



## Bandwidth wars

A digital race run in slow motion

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By Thomas Hazlett

The vaunted digital television transition is under way. It offers to upgrade broadcast television picture quality. But high definition is mostly window-dressing. Indeed, television advertisers will not pay broadcasters much more for HD audiences, either because viewers watch on sets too small to notice it or because big-screen users subscribe to cable or satellite services for their HD fix.

The real pay-off? Spectrum efficiency. What an analogue television transmitter can do using a standard television channel (6-8 MHz, depending on country) a digital station can do four, five or six times. Viewer choice increases multi-fold by flipping a technology switch. Digital's cleaner use of airwaves also accommodates new voice and data applications. Given that vast frequency space was long ago set aside for analogue television, digitisation frees up abundant bandwidth for pretty amazing new stuff.

When Berlin-Brandenburg became the world's first jurisdiction to switch off its analogue television feeds in August 2003, it increased the number of off-air broadcast channels from 12 (analogue) to 27 (digital). Yet, the number of channels used to transmit fell from 12 to just 7. Digitisation allowed a 125 per cent increase in broadcast programming on 42 per cent less spectrum. The five channels made available for other applications make up the "digital dividend". In most places, it is far larger than in Berlin, where geo-politics squeezed the television band allocation, making broadcasting uniquely efficient to begin with.

The US and most European Union countries have set aside at least 400 MHz for off-air television, frequencies considered to be the motherlode of radio spectrum, given their favourable signal characteristics. For cellular or mobile broadband networks, this airspace is far more capacious than what has been made available for 1G, 2G, and 3G cellular combined. Allowing television band frequencies to be used for non-broadcast services would reduce mobile voice prices and unleash a plethora of new applications.

The prospects are exciting but not to governments. While forcing consumers to buy new digital television receivers, regulators are only lazily attending to the digital dividend. Indeed, the five channels made available by Berlin's 2003 switch-over lie idle. The Netherlands, the first country to go all-digital in television broadcasting in 2005, has likewise done nothing to reallocate its airwaves.

These idle frequencies are enormously valuable. A 20 MHz 3G licence sold in Germany in 2000 fetched about \$6bn and the social value what the bandwidth is worth to consumers, in lower prices and increased use of wireless is probably several times as large. In a paper published in 2006 in the journal *Info*, Juergen Mueller, Roberto Munoz and I estimated that EU countries could reward their citizens by up to \$2,000 per person by simply allowing wireless markets to feast on these digital dividends.

These estimates conservatively focus solely on price reductions in existing cellular markets. But innovative gains may be even more important. By limiting bandwidth that entrepreneurs may access, regulators raise the price of entry. This blocks unknown applications.

We have trekked to just the cusp of the Wireless Age. For instance, the market for in-car mobile wireless including auto diagnostics, steering controls to reduce accidents, locational services and audio-video entertainment is today mostly a bubbly business plan. But high-speed internet connections for telematics and a batch of wireless gizmos will one day appear as factory-standard equipment, the AM/FM car radios of tomorrow.

That day is delayed by go-slow spectrum policies, accounted for by three factors. First, regulators enjoy, and profit from, control over valuable stuff. Given that no agency official stands to lose salary or share price by squandering socially valuable bandwidth, state "warehousing" of frequencies is endemic. Second, market players are generally comfortable with market stability. From the operators' perspective, cellular licence auctions do three things cost money, yield more spectrum for them to use, yield more spectrum for their rivals to use and two of them are bad. Finally, there is a great temptation for other political interests, including those affiliated with television broadcasters, to keep the spectrum subject to political allocation. That yields power and opportunity.

Consumers have a strong interest in liberalisation. The US is now slated to auction licences to use chunks of the television band after a 22-year regulatory deliberation (and at least seven cancelled auctions). Licences yielding access to about 15 per cent of the television band for non-television services are to be sold by January 2008.

The US, which pioneered analogue cellular technology in the 1980s, dawdled in issuing digital 2G licences, starting in 1995 what most European regulators had completed by 1992. The US then slept some more, auctioning 3G licences only in 2006, again lagging behind Europe by years. These delays suppressed network development and retarded economic growth.

The US performance on television band reallocation is not visibly improved, but the plodding elsewhere appears as bad or worse. By making some progress to advance productive use of the digital dividend, the Americans may paradoxically stumble to a first-place finish in an international race being run in slow motion.

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