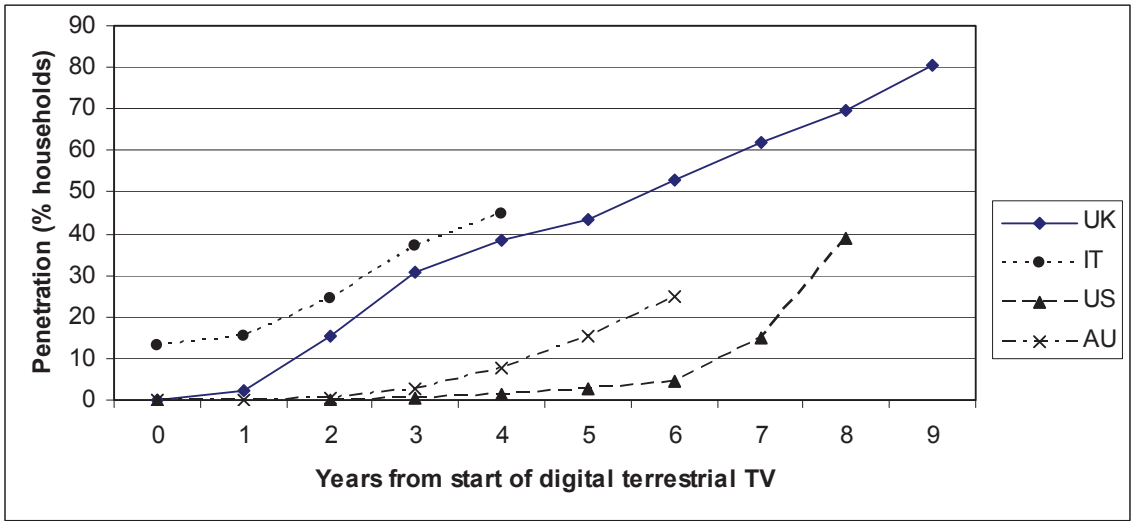
The popularity of innovative use of a pre-paid card system for access to premium pay-per-view sports and major event programs, without ongoing rental contract obligations, underscored the critical role of popular programming as an incentive to digital take-up. The availability of popular programming was particularly important in the Italian context because consumers had access to an extensive range of FTA analog programming before the start of conversion, thus limiting the incentive factor of an increased digital only programming offer. As highlighted by Padovani (2007) and Richeri (2000), the migration of quality TV content from free-to-air to subscription and pay-per-view platforms, is likely to reduce the incentive to switch to digital television.

The government's continued commitment to provide subsidies for the purchase of digital decoders and emphasis on further expansion of the digital programming offer along the lines of the UK *Freeview* model should continue to provide significant incentives for consumer take-up.

Clearing of the spectrum needed for digital conversion remains a potential obstacle to the achievement of the revised switch-off date. The regional switch-off program is very much predicated by the availability of spectrum. Although the problem of spectrum availability poses major difficulties in the early phases of the program, it should become increasingly less critical in later phases with the release of analog spectrum no longer needed for simulcasting in the regions where switch-off has occurred.

[11] 'Digitale Terrestre: La Televisione di Tutti', Second National Conference, Castel dell'Ovo, Naples, 14-15 July 2006.

Figure 1: Digital Television Penetration



Note: Satellite digital television was introduced in Italy in 1996. Thus at the start of DTTV in 2003 approximately 13 per cent of homes were already digital.

Source: Ofcom, Idate, CEA, DBA.

Conclusion

Faced with lower than anticipated digital take up rates, policy makers in the four countries in our sample have postponed their analog switch-off dates. The US has set a firm date of 17 February 2009 for analog switch-off, while the other three countries are aiming for switch-off by 2012. The UK and Italy plan to achieve national switch-off via a series of sequential regional switch-offs — already underway in the regions of Sardinia and Valle d'Aosta in Italy and due to start in the UK 'Border Region' in 2008.

On the supply side, in all four countries, the roll-out of digital transmission infrastructure has been roughly consistent with expectations. The main delays to the original switch-off target dates have been due to much slower consumer take-up than had been anticipated.

The different experiences of the countries in our group highlight several important lessons for digital conversion policy makers:

- Most consumers need a stronger incentive than improved reception quality to invest in digital reception technology. This is highlighted by the contrast between the experience in Australia, where improved reception is the main benefit of adoption, and the UK and Italy, where improved reception is augmented by a substantial digital-only program offering.
- The high cost digital television sets in the late 1990s and early 2000s was a major barrier to consumer purchases. Similarly, high early decoder prices discouraged consumers from switching to digital reception. Declining prices of decoders and digital TVs have since combined with expanded programming to attract increasing interest from consumers. Subsidies for the purchase of decoders have been popular in Italy. In the longer term, financial assistance to those who cannot afford the expenditure for digital equipment is likely to prove necessary to avoid extensive delays to analog

switch-off. Both the US and UK have recently introduced subsidy programs — only Australia has no plans for a financial help scheme.

- FTA television is a highly valued service in most households and the setting of definite analog switch-off dates should encourage many of those resisting transition to digital TV to invest in the new technology. In places where analog switch-off has already occurred, the setting of a definitive date appears to have had the desired effect on consumer inertia towards purchasing digital reception equipment.
- Poor consumer understanding of the implications of digital conversion is a common factor in all four countries in our sample. Surveys have consistently found that consumers are largely unaware or vaguely aware that conversion is underway and that even many of those indicating awareness had little comprehension of the implications to them. Without better and more effective information programs on the need to have digital tuners to access new television services or continue receiving existing programs after the switch-off date, many consumers may not have a sufficient incentive to convert to digital reception. A comprehensive information campaign becomes increasingly critical as the switch-off date nears.
- A substantial proportion of TV set sales in all the countries in our sample relates to the replacement (or upgrading) of existing sets. Indications are that up to 15 per cent of the stock of household TV sets is being replaced each year. It is also apparent that many of the TV sets on the market do not incorporate digital tuners. A mandatory scheme requiring new TV sets offered for retail sale to incorporate a digital tuner, such as that introduced in the US, would ensure households replacing existing TV sets do so with sets with digital reception capabilities.
- Delays in the analog switch-off date have significant cost implications for broadcasters because of the need to simulcast analog and digital signals. It also retards the release of analog spectrum for more efficient use. When weighed against these costs, schemes for the provision of free or highly subsidised digital decoders to residual unconnected minorities may prove a cost-effective policy option.

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