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WHAT DRIVES BROADBAND TAKEUP?

Abstract

This article summarises an econometric study undertaken by the author for the OECD which found several key factors explaining the level of broadband takeup in different countries. On the demand side, they are price, income, education, weather and the size of the addressable market. On the supply side, they are urbanisation, unbundling of the local loop and competition. Most of the factors that drive broadband takeup are beyond the reach of government regulation and policy.

Most of the factors that drive broadband takeup are beyond the reach of government regulation and policy. This article examines those factors and the measures governments are taking to support the establishment of high-speed broadband networks at a time when the focus of industry and government is shifting to the introduction of fibre into the local loop to increase broadband speeds.

The concept of broadband is shifting upwards as a result of technology and users' expectations. Statistical agencies in Australia and overseas generally count fixed lines as broadband services if they deliver downstream speed of 256 kbps, sometimes less. Mobile services are currently ignored. Some ISPs in Australia provide broadband services up to 24 Mbps using ADSL2+ over unbundled copper loops, nearly a hundred times faster than the official definition, but only if the customer is close enough to the telephone exchange with the required equipment.

In July 2006 the Internet Industry Association (IIA) proposed a national target to get 10 Mbps to 80 per cent of the Australian population by 2010. The Labor policy for a National Broadband Network set in March 2007 is to provide at least 12 Mbps to 98 per cent of Australians. Telstra's proposed (metro only) Fibre to the Node (FTTN) network promised a minimum of 25 Mbps, using VDSL2 technology over the copper lines still required to connect the fibre nodes to customers' premises. Ultimately, fibre-all-the-way (FTTH) will deliver speeds in excess of 100 Mbps.

Governments believe that broadband is a 'general purpose technology' like electricity that will transform economic relations, enhance productivity and create new services. It is very difficult to measure these impacts (see ITU, 2006). But, like climate change, it is accepted as an article of faith by governments who want to facilitate broadband.

For teleworking, at least 12 Mbps is desirable. For music and film downloads, compression techniques are improving and constrain the need for speed. But

for real-time applications like IPtv service, higher speeds are necessary. Higher speeds also improve the quality of cheap, non-switched voice telephony (VoIP), making it more attractive.

In June 2007, Australia was ranked 12th out of 30 OECD countries for broadband takeup. This ranking is better than its 17th place in December 2005. But can we do better?

The first two columns in Table 1 show country rankings on broadband takeup as of June 2007 and December 2005. The top 10 places in both years are taken by the same 10 countries. We have a pretty good idea why they are consistently good performers.

Table 1: OECD broadband statistics

Penetration rank (1)		*Country*	*Speed (2) Average advertised Mbps*	*Fibre (3) % of broadband connections*	*Price (4) US$ monthly per Mbps*
June 2007	*Dec 2005*				
		Top 10			
1	4	Denmark	6.0	9	17.70
2	3	Netherlands	5.3	1	15.26
3	5	Switzerland	5.5	0	8.17
4	2	Korea	43.3	31	5.96
5	7	Norway	11.8	6	9.81
6	1	Iceland	4.9	1	22.22
7	6	Finland	13.0	0	13.45
8	9	Sweden	21.4	16	18.40
9	8	Canada	8.0	0	28.14
10	10	Belgium	6.3	0	18.55
		Other			
11	13	UK	10.6	0	5.29
12	17	Australia	12.1	0	21.34
13	14	France	44.2	0	3.70
15	12	USA	8.9	2	12.60
16	11	Japan	93.7	36	3.09
17	18	Germany	9.2	0	8.44
20	22	NZ	13.6	0	16.75

Source: OECD Broadband portal at www.oecd.org/sti/ict/broadband.

(1) Ranked according to number of broadband subscribers per 100 inhabitants

(2) Average advertised download speed of broadband plans included in the survey (October 2007).

(3) Share of fibre connections in total broadband connections (June 2007).

(4) Monthly price per advertised Mbps in US$ at purchasing power parity (October 2007).

An econometric study for the OECD (de Ridder, 2007) found several key factors explaining the level of broadband takeup in different countries. On the demand side, they are price, income, education, weather and the size of the addressable market. On the supply side, they are urbanisation, unbundling of the local loop and competition.

- *Price:* Low broadband prices are generally associated with high takeup, but not always. Japan has the lowest broadband prices in the OECD but its penetration ranking is outside the Top 10 and falling. The last column in Table 1 shows three of the Top 10 have prices under $10/Mbps and the mean price of the other seven at $19 is close to the Australian price of $21.
- *Income:* The positive relationship between income and broadband takeup is clearer across customers within a country than at the national level across countries. Governments pursue general economic policies that increase national income and the demand for broadband. They also hope that causality will go both ways — that broadband will increase productivity and national income.
- *Education:* Tertiary education shows up as a significant factor driving higher penetration, both within and across countries. This is something governments can act upon. But it has not been a reason for Australia's relatively poorer performance in broadband takeup.
- *Weather:* Poor climate seems to be part of the explanation for Iceland's strong performance in broadband rankings. The hypothesis is that fewer hours of sunshine or more days of rain keep people indoors and close to their PCs. But weather may better explain how much time customers spend online rather than the type of connection they choose.
- *Addressable market:* The main addressable market for broadband is dial-up customers. At December 2005, Denmark, New Zealand and Germany were among the seven countries with the greatest potential for broadband growth because dial-up customers still exceeded broadband customers. In New Zealand's case, free local calls appear to account for the slow takeup of broadband because there is less incentive to migrate to broadband (Howell, 2008).
- *Urbanisation:* It is cheaper to connect customers in densely populated areas than in country areas. A city like Paris with over 20 000 inhabitants per square kilometre is likely to have more broadband than cities like Sydney and Melbourne with less than 500 people per square kilometre.
- *Unbundling:* Intuition suggests that unbundling the local loop should lead to greater broadband takeup, because it makes it easier for operators other than the incumbent to offer services. Attempts to prove this using cross-country data, however, have generated mixed results (see Table 1 and de Ridder, 2007). Korea did not require local loop unbundling until 2002, when it was already the world's leader in broadband penetration. The *lack* of forced local loop unbundling may have spurred investment in competing broadband infrastructure. Thrunet was the first to offer broadband, and it did this over its own cable.
- *Competition:* The main form of cross-platform competition for broadband has been between cable and ADSL. Wireless also looks like it could become

significant. The United States is the only country where there were more cable than ADSL customers at December 2005, but it is not in the Top 10 for broadband penetration. In fact, the United States is a mystery because on five of the eight key factors it is more than one standard deviation from the OECD mean in a direction that should lead to higher broadband penetration than it has.

Full speed ahead

The current telephony network (public switched telephone network or PSTN) was designed for voice. Technology and falling costs of equipment have enabled broadband speeds that meet current demand, but user expectations are changing and other countries have shown more urgency in preparing for this than Australia. To get higher speeds, the copper loops to customers from the local telephone exchange have to be shortened with FTTN or, better still, eliminated with FTTH.

The middle columns of Table 1 show that the highest advertised speeds are in countries with fibre in the customer access network, especially Japan, South Korea and Sweden, which have fibre-all-the-way (FTTH) networks. Note that speed is not advertised in New Zealand (i.e. the OECD estimated it for New Zealand) and in Australia it has to be advertised conservatively to satisfy the ACCC. The French result may be a result of advertising the three new competing fibre networks. Broadband there is usually provided over copper, which does not support the high average advertised speed.

Table 2: Fibre deployments

	Cost $A	*Homes (m)*	*Coverage %*	*Complete year*	*Comments*
FTTH:					
NTT Japan	$55bn	47	95	2010	Open access but rarely used
KT Korea	n.a.	12	92	2010	Government subsidy
Verizon (USA)	$24bn	18	50	2010	Regulatory forbearance
France Telecom	$0.4	1	4	2009	Regulatory forbearance
FTTN:					
AT&T (USA)	$7bn	18	50	2008	Regulatory forbearance
DT (Germany)	$5bn	8	21	2008	Regulatory forbearance
KPN (Netherlands)	$1.5bn	8	100	2009	Open access
TDC (Denmark)	n.a.	2	90	2010	

Sources: Ofcom (2007) and the author.

Table 2 indicates the scale and scope of investments by incumbents in fibre access networks. Sweden is not shown because the FTTH investments are not done by the incumbent. Note that some FTTN deployment will also include FTTH in new estate or 'green field' developments. It is at least three times more expensive to deploy FTTH in existing premises or 'brown field' situations — compare Verizon and AT&T below.

Putting fibre into the customer access network is expensive. Incumbents are reluctant to make such investments if they have to share them at regulated access prices as they are currently determined. As noted in Table 2, regulatory forbearance is one solution:

- In the United States, the FCC decided in 2003 that it would not regulate access to fibre networks built by phone companies because cable companies were not regulated and provided inter-platform competition.
- In France, access to fibre access networks is currently unregulated. ARCEP, the French regulator, has discounted sub-loop unbundling as a potential remedy on the basis that France Telecom's network topology is not suitable for a FTTN with VDSL deployed between the fibre nodes and customers (Annex 6.4, Ofcom, 2007). It is concentrating on options to facilitate end-to-end competition in access networks by seeking to 'mutualise' next-generation access investment (i.e. sharing common costs and bottleneck assets, typically ducting and in-building wiring). There has been a burst of investments by France Telecom, Free and Neuf Cegetel. Free has indicated that its network will be open access.
- In Germany, the government does not require Deutsche Telekom (DT) to provide bitstream access to competitors over its FTTN network. This defies EU regulation requiring incumbent operators that choose to provide bitstream DSL for their own services or to subsidiaries or third parties also to provide these forms of access to others under transparent and non-discriminatory terms. In January 2008, the German regulator told Deutsche Telecom to grant access to its ducts and — in cases where duct capacities are not available — also to its 'dark fibre' (fibre laid but not yet used). In addition, the order made it clear that DT must also offer its competitors access to the local loop in street cabinets.

Telstra unsuccessfully sought regulatory forbearance when it approached the government with a national broadband plan in August 2005. It was from this plan that the federal Labor government plucked the $4.7 billion cost estimate for its own National Broadband Plan. Forbearance is one of the options being considered by the UK regulator Ofcom. There are other solutions for access regulation (see de Ridder, 2008).

In Japan, providers are required to give competitors access to their fibre, but nearly all fibre connections are provided by facilities-based carriers using their own lines. And in Korea the government subsidised the construction of the country's internet backbone and provided subsidised loans to broadband providers.

In conclusion, most of the key drivers to broadband takeup are beyond the reach of government regulation and policy. Regulation and policy to promote broadband

in Australia have centred on unbundling (unbundled local loop and line sharing) and subsidies in regional areas. However, they now face their biggest challenge in deciding how to facilitate the National Broadband Network. If they succeed, Australia will be able to catch up with its peers in using broadband.

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