



## FINAL REPORT

**Prepared For:**

Bell Canada

# An international comparison of end-to-end facilities based competition in telecommunications

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An International Comparison of Telecom Facilities-Based Competition  
March 15, 2007

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## EXECUTIVE SUMMARY

- 1 Historically, telecommunications regulation enabled competing service providers to access the networks of incumbent carriers with monopoly heritage on pro-competitive terms. In this way, consumer welfare could be improved through retail competition, without requiring entrants to expend the very substantial fixed costs required to duplicate the underlying networks.
- 2 In parallel, less regulated cable networks developed, typically to carry television signals. These, too, typically had a monopoly heritage. Over time, technological and market developments – including the development of IP transmission allowing for products such as the world-wide web, Internet-protocol television (IPTV), voice-over-IP (VOIP) and cable telephony – have brought these two networks into the same arena of competition. No longer is either network the sole path to the home. In addition, wireless, satellite and other platforms provide additional paths into the home.
- 3 At the same time, the dismantling of telecommunications monopolies has enabled legacy copper networks to be overbuilt by more modern fibre-based networks, particularly in densely populated areas, reducing the need for regulated access to incumbent networks.
- 4 These developments have occurred to a greater or lesser degree around the world. In combination, they have created the prospect - and in some countries, the reality - of true end-to-end facilities-based competition, with two or more end-to-end networks capable of delivering services into the home.
- 5 As a result, the regulatory challenge has evolved from enabling retail competition based on wholesale access, to balancing this objective with the desire to create incentives for investment in facilities. Typically the latter is done by creating the conditions where an access seeker will progressively invest (i.e. climb the “ladder of investment”) and ultimately compete using its own facilities. The degree of investment considered desirable by regulators varies, however, with some setting access policies that provide incentives for competitors to develop end-to-end networks, and others considering that something short of this is optimal while pressing for the “last mile” to be accessed in a way that amounts to a second virtual pipe into the home. Against the overall economic and policy goals of efficient competition and consumer welfare, regulators have chosen a variety of regulatory settings.
- 6 Just as regulatory responses have differed, so have demand conditions. As a result, a range of broadband market outcomes are visible around the world.



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- 7 This study explores the relationships between market outcomes, wholesale regulation and end-to-end facilities based competition (EFC) in fixed networks<sup>1</sup> in thirteen countries around the world, with a focus on broadband (because it is a relatively new arena of competition between copper and cable networks, with no incumbency, and more readily yields comparable cross-country data).
- 8 We collected information for thirteen countries around the world, namely, Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Korea, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States. These were selected to provide a geographic range of markets in Europe, Asia Pacific and North America; markets within and outside the EU; large, mid-sized and small economies; markets with a range of levels of alternative infrastructure deployment; and markets with a range of broadband take-up levels. We gathered measures of:
- The extent of EFC, proxied by the extent of competing broadband-ready cable facilities to the home;
  - The extent of wholesale regulation (as identified by Gilbert + Tobin's regulatory index number, adjusted for broadband, in their companion report)<sup>2</sup>; and
  - Two broadband market outcomes in each country: broadband penetration and performance-adjusted price.
- 9 Importantly, this data showed that Canada is alone in the sample set as the only country with high levels of both EFC and wholesale broadband regulation. In other words, no other country in our study group with the extent of Canada's end-to-end facilities rollout has elected to impose as high a level of wholesale regulation as Canada.
- 10 We then analyzed this data to test three hypotheses that economics implies about the impact of competition and regulation:
- First, that more EFC results in superior market outcomes;
  - Second, that more EFC is better than more wholesale regulation; and
  - Third, that in countries with high EFC, wholesale regulation does not bring much additional benefit (that is, a double dose is not better than a single dose).
- 11 Our results on broadband penetration outcomes were clearly consistent with all three of these hypotheses.<sup>3</sup>

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<sup>1</sup> We have focused on competing cable, rather than wireless, facilities because it is presently the main mode of competition to fixed copper networks in the delivery of broadband services. Wireless technologies are relatively immature in offering broadband services, and comparable cross-country data is not easily available.

<sup>2</sup> Gilbert and Tobin, *International Comparison of Wholesale Regulation in Canada*, February 2007.





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- 12 Our results on performance-adjusted price are consistent with the first two hypotheses, and supportive (but not conclusive) with respect to the third hypothesis. That being said, it is telling that notwithstanding the fact that Canada has both high EFC and an extensive wholesale regulatory regime, Canada did not have much better market outcomes than those countries that had high EFC only.
- 13 We then considered in qualitative terms some of the key issues and implications relating to the relationships under scrutiny.
- 14 First, we considered how wholesale regulation may impact EFC. Across the studied countries, we saw substantial rollout of next-generation networks in countries with low wholesale regulation, and less or delayed rollout in countries with high levels of wholesale regulation, suggesting that network upgrades may be held back by regulatory considerations. We also saw some evidence that rollout of competing cable networks was being forestalled as competitors chose to use access-based alternatives rather than continue to invest in facilities – even, in some cases, within their own cable footprint.
- 15 Second, we considered how wholesale price regulation impacts upon “ladder of investment” access-based competition. In particular, we conducted a case study of the European countries in the study group, examining the relative prices and take-up of access-based alternatives such as Local Loop Unbundling (LLU) and line-sharing (LSS) (being different “rungs” on the ladder).<sup>4</sup> We found that these products are likely to be mis-priced relative to each other, distorting access decisions and investment decisions through which the ladder of investment is climbed.
- 16 Finally, we considered the circumstances in which regulation might be reduced, given the costs and distortions associated with perpetuating it. Some countries have looked to the number of networks as an important indicator of whether competition is sufficiently developed to deregulate customer access networks, with remedies removed only after thresholds have been reached. Other countries (including those that use the number of networks as a key indicator of competition) consider that deregulation is the best means of achieving a competitively optimal number of networks, effectively acknowledging the role that removal of regulation will play in achieving that outcome. Economics suggests that this is the right approach: consistent with our analysis, the extent of wholesale regulation is an important determinant of the incentive to invest in facilities, which will ultimately be to the benefit of consumers.

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3 Note that our empirical work represents correlations rather than proof of causality, but nonetheless presents support for the hypotheses that were tested.

4 Unbundling is a form of regulation which grants telecommunications operators access to the “local loop”, or the connection between the telephone exchange and the customer’s premises. Under full unbundling (or LLU), the operator has full access to the line and can provide both traditional voice telephony and data services. Under line sharing (sometimes referred to as LSS), the operator only has access to the bandwidths used for data, while the incumbent continues to provide traditional voice telephony over the same line.



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- 17 In summary, our results are consistent with the hypotheses that EFC delivers better market outcomes than access-based competition; and that wholesale regulation may bring little benefit if EFC is present.
- 18 Because of the costs associated with wholesale regulation – such as reduced incentives to extend cable networks – and the problems of pricing access so that the ladder of investment functions without distortion, regulators should consider reducing wholesale regulation, especially where EFC is evident. In doing this, regulators should have regard to the likely positive impact that reducing wholesale regulation will have upon future investment, competition and consumer welfare. Canada particularly - being the only country in the study group that yielded high scores on both the level of wholesale regulation *and* the level of EFC – could benefit from this approach.



## 1. INTRODUCTION

19 Policymakers around the world seek to ensure that their national telecommunications markets work well for consumers, delivering value for money, product innovation and good customer service. Historically this meant regulation that was focused on preventing the exercise of market power by the national incumbent telecommunications provider given its ownership of what was once a “natural monopoly” network. But as technology has advanced and rival networks have arisen to compete against incumbent telecommunications providers worldwide, the natural monopoly motivation for much of telecommunications regulation has disappeared. In its place, regulators have found themselves grappling with how best to facilitate investment in competing networks, while also creating the conditions for efficient competition by ensuring that rivals can gain access to any residual monopoly components of the incumbent’s network at rates commensurate with economic costs.

20 Regulators have responded to these technological changes in varying ways depending on the cost and demand conditions and the levels of investment in rival networks that have occurred within their jurisdiction. These underlying market differences, together with different regulatory responses, have produced a range of market outcomes.

21 CRA International was commissioned by Bell Canada to:

- Discuss what economics would suggest about wholesale regulation in telecommunications and the relationship to EFC; and
- Compare different levels of EFC and wholesale regulation with market performance of the telecommunications industry across a number of countries.

We have focused on broadband markets for three main reasons: first, broadband markets represent a relatively new arena of competition in which no player has a historic monopoly; second, comparative data on broadband was readily available for a wide range of countries; and third, the broadband market is likely to be the basis of competition in telecommunications going forward.

22 EFC refers to competition between two or more fully integrated platforms. This is distinct from access based competition, which refers to situations where non-incumbent operators compete partially or fully through use of the incumbent’s facilities. Access-based competition includes the use of LLU, LSS, bitstream or wholesale DSL products.

23 We compare Canada’s levels of EFC and wholesale regulation, and its performance on key broadband metrics, with 12 other countries included in this study: Australia, Denmark, Finland, France, Germany, Hong Kong, Korea, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States. These countries cover a variety of regions, market structures, regulatory responses, and market outcomes.<sup>5</sup>

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<sup>5</sup> This study is not intended to be a complete international comparison of all possible market outcomes.



- 24 Using these comparisons, we tested three hypotheses that arise from economics:
- First, that more EFC results in superior market outcomes;
  - Second, that more EFC is better than more wholesale regulation; and
  - Third, that in countries with high EFC, wholesale regulation does not bring much additional benefit.
- 25 We also discuss some of the key themes and issues that arise when the relationships between wholesale regulation, EFC and market outcomes are scrutinized.
- 26 The remainder of this report is structured as follows:
- Section 2 provides the economic framework for this study;
  - Section 3 analyses the country information to test the hypotheses, and discusses some key issues arising;
  - Section 4 provides some concluding remarks;
  - Appendix A discusses competition between two competitors;
  - Appendix B sets out relevant information regarding each country in the study;
  - Appendix C sets out summary data and information sources; and
  - Appendix D contains biographical information regarding the authors.



## 2. ECONOMIC FRAMEWORK

- 27 Telecommunications markets can vary across countries and over time for many reasons, including differences in competitive conditions, underlying cost and demand conditions, and regulation. Moreover, these reasons are not separable, in that the observed level of competition at any time may be the result of past regulatory action and it may simultaneously determine current regulatory responses. Our goal in this report is to provide meaningful comparisons of observed market outcomes across different telecommunications markets.
- 28 In telecommunications, this task is complicated. Several factors account for this.
- 29 First, in telecommunications the available consumer benefit is influenced by market structure at two levels: the network facilities level and the services level. At the network facilities level, the *market conditions* under which networks operate are critically important because they influence the downstream service layer. The types of services that may be available to consumers, and the prices at which those services are offered, then depend on market conditions at the network level. Complicating the analysis further, network capabilities are not fixed and unchanging; rather network owners may respond to opportunities created by technological or market developments at the services level by expanding or enhancing their networks.
- 30 Second, technological developments are enabling networks to deliver an increasing range of services. Incumbent telephony providers operate using their own copper and fibre networks, while cable incumbents have historically offered television service over their coaxial cable networks, and most have upgraded these networks to allow broadband access. As both types of networks increasingly move to IP-based technology and as access speeds and reliability increase, the networks can carry a wide variety of services. Cable networks may be used to provide Voice over Internet Protocol (VOIP) services, while IPTV services can be provided through incumbent copper networks. In short, technological and market developments are creating the potential for a much more open and competitive service environment.

### 2.1. DIFFERENCES IN COMPETITIVE CONDITIONS

- 31 A key reason as to why market outcomes can differ between countries is differences in competitive conditions. In this section, we discuss economic theory in relation to the implications of different market structures in telecommunications.
- 32 The least competitive market structure is an integrated monopoly at both the network and services level. Such a market (in the absence of regulation) could be expected to lead to prices significantly above efficient levels with the consequence of limiting demand for telecommunications services and constraining consumer welfare. A monopolist, without any competitive threat, may also face less incentive to invest in the development and deployment of new services delaying or denying completely the benefits those services could provide.



33 This benchmark market outcome can be compared with progressively more competitive structures. We first consider access-based competition, i.e. competition at the services level in which the service providers rely on wholesale access to the incumbent's network or components thereof. We then consider full platform competition between independent networks – that is, end-to-end facilities-based competition (EFC)<sup>6</sup>.

### 2.1.1. Access-based competition

34 Access-based competition arises where competitors purchase components of the incumbent's network, rather than build their own networks entirely, thus facilitating some competition in downstream markets where there may otherwise be none. However, as rivals depend to a greater or lesser extent on the networks of the incumbent operator, the scope for differentiating the type and quality of services provided is more limited under access-based competition than it would be if competitors had their own networks. As well, rivals will be dependent on the incumbent for inputs making up a potentially large part of their cost structure.

35 Access-based competition can also impact network investment. Under the ladder of investment model of regulation,<sup>7</sup> access-based competitors are presumed to enter the market at the resale or network element level and build a customer base and brand name before investing in their own networks. Initial entry at the retail level in this manner is seen to be a means to reduce the risk of further investment by the entrant to gradually roll out more of its own infrastructure. Thus access-based entry is seen as representing a 'stepping-stone' to greater network build.

36 The effectiveness of the ladder of investment model is under question, however. Well functioning capital markets could be expected to fund the start-up period for entrants to telecommunications markets, as occurs in other industries, without the need for the regulator to reduce investment risks. More critically, if regulators retain regulated access-based products in the marketplace for too long or at too low a price, they will deter entrants from making investments in their own networks.

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6 We use the term "end-to-end facilities based competition" or "EFC" to identify deployment by entrants of their own infrastructure directly connecting customer premises, as distinct from deployment by entrants of DSLAMs and other similar infrastructure but utilising unbundled local loops or other wholesale inputs supplied by the incumbent.

7 Cave, M., (2006), "Encouraging Infrastructure Competition via the Ladder of Investment", *Telecommunications Policy*, vol. 30, pp. 223-237.



- 37 Regulated access to the incumbent operators' networks can also affect the returns to the incumbents and their own incentives to invest in the maintenance and upgrade of their networks. In practice, setting access prices is prone to significant error, with the risk that prices may be set below the economic costs of providing the service, particularly where the measure of costs needs to take into account a reasonable return on risky investments in new technology.<sup>8</sup>
- 38 Given that regulated access prices carry a significant risk of error, the presence of access regulation by itself may act as a deterrent to new investment.<sup>9</sup> In this regard, there are reasons as to why access regulation should be removed wherever there is the *potential* for effective EFC. Retaining regulation until new networks are built may prevent those networks from ever being rolled out. The risk to investment incentives is a particularly serious issue in the current environment in which incumbent operators are contemplating large investments in Next Generation Networks (NGN). Such investments carry substantial risks, and traditional approaches to regulating access to the incumbent's network may not provide a sufficient return to justify these risks. In the current environment, the existence of access regulation carries significant risk of distorting technology choices and investment timing.<sup>10</sup>

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8 This might occur for at least two reasons. First, some regulators have tended to take an unrealistic view as to how efficiently a telecommunications network can be designed and operated in the real world. Second, the access regulation process tends to result in risk asymmetry for new investments by incumbent operators: if an investment succeeds in the market, the benefits are made available to the rest of industry through lower-than-otherwise access charges driven by low unit costs from high network utilization; whereas if an investment fails and the new network languishes, the investor is left bearing the cost.

9 See, for example, Jean-Jacques Laffont, (1994), "Access pricing and competition", *European Economic Review* 38: 1673-1710; Robert S. Pindyck (2004), "Mandatory unbundling and irreversible investment in telecom networks," National Bureau of Economic Research Working Paper 10287.

10 For example, the US Federal Communications Commission (FCC) found that access regulation in relation to broadband service was impeding the development and deployment of innovative broadband access technologies and services because vendors do not create technologies based around providing third-party access. Such technologies may not be implemented under access regulation, or they might be implemented only after they have been re-designed for access (see FCC, *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, August 5, 2005, para. 65ff).



- 39 The provision of access has been accompanied by ever more detailed and intrusive regulation in some countries<sup>11</sup> in respect of the conditions of access and the level and structure of final retail prices. Regulators have been drawn into setting not only prices but also detailed rules in relation to matters such as quality and the shared use of facilities by personnel of rival companies. In such a situation, there is significant scope for regulatory inefficiencies given the regulator's limited information on the costs of the incumbent, and the potential for regulatory capture by one side of the debate or the other.<sup>12</sup>
- 40 Finally, the cost to consumers of under-pricing access is likely to be greater than the cost of over-pricing.<sup>13</sup> If companies do not receive an adequate return, particular products may not be available at all, resulting in a loss of the entire consumer surplus that would be generated by their supply rather than a loss in some consumer surplus at the margin.

### 2.1.2. End-to-end facilities based competition

- 41 In this section we discuss the scenario of full competition between vertically integrated providers of network infrastructure and services ("platform" providers) as well as service-only providers.
- 42 In contrast to access-based competition, EFC enables competition over the entire value chain. As such, it can lead to greater price competition as entrants have full control over costs and face incentives to develop and deploy more efficient technologies in order to compete with the incumbent operators.<sup>14</sup> Once network operators have sunk the costs of infrastructure, they would, where necessary, be willing to offer at least some services to some customers at prices as low as the marginal cost of service provision. This is not to say that the market can or will settle into an equilibrium in which prices equal incremental cost; product differentiation as well as differences across consumer types make this highly unlikely, and the recurring fixed costs of network operation mean that marginal cost pricing for all services is not sustainable. Much more likely is a situation in which there is significant price differentiation taking into account demand as well as cost conditions.

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11 For example, the UK and Australia impose operational separation requirements on the incumbent.

12 George J. Stigler (1971). "The Theory of Economic Regulation" *Bell Journal of Economics and Management Science* 2(1): 3-21; Jean-Jacques Laffont and Jean Tirole (2000), *Competition in Telecommunications*, MIT Press, pp. 56-60.

13 See, for example, Productivity Commission, (2001), "Review of the National Access Regime", Report no. 17, Ausinfo, Canberra, p.83.

14 See e.g. Duarte Brito and Pedro Pereira, (2005), "Ownership Structure of Cable Networks and Competition in Local Access," *mimeo*, April.





- 43 By enabling competition between rival vertically integrated networks, EFC through competing networks can avoid the inefficiencies associated with uniform average cost based access pricing.<sup>15</sup>
- 44 EFC also enables greater service innovation.<sup>16</sup> First, entrants are no longer tied to the functionality of the incumbent's network. Second, end-to-end facilities based competition can overcome a "chicken and egg" problem: consumers may delay adoption of a technology until services or content operating on that technology are widely available, yet service or content provision may not be forthcoming until consumers adopt the technology in sufficient numbers. Development of the market may be delayed as long as control over the technology and the services remains decentralized. A more appropriate alignment of incentives for service introduction and network sponsorship may exist when owners of the technology (here, the network infrastructure) vertically integrate into service provision.<sup>17</sup> These network owners will be expected to introduce innovative new services in an effort to spur adoption and use of their network platform; they are the direct beneficiaries of consumer gains generated by innovative services, and can ensure that network development proceeds in a fashion that is supportive of services demanded by consumers.
- 45 Greater service differentiation, such as differing broadband speeds and new services, can help drive penetration by catering to a wider range of customers. The ability of entrants to develop entirely new services can also spur the incumbent to develop and more rapidly deploy its own innovations. For instance, cable operators were the first to introduce broadband services in many markets and have often taken the lead in increasing broadband speeds with the incumbent telcos following the cable providers' lead.<sup>18</sup> Indeed, the first country in the world in which DSL was deployed was Canada in 1997, one year after cable modems were introduced.<sup>19</sup>

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15 Under access-based systems independent retail entrants generally face access prices that are set on the basis of average cost (to allow the network owner to recover its fixed costs). This can lead to inefficient pricing where competition is not fully effective downstream. See, for example, Ingo Vogelsang, (2003), "Price regulation of access to telecommunications networks," *Journal of Economic Literature*, XLI, pp. 830-862.

16 Cave, M., 'Encouraging infrastructure competition via the ladder of investment', *Telecommunications Policy*, 30, 223-237, 2006.

17 See e.g. Robert W. Crandall, (2005), *Competition and Chaos: U.S. Telecommunications Since the 1996 Telecommunications Act*, Brookings Institution Press, pp. 122-123.

18 For instance, see the country studies in the European Regulators Group, *Broadband market competition report*, May 25, 2005.

19 Canadian Telecommunications Policy Review Panel, *Final Report*, 2006. In the US independent cable networks still retain around 60% of broadband customers, which may also reflect a greater incentive for independent cable operators to maintain competitive offerings including in terms of price and service functionality.

- 46 EFC can also create the conditions for the ultimate removal of access regulation and its attendant costs. This was recognized by the US Federal Communications Commission (FCC) in its decision to remove key regulations governing access to the fixed incumbent's networks for the provision of broadband services.<sup>20</sup>
- 47 In many markets, EFC has been limited to two operators in any one area, the incumbent telco and cableco.<sup>21</sup> Market evidence suggests that competition between incumbent telcos and cablecos has been intense. Operators are investing heavily to supply and take market share in relation to the core services of their rivals (e.g. cable operator investments in VOIP and fixed incumbent investments in IPTV).<sup>22</sup> Specifically, in relation to broadband competition, there is significant evidence that competition between cable companies and fixed wireline incumbents can boost broadband penetration. The OECD notes that "infrastructure competition has been the main driver of overall broadband penetration particularly in the residential market due to competition between DSL and cable modem services."<sup>23</sup>
- 48 Competition between the fixed incumbent operator and cable operators is increasingly taking the form of triple or quad play offers entailing fixed voice service, Internet, television, and (potentially) wireless. The economics literature predicts that "competition between bundles" can be a particularly effective form of competition between multi-product firms, and highly beneficial for consumers.<sup>24</sup> Competition between bundles "raises the stakes" of competition, and implies that lowering the price of one component can increase the sales of all components. Stronger triple-play competition will also imply that each platform will initially be a relatively small entrant in the core product of the other platform, strengthening the entrant's incentives to price aggressively and undermining the prospects for coordination.
- 49 We summarize the key incentives under EFC compared with access based competition below.

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20 In noting the existence of two competing platform providers in most parts of the country, the FCC held: "the marketplace should create incentives for facilities-based wireline broadband providers to make broadband transmission available on a wholesale basis without these requirements." See *FCC Report and order and notice of proposed rulemaking - Wireline Broadband Access*, August 5, 2005, para. 19.

21 We consider this type of competition in greater detail in Appendix A.

22 The European Commission has seen this as evidence of strong platform competition. See EC 11<sup>th</sup> Report, Vol. 1, p.211.

23 OECD, *Broadband access for business*, December 4, 2002, p.17.

24 For example, work by Nalebuff suggests that firms will face strong incentives to bundle their products to gain market share from rivals, and that competition in the provision of bundled products can lead to lower prices than when products are offered individually. See B. Nalebuff, (2002), "Competing against Bundles", in Hammond and Myers (eds.), *Incentives, Organisation and Public Economics*. See also M. Del Bianco, (2004), "Antitrust issues raised by product bundling in Communications market", *The Antitrust Source*, July.



**Table 1: Key Incentives under Access-Based and End-to-end Facilities Based Competition**

	<b>Access-Based Competition</b>	<b>End-to-end Facilities Based Competition</b>
Incentives for incumbent to invest and innovate	Investment and innovation on the part of the entrant may be deterred by low regulated access prices and on the part of the incumbent it may be limited by an inability to retain full returns to investment	Competition from rival networks can spur the incumbent to develop and deploy new products at a faster rate
Incentive for cost reductions over time	Price-cap regulation can be used to drive cost reductions, but it is limited by regulator's information on efficient costs. Cost-based price regulation can diminish the incumbent's incentives to reduce costs where cost savings are taken into account in setting future price levels	High as networks face incentives to reduce costs to be able to undercut rival infrastructures
Incentives for incumbent to grant network access	Limited, since wholesale services are generally seen as cannibalizing higher margin retail revenues	Enhanced by competition from alternative network, and the incentive to protect wholesale revenues by encouraging downstream entry
Incentive for entrants to invest	Build/buy decisions may be distorted by regulated access price – if the access price is set below realistic build costs, there is little incentive to invest	Efficient build/buy decisions provided there are no distortions elsewhere (e.g. asymmetric regulation)

## 2.2. MEASURING THE IMPACT OF REGULATION ON MARKET OUTCOMES

- 50 The relative merits of access-based competition and EFC is clearly an empirical question. At this juncture, the empirical literature testing these opposing views is relatively limited. Further, broadband markets are undergoing such rapid change that conclusions drawn from outcomes from several years prior may be overturned with more current information.
- 51 When undertaking any empirical comparison, it is important to take into account non-regulatory differences between countries such as demand and cost conditions that can lead to different market outcomes. For example, a key factor affecting the cost of broadband provision is population density. Populations that live in relatively concentrated areas are likely to be less costly to serve<sup>25</sup>, have greater broadband penetration<sup>26</sup> and have higher connection speeds.<sup>27</sup>

25 For instance, more concentrated populations enable the cost of street ducts to be spread across multiple customers and shorter local loop lengths. Similarly, a relatively high share of the population living in apartment buildings offers the potential to provide multiple connections at relatively low cost. Geographic terrain can also impact the cost of providing services to customer premises.

26 A number of econometric studies have confirmed the significance of population density in driving broadband penetration. See, for instance, J. Bauer, J.H. Kim and S. Wildman, (2003), "Broadband Uptake in OECD Countries: Policy Lessons from Comparative Statistical Analysis"; K. Flamm, "The Role of Economics, Demographics and State Policy in Broadband Availability", LBJ School of Public Affairs, Austin, TX.



- 52 Population density can also help determine the extent of EFC, because if the cost of broadband provision is lower, so alternative networks can become more economic to roll-out. In particular, the lower the cost of roll-out, the fewer customers would need to be acquired to make investment in an alternative network profitable.
- 53 Ultimately, the demand for a broadband connection is derived from the demand for the communication, information and entertainment services delivered over the broadband connection. As such, there are potentially a large range of factors influencing the demand for broadband connections. Demand-related variables that have been found to have a significant impact include income levels and the pricing of substitute products, particularly dial-up Internet.<sup>28</sup>
- 54 Given the difficulty in accurately measuring all of the fundamental cost and demand factors potentially affecting broadband outcomes, and the small sample size, there is a need for caution in drawing any strong inferences from the performance of any particular country. It is always possible that the performance of a particular country is at least partly attributable to a factor that has not been fully taken into account. Nonetheless, considering differences in cost and demand conditions will help to isolate the impact of competition and regulatory differences.

#### 2.2.1. Econometric studies to date

- 55 Distaso *et al.* present a framework of oligopoly competition with differentiated products to assess the distinct effects of access-based competition and platform competition, and then test this model using recent European data. The authors find:

*[T]he empirical evidence, using data available from 14 European countries, supports the theoretical predictions of the model and establishes inter-platform competition as the main driver of broadband adoption while competition within the DSL segment of the market seems to play a less significant role.<sup>29</sup>*

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- 27 S. Wallsten, (2006), "Broadband and Unbundling Regulations in OECD Countries", *AEI-Brookings Joint Center for Regulatory Studies Working Paper 06-16*.
- 28 Savage & Waldman found that higher income households have a stronger preference for high-speed Internet access (S.J. Savage & D. Waldman, (2005), "Broadband Internet access, awareness, and use: Analysis of United States household data", *Telecommunications Policy*, 29, 615–633. Income was found to be significant by K. Flamm, (2005), "The Role of Economics, Demographics and State Policy in Broadband Availability", LBJ School of Public Affairs, Austin, Texas, while the significance of dialup prices was found to be significant by A. Chaudhuri and K. Flamm, (2005), "An Analysis of the Determinants of Broadband Access", LBJ School of Public Affairs, Austin, Texas.
- 29 Distaso, W., P. Lupi, F. Maneti, (2006), "Platform competition and broadband uptake: Theory and empirical evidence from the European Union", *Information Economics and Policy*, 18, at 89.



- 56 Denni and Gruber find that access-based competition has a positive impact on the growth of penetration only initially, with the effect then dissipated over time.<sup>30</sup> They find that EFC has a much more important role in driving the rate of penetration in the long term. Similarly, a study by Garcia-Mullo and Gabel found evidence on the role of competition in stimulating broadband adoption, although they did not find a statistically significant effect of unbundling policies (i.e. access-based regulation).<sup>31</sup> Lee finds that while platform competition was significant in driving broadband take-up in the US, access-based entry has not had a significant impact.<sup>32</sup>
- 57 Wallsten tests the effect of a variety of regulatory policies.<sup>33</sup> He finds that local loop unbundling has no robustly significant impact on broadband penetration. He also finds that more extensive “subloop” unbundling is *negatively* correlated with penetration (that is, more subloop unbundling regulation is associated with worse broadband penetration). In fact, the only regulatory measure that was found to support higher penetration is regulation to allow competitors to collocate their equipment. In relation to this finding, Wallsten notes: “Rules that might be interpreted as making it more difficult for the incumbent to exercise market power—but without putting the incumbent at a disadvantage—seem to foster broadband adoption”.<sup>34</sup> However, Wallsten finds that regulating collocation prices slows broadband penetration as incumbents have little incentive to upgrade equipment when they may not gain a reasonable return on that investment.

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30 Gruber, Harald and Denni, Mario, (2005), “The Diffusion of Broadband Telecommunications: The Role of Competition”, September.

31 Martha Garcia-Murillo and David Gabel, (2003), “International Broadband Deployment: The Impact of Unbundling,” paper presented at the 31st Telecommunications Policy Research Conference, September.

32 Lee, S., (2006), “Broadband Deployment in the United States: Examining the Impacts of Platform Competition”, *International Journal on Media Management*, 8(4), 173–181.

33 S. Wallsten, (2006), “Broadband and Unbundling Regulations in OECD Countries”, *AEI-Brookings Joint Center for Regulatory Studies Working Paper 06-16*.

34 S. Wallsten, (2006), “Broadband and Unbundling Regulations in OECD Countries”, *AEI-Brookings Joint Center for Regulatory Studies Working Paper*.



### 2.2.2. Summary

58 Economic theory and the existing empirical studies underscore that large consumer benefits can be achieved by EFC, both in terms of low prices and high availability and quality of services at a point in time, and in the introduction of innovative new services over time. In contrast, competition based on access regulation is expected to deliver fewer benefits while carrying the risk of significant harm if investment by incumbents and entrants is deterred. Where EFC is already strong, there are reasons to question whether regulation of access-based competition would deliver sufficient additional benefits to warrant the risks to investment. We now turn to examine whether these propositions are borne out in the evidence from the countries studied.



### 3. ANALYSIS AND RESULTS

#### 3.1. INTRODUCTION

59 This section presents the results of our quantitative and qualitative analysis.

- First, we draw on market evidence to explore the drivers of competitive outcomes in broadband markets in the studied countries. We do this by considering the correlation between market outcomes and the levels of EFC, access-based competition and wholesale regulation.
- Second, we discuss three important issues that arise. These are:
  - The impact of wholesale regulation on EFC;
  - The impact of wholesale price regulation on “ladder of investment” access-based competition; and
  - When the regulatory burden should be eased.

60 In our analysis, we focus on residential broadband markets. Compared to other mainstream telecommunications services, broadband represents a relatively new arena of competition between facilities-based competitors (typically cable companies and fixed network incumbents). Neither network owner starts from a position of incumbency for broadband,<sup>35</sup> unlike the position if telephony or television services were included, so incumbency (and the retail regulation that often accompanies it) is less likely to distort the results. Moreover, comparable data is more easily available across the range of countries than if telephony/VOIP or television/IPTV were included.

##### 3.1.1. Market measures

61 The market variables we examine are as follows.

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<sup>35</sup> While incumbent telcos are likely to start with a large number of dial-up Internet access customers, market research suggests that the move to broadband is a major decision point for consumers at which they generally contemplate a change of service provider as well as the type of service they are purchasing.

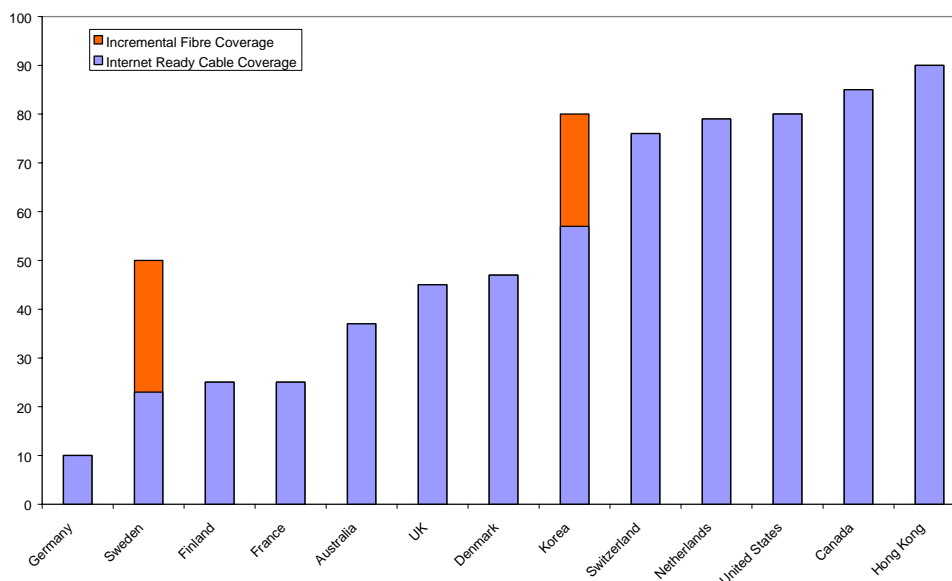


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*End-to-end facilities based competition (EFC)*

- 62 We measure the degree of EFC in each country using the percentage of homes that are passed by infrastructure that is broadband-capable (i.e., coax, fibre, or HFC).<sup>36</sup> Interestingly, some countries show large gaps between the number of homes passed and the number of broadband-ready homes. This is generally dependent on how old the cable is, and the ability or motivation of the cable owner to upgrade it.
- 63 The OECD's measure of the percentage of households passed by Internet-ready cable provides a consistent measure across all countries in our study. This is adjusted for Korea and Sweden because fibre-to-the-home networks in those (and only those) countries are sizeable and not included in the OECD's measures (see Figure 1).

**Figure 1: EFC Measures in Selected Countries**



Source: Total cable and Internet Ready cable coverage data from OECD Communications Outlook 2005 Figure 4.5 (p. 97). The fibre coverage data for Sweden is from Broadband Wales Observatory (<http://www.bbwo.org.uk/broadband-3045>) and for Korea is from Hanaro Form 20-F ([www.secinfo.com/d12Um2.vsp.htm#1stpage](http://www.secinfo.com/d12Um2.vsp.htm#1stpage)).

<sup>36</sup> We recognize that using the extent of cable as a measure of overbuild involves the inherent assumption that incumbent copper networks cover virtually all of the country, but we view this assumption as reasonable.





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*Wholesale regulation*

- 64 While the degree of wholesale regulation bears some relationship to the degree of access-based competition, this varies across countries (in both directions) and is not as close as might be expected. We have therefore used the degree of wholesale regulation – which is directly controlled by governments and policy-makers, in a way that the degree of access-based competition is not – as the prime measure to test against market outcomes.
- 65 We use the broadband scores in Gilbert + Tobin’s Regulatory Index Number assessments, as described in their companion report (G+T Report),<sup>37</sup> to classify each of the 13 countries as Low, Medium, High or Very High regulation countries. Our classification is based on the G+T regulation index for broadband markets only (that is markets 11,12 and 14). A detailed description of the methodology used by Gilbert + Tobin is set out in their report.
- 66 Table 1 presents the regulation classification for each country. The United Kingdom, Australia and France have the highest levels of wholesale regulation in broadband markets, while Canada ranks just below these countries. Switzerland and Hong Kong are the countries with the lowest wholesale regulation.

**Table 1: Levels of Wholesale Regulation in Selected Countries**

<i>Low Regulation Countries</i>	<i>Medium Regulation Countries</i>	<i>High Regulation Countries</i>	<i>Very High Regulation Countries</i>
Hong Kong	Denmark	Canada	Australia
Switzerland	Finland		France
	Germany		UK
	Korea		
	Netherlands		
	Sweden		
	US		

Source: Gilbert + Tobin, *International Comparison of Wholesale Regulation in Canada*, February 2007.

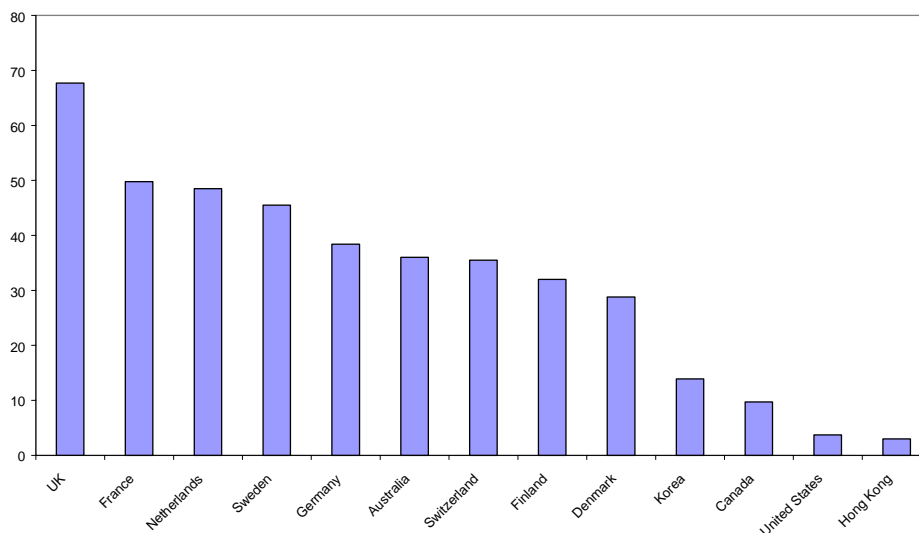
<sup>37</sup> Gilbert + Tobin, *International Comparison of Wholesale Regulation in Canada*, February 2007.



*Access-based competition*

67 As a secondary measure to wholesale regulation, we also consider the degree of access-based competition in broadband. Here, we look at the percentage of DSL lines that are sold under wholesale arrangements. The level of access-based competition that actually occurs in a country may vary from its degree of wholesale regulation, because wholesale regulation may or may not lead to sustainable access-based entry. We do this in order to examine differences across countries that may be relevant to understanding our results. For example, Switzerland has little wholesale regulation, but a reasonably high level of access-based competition in broadband. Canada has the opposite. It is helpful to be aware of these kinds of variations when considering the results of other comparisons. Figure 2 below shows these measures for the studied countries.

**Figure 2: Proportion of DSL Lines Provided to Competitors via Wholesale**



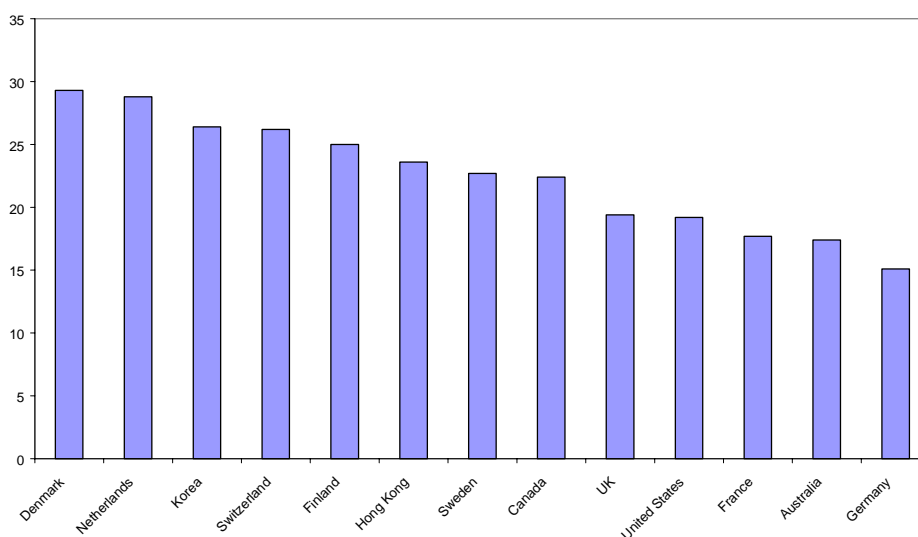
Source: Access-based competition data from IDATE (European data), MIC (Korean data), ACCC (Australian data), FCC (2006) High Speed Data Services for Internet Access: Status as at December 31 2005 (United States data), and CRTC (2006) CRTC Telecommunications Monitoring Report, July (Canadian data).



### *Penetration outcomes*

68 Broadband penetration is a key measure of success. It is certainly the most easily measured, typically by the number of broadband subscribers per 100 of population<sup>38</sup>. We use the OECD (2006) broadband penetration measure. The measures for the countries in question are shown in Figure 3 below.

**Figure 3: Broadband Penetration, (Broadband Subscribers per 100 Inhabitants), in Selected Countries**



Source: OECD Broadband Statistics to June 2006 ([http://www.oecd.org/document/9/0,2340,en\\_2649\\_34225\\_37529673\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/9/0,2340,en_2649_34225_37529673_1_1_1_1,00.html)) for all countries except Hong Kong. Since Hong Kong is not an OECD country, their penetration data comes from the ITU Internet Report 2006.

### *Performance-adjusted price outcomes*

69 Broadband price is also a key outcome, but is less easily compared than penetration because broadband services typically vary among providers on several value dimensions that change frequently. These can include:

- Speed of connection;
- Download and upload limits (volume of data);

<sup>38</sup> Household penetration is another oft-used measure of broadband penetration (which yields a higher figure than subscribers per 100 population, because on average households consist of more than one person), but comparable data across the range of countries in our study is not easily available.



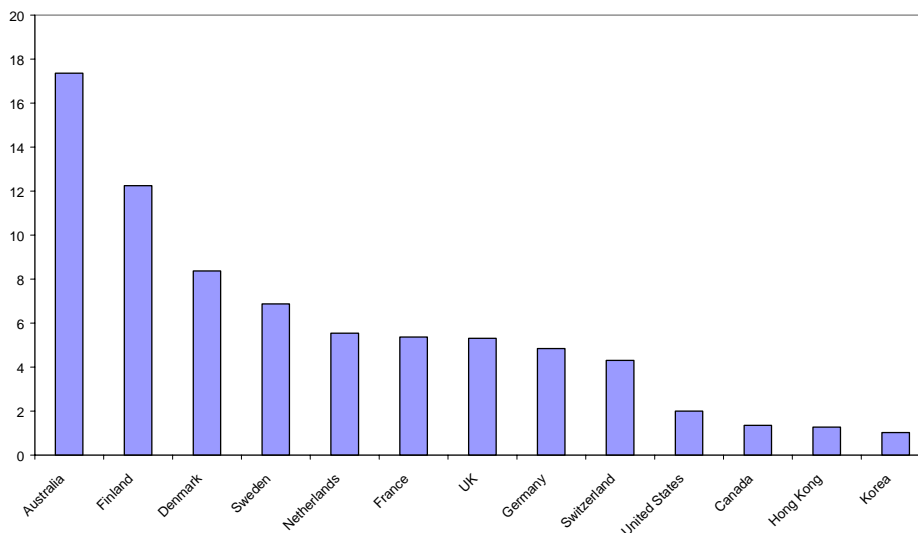
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- Shaping (slowing of connection once download limits are reached) or excess download charges;
- Commitment term; and
- Included content.

70 As a result, it is difficult to obtain “apples-with-apples” cross-country data that appropriately encompasses all of these variables.

71 It is likely, however, that speed is the most visible and valued dimension of service, with download limit also important (although typically higher for higher-speed plans). We have therefore used a measure from the OECD that adjusts price for speed to give price per 100 kbps in purchasing power parity (PPP) adjusted US dollars (Figure 4). The OECD measure is based on incumbents’ basic DSL offerings with unlimited downloads. As the OECD does not produce a measure for Hong Kong, we use the equivalent basic DSL offering from the Hong Kong incumbent.

**Figure 4: Performance-Adjusted Broadband Price (Price per 100 kbps), in Selected Countries**



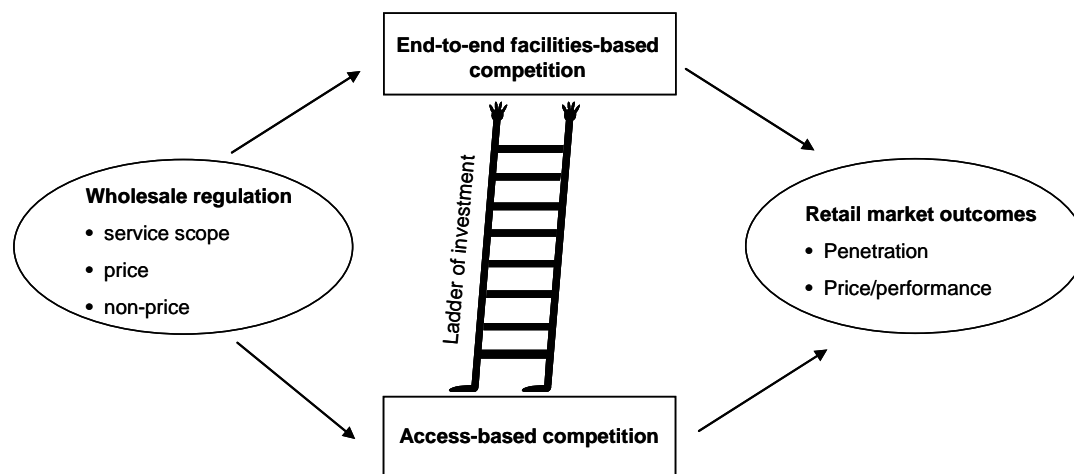
Note: Price (in US\$ PPP) per 100kbps in selected countries. Based on basic incumbent DSL offering with unlimited downloads.

Source: OECD Communications Outlook 2005 for all countries except Hong Kong. Since Hong Kong is not an OECD member an equivalent offering from the incumbent (PCCW) is used for comparison.

- 72 This measure favours countries that have higher-speed plans, because the denominator is many times larger. Speed is a function of network upgrade, which requires investment. These scores, then, should not be considered as pure price comparisons, but a more general assessment of price and performance of the product, as influenced by the level of network investment in each country.
- 73 Of the two market outcome measures, we believe that more weight should be placed on broadband penetration outcomes than the performance-adjusted price outcomes. This is because penetration is more objectively and accurately measured, data is more recent, and price and performance issues should already be reflected to some degree in penetration data. Further, the penetration figure measures subscribers of all market participants, while the performance-adjusted price figure is that of the incumbent fixed-line network owner only.

### 3.1.2. Conceptual framework and hypotheses

- 74 These variables and outcomes can be conceptually mapped, as shown below.



The ladder of investment, whereby entrant competitors are intended to climb from access users to facilities owners, is described in more detail in Gilbert + Tobin's companion report in section 8, including the following description: <sup>39</sup>

<sup>39</sup> Oldale and Padilla, *From state monopoly to the investment ladder: competition policy and the NRF*, in "Pros and Cons of Antitrust in Deregulated Markets", published by Swedish Competition Authority (2004) at page 70, cited in Gilbert + Tobin's companion report, section 8.



*“The mechanism underlying the ladder of investment is in theory rather simple. Initially, regulation will encourage entry into the wholesale market where SMP is found to exist by setting low (possibly below cost) access prices for those assets that entrants find difficult or costly to replicate. ... Over time, once entrants consolidate their beachheads and start to earn positive rents, regulators will proceed to increase access prices. They will have to do so in descending order of asset replicability: those assets that are easier to replicate will experiment [sic] the price increase first. Entrants are expected to respond to those price increases by investing in assets that were previously regarded as non-replicable. In this way, what started as serviced-based competition will blossom into self-sustaining infrastructure competition.”*

### *Hypothesis outlines*

- 75 Economics suggests certain hypotheses regarding the relationships between EFC, wholesale regulation and market outcomes. The first hypothesis that we test addresses the relationship between EFC and retail market outcomes: namely, *that high levels of EFC lead to better retail market outcomes.*
- 76 The second hypothesis tests whether the outcomes in countries with high levels of end-to-end facilities competition (and low levels of wholesale regulation) are superior to the outcomes in countries with high levels of wholesale regulation (and low levels of EFC): namely, *that end-to-end facilities based competition leads to superior retail market outcomes than wholesale regulation.*
- 77 The third hypothesis addresses whether a “double-dose” of both EFC and wholesale regulation is associated with better retail market outcomes than EFC alone: namely *that “double-dose” countries have no better (and possibly worse) outcomes than countries with a “single dose” of EFC alone.*

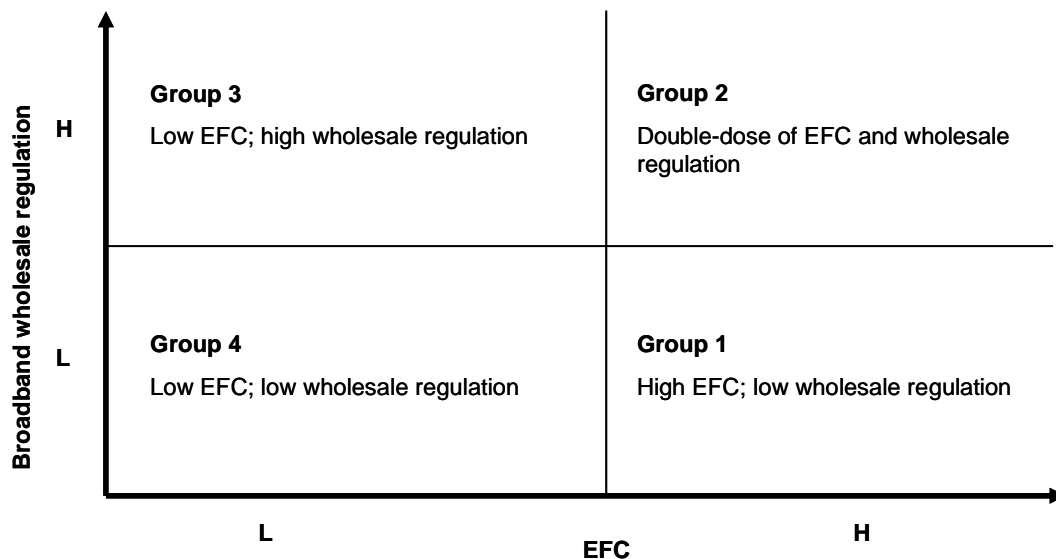
### *Methodology*

- 78 We undertake four steps to test these hypotheses.
- 79 First we map each country on a 2x2 matrix, showing EFC on one axis, and wholesale regulation on the other. This identifies, for future reference, the countries falling into each quadrant shown in Figure 5 below:



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Figure 5: The Quadrant Diagram



- 80 Next, we plot the two market outcome measures (penetration and performance-adjusted price) against the extent of EFC to see if they correlate. This tests our first hypothesis.
- 81 Then, we compare performance data for Group 1 countries and Group 3 countries, to see which is better. This tests our second hypothesis.
- 82 Finally, to test the third hypothesis, we consider only the sub-set of countries that have high EFC. We then examine market outcomes for each country, to test if the “double-dose” country (Canada) achieves better outcomes than the countries that have high EFC but not extensive wholesale regulation.

### 3.2. HYPOTHESIS TESTING

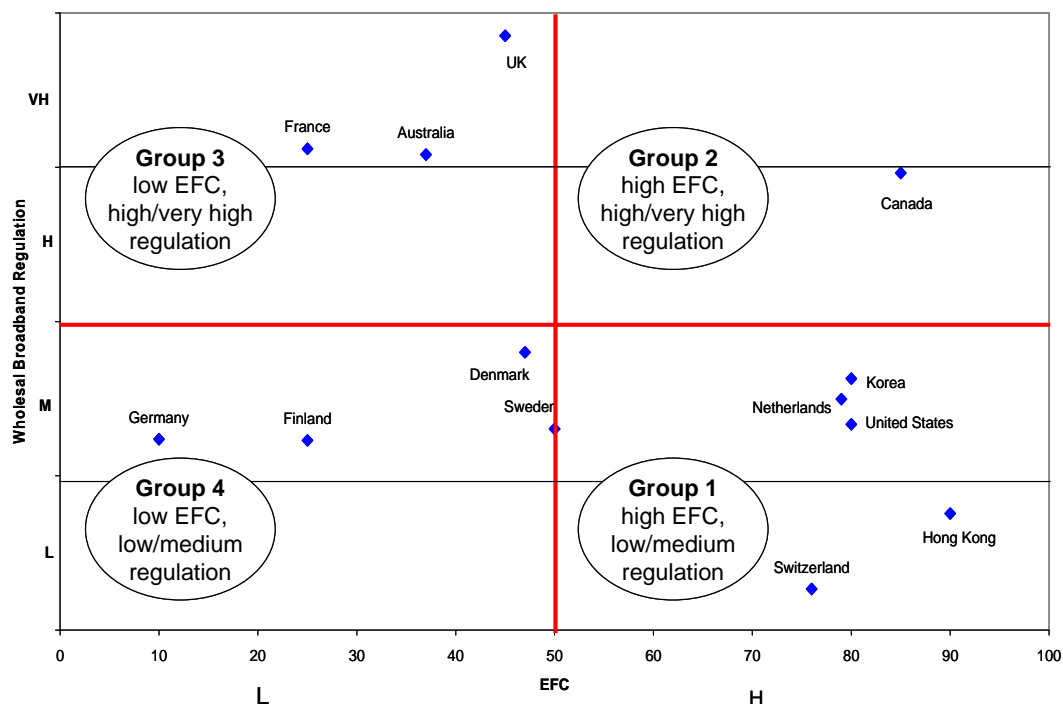
- 83 In this section, we utilize various input and output measures to test the three hypotheses presented above. We acknowledge the analysis does not prove these hypotheses; rather it highlights a number of key relationships and trends. Results are couched in terms of whether they are consistent with the hypotheses or otherwise.
- 84 Figure 6 plots the thirteen countries in terms of the extent of EFC and wholesale broadband regulation. It can be seen that all countries fall broadly into one of four clusters:
- Countries with low or medium wholesale regulation and high EFC, being Hong Kong, Switzerland, United States, the Netherlands and Korea (“Group 1”).
  - Countries with high or very high wholesale regulation and high EFC, consisting only of Canada (“Group 2”).



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- Countries with high or very high wholesale regulation and low EFC, being France, Australia and the United Kingdom (“Group 3”).
- Countries with relatively low EFC and low or medium wholesale regulation, being Germany, Finland, Denmark and Sweden<sup>40</sup> (“Group 4”).

**Figure 6: End-to-end Facilities-based Competition and Wholesale Broadband Regulation Index in Selected Countries**



### 3.2.1. Testing Hypothesis 1 – End-to-end facilities based competition results in superior outcomes

**Hypothesis 1:** High levels of EFC lead to superior market outcomes, all else being equal (i.e. countries in Groups 1 and 2 deliver better outcomes than countries in Group 3 and 4).

#### Broadband penetration

85 Figure 7 plots broadband penetration against EFC for study countries. The results indicate that broadband penetration is generally higher in countries with higher platform competition. This is consistent with hypothesis 1, that platform competition is important in stimulating overall broadband penetration.

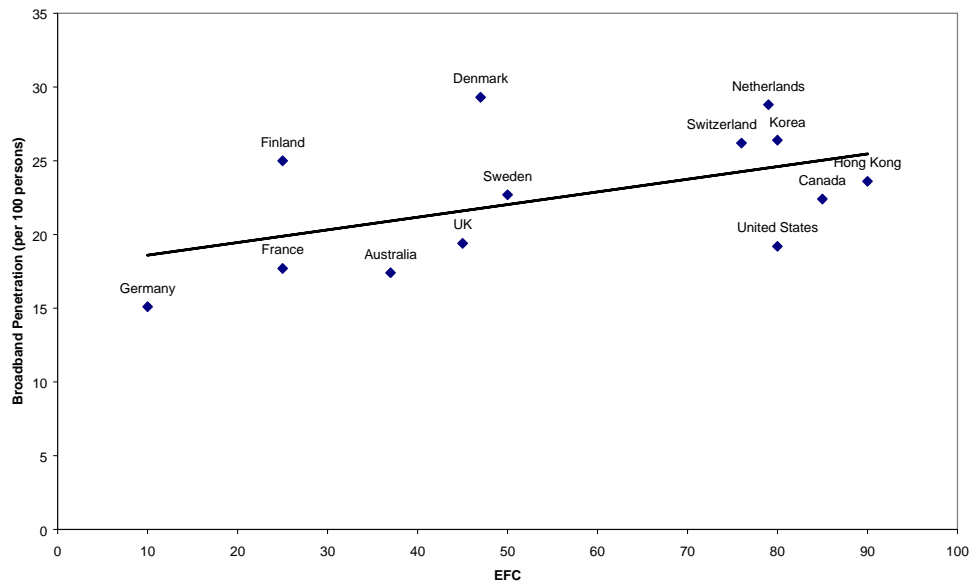
<sup>40</sup> Sweden has greater EFC than other Group 4 countries; however it is well below Group 1 countries. The inclusion of Sweden as a Group 4 country does not impact results.





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**Figure 7: End-to-end facilities based competition and Broadband Penetration in Selected Countries**



Note: In this and other charts where a line is shown, it is the line of best fit (or regression line).

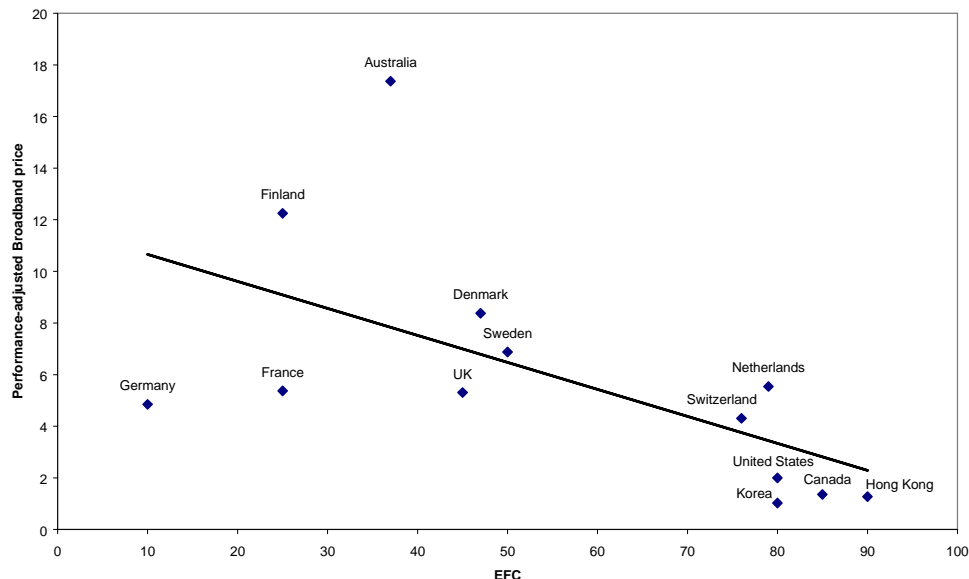
***Broadband price and performance***

86 Figure 8 plots performance-adjusted broadband price against the degree of EFC. The results indicate that broadband price/performance outcomes are generally better in countries with higher platform competition. This too is consistent with hypothesis 1, in that platform competition is important in stimulating lower performance-adjusted broadband prices.



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**Figure 8: End-to-end facilities based competition and Performance-Adjusted Broadband Price in Selected Countries**



87 Australia is the outlier in this set of results. Its performance-adjusted price score is affected by the relatively slow speeds available. As noted in section 3.1, this reflects a lack of investment in network upgrades that in turn reflects the low investment incentives faced under Australia’s wholesale regulatory regime.

88 Overall, these results show a positive correlation between superior outcomes and EFC, consistent with hypothesis 1 (all else being equal).

**3.2.2. Testing Hypothesis 2 – More end-to-end facilities based competition is better than more wholesale regulation**

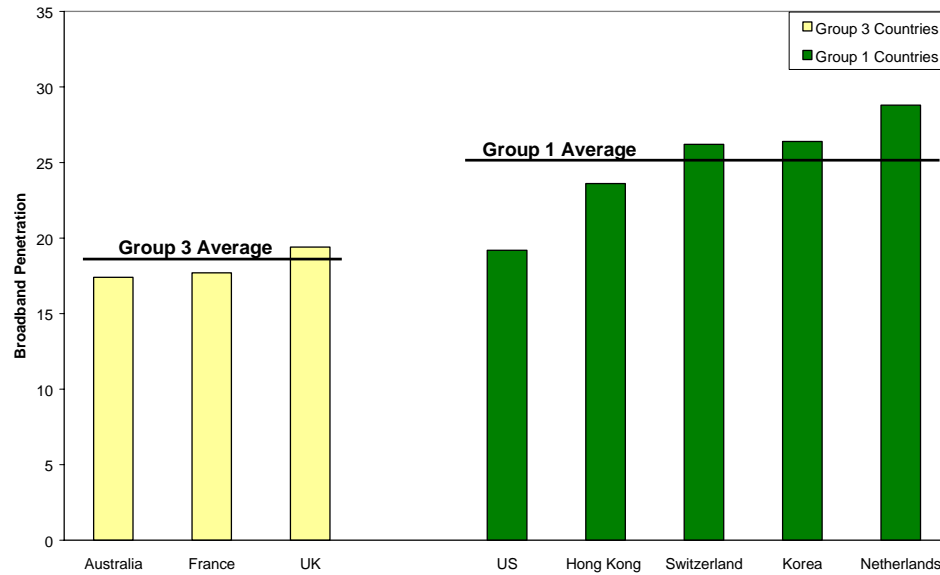
*Hypothesis 2: EFC leads to better retail market outcomes than wholesale regulation (i.e. countries in Group 1 deliver better market outcomes than countries in Group 3)*

*Broadband penetration*

89 Figure 9 below shows broadband penetration in Group 1 and Group 3 countries. Penetration is almost universally higher in group 1 countries and the average penetration rate in Group 1 is higher than that in Group 3. In other words, superior performance correlates better with high EFC than with high wholesale regulation, consistent with hypothesis 2.



**Figure 9: Broadband Penetration in Group 1 and Group 3 Countries**

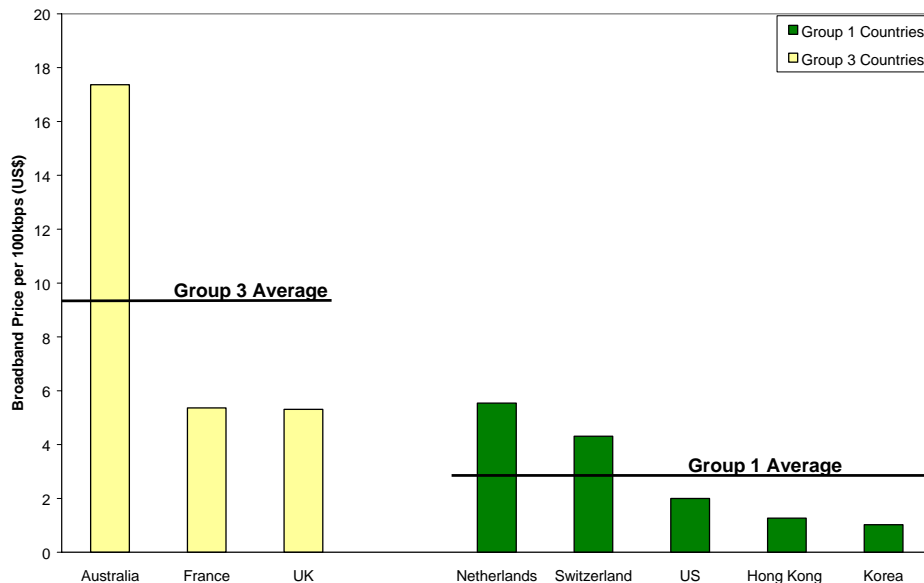


*Broadband price and performance*

90 Figure 10 plots performance-adjusted broadband price for Group 1 and Group 3 countries. The results suggest that broadband price/performance outcomes are generally better in countries with lower levels of wholesale regulation and higher levels of EFC. These are also consistent with hypothesis 2.



**Figure 10: Wholesale Broadband Regulation and Performance-adjusted Broadband Price in Selected Countries**



91 The results support the hypothesis that high levels of EFC correlate more closely with superior market outcomes, compared with high levels of wholesale regulation. It could, in theory, be the case that causation flows in the other direction, i.e. that more regulation is imposed precisely in those countries whose markets are performing poorly by international standards. However, if this were the case, the evidence would suggest that regulation has not been successful in eliminating the inferior performance.

### 3.2.3. Testing Hypothesis 3 – In countries with high end-to-end facilities based competition, wholesale regulation does not give additional benefits

**Hypothesis 3:** Countries with a “Double Dose” of both EFC and wholesale regulation have no better (and possibly worse) outcomes than countries with a “single-dose” of EFC alone (i.e. countries in Group 1 deliver better outcomes than countries in Group 2).

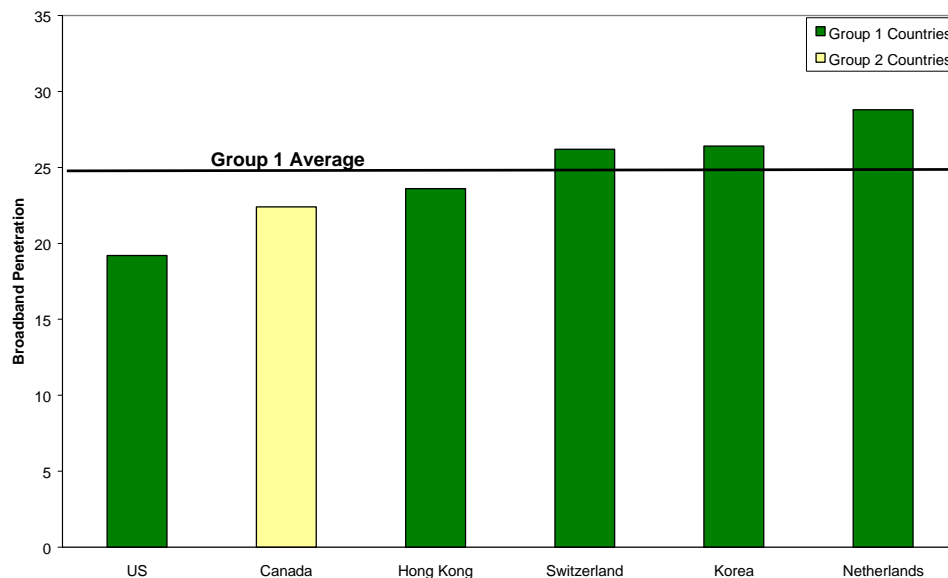
92 Significantly, Canada is the only Group 2 country. That is, it is the *only* country with a high level of EFC *and* high wholesale broadband regulation (see Figure 6).

93 As indicated in section 3.1 above, hypothesis 3 requires us to focus only on countries with high levels of EFC (i.e. Groups 1 and 2). In Figure 11 below, we compare broadband penetration in these countries only.

94 It can be seen that all Group 1 countries (excluding the United States) have higher broadband penetration than Canada, suggesting that a double dose does not correlate with improved penetration, in the presence of EFC.



Figure 11: Broadband Penetration in High EFC Countries Only



- 95 Turning to performance-adjusted broadband price, Canada is achieving price/performance outcomes around the level of Korea, Hong Kong and the United States, which have lower levels of broadband wholesale regulation (Figure 12). This result suggests that the higher levels of wholesale broadband regulation in Canada are not indicative of improved price/performance outcomes relative to those countries.
- 96 However, Canada (like Korea, Hong Kong and the United States) has a better broadband price/performance score than Switzerland and the Netherlands. While this is, in our view, a less important measure (for reasons explained in section 3.1.1 above), it is worth considering why this is so<sup>41</sup>.

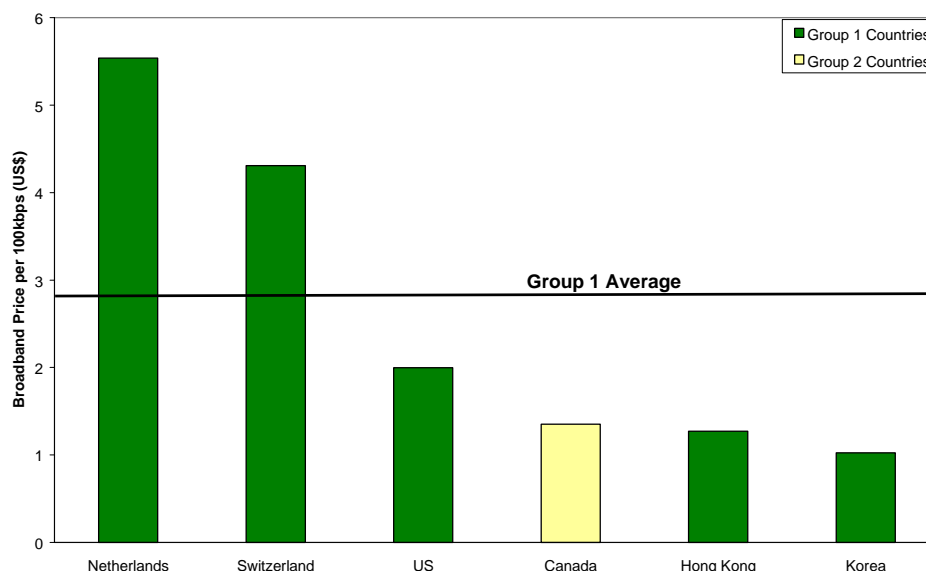
41 Interestingly, both Switzerland and the Netherlands also experience high levels of access-based competition, even though levels of wholesale regulation are relatively low.



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97 One possibility is that the cable companies in those countries are less robust and effective competitors than the Canadian cable companies, and do not invest in higher speed services (which reduce the performance-adjusted price score) or otherwise place strong price pressure on the incumbent. Canada does offer higher maximum speeds than those available in Switzerland or the Netherlands. Scale economies may also play an important role in these results. While the extent of EFC in Switzerland and the Netherlands is on par with Hong Kong, Korea, Canada and the US, cable networks are more fragmented; and cable operators may fail to capture the economies of scale that enable them to invest and compete more aggressively. In Switzerland, there are around 415 different cable operators, with the largest having only around 50% share and the next largest less than 5%<sup>42</sup>, severely limiting the potential for scale economies. In the Netherlands, lack of scale, as well as financial pressure on cable operators is said to hinder their ability to compete effectively with the incumbent.<sup>43</sup> As a result, cable operators may be putting less competitive pressure on incumbents in these countries through higher-speed or lower-priced offerings. In contrast, in Canada the four largest cable operators serve the vast majority of cable subscribers.<sup>44</sup>

**Figure 12: Performance-adjusted Broadband Price in High EFC Countries Only**



42 [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.34

43 <http://www.bbwo.org.uk/broadband-3052>

44 CRTC, (2006), *Broadcasting Policy Monitoring Report 2006*, pp. 102, 105.



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98 Results for (the less significant measure of) performance-adjusted price are less clear than for penetration, but they do show that Canada's performance only matches the best-performing countries, which have far less wholesale regulation, but similar levels of EFC. While Canada performs better on this score than less-regulated Switzerland and the Netherlands, it is not clear whether this may be due to factors unrelated to wholesale regulation (such as relatively stronger competition from cable companies).

#### 3.2.4. Summary

99 In this section we categorize each country in the study according to its level of EFC, and its level of broadband wholesale regulation. We find that Canada alone has high levels of both.

100 We then test three hypotheses about the impact of competition and regulation:

- More EFC results in superior market outcomes;
- More EFC is better than more wholesale regulation; and
- In countries with high levels of EFC, wholesale regulation does not bring additional benefits (that is, a double dose is no better than a single dose).

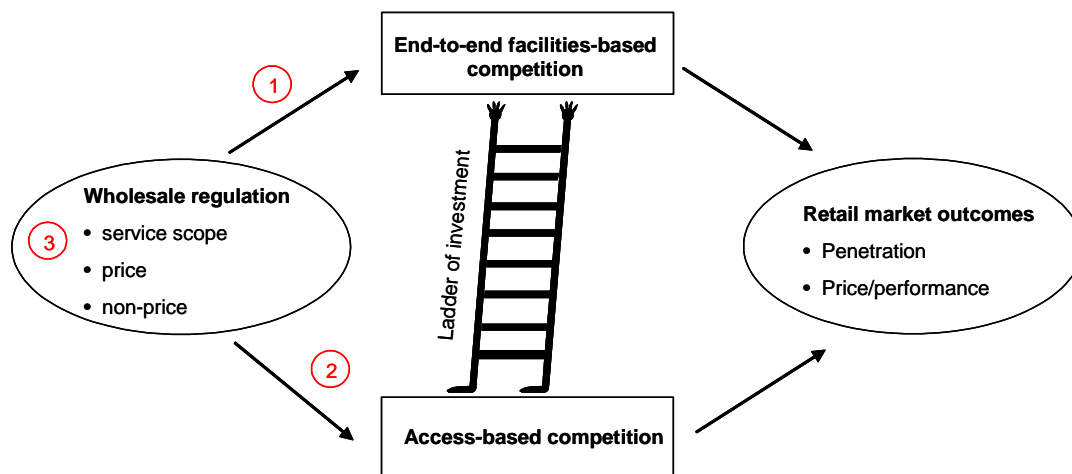
101 Our results on broadband penetration outcomes were clearly consistent with all three hypotheses, although these represent correlations rather than causality.

102 Our results on (the less important) performance-adjusted price measure are consistent with the first two hypotheses, but less clear on the third hypothesis – although the outcome for Canada only matches that of countries with much lower levels of wholesale regulation.

### 3.3. DISCUSSION OF KEY ISSUES

103 The above section considers some quantitative relationships that emerge from the data we have gathered. However, the data tells only part of the story. In this section we explore in more detail how important factors that influence market outcomes interact with each other and with the observed outcomes across the studied countries.

104 The retail market outcomes we have observed – penetration and performance-adjusted price of residential broadband services – are the result of competitive activity that takes place between end-to-end *facilities-based competitors* and *access-based competitors*. Wholesale regulation clearly supports and sustains access-based competition, but it also influences the economics of facilities-based competitors and the competition that they offer, as conceptually illustrated below.



105 In this section, we discuss three themes, relating to the areas of the diagram as numbered above:

1. How wholesale regulation impacts EFC: In particular, is wholesale regulation chilling the incentive for end-to-end facilities-based competitors to extend networks?
2. How wholesale price regulation affects 'ladder of investment' access-based competition: Is there evidence that wholesale price regulation is distorting access decisions and acting as a disincentive to climbing the 'ladder of investment'?
3. Reducing the regulatory burden: Given the costs and distortions associated with wholesale regulation, how and when should its roll-back be considered?

### 3.3.1. How wholesale regulation impacts end-to-end facilities based competition

106 In this section we discuss whether the studied countries show any evidence that wholesale regulation is chilling the incentive for EFC competitors to extend their networks; and in particular, whether wholesale regulation is providing appropriate "build versus buy" pricing signals<sup>45</sup> and whether EFC competitors view wholesale access as a substitute for network expansion.

<sup>45</sup> The impact of wholesale regulation on the incentives for access-based competitors that have not undertaken infrastructure investment is considered in a later section.





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- 107 We recognize that to ensure competition in the service provision to certain customers (for example, in remote areas) current facilities-based competitors may rely on wholesale access. Nevertheless, it is highly likely that wholesale regulation can dampen the incentives for competitors to extend network coverage, especially to exchanges neighbouring the current network, and it appears that this may be occurring in at least some countries in the study group, and is not limited to these countries.<sup>46</sup>
- 108 In the UK, the cable company NTL is making extensive use of LLU provided by BT. NTL's (former) chief executive, Simon Duffy, has been quoted as saying that it is more cost-effective to extend the reach of its broadband offering through LLU, than to expand its network to satisfy demand from customers who reside outside its areas.<sup>47</sup>
- 109 In France, where a complete, price-regulated portfolio of DSL services is in place, cable has developed poorly as a rival technology. Only 36% of French homes were passed by cable in 2003, only slightly higher than the 32% of homes passed by cable in 1999.<sup>48</sup> Accordingly, French cable rollout remains significantly below the OECD average. Moreover, the absence of new investment in France can be contrasted with the situation in Switzerland in which the percentage of homes passed by cable increased from 75% to 95% over 1999 to 2003. Switzerland is noticeable for the absence of either LLU or wholesale bitstream access regulation. The French Cable Operators Association has attributed the lack of investment in alternative infrastructure to French regulatory policy favouring service competition based on regulated access to France Telecom's copper network.<sup>49</sup>
- 110 In Australia, where the degree of wholesale regulation is high, Telstra's main facilities-based competitor, SingTel Optus, stopped its hybrid-fibre coax cable (HFC) rollout some years ago and has since been a heavy user of regulated wholesale services in Telstra's network, including LLU and line-sharing.

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46 For example, in Spain, the biggest cable operator, ONO-Auna, uses regulated wholesale products to increase its coverage area. The result of wholesale regulation has been considerable growth of unbundling and DSL lines, but at the same time the rate of growth of cable broadband connections has slowed (ETNO (2005), ETNO reflection document on re-assessing the "ladder of investment" in the context of broadband access regulation", September 2005).

47 See <http://news.zdnet.co.uk/communications/0,1000000085,39167411,00.htm> and; [http://www.theregister.co.uk/2004/09/21/ntl\\_llu/](http://www.theregister.co.uk/2004/09/21/ntl_llu/).

48 OECD Communications Outlook 2003 and 2005.

49 AFORM's response to the consultation by the EC regarding the revision of the regulation of electronic markets , [http://europa.eu.int/information\\_society/policy/ecomms/doc/info\\_centre/public\\_consult/review/comments/aform.pdf](http://europa.eu.int/information_society/policy/ecomms/doc/info_centre/public_consult/review/comments/aform.pdf).



111 In summary, wholesale regulation of DSL input services likely increases the risk of disincentives to invest in alternative infrastructure. Cable network owners appear to view wholesale access as a substitute to network expansion, and it remains questionable whether access prices send the appropriate build/buy signals. (We further comment on the challenges inherent in access pricing in the following sub-section.)

### 3.3.2. How wholesale price regulation impacts “ladder of investment” competition

112 In this section we turn to the impact of wholesale regulation on the incentives for access seekers that have not undertaken end-to-end facilities-based investments.

113 It is widely recognized in economics that EFC provides the greatest scope for superior market outcomes. This is confirmed by our findings in section 3.2. However, the process of encouraging the development of EFC is oft debated. It is widely accepted that competition is best promoted at the wholesale level by granting access to the lowest meaningful level of wholesale input, because the further upstream firms enter, the less dependent they are on the incumbent or on regulation to remain competitive and the greater scope they have to innovate.

114 Under the “ladder of investment” approach, regulators make access products available at various levels, enabling entrants to start small and grow over time. One of the major regulatory challenges of this approach is setting the right incentives as between different access products to ensure that the ladder of investment is demanding, but feasible, in terms of the distance between the rungs (the incremental investment to be undertaken) and the extent of the ladder’s climb.<sup>50</sup> Ideally, access regulation should be decreased over time (in preference to granting an endless time period for entrants to climb the ladder) so a further regulatory challenge is to credibly signal that access conditions will change over time<sup>51</sup>.

115 We now consider evidence relating to the regulation of LLU and LSS in study countries to examine whether regulators are:

- Setting relative LLU and LSS efficiently (i.e. in a way that does not distort consumption in favour of one access alternative at the expense of another); and

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50 Cave, M., ‘Encouraging infrastructure competition via the ladder of investment’, *Telecommunications Policy*, 30, 223-237, 2006.

51 The European Regulators Group, in its *Revised ERG Common Position on the approach to appropriate remedies in the ECNS regulatory framework* (May 2006), at p 57 noted the desirability of selecting remedies that “bring forward the day that regulation (for a particular issue) may no longer be required”; and at p. 61 said “...where infrastructure-based competition is feasible, such interventions have as their long-term objective the emergence of self-sustaining effective competition and the ultimate withdrawal of regulatory obligations which implies a built-in ‘sunset clause’ for the removal of ‘rungs’, i.e. access obligations”.



- Creating appropriate incentives for access seekers to move up the 'ladder of investment.

116 Table 2 presents regulated LLU and LSS prices for 7 countries included in our study.<sup>52</sup> The results highlight that regulated LLU prices vary by over 45% (as is the case for Sweden and the Netherlands) and variation in LSS prices are even more marked. For example, LSS prices in Finland are almost three times higher than prices in the Netherlands. It is highly unlikely the price difference across these countries can be explained by underlying cost variations as local access networks are relatively homogenous as the urban environments are similar and population densities are relatively uniform. This suggests regulators have mis-priced LLU and LSS, a hypothesis that is confirmed by data on the uptake of these services.

**Table 2: Regulated LLU and LSS Prices in Select Study Countries<sup>1</sup>**

Country	LLU Price (€)	LSS Price (€)	Ratio of LLU to LSS price
Denmark	10.3	5.53	1.86
Finland	15.1	8.30	1.82
France	10.9	4.39	2.48
Germany	11.8	3.74	3.16
Netherlands	10.4	2.95	3.53
Sweden	15.2	7.67	1.98
UK	11.2	3.34	3.35

Notes: (1) Based on study countries where both LLU and LSS subscriber data was available. EU countries with less than 10,000 LLU and LSS lines were omitted from the table.

Source: European Commission, European Electronic Communications Regulations and Markets 2005 (11<sup>th</sup> Report), Annex 2.

117 Table 3 indicates access seekers in each country tend to demand either LLU services or LSS services and rarely consume both. For example, the Netherlands has the lowest LSS price and the highest LLU to LSS price ratio. Not surprisingly, in the Netherlands, the ratio of LLU to LSS lines is also the lowest of the countries listed. At the other extreme, Finland has the highest LSS price and lowest LLU to LSS price ratio, and the second highest ratio of LLU to LSS lines. While Sweden has a relatively high LSS price, its low LLU to LSS line ratio is likely explained by its very high LLU price. The only result inconsistent with LLU/LSS prices is Germany. Although the relative LLU/LSS price in Germany is high, access seekers almost entirely use LLU.

<sup>52</sup> Consistent data on LLU and LSS prices and subscriber numbers was unavailable for all study countries.



118 In Germany, as the ERG notes, 'line sharing was not accepted by the market' until 2004.<sup>53</sup> Although both LLU and LSS have been available in Germany since the late 1990s, competitors have argued that prior to 2004 LSS prices were too high and as a result, almost all wholesale access was via LLU. Therefore the high LLU/LSS subscriber ratio is likely to reflect that access-based competition has been established largely on a LLU-based platform (i.e. rigid to changes in relative LLU/LSS prices) and recent reductions in relative LLU/LSS price are unlikely to have flowed through to LSS investments and in turn subscriber numbers.

**Table 3: LLU and LSS Subscribers in Select Study Countries<sup>1</sup>, October 2005**

Country	Subscribers			LLU/LSS
	LLU	LSS	LLU + LSS	
Germany	2,936,000	5,352	2,941,352	548.6
Finland	234,578	55,642	290,220	4.22
UK	38,418	34,722	73,140	1.11
Denmark	57,283	64,184	121,467	0.89
France	360,788	2,153,072	2,513,860	0.17
Sweden	45,185	287,060	332,245	0.16
Netherlands	68,880	588,247	657,127	0.12

Notes: (1) Based on study countries where both LLU and LSS subscriber data was available. Countries are arranged in order of the LLU to LSS line ratio.

Source: European Commission, European Electronic Communications Regulations and Markets 2005 (11<sup>th</sup> Report), Annex 2.

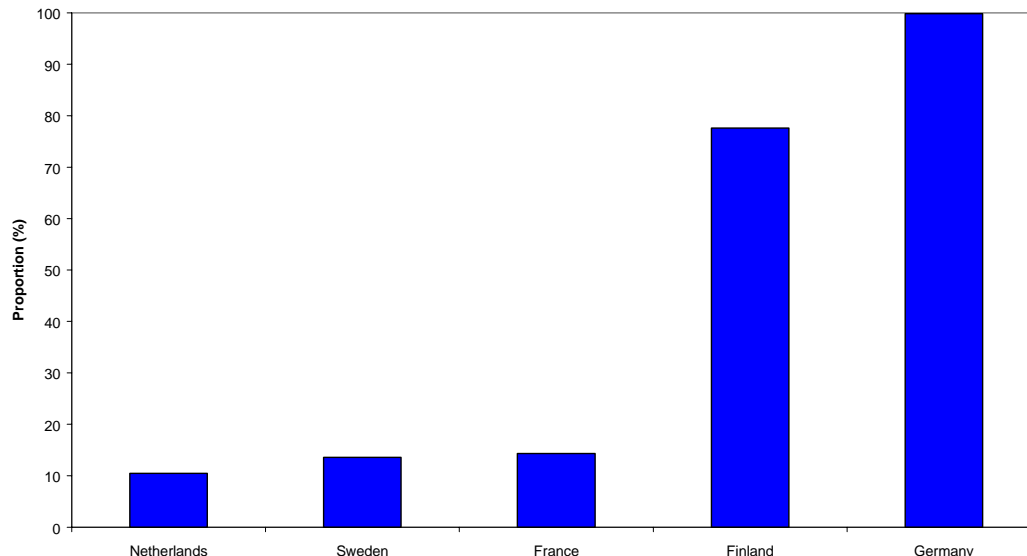
119 Turning to countries with relatively mature LLU and LSS markets,<sup>54</sup> we see two clusters of countries emerge: those with a substantial uptake of LLU and those with a substantial uptake of LSS (see Figure 13). In mature markets, regulation appears to be having a strong "tipping" effect that suggests access seekers are favouring the access alternative which provides the highest margin. This result implies regulators in these countries have set relative LLU and LSS prices incorrectly and may have implications for access seekers moving up the 'ladder of investment'.

53 ERG (05) 23 'Broadband Market Competition Report – Annex.

54 Defined as countries where unbundled lines account for over 5% of total PSTN lines.



**Figure 13: LLU Share of Total Unbundled Lines in Select Study Countries<sup>1</sup>, October 2005**



Notes: (1) Based on study countries where both LLU and LSS subscriber data was available and where more than 5% of PSTN lines are unbundled.

Source: European Commission, European Electronic Communications Regulation and Markets 2005 (11<sup>th</sup> Report), 20 February 2006; CIA World Factbook; CRA analysis.

120 From this case study, we conclude:

- Multiple layers of wholesale regulation pose risks of mis-pricing access alternatives. These risks are difficult to mitigate because substitute access products typically share the same underlying infrastructure, and there is no uniquely efficient way to allocate costs between them.
- When the relative prices of substitute access products are misaligned, incentives to climb the ladder of investment are distorted. The costs of regulatory error are therefore potentially very high, while the risk of mis-pricing (as pointed out above) is difficult to reduce.

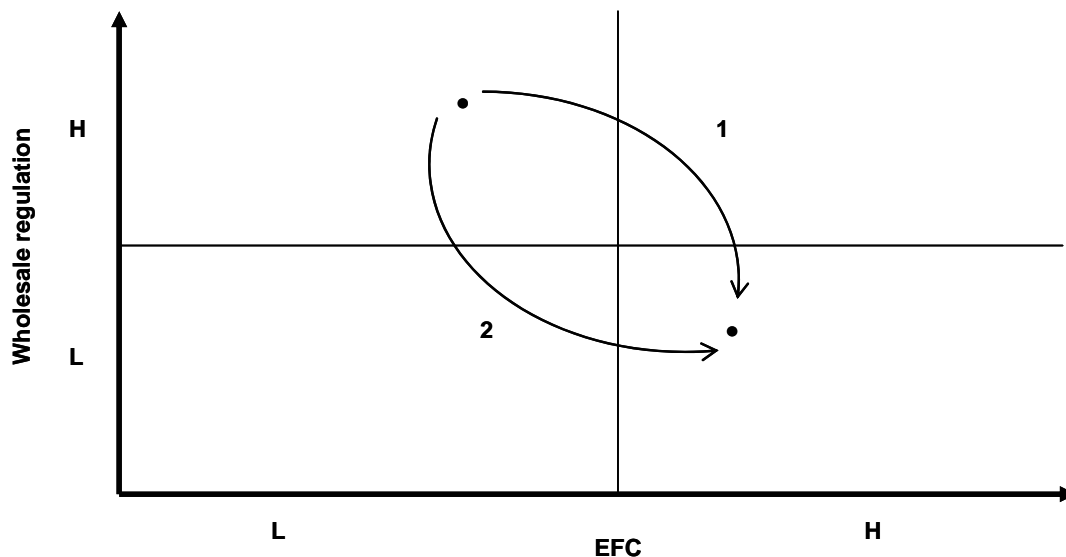


### 3.3.3. Reducing the regulatory burden

- 121 The above sub-sections demonstrate the costs and risks associated with regulatory intervention. We now turn to a consideration of the circumstances in which regulators should consider lifting regulation in order to promote better outcomes. In short, the lower the potential benefits of regulation, and the greater the scope for regulatory distortion, the greater the likelihood of a negative outcome from imposing or maintaining regulatory intervention. In considering the potential for regulation to provide material net benefits, a major consideration is the state of competition in the market. This is because it is generally reasonable to assume that the more competitive the market, the less likely it is that regulation will improve outcomes for consumers, once the costs of that regulation are taken into account.
- 122 Broadly, there are two possible approaches to the question of when regulation should be reduced. The first is to remove regulation only when the desired market outcomes are achieved (such as a particular level of competition or investment, as assessed by the number of competing facilities present in the market). The other is to remove regulation as a means of achieving optimal market outcomes in the future (rather than making the removal of regulation contingent upon having already achieved it).
- 123 These two approaches are conceptually illustrated in Figure 14, showing how in circumstances of low EFC and high wholesale regulation, a regulator might look to move to a position of high EFC and low wholesale regulation. The first approach is to ask whether sufficient levels of EFC are present *before* relaxing regulation, while the second considers that reduced wholesale regulation is conducive to investment, hence reduces regulation “ahead of the curve” with the expectation that improved EFC will follow.



Figure 14: The Quadrant Diagram: reducing regulation



124 Several regulators have expressly considered whether and how to reduce wholesale regulation, in the context of alternative networks into the home. Elements of both approaches are evident.

*Ofcom's view (UK)*

125 The UK's Office of Communications (Ofcom) has recently released a consultation on regulation of broadband access.<sup>55</sup> It describes four different geographic markets, as shown in Table 4.

**Table 4: Summary of the wholesale broadband access market definitions in terms of number of exchanges and population coverage in the UK market**

Market	Exchanges	Coverage
Kingston only exchanges	14	0.7%
BT only exchanges	4,074	24.0%
Exchanges with 2 or 3 operators AND exchanges with 4 or more operators where the exchange serves less than 10,000 homes and businesses	729	21.3%
Exchanges with 4 or more operators where the exchange serves 10,000 or more homes and businesses	784	54.0%

Source: Ofcom. Note that the term operators includes LLU operators.

<sup>55</sup> Review of the wholesale broadband access markets 2006/07, 21 November 2006, at <http://www.ofcom.org.uk/consult/condocs/wbamr/wbamr.pdf>.



126 It appears that Ofcom has split the UK into four areas of (potentially) differing competitive intensity. The first two are single firm supply areas (supply by BT or Kingston). The third is areas with up to three competitors, or with four or more but insufficient demand density to sustain several major competitors. In these areas, Ofcom believes market power issues may still be present, and BT and Kingston were required to provide a wholesale broadband access service on reasonable terms to competing ISPs. However, Ofcom has not proposed any price controls, concluding that 'given the dynamic nature of the market, on-going innovation and investment, it is premature for regulation to set prices'.<sup>56</sup>

127 In the fourth category – four or more competitors (including incumbent copper network owner, the cable owner, and LLU competitors) and sufficient demand to sustain multiple credible operators – Ofcom has reserved its decision, pending further investigation of actual market developments. Ofcom states:<sup>57</sup>

*In Market 3 the competitive conditions are changing very rapidly, with a significant proportion of this change forecast to take place over the next 12 to 18 months. In this consultation document Ofcom has set-out the current situation in this market and has made projections about how this may change in the future. However, because these are projections and given that Ofcom is planning a second consultation document, Ofcom does not believe that it is appropriate or necessary to reach a firm conclusion on whether, or not, BT would hold a position of significant market power in this market. Ofcom will make this assessment in the second consultation document, planned for around May 2007.*

128 Although there is clearly more to Ofcom's analysis of market power than counting networks<sup>58</sup>, its approach offers an insight into the beliefs that Ofcom holds about the relationship between market structure and competition in the UK. Clearly, the level of EFC (as reflected in the number of competitors already in existence) is relevant to its view of whether or not it is appropriate to reduce regulation. In this sense, Ofcom adopts the first approach outlined above.

129 It is important to bear in mind the context of Ofcom's decision. The extent of EFC is less than 50% in the UK; and Ofcom has previously expressed its view that cable competition is limited, and further build is unlikely:<sup>59</sup>

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56 At 1.20.

57 At 1.21.

58 Ofcom's consideration of whether market power exists includes market shares, barriers to entry (sunk costs, economies of scale, scope and density) and the existence of countervailing buyer power.

59 Ofcom, *Strategic Review of Telecommunications, Phase 2 Consultation Document*, paras 4.92





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*...unlike certain other countries, cable has never become the default distribution platform for pay TV in the UK, and its geographic spread remains limited.*

130 In short, Ofcom's approach is to view significant market power and remedies as sequential issues, with the former informed by the number of access networks and the removal of the latter consequential upon the loss of significant market power. As we will discuss below, this approach is not universal among regulators.

*FCC's views (US)*

131 The *Telecommunications Act* 1996 mandated that incumbent local exchange carriers (ILECs) provide unbundled network elements (UNEs) as determined by the FCC to any requesting telecommunications carrier at any technically feasible point and on rates, terms, and conditions that are just, reasonable, and non-discriminatory.<sup>60</sup> The FCC required that UNE prices, which are determined by the state commissions, reflect TELRIC.<sup>61</sup>

132 The FCC's initial unbundling decision implementing the *1996 Act* gave competitors the right to purchase the following two services, among others, from ILECs at TELRIC rates.

- The first, the unbundled network element local loop unbundling (UNE-L) was the equivalent of LLU. Competitors still have the right to purchase UNE-L (low-capacity copper loops) at TELRIC rates.
- The other was known as the unbundled network element platform (UNE-P), a combination of loop, switching, and transport elements that, in effect, was equivalent to a resale service priced at TELRIC. More recently, the FCC has eliminated ILECs' obligation to offer UNE-P at TELRIC rates.

133 Importantly, the FCC has, under the *1996 Act*, deregulated UNEs where it has found competition would not be impaired in the absence of the availability of the UNE. This has led it to scale back regulation in a number of instances, and largely eliminate it in respect of high-speed broadband.

134 Three elements of its approach were important to the FCC's reasoning, as reflected in its 2003 *Triennial Review Order* and its 2005 *Triennial Review Remand Order*.<sup>62</sup>

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60 Act s. 251(c)(3), 251(d)(1) and 252(d)(2).

61 Total Element Long-Run Incremental Cost.

62 *In the Matter of Review of Section 251 Unbundling Obligations of Local Exchange Carriers*, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking 18 FCC Rcd 16978 (2003) (Triennial Review Order, or TRO), *Errata*, 18 FCC Rcd 19020 (2003), *affirmed in part and reversed in part*, *United States Telecom Association v. FCC*, 359 F.3d 554, 571-72 (D.C. Cir. 2004), *cert. denied*, 543 U.S. 925 (2004); *In the Matter of Unbundled Access to Network Elements*, Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, *Order on Remand*, 20 FCC Rcd 2533 (rel. Feb. 4, 2005) ("*Triennial Review Remand Order*"), *affirmed*, *Covad Communications Co. v. FCC*, 450 F.3d 528, 540 (D.C. Cir. 2006).



- First, the FCC explicitly noted the need to weigh investment disincentives against pro-competitive effects of regulation: it “imposes unbundling obligations only in those situations where we find that carriers genuinely are impaired without access to particular network elements and where unbundling does not frustrate sustainable, facilities-based competition. This approach satisfies the guidance of courts to weigh the costs of unbundling, and ensures that our rules provide the right incentives for both incumbent and competitive LECs to invest rationally in the telecommunications market in the way that best allows for innovation and sustainable competition.”<sup>63</sup>
- Second, it focused on whether lack of access constituted a barrier that made entry uneconomic, rather than on the presence or number of facilities-based competitors:

*Thus, ... in lieu of triggers measuring actual deployment with fact-intensive, market-by-market potential deployment analyses,... we adopt ... a regime that accounts for actual and potential deployment by inferring from competitors’ facilities deployment in one market the ability of a reasonably efficient competitor to enter another, similar market in an economic manner.* <sup>64</sup>

*Because this approach assumes that competitors could enter into markets that have economic characteristics resembling those where competitors have entered, ... we ... discount any particular carrier’s failure to enter due to its own inefficiency; rather, this approach presumes that reasonably efficient carriers in one market could enter where competitors have entered in another, similar market:...* <sup>65</sup>

Barriers relevant to the impairment standard were: scale economics, sunk costs, first-mover advantages, absolute cost advantages, and barriers within the control of the incumbent carrier.

- Third, it took a highly localized approach to market definition. The FCC typically analyzed impairment at a geographically granular level (the level of individual exchanges) which means deregulation in one geographic area is not held back by difficulties facing entrants in another.

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63 *Triennial Review Remand Order 2005*, par 2.

64 *Triennial Review Remand Order 2005*, par 43.

65 *Triennial Review Remand Order 2005*, par 45.

- 135 The FCC ordered in 2003 that fibre-to-the home (FTTH) loops would not be subject to unbundled access. It outlined an approach to unbundling that focused on legacy copper facilities, while limiting regulation for next-generation facilities, noting that this approach would appropriately balance the goals of promoting facilities-based investment and innovation against the goal of stimulating competition. Interestingly, it noted that the more lucrative the opportunity presented by the investment, the less appropriate it was to unbundle: “the substantial revenue opportunities posed by FTTH deployment help ameliorate many of the entry barriers presented by the costs and scale economies”.<sup>66</sup>
- 136 The FCC also abandoned regulation of line sharing (known as the “high frequency portion of the loop”, or HFPL).<sup>67</sup> It considered that *not* mandating line sharing would result in better incentives for competition than regulated access.<sup>68</sup>
- 137 In 2004, the FCC announced that FTTC (fibre-to-the-curb) loops would not be subject to unbundled access, subject to certain conditions.<sup>69</sup> In the words of former FCC Chairman Michael Powell: “By limiting the unbundling obligations of incumbents when they roll out deep fiber networks to residential consumers, we restore the marketplace incentives of carriers to invest in new networks.”<sup>70</sup>
- 138 In the same year, the FCC reconsidered the application of unbundling rules to residential multi-dwelling units (MDUs), and decided that unbundling should not be required for fibre loops to MDUs. Noting that up to one-third of Americans live in MDUs, the FCC took the view that leaving unbundling in place would create a disincentive for incumbents to deploy broadband to MDUs, and could shift investment to other markets.<sup>71</sup>

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66 TRO 2003, par 274

67 In reaching its revised decision on line-sharing, the FCC considered the availability of other network elements outside incumbent LECs’ networks (such as cable modem), the full range of revenue sources associated with a standalone unbundled loop – for example, voice, voice-over-DSL, data and video – that would allow the costs of the unbundled loop to be recouped; and the availability of line-splitting.

68 One consideration was the pricing of line sharing. Many states had chosen to allocate the bulk of the loop costs to services other than those provided over the HFPL, which meant that the price of line sharing was almost zero. The FCC considered that this created competitive asymmetries by advantaging those broadband suppliers who purchased line sharing, relative to those that purchased whole loops. See par 260 of TRO 2003.

69 Unbundling for broadband services is never required where fiber reaches to within 500 feet of the home. Where it does not (that is, where the network is a hybrid of fiber and copper/coax) regulations required unbundling only in limited circumstances (for example, not at all to packet switched functions; and only to time-division multiplexing functions for broadband services). The state of US regulation is further detailed elsewhere in the Bell Evidence filed March 15, 2007.

70 See [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-253127A2.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-253127A2.pdf)

71 The FCC, In the Matter of, Review of Section 251 Unbundling Obligations of Local Exchange Carriers, CC Docket No. 01-338; Implementation of the Local Competition Provisions of the *Telecommunications Act of 1996*, CC Docket No. 96-98; Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket No. 98-147. Order on Reconsideration, released August 9, 2004.



139 In short, the US approach has resulted in substantial withdrawal of wholesale regulation of broadband networks by applying a test of impairment, focusing on barriers to competition. The investment incentives of competitors have been an important part of the overall balance, with the larger revenues available to triple-play providers considered to ameliorate entry barriers.

*OPTA's views (Netherlands)*

140 The Netherlands is following a strategy of disengagement and deregulation in broadband markets in cases where the market is moving towards sustainable competition. Key deregulatory steps are in relation to bitstream access and LLU regulation.

141 OPTA has in the past sought to impose a bit-stream access obligation on the fixed incumbent. However, these attempts were annulled in court as the obligation could not be derived from the relevant applicable legislation. Moreover, in its latest market review, OPTA has found that there is no significant market power in the market in the Netherlands for low quality (i.e. high contention ratio, typically supplied to residential users) wholesale broadband access (WBA),<sup>72</sup> and as a result OPTA no longer believes access remedies are warranted in relation to this particular service.<sup>73</sup>

142 In relation to LLU regulation, OPTA is looking to set higher access prices where there is more infrastructure competition. In setting the current multiple year wholesale price cap system (WPC) for LLU (decision dated September 28, 2006) OPTA has defined four scenarios linked to the degree of infrastructure competition. In scenarios with more infrastructure competition expected to emerge, KPN will have more freedom to set its tariffs.<sup>74</sup>

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72 At the wholesale level, OPTA differentiates between the market for WBA with high overbooking ratio (1:20 and higher) (low quality WBA) and the market for WBA with low overbooking ratio (lower than 1:20) (high quality WBA). OPTA found that low quality WBA provided over DSL and cable form part of the same market, the market for low quality WBA.

73 For more details, see the European Commission's comments on OPTA's findings at: [http://forum.europa.eu.int/Public/irc/info/ecctf/library?l=nederland/registeredsnotifications/nl20050281/fileserve\\_enrpdf/\\_EN\\_1.0\\_&a=d](http://forum.europa.eu.int/Public/irc/info/ecctf/library?l=nederland/registeredsnotifications/nl20050281/fileserve_enrpdf/_EN_1.0_&a=d).

74 <http://www.opta.nl/asp/besluiten/besluitenoordelen/document.asp?id=2060>.



- 143 The approach used in LLU regulation is in line with policy discussion papers previously released by OPTA. For example, OPTA's Regulatory Policy Note No. 2 (April 2004) titled *Infrastructure and services-based competition in the broadband access market*, discusses dynamic investment incentives, and notes that in some areas of regulation there will be a need to adjust (increase) access prices over time in order to provide incentives for access based resale competitors to build infrastructure. It notes for example that the tariff for wholesale line rental (which supports resale activity) should be 'higher than the tariff for full and bundling and [that it should] rise over time'.<sup>75</sup>
- 144 Accordingly, through rolling back the potential scope of regulation and lightening existing regulation through higher access prices, OPTA is limiting the role of access regulation. In making its assessment of when this should occur, it looks to the level of actual and potential infrastructure competition.<sup>76</sup>

*OFTA's views (Hong Kong)*

- 145 OFTA, the telecoms regulator in Hong Kong, has also scaled back unbundling rules, taking a different approach to regulators such as Ofcom and OPTA. Rather than asking how many networks are "enough", OFTA decided to lift LLU regulation (known in Hong Kong as Type II interconnection) once two networks were in place because lifting regulation was the best way to encourage the development of more than two networks:<sup>77</sup>

*[T]he benefits of additional consumer choice and competition brought about by mandatory Type II interconnection would be outweighed by the detriment from dampening investment.*  
...

*Withdrawing mandatory Type II interconnection from these buildings would send a clear signal to the carriers, encouraging them to roll out their networks to buildings if they are not to be left out. In addition, it would also encourage carriers to roll out ... because ... they would not face competition from carriers relying on Type II interconnection. ...*

*The option of maintaining the status quo would be untenable as it would encourage some carriers to continue to rely on Type II interconnection to reach customers, thereby discouraging further investment in advanced telecommunications networks.*

- 146 In addition, OFTA set a sunset date of 2008 for the total withdrawal of LLU (other than for those households for whom duplication was not technically or economically feasible).

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<sup>75</sup> See page 26, Regulatory Policy Note No. 2, April 2004. *Infrastructure and services-based competition in the broadband access market*, at <http://www.opta.nl/download/RPN02%5Fuk%2Epdf>.

<sup>76</sup> See Appendix A for a more extensive discussion.

<sup>77</sup> OFTA (2004), 'Legislative Council Brief: Review of Type II Interconnection Policy', File Ref: CTB/T 56/2/1(04). See pars 10,22.



147 OFTA's reasoning provides important insights, reflecting an approach that regulation need not supervise the delivery of competition, but rather regulators need to stand aside to allow the market to deliver competitive outcomes, in this case, through EFC. Regulation reduces (and may even remove) the incentive to enter, creating tension between short and long-run solutions to market power. Market outcomes suggest that OFTA's approach has been successful in Hong Kong, with EFC on the rise.<sup>78</sup>

#### 3.3.4. Summary

148 Wholesale regulation can chill the incentives for end-to-end facilities-based competitors to extend, or even use their networks. Thus we observe that rollout of competing networks has slowed in a number of countries with high levels of wholesale regulation, as outlined in section 3.3.1.

149 It is also clear that wholesale price regulation can distort access decisions and act as a disincentive to climbing the "ladder of investment". This is illustrated by our analysis of LLU and LSS, which are substitute access products representing different rungs on the ladder. While it is important to set relative prices of substitute products optimally, it is difficult to do so because they share the same infrastructure and there is no unambiguously efficient means to allocate shared costs.

150 As a result, access prices may well be incorrectly set, with the result that access decisions will be distorted and under-priced access will reduce incentives to climb the ladder at all. One means of mitigating this problem is to progressively increase the price of access services, or reduce the available range.

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<sup>78</sup> See OFTA, 'Percentage of Households with Choice of Self-built Customer Access Networks Continues to Rise', Press Release, 29 September 2005. [http://www.ofta.gov.hk/en/press\\_rel/2005/Sep\\_2005\\_r2.html](http://www.ofta.gov.hk/en/press_rel/2005/Sep_2005_r2.html)



- 151 Given the significant costs and risks of regulation it is reasonable to seek to reduce or remove regulation as the potential costs of market failure reduce. This has occurred in several countries in our study. In some cases, regulators have sought to reduce regulation after determining that the market is sufficiently competitive, where this is proxied by the number of competitors. Other regulators have approached the question by asking “what is the course of regulatory action that is most likely to lead to optimal facilities-based competition?” In other words, they adopt an approach that comprehends the impact of perpetuated regulation on market incentives. They acknowledge the existence of regulatory “feedback”: that perpetuating remedies actually impedes the emergence of competition, and removing them may contribute to the removal of significant market power by creating an incentive for the very investment that will overcome it.<sup>79</sup>
- 152 Economics suggests this is the better approach. There can be no doubt that perpetuated regulation imposes costs, which may include preventing the market from moving to a more competitive state, with the perverse effect that regulatory intervention becomes a necessity only because it has not already been removed. By contrast, where it is considered that optimal or sufficient EFC may not already have been achieved, a calculated, forward-looking approach to granting regulatory relief “ahead of the curve” can play an important role in clinching the desired outcome. Of course where optimal or sufficient EFC has been achieved, economics suggests that the cost of imposing wholesale regulation will exceed the benefits, and therefore such regulation should be removed.
- 153 This is even more so given (a) the existence in most countries of general competition regulation that can be brought to bear on any future issues that arise; and (b) market developments in telecommunications. Here, the rapidly developing actual and potential threat of competing platforms means that the short-run costs of under-regulation are decreasing.<sup>80</sup> At the same time, the potential dynamic costs of regulation are increasing due to the extent and pace of technological developments. In assessing the costs and benefits of perpetuating industry-specific wholesale regulation (in preference, say, to ex post application of general competition law), both of these factors will mitigate against it.

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79 The European Regulators Group, in its *Revised ERG Common Position on the approach to appropriate remedies in the ECNS regulatory framework* (May 2006), lends support to this approach at p 60, where it says: “... the NRA [national regulatory authority] has the objective of promoting competition in order to deliver the maximum benefits to end users. However, in the setting where replication is feasible the NRA also has to bear in mind the impact that their actions have on the incentives to invest in alternative infrastructure. This is made explicit in the recitals to the Access Directive where it is stated that ‘the imposition by the national regulatory authorities of mandated access that increases competition in the short-term should not reduce incentives for competitors to invest in alternative facilities that will secure more competition in the long-term’.”

80 The lower the probability of entry in response to high prices, and the higher those prices might be likely to go, the higher the short run costs of failure to regulate. But technological developments are increasing the probability of entry, hence reducing the costs of under-regulation.



#### 4. CONCLUSION

- 154 An analysis of the levels of end-to-end facilities-based competition and wholesale regulation in thirteen countries shows that Canada alone has high levels of both.
- 155 A comparative analysis of the relationships between EFC, wholesale regulation and broadband market outcomes gives results that are consistent with the hypotheses that:
- More EFC results in superior market outcomes;
  - More EFC is better than more wholesale regulation; and
  - In countries with high EFC, a high level of wholesale regulation does not bring additional benefits (one of the two market outcome measures supports this hypothesis by showing that Canada's broadband penetration generally lags that of less regulated high-EFC countries, while the other less important measure - performance-adjusted price - shows that Canada only matches less regulated countries).
- 156 While there are limits to the conclusions that can be drawn from these results given the small sample size and the range of other determining factors, they are consistent with the economics that EFC leads to superior market outcomes than access competition.
- 157 Our discussion of the key issues arising from the examination of these relationships suggests that wholesale regulation may impose substantial costs. These include disincentives to extend networks, and the difficulty of setting access prices for multiple access products without distorting incentives to climb the ladder of investment. Regulators should consider reducing wholesale regulation, especially where high EFC is evident; and should have regard to the likely positive impact that removal will have on future investment, competition and consumer welfare. Canada particularly - being the only country in the study group that yielded high scores on both the level of wholesale regulation *and* the level of EFC – could benefit from this approach.





## APPENDIX A: COMPETITION BETWEEN TWO COMPETITORS

158 While it is widely accepted that competition between two competitors can be effective in providing benefits to consumers, two main areas of concern over this form of competition can arise. The first is whether the two competitors will tacitly collude (for example, by holding prices significantly above cost or restricting output below efficient levels). The second is whether, even in the absence of tacit collusion, competition may be ineffective due to residual market power issues. We discuss each of these issues below in relation to broadband markets, and conclude that the necessary conditions for sustainable tacit collusion are unlikely to exist, and that conditions for certain residual market power issues are unlikely to hold. This result suggests competition between two firms can lead to competitive outcomes in broadband markets.

### A.1 TACIT COLLUSION

159 Tacit collusion or 'joint dominance' has an important place in most regulators' analysis of their markets. However, we believe this is unlikely to be a source of sustainable market power even when there are only two competing networks – a telco and cableco.

160 The circumstances under which two firms can exercise joint dominance over a market are well established<sup>81</sup>. As described in the Canadian Competition Bureau's *Merger Enforcement Guidelines*,<sup>82</sup> these include:

- Ability to recognize the gains from cooperation and to arrive at a collusive arrangement;
- Ability to monitor other coordinating firms' conduct;
- Ability to respond to deviations from approved conduct through a punishment mechanism; and
- Lack of external factors that may threaten the stability of collusion.

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81 In Europe, this issue has been the subject of a ruling in the European Court of First Instance, which found that the following conditions needed to be present. (1) There must be sufficient market transparency to allow members of the dominant oligopoly to monitor behaviour – that is, to observe whether other members are complying with the terms of their implicit agreement. (The UK Office of Fair Trading refers to this as the 'ability to align their behaviour in the market', effectively expanding it to include the ability to agree in addition to the ability to monitor.) (2) There must be a suitable punishment mechanism. Without this, there is no way to prevent profitable cheating. (3) Tacit coordination must not be undermined by the actions of current and future competitors, or by the actions of customers.

82 Competition Bureau, *Merger Enforcement Guidelines*, ¶ 5.20.



- 161 With respect to network operators of broadband services, applying the above criteria suggests that co-ordination may be difficult, even if firms are able to recognize that they may mutually be able to benefit from cooperation.
- 162 The first and second conditions – ability to recognize the benefits of co-ordination, arrive at a collusive agreement, and monitor each other's conduct – typically include consideration of market transparency, product homogeneity, (market) stability and symmetry (of size and cost) of the relevant firms as key elements in giving the firms the ability to align on terms of coordination. It is doubtful that these factors would be present in broadband markets. For example:
- In many markets, the networks will differ in both their size and cost structures. This is particularly the case where different technologies are in use, such as cable and copper.
  - The presence of economies of scale will tend to lead to a relatively unstable situation where each network is under significant pressure to build market share. This alone will strain any attempts at tacit co-ordination.
  - Products are unlikely to be fully homogenous when different technologies are used, and successful bundling strategies may create further product heterogeneity.
  - Broadband markets are far from stable, and are currently subject to rapid waves of both small and large scale technical innovations. They will also be buffeted by unexpected demand shocks, depending upon the success of the development of demand driving applications.
  - Retail broadband products offerings are complex and not readily comparable between firms. Although retail deals for consumers are generally observable (because of retail regulation in some markets), complex product bundling makes it difficult to compare offerings between firms. In markets for business services, broadband prices are often less transparent due to confidential contracts with larger customers.
- 163 The third condition is that if cheating is observed, there must be a way to punish the deviating firm – that is, to take actions that remove the benefits (profits) of the cheating. In certain markets, where products are relatively homogenous, it is possible that conventional price matching or undercutting might be used to discipline defection. However, these conditions do not hold in broadband markets as technologies and products are differentiated, making it difficult to punish cheating.



- 164 Perhaps more importantly, rivalry in broadband markets will be heavily driven for the foreseeable future by dynamic competition, with the introduction of new technology, new content, and new product bundles, making it difficult to collude, and difficult to effectively punish innovation. Where new revenue streams may benefit all competitors, there will not even be a collective incentive to prevent innovation; or innovation may provide only a temporary advantage and no opportunity to administer an effective punishment. Moreover, innovations may come from other sectors (e.g., mobile, IT, media), or powerful global suppliers, making collusion even more difficult and unlikely. Considerations of this type suggest that tacit collusion preventing the most critical form of competition in technology markets – that is, dynamic competition – would be difficult, if not impossible, in broadband for the foreseeable future.
- 165 The final condition is that co-ordination must not be destabilized by actual or potential competitors, or powerful customers or suppliers. On this condition, it might be thought that fixed entry is unlikely if the basic market structure is a single fixed incumbent and a single cable network. But entrants now come in many forms, including mobile and fixed wireless solutions.<sup>83</sup> Also, powerful suppliers exist, such as global technology providers with an interest in ensuring that the technology that supports their products and content is propagated. These may be capable of sponsoring competing platforms (e.g., satellite broadband transmission). Considerations such as these suggest that in anything except the short term, fixed networks face significant threats to the volumes that are expected to cross their networks.
- 166 The considerations above suggest that two networks may well be enough to ensure competitive market outcomes, because the characteristics of broadband competition are such that tacit collusion is unlikely to be sustainable<sup>84</sup>. But regardless of how many competitors are enough to support a competitive market outcome, where that outcome has not been reached in a particular area, the expected growth in EFC over time may enable a calculated, forward-looking approach to rolling back ex ante regulation. Market outcomes can then be determined by the interplay of competing networks subject to general competition law principles on an ex post basis.

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83 The FCC expressly acknowledged the importance of new technologies when it lifted line-sharing orders, noting “the important broadband potential of other platforms and technologies, such as third-generation wireless, satellite and power lines”. See TRO 2003, par 263.

84 A similar set of points was made regarding telco vs cableco competition in the *Reply Argument of the Commissioner of Competition, Forbearance from Regulation of Local Exchange Services*, Telecom Public Notice CRTC 2005-2 dated October 7, 2005, at pages 9 – 10. Here, the difficulty of reaching consensus was acknowledged, because (summarizing) (1) entrants are small and seek market share; (2) entrants use different technologies and have different costs; (3) entrant product bundles differ from the incumbent’s; (4) technical change and innovation offers significant rewards; (5) competition occurs over many services and dimensions, such as service, reliability, applications and price, making co-ordination difficult; (6) there is historic rivalry; and (7) service competitors also exist eg access-independent VOIP providers.



## A.2 RESIDUAL MARKET POWER ISSUES

- 167 A second concern is that non-competitive outcomes may arise not from *co-ordinated* effects, but from *unilateral* effects where each firm independently engages in standard profit-maximizing responses to market conditions.
- 168 It has been suggested that one reason this might occur is that firms compete by setting quantities (known as Cournot competition), in particular due to the fact that capacity is constrained and firms cannot serve total market demand.<sup>85</sup> (This differs from the alternative economic model, which is known as a Bertrand model of competition, under which firms choose their prices. It is well established in the economics literature that competition among two firms competing on price may yield a competitive market outcome.<sup>86</sup>)
- 169 We disagree that capacity is constrained in relation to broadband markets. The decision a fixed network owner makes to provide service in an area is a significant investment decision that is in reality a (geographic) market entry decision. Once an operator has established its area of network coverage, the market it is able to serve is the area that its network serves. The capacity question then becomes: Is the firm able to serve all the demand within its footprint? In anything other than the short run<sup>87</sup>, the answer to this question is yes – the firm can upgrade its network, systems and processes to serve all market demand within its network serving territory. Indeed, this is exactly what incumbents have traditionally done.

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85 This question was explored in an economic policy note issued by the Economic Analysis Team of the Dutch regulator OPTA, *Is Two Enough?* dated September 2006. This paper makes the fundamental assumption (with which we disagree) of competition based on quantity rather than price, suggesting that firms in electronic communications markets typically face problems serving unexpected large demand. It noted that these problems “were mainly caused by malfunctioning administrative processes, billing, technical migration problems and the like” (see s 4.3.1). Note that this paper expressly does not have legal status and does not necessarily represent the opinions of the Commission of OPTA. <http://www.opta.nl/download/EPN+06+Is+two+enough%2Epdf>

86 See, for example, Jean Tirole (1988), “The Theory of Industrial Organization”, MIT Press, pp. 209-211.

87 We note here that it is not appropriate for regulators to focus on short run issues when considering regulatory design decisions that will affect the market in the long run. The regulator’s analysis should consider the period impacted by the regulation, which in general will be closer to the economic long run – a period during which both capital and labor inputs can be varied.



- 170 It is true that there are incremental costs associated with connecting new customers to the network, but these are conceptually similar to the customer acquisition costs of connecting customers to a mobile network (e.g., handset subsidies, customer service costs, etc.). These are marginal expansion costs, not capacity constraints. Beyond the activities and equipment associated with connecting customers to a multi-play broadband network, it is unlikely that any of the services that would be offered as part of the bundle are subject to any economically meaningful capacity constraints. In this scenario, prices may well be close to average cost where the fixed costs of capacity are sunk, and competition for customers is strong – an outcome that is not consistent with market power issues and supra-competitive returns.<sup>88</sup>
- 171 For these reasons, the better two-competitor model of broadband competition to predict market outcomes is likely to be one based on competition in prices (i.e. some form of Bertrand competition).

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88 Shelanski notes that in telecommunications, prices above marginal cost are not an indicator of market power because: "The telecommunications industry has several specific features that affect oligopoly performance. Most importantly, telecommunications networks involve large, fixed costs and low marginal costs of adding new subscribers.... Thus, the presence of price-cost margins is not the indicator of market power in telecommunications that it might be in industries with different cost structures". Shelanski, H. (2007), "Adjusting Regulation to Competition: Toward a New Model For U.S. Telecommunications Policy", *Yale Journal on Regulation*, Vol. 24:1, pp. 89-90.



## APPENDIX B: COUNTRY SUMMARIES

172 This appendix sets out the overall results of our international comparison of the performance of national telecommunications industries. In particular, we have assessed the performance of telecommunications markets in Australia, Canada, Denmark, France, Hong Kong, Germany, Korea, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

### B.1 AUSTRALIA

173 In Australia, access-based competition is the main source of competition in telecommunications. In a large part, this is due to a protectionist approach to free-to-air television networks (residential pay TV could not lawfully be offered until the 1990s) with the result that cable networks were not established. Although a rival cable network does now exist, its reach is limited to 35%; and interestingly, its owner appears to use the incumbent telco's wholesale products in preference to its own cable network in many of its cabled areas. The relative attractiveness of wholesale products such as LLU, LSS and bitstream access have led to a high level of access-based competition relative to the level of EFC.

174 The dominance of access-based competition has led to generally poor market outcomes in Australia. Broadband penetration is lower than that observed in most OECD countries, there has been relatively little innovation in the way of broadband speed and product offerings; and the price of broadband offerings is relatively high when the speeds offered are considered. Below we summarize the key market outcomes.



**B.1.1 Headline data<sup>89</sup>**

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	35%
	EFC (internet ready cable and incremental fibre)	35%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	VERY HIGH
Wholesale access	% DSL lines subject to access, measured by [(LLU + LSS + resale DSL) / total # DSL lines]	36%
Broadband penetration	# broadband subscribers / 100 people	17.4
Price	Price per 100 kbps for a basic connection (US\$)	17.37
Speed	Maximum Speed Available	24Mbps
	Average speed	1.3Mbps
Innovation	VOIP and/or IPTV uptake	Some VOIP

**B.1.2 Network competitors**

- 175 Telstra is the incumbent telephone operator and owns Australia’s virtually ubiquitous copper network. Telstra also owns a hybrid fibre-coax (HFC) network that passes around 40% of homes. Telstra’s HFC carries Australia’s leading pay TV provider, FOXTEL, a joint venture of News Corporation (25%), PBL (25%) and Telstra (50%).
- 176 SingTel Optus owns a competing HFC network<sup>90</sup> that passes around 35% of homes. The rollout area was selected on the basis of its attractive demographics for telephony spend; hence, it is likely to represent more than 35% on a revenue basis. Both HFC networks were built in the mid-1990s when pay TV first became available in Australia, with the two HFC networks having a very high degree of overlap (as each carrier sought out the most lucrative telephony customers) amid an environment of intense competition for pay TV. However, a protectionist approach to free-to-air television meant that pay TV was not only late to arrive, but did not (and still has not) reached the degree of penetration that it has in other countries (for example a strict anti-siphoning regime gives free-to-air networks preference in signing program rights to major sporting events). This has compromised the viability of the cable networks to acquire customers.

<sup>89</sup> Refer to Appendix C for sources of all headline data

<sup>90</sup> In addition, there are some small localised cable networks in regional population centres and in Canberra.



- 177 There is substantial duplication of telephony networks in the central business districts, with multiple operators laying fibre loops. There are a number of small firms which have geographically isolated cable networks, such as Neighbourhood Cable which operates a network in three regional centers. In Canberra, TransACT owns and operates a competing cable network and offers phone, broadband and television services.
- 178 Wholesale access to LLU and LSS is enabling competitors to place network facilities into local exchanges around the country. In the last twelve months, substantial DSLAM investments have been made by Optus, Primus and iiNet primarily in and around central business districts and metropolitan areas. These DSLAMs will primarily be used to supply broadband services, and in some instances voice (particularly by Optus and Primus).

### B.1.3 Innovation

- 179 The Australian telecommunications industry has been relatively slow to implement innovative new services and networks. As a result, Australian broadband speeds lag behind international best practice. Speeds in excess of 1.5Mb/s are relatively uncommon in the Australian residential market, with the incumbent only having recently deployed a high-speed DSL network. The fastest attainable speed on the Telstra HFC network is 17Mbps, with a 10Gb download allowance costing the user AUD69.95.
- 180 Australia's poor broadband performance directly reflects low investment in telecommunications infrastructure. Over the period 2001-2003, Australia's annual average investment per access channel of US\$330.9 lagged the OECD average of US\$346.4 and was well below the United States at US\$523.6.<sup>91</sup>
- 181 Recently, Telstra indefinitely suspended its plans to deploy high-speed fibre access lines in the five major state capitals. This fibre-to-the-node (FTTN) network, which would have cost in the vicinity of AUD4bn, was cancelled after Telstra was unable to reach an agreement with the regulator as to an appropriate access price. The FTTN network would have significantly improved access speeds, although some competitors have claimed that speeds could be improved over existing lines.<sup>92</sup> In effect, on the existing copper network, households within 1.5 km of an exchange can receive services at 12Mbps (and potentially up to 24Mbps). By contrast, those more than 1.5 km from the exchange can generally only receive much lower speeds, with available bandwidth falling rapidly as distance from the exchange rises.

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91 OECD Communications Outlook 2005

92 iiNet, 2006, The Myth of Fibre, May, <http://www.iinet.net.au/about/media/releases/The-Myth-of-Fibre-May-06.pdf>





182 While there are some movie download services available to PCs, there is no IPTV (i.e. dedicated set-top boxes receiving real-time transmission of encrypted video content) and its viability is questionable given the low bandwidth available to consumers. VOIP remains a niche product and is largely unregulated. Nevertheless there are some 43 VOIP carriers targeting the residential market, and another 19 offering IP-centric products.<sup>93</sup>

#### B.1.4 Pricing and competitive dynamics

183 Price competition has been most evident in the area of bundled offerings. There has been a strong trend towards bundling of telecommunications products in Australia in recent years led mainly by network competitor Optus.

184 Optus initially bundled pay TV with phone and Internet offerings, however now the focus is on bundling broadband with telephony. Both Optus and Telstra now offer AUD10/month discounts on most broadband offerings when they are bundled with fixed or mobile telephony. Access-based competitor iiNet has also recently started offering discounts for bundling of VOIP with broadband offerings.

#### B.1.5 Other observations

185 Australia has a high degree of wholesale regulation. Access seekers have regulated access to eleven different access products,<sup>94</sup> and another three telecommunications products.<sup>95</sup> The Australian Consumer and Competition Commission (ACCC) recently regulated access to another product (line rental) even though that product was already effectively provided through another declaration. Indeed, the Conditioned Local Loop Service (although declared) has never been used by an access seeker<sup>96</sup> – yet it has imposed compliance and administrative costs on Telstra since 1997. It was finally allowed to expire in June 2006.

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93 Telstra, Response to the ACCC Proposal “Strategic review of the regulation of fixed network services” (February 2006).

94 Domestic PSTN Originating Access, Domestic PSTN Terminating Access, Digital Data Access Service, Conditioned Local Loop Service, ISDN Terminating Service, ISDN Originating Service, Local Carriage Service, Local PSTN Originating Service, Local PSTN Terminating Service, Unconditioned Local Loop Service, Line Sharing Service.

95 Domestic Transmission Capacity Service, Mobile Terminating Access, Analogue Subscription Television Broadcast Carriage Service.

96 The ACCC conceded that the ‘precise use’ had ‘never been clear’, and stated that it ‘appears that the service would mainly be used to provide voice or other services over the copper line’. ACCC, Declaration Inquiry for the ULLS, PSTN OTA, and CLLS (July 2006).



186 Interestingly, the provision of regulated access appears to be so favourable that even Singtel Optus, with its existing cable network, has not found it attractive to extend its network coverage. Moreover it appears that Optus is utilizing wholesale access *in preference to its own facilities* in the areas where it owns a cable network (as discussed earlier).

## B.2 CANADA

187 In Canada there is a relatively high level of competition between copper and cable platforms and limited access-based competition in broadband. Approximately 92% of Canadian households have access to broadband services<sup>97</sup> and in 2005, 64% of Canadian households had an Internet subscription with 51% having high-speed Internet and only 13% having dial-up subscriptions.<sup>98</sup> For those households subscribing to high-speed Internet service, the breakdown of technologies was approximately 48% DSL and 52% cable modem as of 2005.<sup>99</sup>

188 Internet enabled cable passes around 89% of Canadian households, allowing for competition between network operators in most areas.<sup>100</sup> Access-based competition is limited, with less than 10% of DSL subscribers receiving service from providers who took advantage of either unbundling, line sharing or resale measures.<sup>101</sup>

189 The prevalence of EFC has allowed for strong market outcomes, including broadband penetration above 20%, low broadband prices when adjusted for speeds offered, and strong innovation, particularly in the offering of VOIP and IPTV products.

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97 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.

98 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006

99 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006, p. 62. Note that this excludes the so-called "high-speed lite" services which provide bandwidth in the range of 128 Kbps.

100 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006, p. 15

101 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.



An International Comparison of Telecom Facilities-Based Competition  
March 15, 2007

### B.2.1 Headline data<sup>102</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	93%
	EFC (internet ready cable and incremental fibre)	85%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	HIGH
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	9.7%
Broadband penetration	# broadband subscribers / 100 people	22.4
Price	Price per 100 kbps for a lower speed connection (US\$)	1.35
Speed	Maximum Speed Available (Mbps)	100 Mbps
	Average speed (Mbps)	2.9 Mbps
Innovation	VOIP and/or IPTV uptake	Yes

### B.2.2 Network competitors

190 There are a number of incumbent telecommunications operators in the Canada with the largest being Bell, Telus, Aliant, MTS and SaskTel. Together, the incumbent companies own the vast majority of the copper twisted pair access links to homes and businesses and account for 42% of residential high speed Internet access in Canada.<sup>103</sup>

191 There are many different cable providers, with the largest two being Rogers Communications Inc. and Shaw Cablesystems Ltd. Other providers include Vidéotron Ltée., East Link and Cogeco Inc. The larger cable providers own the coaxial-based television distribution networks serving homes and, to a lesser extent, businesses. Cable networks cover a large portion of Canada with 89% of households located within areas where cable operators can provide broadband services. These providers account for 54% of residential high speed Internet access in Canada.<sup>104</sup>

<sup>102</sup> Refer to Appendix C for sources of all headline data

<sup>103</sup> CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.

<sup>104</sup> CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.



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### B.2.3 Innovation

- 192 Newer data services to meet customer requirements for increased speed, functionality and cost efficiency, such as Ethernet and IP based virtual private network offerings, have quickly penetrated the data market in Canada with average annual revenue growth of 18% and 64%, respectively – these services now represent almost 50% of the data protocol revenues.<sup>105</sup>
- 193 In Canada, FTTH is still in the development stages with companies only starting to deploy or announce plans for services this past year. Bell is ahead of the game and has deployed FTTN in 2,048 neighborhoods serving over 500 000 households, mainly in the greater Toronto and Montreal areas.<sup>106</sup>
- 194 Next Generation Network (NGN) plans are being announced by most major players in Canada. Telus was one of the first major communications providers in the world to deploy leading-edge IP-based NGN services. With its successful launch of VOIP technology Telus aims to provide all voice and data services over one platform in the near future. Bell has also invested in NGN technology with the development of EVDO wireless data network, a data-only network that benefits voice-only customers by freeing up data use on the Bell voice network.
- 195 Similar to the situation in the US, there is increasing competition between cable providers and telephone providers with the growing overlap in products offered. The major cable operators have evolved their Internet and distribution network infrastructure and in 2005 entered the local residential telephone market offering VOIP services.<sup>107</sup> In 2005, competitor lines grew from 428,000 to 976,000, an increase of 128%, with cable telephony accounting for 59% of the increase.<sup>108</sup> IPTV is a relatively recent innovation in broadcasting distribution technology although Canadian telephone operators have offered television services competing directly with cable providers through satellite technologies for ten years. Bell Aliant, Bell, SaskTel and Telus are licensed to provide IPTV service using DSL technology. It is estimated that, as of 2005, there were approximately 100,000 subscribers to IPTV services in Canada.<sup>109</sup>

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105 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.

106 Industry Canada, Telecommunications Policy Review Panel Final Report, 2006. [online] [http://www.telecomreview.ca/epic/internet/intprp-gecrt.nsf/vwapj/report\\_e.pdf/\\$FILE/report\\_e.pdf](http://www.telecomreview.ca/epic/internet/intprp-gecrt.nsf/vwapj/report_e.pdf/$FILE/report_e.pdf)

107 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006. Eastlink has been a provider of local telephony for a longer period of time, having deployed this over its cable infrastructure without waiting for VOIP.

108 CRTC Telecommunications Monitoring Report, Status of Competition in Canadian Telecommunications Markets, July 2006.

109 CRTC The Future Environment Facing the Canadian Broadcasting System, 14 December 2006.



### B.2.4 Pricing and competitive dynamics

196 With greater overlap in product offerings between cable and telephone providers, bundling services and offering discounts are also observed in Canada, much like the US. Major cable operators such as Rogers, Vidéotron, Shaw and Eastlink offer bundles with discounts ranging from 5%-15% or \$3-\$30 depending on the service provider and number of services combined. Unlike cable operators, ILECs such as Bell and Telus generally do not offer discounts for bundling products that include regulated services for residential customers, but rather offer greater discounts on each individual product purchased over shorter periods. This is the result of regulation that prevents the ILECs from discounting regulated services included in any bundles below specified cost thresholds, and in some cases forces them to include revenues from the entire bundle as part of a price cap basket subject to an annual reduction.

### B.3 DENMARK

197 Denmark has a relatively high broadband penetration rate compared to most OECD countries. However, prices are relatively high suggesting that other demand factors are encouraging customer take-up of broadband. High penetration may reflect relatively high incomes and high penetration of complementary products such as PCs.

198 The Danish market is dominated by the incumbent TDC with more than 70% share of the DSL market.

199 Denmark was one of the first countries to require LLU in 1998, and take-up is around 15%. This figure has been decreasing recently. The second largest broadband provider has experienced significant losses in Denmark. As a result it has scaled down its operations, withdrawing from the residential DSL market in order to concentrate on delivering services to higher value niche markets such as symmetrical and high-speed business services.

200 Denmark is noticeable for the presence of significant alternative technologies in the supply of broadband, including cable, Fibre-to-the-Home and Wireless Local Loop. Danish energy companies have been particularly active in deploying Fibre-to-the-Home networks.

#### B.3.1 Headline data<sup>110</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	75%
	EFC (internet ready cable and incremental fibre)	47%

<sup>110</sup> Refer to Appendix C for a list of sources of all headline data



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Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by $[(LLU + LSS + \text{resale DSL}) / \text{total \# DSL lines}]$	28.8%
Broadband penetration	# broadband subscribers / 100 people	29.3
Price	Price per 100 kbps for a basic connection (US\$)	8.38
Speed	Maximum Speed Available	8Mbps
	Average Speed	1.9 Mbps
Innovation	VOIP and/or IPTV uptake	High VOIP uptake and IPTV uptake

### B.3.2 Network competitors

- 201 The Danish market is dominated by the incumbent TDC, whose network covers virtually all the country and which holds a large share in both DSL and cable sectors.
- 202 Although 75% of homes in Denmark are passed by a cable network, just 47% of Denmark is covered by an Internet enabled cable network. TDC's main competitor, TeliaSonera, is the second largest broadband provider in the market. The majority of its lines are provided by cable subsidiary Telia Stofa.
- 203 Despite the early introduction of LLU, access-based competition in Denmark has been limited with bitstream resale and LLU accounting for less than 30% of the DSL market. In particular, LLU has a smaller share of the DSL market than in many other countries and the lowest among the European countries analyzed in this report. LLU accounted for 15.2% of the DSL market subscriptions in mid 2006. The take-up of LLU has decreased in recent times, partly due to better offers from cable operators and an increase in broadband subscription from the incumbent. This is remarkable given that Denmark was an early mover in respect of LLU as fully unbundled lines were mandated in 1998 and line sharing was mandated in 2001.

### B.3.3 Innovation

- 204 TeliaStofa was the first in Denmark to offer wireless broadband connections to the home. There are also some smaller cable providers such as Arrownet that use FWA (fixed wireless access) to increase the footprint around its cabled areas. Sonofon also provides nationwide FWA but has failed to establish a sizeable customer base. High subscription costs have made it very difficult to compete with ADSL and cable services in the residential market.



- 205 For residential customers, TDC offers DSL services up to 2Mbit/s. Business customers on the other hand are able to receive 8Mbit/s services, with additional services. Whilst this seems quite low relative to many of its European counterparts, TDC is planning to launch ADSL2+ as well as VDSL with fibre. This will enable it to go beyond its broadband and telephony offerings and to provide full triple-play services. The operator already offers TV via broadband but its availability is likely to improve considerably in the short to mid term.
- 206 TDC Kabel is TDC's cable division. The subsidiary offers cable TV services, together with cable modem broadband services. Both residential and business customers are able to receive up to 4Mbit/s currently. The operator has recently announced plans to upgrade its traditional phone line, in a move toward offering full multimedia services, including HDTV services. Tele2, one of the other major alternative operator, offers 2Mbit/s DSL services to both business and residential customers, together with free VOIP (under the label Parlino).
- 207 Fibre to the home is becoming increasingly important for broadband access, particularly in countries with high broadband penetration. In Denmark, Danish power companies are rolling out fibre to consumers as they work to bury overhead power lines. The future expansion of these FTTx networks may not run as planned, however, as a ruling by the Danish Energy Authority has stated that energy companies cannot use public funding to build new broadband networks. Under this ruling, energy companies will only be able to deploy FTTx networks at the same time and in the same ditch as electricity cables. This may limit network roll-out by energy companies to profitable areas only.

#### **B.3.4 Pricing and competitive dynamics**

- 208 In terms of pricing; basic 'first generation' broadband packages cost around €45-55 per month; which is more expensive than many other Western European markets. Similar services in the UK and France cost around €25-30 per month, while in the Netherlands, a country with similar penetration levels and GDP per capita to that of Denmark, a similar Dutch service costs around €20-30 per month. The high Danish costs are mainly the result of little competition in the residential retail sector.<sup>111</sup>
- 209 At US\$57 (PPI) the monthly price of the most popular broadband plan for residential consumer is the highest among the countries analyzed in this report. This is higher than the US\$37 (PPI) observed in Canada. This is even more remarkable if one considers that the speed of the package in Canada is 3000 kbps in contrast to the 1024 kbps of the Danish plan.

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<sup>111</sup> Although according to TDC, competition has resulted in price reductions of 20 per cent from 2004 to 2005. Nonetheless, the telecom regulator considers that prices for ADSL remain relatively high in Denmark.



## B.4 FINLAND

210 The Finnish broadband market is characterized by a relatively low level of EFC and moderately high levels of wholesale regulation and access-based competition. Whilst the coverage of cable networks is relatively high, especially in urban areas, the majority of this cable is not Internet enabled and instead is used mainly for cable television. This means that competition between copper and cable platforms in broadband services is somewhat limited in Finland. This has led to relatively poor market outcomes in Finland compared to many of the other surveyed countries. While broadband penetration is one of the highest in the EU (broadband take-up growth has been tremendous in recent years), the quality-adjusted price of broadband services is also high. Moreover, innovation in broadband markets has been limited in recent years. Finland's broadband market is dominated by DSL. As a result of Finland's telecommunications history of many local operators around the country (there are 37 local copper network operators besides the incumbent), Finland's introduction of fixed-line services – such as DSL – has also been fragmented, with varied regional experiences.<sup>112</sup>

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<sup>112</sup> Post & Teletyrelsen, *Broadband prices in the Nordic countries in 2006*, Jan 2007, page 21.





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**B.4.1** **Headline data**<sup>113</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	67%
	EFC (internet ready cable and incremental fibre)	25%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measured by [(ULL + LSS + resale DSL) / total # DSL lines]	32%
Broadband penetration	# broadband subscribers / 100 people	25.0
Price ...	(i) Price per 100 kbps for a lower speed connection (US\$)	12.3
Speed ...	Maximum Speed Available (Mbps)	24 Mbps
	Average speed	4 Mbps
Innovation	VOIP and/or IPTV uptake	Digital TV penetration was 51% in Aug 2006. <sup>114</sup>

**B.4.2** **Network competitors**

211 Finland has never had one single incumbent telecommunications operator. Rather, the market was originally made up of many local incumbent operators. Today, the three major incumbent telecommunications operators in Finland are Telia-Sonera, Elisa and Finnet. Telia-Sonera is Finland's largest operator, but its fixed copper network covers only parts of northern and eastern Finland. Telia-Sonera is the result of a merger between Sonera (previously the Finnish PTT) and the Swedish company Telia in 2002, to become the largest operator in the Nordic market.<sup>115</sup> Elisa (previously Helsinki Telephone Company) is the next largest operator and has formed a partnership with Vodafone in its mobile arm. Finnet is a consortium of 46 regional operators and affiliates.

<sup>113</sup> Refer to Appendix C for sources of all headline data

<sup>114</sup> FICORA, *Digital TV penetration*, Oct 2006, available at <http://www.ficora.fi/en/index/tutkimukset/markkinajatilastotietoa/digitvnyleisyys.html>.

<sup>115</sup> <http://www.ovum.com/beacon/pdf/finland.pdf>



212 The major cable competitor is Welho (otherwise known as Helsinki Television or HTV), one of the major cable television operators. Welho has been offering triple play (television, broadband and VOIP) since March 2005.<sup>116</sup>

#### B.4.3 Innovation

213 IPTV is offered by Elisa (Elisa TV), Maxisat and Finnet. Aland Datakommunikation (Alcom) launched the first IPTV over DSL service in the Aland Islands in mid-2005 using Paradyne's (a broadband access service provider) DSL access service.<sup>117</sup> Welho also offers cable television in Finland, operating mainly in the Helsinki area.

214 Finland's Maxisat, recognized as the second broadband provider to offer IPTV services in Europe in 1999, offers over 40 channels of IPTV, video on demand (VoD), VOIP and Internet access at up to 24 Mbps over ADSL and ADSL 2+ connections to its subscribers in Finland (generally the Greater Helsinki Area).<sup>118</sup>

215 VOIP was initially offered by Telia-Sonera but the offer was withdrawn in late 2005. According to Telia-Sonera, it was difficult to compete with free software such as Skype.<sup>119</sup>

#### B.4.4 Pricing and competitive dynamics

216 Finland's Ministry of Transport and Communications (MINTC) has claimed that broadband prices are one of the most competitive in the EU. The January 2006 report<sup>120</sup> stated that prices of broadband subscriptions<sup>121</sup> have been declining year-on-year with a 39-45 per cent drop in the previous 12 months.

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116 <http://www.welho.fi/?d=38863>

117 <http://www.iptv-industry.com/pr/1d.htm>

118 PRNewswire, *Maxisat Selects Ruckus Wireless for In-Home Distribution of VOIP, Internet and IPTV Services*, 15 May 2006.

119 <http://e.finland.fi/netcomm/news/showarticle.asp?intNWSAID=45303>

120 Available at <http://www.mintc.fi/scripts/cgiip.exe/WService=lvn/cm/pub/showdoc.p?docid=1971&menuid=13&channelitemid=12715>.

121 This refers to the most common subscriptions offered in Finland – 512 kbps, 1 Mbps and 2 Mbps.



- 217 Cable television dominates Finland's television market, with a share of over 50 per cent. Thus, the likely area of growth for IPTV will be mostly in areas where cable television is not available. There are a total of 35 local cable television operators in Finland. In addition, 17 cable companies have announced that they also offer broadband access through the cable television network.<sup>122</sup>
- 218 Elisa has taken over Telia-Sonera as the largest private broadband operator in Finland, largely as a result of corporate acquisitions. It offers cable broadband over its cable television network in the Helsinki area.<sup>123</sup>

#### B.4.5 Other observations

- 219 The Finnish Government is very committed to developing broadband in Finland. To this end, it has a broadband strategy that, *inter alia*, seeks to have 90 per cent of all broadband connections equipped with high transmission capacity by the end of 2007. An idea that FICORA has contemplated is setting up locations where high speed public access to the Internet is available in order to aid in rural and regional development of broadband. Currently, just 26 per cent of broadband subscriptions have a download speed of 2 Mbps or faster.<sup>124</sup>

#### B.5 FRANCE

- 220 France has a relatively low broadband penetration rate of 15.6% compared with the other study countries. While the price for basic broadband service is relatively low, once adjustments are made for connection speeds between countries, the incumbent's broadband offer is not particularly cheap in France. Alternative service providers do offer cheaper and faster services.
- 221 The relatively poor market outcomes observed in France may be partly attributed to high levels of wholesale regulation and the dominance of access-based competition over EFC. The French telecommunications market is characterized by a low level of FBC, with only a quarter of homes passed by Internet-ready cable. On the other hand, access-based competition is well established and France Telecom only accounts for 45% of retail broadband connections.<sup>125</sup>

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122 Post & Telesystrelsen, *Broadband prices in the Nordic countries in 2006*, Jan 2007, page 23.

123 Post & Telesystrelsen, *Broadband prices in the Nordic countries in 2006*, Jan 2007, page 32.

124 FICORA, *Market Review 3/2006*, Dec 2006, available at <http://www.ficora.fi/en/index/tutkimukset/markkinajatilastotietoa/markkinakatsaus.html>.

125 ECTA Broadband scorecard end of March 2006.



### B.5.1 Headline data<sup>126</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	36%
	EFC (internet ready cable and incremental fibre)	25%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	VERY HIGH
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	49.8%
Broadband penetration	# broadband subscribers / 100 people	17.7
Price ...	Price per 100 kbps for a basic connection (US\$)	5.37
Speed ...	Maximum Speed Available	24Mbps
	Average Speed	6.75 Mbps
Innovation	VOIP and/or IPTV uptake	High VOIP uptake and IPTV offered

### B.5.2 Network competitors

222 France Telecom is the incumbent telecommunications operator in France and owns an almost ubiquitous copper network, with 96 - 97% of French homes passed by the DSL enabled network and broadband coverage of 92%.<sup>127</sup> France Telecom had 26.9 million fixed-line subscribers, 830,000 VOIP customers and 200,000 customers for its TV over fixed line service in 2005.<sup>128</sup>

223 EFC has been limited in France which has instead achieved significant access-based competition. There has been substantial deployment of LLU in the country (1.6 million unbundled lines at the end of 2004, compared with 28,000 in the UK and 210,000 in Sweden) allowing the rise of smaller broadband operators such as Free, Neuf and Cegetel. The main access-based competitor for the incumbent is Iliad which operates on France Telecom's copper network and has 45% all the unbundled lines in France.<sup>129</sup> Iliad is the leading triple play operator in France and has the largest subscription base for its VOIP service. In September 2006, Iliad announced plans to set up their own FTTH network to provide facilities based competition.

<sup>126</sup> Refer to Appendix C for sources of all headline data

<sup>127</sup> 'Sophisticated Broadband Services' (Final Report for the Department of Trade and Industry)

<sup>128</sup> FT Annual Report 2005

<sup>129</sup> ABN Amro, 'Telecommunication Services', 3 Feb 2005



224 There are a number of small cable operators which in total offer Internet ready coverage to only 25% of households.<sup>130</sup> The main cable operators are Noos/UPC, FT Cable and Numericable. During the past two years, the major cable operators have consolidated. NC Numericable, UPC France and France Telecom Cable, France's three largest operators were all absorbed into the Altice One group (which is in turn owned by the private equity firm Cimven). Altice One is a pan-European cable operator, but in France, has kept the existing brands of its acquired operators intact. The cable firms suffer from not offering voice services and can only offer dual-play bundles. As a result, the cable operators do not provide significant competition for the incumbent or alternative ADSL operators with regard to broadband. The cable operators have captured only 6.5% of the market. Even for TV, the French cable operators have achieved a penetration rate of only 14%.

### B.5.3 Innovation

225 France is the leading country in Western Europe in terms of VOIP and IPTV subscriptions. In 2006, 1.7 million households subscribed to IPTV services in France out of only 3.3 million in the whole of Western Europe.<sup>131</sup> By the end of 2005, France had over 2.8 million VOIP subscribers, excluding Skype users. This is over half the total 5.3 million VOIP users in Europe.<sup>132</sup>

226 There has been significant innovation observed in France in terms of television offerings. Iliad has regularly introduced new broadband services such as time-shifting and recording capabilities. Digital Terrestrial TV (DTTV) was launched nationwide in France in March 2005. As part of the French incumbents' triple-play broadband services, France Telecom plans to offer free TV programming such as films through high-speed Internet connections.

### B.5.4 Pricing and competitive dynamics

227 France in 2005 had a broadband 'price war' as prices came down for all operators. Wholesale prices in France are among the lowest in Europe and this has allowed the LLU operators to offer very low prices for broadband in France for a large download speed. Prior to these price reductions, in the first quarter of 2005, an 8 Mbps broadband service was being offered by LLU operators for less than €15 a month. Faster 20 Mbps broadband was sold for €30 a month. Cable operators also offered competitive prices for different broadband speeds. France Telecom, by contrast, was only offering 2 Mbps broadband for nearly €40 a month. It was this environment that led to the price reductions of late 2005 by all operators.

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130 OECD Communications Outlook 2005.

131 Gartner Press Releases, *Gartner Says IPTV subscribers in Western Europe to reach 16.7 Million by 2010*, 10 April 2006

132 Point Topic, 2006



### B.5.5 Other observations

228 We have seen the effects of relatively low wholesale prices charged for local loop unbundling in France as the market has been dominated by these operators with very little facilities based competition emerging. Greater facilities based competition is likely to emerge in France. Although the individual cable operators still offer separate brands in France, the purchase of the three largest by the Altice One group will consolidate their position and allow for a stronger market position in the future. FTTH will also provide facilities based competition in the future with Iliad planning its network rollout. Two days after Iliad released news on its FTTH-plans, France Telecom announced its own FTTH plans.

### B.6 GERMANY

229 The German broadband market is characterized by a low level of EFC. Despite relatively high cable coverage, Germany has the lowest share of households passed by Internet-enabled cable in the group of comparator countries. The lack of infrastructure based competition has led to very weak market outcomes: Germany has one of the lowest broadband penetration rates of the countries examined in this report. Indeed, given Germany's high cable coverage, highly technologically developed status, high per capita income and considerable urbanization, we would expect broadband penetration to be significantly higher than it is. Besides low broadband penetration, German consumers are paying a high price for the lack of infrastructure competition in terms of a slower introduction of innovative products such as VOIP and IPTV. Although maximum broadband speeds offers are high, average broadband speed is comparatively low.

230 Regulation imposed by the BNetzA, the telecoms regulator, has not improved the situation. For example the incumbent Deutsche Telekom (DT) is required to provide line sharing as well as full LLU. In September 2006, the BNetzA required DT to publish a reference offer for bitstream access including all variants of DSL.<sup>133</sup> Despite this, competitors have focused on the business market and have had little impact on the residential market, resulting in high prices for such a large and profitable market. Indeed, despite the fact that the regulator has imposed price cuts on LLU and monthly line sharing charges, DT continues to dominate the market.<sup>134</sup>

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133 Overview on regulation in Germany, OVUM, December 2005 and press release by the BNetzA, "Regulierungsverfügung für den IP-Bitstrom-Zugang", September 2006, available at <http://www.bundesnetzagentur.de/media/archive/7410.pdf>.

134 International Broadband Market Comparisons Update March 2006, October to December 2005, OVUM.



### B.6.1 Headline data<sup>135</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	83%
	EFC (internet ready cable and incremental fibre)	10%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	38.4%
Broadband penetration	# broadband subscribers / 100 people	15.1
Price	Price per 100 kbps for a basic connection (US\$)	4.85
Speed ...	Maximum Speed Available	16Mbps
	Average Speed	3.25Mbps
Innovation	VOIP and/or IPTV uptake	Low uptake of VOIP, IPTV recently launched

### B.6.2 Network competitors

231 DT is the copper line incumbent. It held 50% of the retail DSL lines in September 2006 (DSL accounts for 96% of all broadband access).<sup>136</sup> Currently there are no effective network competitors for DT's network.<sup>137</sup> The only competitive pressure was forced on the incumbent through regulatory action on the wholesale level since 2004 and LLU action since 2002.

<sup>135</sup> Refer to Appendix C for sources of all headline data

<sup>136</sup> ECTA, Broadband Scorecard, Q3, 2006.

<sup>137</sup> ECTA, Broadband Scorecard, Q3, 2006.



- 232 Despite the high coverage of cable-TV, there is no network competition from cable operators because a large part of their networks is not broadband enabled. The lack of investment can be explained mainly by the current ownership structure of cable networks, which is highly complex and the result of misguided state involvement. There are almost 40 operators offering high-speed broadband services over cable networks. Moreover, most cable networks were previously owned by DT, which concentrated on DSL and did not upgrade its cable networks.<sup>138</sup> In 1999 DT sold its 9 regional cable networks to private investors. The sale process was lengthy, taking up to two years for some regional cable networks. Some regional cable networks which were sold quickly to private investors experienced financial difficulties, even insolvency (for example Callahan NRW). This contributed to the delay in the upgrading of the cable networks for broadband.<sup>139</sup>
- 233 However, cable operators have started to upgrade their networks, increasing potential future network competition for broadband services. For example, KDG, one of the largest cable operators, is planning to invest €500 million in its network to allow it to offer triple-play services to 90% of its connectable households.<sup>140</sup>

### B.6.3 Innovation

- 234 One of the most significant innovations in the broadband market is DT's roll-out of high-speed 50Mbit/s VDSL in major German cities. The German government had originally agreed with DT's argument that it could only make a decent profit on its proposed €3 billion high-speed network if it was entirely exempt from regulation and from any requirement to offer its lines to rivals. The European Commission, however, later called the arrangement unfair. In December 2006, the German government adopted amendments to the German telecommunications law clarifying that "new" markets will be exempt from regulation. According to these new amendments, the BNetzA would regulate new markets only if it proved that not regulating such a market would obstruct "sustainable" competition "on a long-term basis".<sup>141</sup> Given these changes to the German telecommunication law and the EC's criticism of the "regulatory holiday" the amendments may imply it remains to be seen whether access to DT's VDSL network will become mandatory or not in the future.

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138 Germany – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3323>

139 Kabel Deutschland AR 2005/6, p. 6, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p. 42

140 Total Telekom, December 2005 in Ovum's International Broadband Market Comparison, October – December 2005.

141 See press release by the Bundestag, "Änderungen des Telekommunikationsrechts in modifizierter Form angenommen", [http://www.bundestag.de/aktuell/hib/2006/2006\\_363/03.html](http://www.bundestag.de/aktuell/hib/2006/2006_363/03.html).





- 235 As of the end of 2005, the telephone network/DSL platform had not been used to provide IPTV as part of triple-play portfolio. The incumbent DT and some cable operators now offer triple-play services. However, the launch of IPTV services occurred relatively late - for example Kabel Deutschland, the largest cable operator, only launched triple play services in autumn 2005.<sup>142</sup> This is late compared to Switzerland, where cable operators consider themselves as triple-play operators since 2003.
- 236 VOIP services have been more successful in the German market. Several companies offer VOIP services – for example Arcor, an ISP, launched a VOIP service in April 2005 which included video-telephony and calls via WiFi hotspots. A number of cable operators have also launched VOIP services.<sup>143</sup>

#### B.6.4 Pricing and competitive dynamics

- 237 Prices in Germany are the highest among those countries for which OVUM reports prices.<sup>144</sup> High prices for second-generation broadband services are also reported by Analysis, although prices for basic first generation broadband services have fallen considerably.<sup>145</sup> These high prices can be considered to be a result of the lack of competition and consolidation in the broadband market.

### B.7 HONG KONG

- 238 The Hong Kong telecommunications market is characterized by a high level of EFC. Wholesale access is relatively limited in Hong Kong and is likely to become even more limited in the future as the Hong Kong government phases out Type II Interconnection (unbundling) by June 2008.<sup>146</sup>

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142 Kabel Deutschland AR 2005/6, p. 6, available at [http://www.kabeldeutschland.com/fileadmin/redaktionselemente/presse/dokumente/GF-Bericht/KDG\\_GB0506\\_E\\_LR.pdf](http://www.kabeldeutschland.com/fileadmin/redaktionselemente/presse/dokumente/GF-Bericht/KDG_GB0506_E_LR.pdf)

143 Germany – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3323>.

144 Prices are based on the price index by OVUM and consider mainstream residential products. They include connection fees amortised over a three-year period and are adjusted for PPPs.

145 Analysis Research, Broadband Pricing Study, December 2005, cited in <http://www.bbwo.org.uk/broadband-3323>.

146 Press Release (July 6 2004), 'Type II Interconnection to be Withdrawn' (<http://www.info.gov.hk/gia/general/200407/06/0706214.htm>)



239 There is strong competition between copper, cable and fibre platforms in Hong Kong. The competing cable network passes over 90% of Hong Kong homes, and broadband enabled cable passes 88% of homes.<sup>147</sup> However the regulator, OFTA, does not consider the cable network to be a competing customer access network since it cannot provide traditional voice services.<sup>148</sup> Based on this classification, OFTA estimates that 71% of homes in Hong Kong can access two or more networks providing competing telecommunications services (i.e., non-cable networks); and 43% of households have access to at least three alternative customer access networks.<sup>149</sup> The prevalence of EFC has led to very strong outcomes, including high broadband penetration, very fast download speeds and high levels of innovation.

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147 I-Cable Operating Information (<http://www.i-cablecomm.com/ir/operating/index.php>)

148 OFTA (2004), 'Legislative Council Brief: Review of Type II Interconnection Policy' (File Ref: CTB/T 56/2/1(04))

149 OFTA, 'Percentage of Households with Choice of Self-built Customer Access Networks Continues to Rise', Press Release, 29 September 2005.



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### B.7.1 Headline data<sup>150</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	93%
	EFC (internet ready cable and incremental fibre)	88%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	LOW
Wholesale access	% DSL lines subject to access, measured by [(LLU + LSS + resale DSL) / total # DSL lines]	< 5%
Broadband penetration	# broadband subscribers / 100 people	23.6
Price	(i) Price per 100 kbps for a basic connection (US\$)	1.27
Speed	Maximum Speed Available	1GBps
	Average Speed	6MBps
Innovation	VOIP and/or IPTV uptake	High VOIP & IPTV uptake

### B.7.2 Network competitors

- 240 Pacific Cyber Century Works (PCCW) is the incumbent telecommunications operator in Hong Kong and owns an almost ubiquitous copper network, with 98% of Hong Kong homes being passed by PCCW's DSL enabled network.
- 241 Hong Kong Broadband Network (HKBN), a wholly owned subsidiary of City Telecom, is the owner of one of the major rival networks to PCCW. The reach of HKBN's self-owned fibre network has grown substantially in recent years, from 55% at the beginning of 2005, to 80% in 2006. HKBN has plans to further expand this network to reach 90% of Hong Kong homes.<sup>151</sup> HKBN recognizes that it cannot simply be a "me too" carrier and focuses on differentiating its product from competitors' offerings. The firm's mantra is: "build it better and cheaper than DSL and they will come!"<sup>152</sup>

150 Refer to Appendix C for sources of all headline data

151 IDC, (2005), "Case Study: Hong Kong Broadband Implements IPTV Solution on Cisco IP NGN Converged Infrastructure", October.

152 IDC, (2005), "Case Study: Hong Kong Broadband Implements IPTV Solution on Cisco IP NGN Converged Infrastructure", October.



242 The cable television operator i-Cable owns a HFC cable network which reaches 95% of Hong Kong homes. Like HKBN, i-Cable has been expanding its network reach in recent years. Hutchison Global Communications (HGC) also owns a fibre network which reaches around 1.3 million households and 5,500 buildings. HGC claims that it owns the largest fibre-to-the-building network in Hong Kong. New World Telecom also operates a fibre network although the reach of this network is unknown.

### B.7.3 Innovation

243 Due to the fierce facilities based competition in Hong Kong, there has been significant innovation by almost all players in recent years. Broadband speed offerings have been improving dramatically and in this area, HKBN appears to be the market leader. HKBN now offers a maximum download speed of 1GBps on its Ethernet network, and its standard 'mass market' package offers a download speed of 100MBps.

244 Broadband TV is now offered by a number of operators, and the incumbent's service, 'nowTV' has, according to PCCW, "won worldwide acclaim as the most successful IPTV operation, not only in subscriber numbers, but also in richness of content."<sup>153</sup> PCCW has expanded nowTV from 23 to 118 channels (including 38 exclusive channels) and built a subscription base of 608,000. nowTV also offers new interactive services such as shopping and gaming.<sup>154</sup> HKBN has developed a rival broadband TV service which offers 60 channels and has 120,000 subscribers.

245 VOIP is offered by several network operators in Hong Kong. i-Cable offers the service over its cable network, while HKBN offers VOIP over Ethernet. Both these operators bundle VOIP with television and broadband as a triple play offering.

### B.7.4 Pricing and competitive dynamics

246 HKBN appears to be taking the pricing lead by offering high speed services at very competitive rates. HKBN's standard package offers download speeds of 100MBps, and is priced at around US\$25/month.<sup>155</sup> HKBN also offers packages with download speeds of 10MBps and 1GBps. HKBN's pricing may be seen as a challenge to the incumbent whose prices are substantially higher than those of HKBN. PCCW prices stand-alone broadband with download speeds of 3-6MBps at around HK\$298 (US\$38).<sup>156</sup>

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153 PCCW, 'Statement from Deputy Chairman and Group Managing Director - 29 March 2006' ([http://www.pccw.com/ImagesNew/Investor/DCGMD\\_statement\\_eng.pdf](http://www.pccw.com/ImagesNew/Investor/DCGMD_statement_eng.pdf))

154 PCCW, (2006), "Interim Results Announcement", June.

155 [http://money.cnn.com/magazines/business2/business2\\_archive/2006/01/01/8368133/index.htm](http://money.cnn.com/magazines/business2/business2_archive/2006/01/01/8368133/index.htm)

156 PCCW website ([www.pccw.com/eng](http://www.pccw.com/eng))



247 Since HKBN, PCCW and i-Cable all have the ability to offer voice, broadband and television services, and so compete with each other in the pricing of triple play services. In response to HKBN's competitive pricing of its high speed broadband services, PCCW has released a number of bundled offers. For example, bundling nowTV with PCCW Netvigator broadband only costs an extra HK\$38 (US\$5) on top of the standard monthly charge for broadband.<sup>157</sup>

#### **B.7.5 Other observations**

248 Hong Kong is dominated by EFC. Competing with the incumbent's copper network for broadband services, there is an almost ubiquitous cable network, as well as several high speed fibre networks. As a result of this high level of EFC, the government has looked to roll back regulation of wholesale access – LLU services at the local exchange are to be phased out by the end of 2008, while access to in-building wiring or access at street level remains regulated.

249 Arguably, competition between alternative access networks in Hong Kong has been a major driver of the good market outcomes witnessed there. Relatively high penetration, low prices and strong innovation are evidence of the merits of EFC.

#### **B.8 KOREA**

250 Like Hong Kong, Korea is dominated by EFC, and access-based competition is relatively low compared to most other countries. As a result of strong competition between copper, cable and fibre platforms Korea has a broadband penetration rate that is among the highest in the world (Korea was the world leader in this area until recently), speed offerings superior to most other countries, and extremely competitive pricing of high-speed broadband products. Although the local loop has been open to unbundling since 2002, this has not been a major driver of Korea's strong broadband performance. Korean uptake of broadband services pre-dated the 2002 MIC decision to unbundle the local loop (see Figure 15) and was driven by fierce competition between network operators as well as strong demand from technology-savvy consumers.

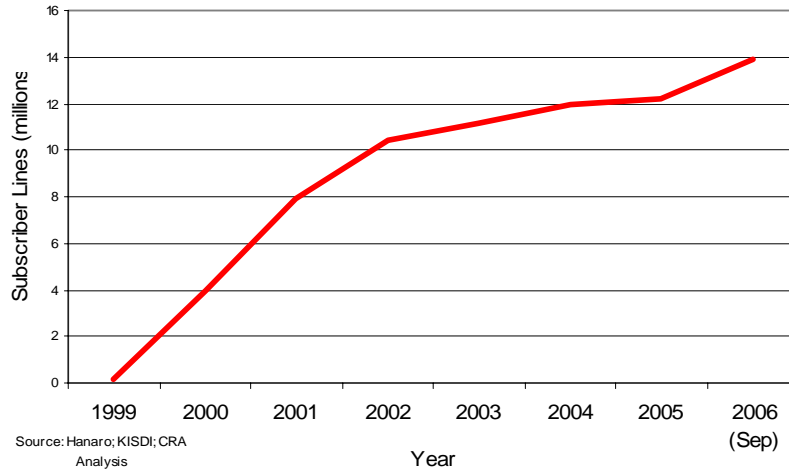
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157 PCCW website ([www.pccw.com/eng](http://www.pccw.com/eng))



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**Figure 15: Broadband Subscription in Korea**





### B.8.1 Headline data<sup>158</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	57%
	EFC (internet ready cable and incremental fibre)	80%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	13.9%
Broadband penetration	# broadband subscribers / 100 people	26.4
Price ...	(i) Price per 100 kbps for a basic connection (US\$)	1.02
Speed	Maximum Speed Available	100MBps
	Average Speed	10MBps
Innovation	VOIP and/or IPTV uptake	High VOIP & IPTV uptake

### B.8.2 Network competitors

- 251 Korea Telecom (KT) is the incumbent telecommunications operator and the owner of the near ubiquitous copper network. KT reports that 98% of the population is able to receive DSL broadband over its existing copper lines.<sup>159</sup> KT has also invested in fibre optic cables many of which connect to apartment LANs. Around 23% of KT's subscribers are on apartment LANs while the bulk of the remainder (76%) has DSL access via the copper network (a small number are on FTTH or satellite).
- 252 KT's major network competitor is Hanaro Telecom. Hanaro owns an HFC network which reaches around 9.5 million households (roughly 57% coverage) as well as a fibre optic network which provides access to large apartment complexes and office buildings.<sup>160</sup> Overall, Hanaro's network coverage is around 80%. The reach of Hanaro's fibre optic cable has more than doubled in the last five years as it has looked to provide high-speed access to consumers in high-density areas.

<sup>158</sup> Refer to Appendix C for sources of all headline data

<sup>159</sup> KT (July 2005), Form 20-F/A (as filed with the securities and exchange commission)

<sup>160</sup> Hanaro (June 2006), Form 20-F (as filed with the securities and exchange commission)



### B.8.3 Innovation

- 253 Innovation in Korea has mainly been in the area of speed offerings. Both KT and Hanaro offer high speed (100Mbps) LAN connections to apartment blocks and office buildings in high population density areas. Apartment blocks with these high speed broadband connections are often referred to as 'cyber apartment buildings' and are becoming increasingly prevalent in Korea. For Koreans living in cyber buildings, the high speed offerings are moderately priced. The monthly charge on a 100Mbps LAN connection from Hanaro is just 33 000 Won (roughly US\$35), which is cheaper than a lower speed VDSL connection (for example, a 50Mbps VDSL connection from Hanaro is 43 000 Won).<sup>161</sup>
- 254 Hanaro has also looked to expand its VOIP business in recent times. In particular, since the implementation of Fixed Line Number Portability (a system that makes transferring to VOIP simpler) in mid-2004, Hanaro has looked to increase its VOIP subscriber base. Between August 2004 and April 2006, Hanaro added over 400,000 voice lines, and in the same period, its share of the voice market increased from 5% to 6.9%.<sup>162</sup>
- 255 KT has recently announced the launch of IPTV services. In November 2006, KT announced the launch of its pilot IPTV service which aims to provide at least 24 channels to around 260 households initially.<sup>163</sup> This move by KT may be a response to Hanaro's launch of hanaTV in July 2006, which allowed Hanaro to begin offering triple play services.<sup>164</sup> The quick response by KT to Hanaro's July launch indicates that the incumbent feels it must keep up with its network competitor. Thus, the high level of competition between copper, cable and fibre platforms in Korea is allowing consumers to sample a wider range of high quality products at competitive prices.

### B.8.4 Pricing and competitive dynamics

- 256 Hanaro appears to be the market leader in terms of price in the Korean broadband market. At present, Hanaro and KT make almost identical offerings in terms of speed, however Hanaro's offerings are priced 2000 Won cheaper than KT's offerings at each speed (see Table 5). Interestingly, these prices have not changed substantially over the past year.

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161 Hanaro website ([http://www.hanaro.com/eng/iproduct/vne\\_evalley.asp](http://www.hanaro.com/eng/iproduct/vne_evalley.asp))

162 Hanaro (June 29 2006), Form 20-F (as filed with the securities and exchange commission)

163 KT Press Release 22/11/06 'Internet Service on your Television Set!' ([http://www.kt.co.kr/kthome/eng/press/press/press\\_kt\\_view.jsp?news\\_seq=85](http://www.kt.co.kr/kthome/eng/press/press/press_kt_view.jsp?news_seq=85))

164 Hanaro (2006), 'Quarterly Report November 2006'





**Table 5: Broadband Pricing in Korea (Apartment LAN offerings excluded)**

Speed (Mbps)	KT Monthly Charge (Won)	Hanaro Monthly Charge (Won)
50	45,000	43,000
20	42,000	40,000
13	40,000	38,000
4	30,000	28,000

Source: Provider Websites.

Note: Fibre LAN offerings not included.

257 More vigorous competition has been witnessed in the offering and pricing of multiple play services. Since launching hanaTV in mid-2006, Hanaro has been able to offer customers triple play services, with discounts of 10-40% off monthly charges for bundling.<sup>164</sup> In response, KT may also begin to offer discounts for bundling once its IPTV service is fully operational.

#### B.8.5 Other observations

258 Korean society is highly Internet focused and as a result there is strong demand for broadband services. Evidence of this can be seen in the proliferation of 'PC bangs' (or PC rooms) where Koreans can access high-speed broadband, and use the Internet to play games, watch movies or television or communicate via email or VOIP.

259 This is partly a result of policies implemented by the Korean government in recent years. The government has recognized the importance of information technology to economic progress and has looked to stimulate broadband uptake through both demand side and supply side measures. On the demand side, the government has tried to bridge the 'digital divide' by providing IT training and providing subsidies so that Koreans can buy PCs cheaply. Over 10 million Koreans have received IT training from the government and this is likely to have contributed to the rising demand for broadband. On the supply side, the government has provided low interest loans and subsidies for the roll-out of broadband infrastructure by telecommunications operators.<sup>165</sup> This has allowed for strong EFC and its associated benefits in Korea.

<sup>165</sup> ITU (2005), 'Ubiquitous Network Societies: The Case of the Republic of Korea'



## B.9 THE NETHERLANDS

- 260 Unlike Germany, the Netherlands is dominated by EFC. The main competitors to the incumbent KPN's broadband network are cable operators.<sup>166</sup> EFC has contributed to a high broadband penetration, with the Netherlands having the second highest broadband penetration of OECD countries in June 2006 and the highest broadband penetration in the EU-15 countries. The Dutch cable operators, which have widespread coverage, have played an important role in this. Cable operators in the Netherlands started offering broadband access significantly earlier than DSL providers.<sup>167</sup>
- 261 Despite a relatively low level of wholesale regulation, access-based competition is also significant in the Netherlands, although a large share of this represents DSL resale.

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<sup>166</sup> OPTA (The Dutch telecom regulator) Annual Report 2005, available at <http://www.opta.nl/download/jaarverslag%5F2005%5Finteractive%5Fwebsite%5Fen%2Epdf>.

<sup>167</sup> KabelInternet in Deutschland (Cable-based Internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_KabelInternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_KabelInternet_in_Deutschland.pdf), p.30.



### B.9.1 Headline data<sup>168</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	97%
	EFC (internet ready cable and incremental fibre)	79%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	48.5%
Broadband penetration	# broadband subscribers / 100 people	28.8
Price ...	Price per 100 kbps for a basic connection (US\$)	5.54
Speed ...	Maximum Speed Available (Mbps)	8Mbps
	Average Speed (Mbps)	5.25 Mbps
Innovation	VOIP and/or IPTV uptake	High uptake of both

### B.9.2 Network competitors

262 KPN is the incumbent telecom provider. Its broadband enabled copper network covers nearly 99% of the Dutch population.<sup>169</sup> The triple-play offers by cable competitors have encouraged KPN to expand its DSL offer much more aggressively. Hence the penetration of cable Internet has led to a much faster adoption of broadband in general.<sup>170</sup>

<sup>168</sup> Refer to Appendix C for sources of all headline data

<sup>169</sup> The Netherlands – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3052>.

<sup>170</sup> KabelinternetInternet in Deutschland (Cable-based internetInternet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_KabelinternetInternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_KabelinternetInternet_in_Deutschland.pdf), p.31.



263 Cable operators are the main competitor to the KPN's broadband offer. Three Dutch cable operators serve around 85% of all cable customers: UPC (37%), Essent (27%) and Casema (21%).<sup>171</sup> Cable accounts for around 40% of the broadband market whereas KPN DSL-services account for around 43% of the market. LLU accounts for the rest of the broadband market, however this is mainly via shared lines.<sup>172</sup> This shows that network competitors, especially cable operators, have managed to win significant market share.

### B.9.3 Innovation

264 The Dutch broadband market shows high performance in terms of both the maximum and the average speed. Cable operators have promoted high-speed offers - one of the cable operators was the first to offer speeds of 20 Mbps download retail connection.<sup>173</sup>

265 The Dutch cable operators have also been particularly innovative in the area of VOIP. Cable operators have agreed to offer VOIP services on a joint IP-platform, the first example of such an agreement.<sup>174</sup> Besides the high degree of innovation in VOIP services, there is also a high degree of competition between Dutch cable operators and KPN in terms of triple-play services. While many Western European markets have yet to see the introduction of triple-play products, competition is already high in this area in the Netherlands.<sup>175</sup> Moreover, cable operators are starting to diversify by investing in content acquisition by purchasing TV-channels from Canal+.<sup>176</sup>

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171 Based on 2005 data. Kabelinternet in Deutschland (Cable-based internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.31.

172 Kabelinternet in Deutschland (Cable-based internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.30.

173 The Netherlands – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3052>.

174 The platform allows participating operators to share VOIP traffic directly over their IP networks, completely bypassing traditional phone networks and thereby eliminating PSTN interconnection fees. See "UPC Netherlands, Casema, MultiKable, Essent and CaiW jointly select X-connect to exchange all VOIP traffic", January 2006., see [http://www.eurocomms.co.uk/online\\_pr/online\\_pr.ehtml?o=1319](http://www.eurocomms.co.uk/online_pr/online_pr.ehtml?o=1319).

175 The Netherlands – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3052>.

176 The Netherlands – Broadband market 2005, Wales Broadband Observatory, <http://www.bbwo.org.uk/broadband-3052>.



266 The high degree of innovation by cable operators has increased the competitive pressure on the incumbent KPN. The incumbent KPN plans to create an All IP network. To do so, KPN is rolling out fibre optic to all 28,000 street cabinets, and will be offering broadband Internet access from there based on VDSL technology.<sup>177</sup> Thus, innovation by cable operators appears to have led to increased innovative pressure on the incumbent.

#### **B.9.4 Pricing and competitive dynamics**

267 The performance of the Netherlands rates very high in terms of average speeds (5.3 Mbps). Speeds in excess of 5 Mbps account for 42% of all products surveyed.<sup>178</sup> Prices in the Netherlands are also the lowest in all countries for which COMREG reports price indices based on an ADSL and Cable basket. Cable operators are attempting to increase their numbers of triple-play subscribers by keeping single products at a price that creates a significant saving when they are bought in a 'bundle'.

#### **B.9.5 Other observations**

268 The Netherlands benefits from nearly ubiquitous coverage by both cable and copper networks and a high broadband penetration. At the same time, regulation of the incumbent KPN has been more relaxed than in many other countries, with no legal requirement on KPN to offer wholesale bitstream access.<sup>179</sup> As a result, the main threat to the incumbent's market share has come from infrastructure based competition, particularly from the cable operators.

### **B.10 SWEDEN**

269 The Swedish broadband market is characterized by a mix of technologies. With a share of over 60%, DSL is the predominant broadband technology, but cable and fibre are also widely spread (about half of the households in this country are passed by fibre infrastructure). Sweden is one of the world's leading countries for the deployment of fibre. Its success is largely due to the high proportion of the population living in a small concentrated geographical area; more than 50% of Sweden's workforce lives within the three main cities, many of whom live in blocks of flats. Sweden is also highly urbanized, with 83% of population living in urban areas.

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177 Vision and Annual Plan 2007, OPTA (the Dutch Telecoms Regulator), available at <http://www.opta.nl/download/Visie%5F2007%5FENG%2Epdf>.

178 Comparison of OECD Broadband Markets, May 2006, Wairua Consulting.

179 [http://erg.eu.int/doc/publications/erg\\_05\\_23\\_broadbd\\_mrkt\\_comp\\_annex\\_a\\_p.pdf](http://erg.eu.int/doc/publications/erg_05_23_broadbd_mrkt_comp_annex_a_p.pdf), p. 43



- 270 Fibre broadband however, has no advantage over DSL in price or speed. Thus as DSL is favoured by the incumbent, fibre has yet to wrestle a large share of the market. Over the last few years however, 100Mbps services have been introduced directly to the premises and more bandwidth intensive services have been launched. This speed advantage over DSL may see fibre taking a greater share of the market in the future.
- 271 Despite the relatively high network coverage, penetration of broadband (22.7%) in Sweden is about the average for European countries and just above Canada. This has grown relatively fast over the last few years though.
- 272 As well as technology competition, competition is also stimulated in the market by a large amount of LLU. Indeed, Sweden has been one of the most active country markets in this area. As of June 2005, Sweden had one of the highest LLU shares of the DSL market in Western Europe at 31.3%. LLU operators in Sweden were given a boost in December 2003, when PTS ordered the incumbent, TeliaSonera, to lower its prices for LLU access. It ruled that the incumbent had been discriminatory by charging different prices to different operators. Another interesting aspect of the Swedish market is that three operators compete with the incumbent with a resale product based on the LLU wholesale products of the incumbent.
- 273 The high level of competition that has resulted in the low incumbent retail share has also had a positive impact on the choice of services available in Sweden, with high speed (up to 50Mbps) broadband packages widely available. Despite this relatively high level of performance, Sweden rates only moderately in terms of cost, with prices around the European average. VOIP in Sweden has had no significant impact thus far.



**B.10.1 Headline data<sup>180</sup>**

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	62%
	EFC (internet ready cable and incremental fibre)	50%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	45.5%
Broadband penetration	# broadband subscribers / 100 people	22.7
Price / performance	(i) Price per 100 kbps for a lower speed connection (US\$)	6.8
Speed ...	Maximum Speed Available (Mbps)	100Mbps
	Average Speed (Mbps)	8.5 Mbps
Innovation	VOIP and/or IPTV uptake	low uptake of both

**B.10.2 Network competitors**

274 Telia Sonera's (the incumbent) network reaches all of Sweden's 289 administrative areas of which DLS services are available to 93% of households. The Swedish cable market is very fragmented, with over 70 operators, both regional and national. The major national operators are Com Hem, Canal Digital, Tele2Vision and UPC Sverige AB. Although the total cable TV networks are fairly extensive, the majority of these lines have not yet been modified for broadband access. Internet enhanced cable network is available to only 23% of the population. Currently, work to upgrade the cable television network is in progress and the number of connections ready for delivery to residential customers is reported to be increasing though.<sup>181</sup>

180 Refer to Appendix C for sources of all headline data

181 Broadband prices in the Nordic countries in 2006 p. 23.



- 275 As noted above, Sweden is characterized for its (publicly built) fibre optic backbone network (Svenska Kraftnet). This network consists of, among other things, fibre-optic cables which, from 1988, are being installed on the sky wires of power lines. Svenska Kraftnät also leases fibre-optic capacity to external customers. By June 2001 this network reached 159 municipalities (out of the 289), and 85% of population. In 2005 however, only 1.6 million homes (out of 4.2 million total homes) had access to broadband enhanced fibre. The network has grown considerably over the last few years and it is expected to reach all of Sweden in the near future.
- 276 At the retail level TeliaSonera DSL lines account for around 38%. This is one of the lowest incumbent retail shares in Western Europe. Fibre and cable had almost equal shares of the market (around 17%).

### B.10.3 Innovation

- 277 The availability of 'second generation' services is one of the highest in Western Europe. Figures from Analysys Research show over 71% of all households could access broadband services at speeds of 8Mbps or higher; whilst Glocalnet claimed that it had extended the coverage of its 8Mbps DSL product to 80% of Swedish households. There are also many ADSL2+ services with download speeds of 20Mbps or higher, and some FTTx services of up to 100Mbps available.
- 278 TeliaSonera's main broadband competitor, B2, has taken a different approach by concentrating mainly on high speed Ethernet and VDSL connections to households. Having originally offered 10Mbps services over Ethernet, it is in the process of upgrading these connections to 100Mbps, at no cost to the user, and aimed to finish upgrading all lines by 2006. However it has started to migrate its VDSL users over to ADSL2 and ADSL2+. Although ADSL2+ looks set to become B2's main access technology, it had intentions to deploy VDSL2 services sometime during 2006.
- 279 Other important development in the market is that Stokab, the broadband services operator owned by the City of Stockholm, has received clearance to build a wireless broadband network based on WiMax technology in the greater Stockholm area. Stokab plans to connect 50,000 apartments managed by the City of Stockholm-owned housing company Svenska Bostader to broadband services by 2009.
- 280 In October 2005, Denmark-based TDC also launched three broadband products and two types of telephony subscription to residential customers in Sweden. TDC is able to offer its new products to about a third of the Swedish market, mainly large urban areas, with the aim to increase coverage to more than 50% in the course of the next few years. TDC also has plans to introduce a broadband TV service in Sweden in 2006.





#### **B.10.4 Pricing and competitive dynamics**

- 281 In terms of pricing, basic 'First generation' broadband services with download speeds of 512kbps to 2Mbps are available in Sweden for around €30-35 per month. This is slightly expensive when compared to other Western European markets. Similar services in the Netherlands, which has similar GDP per capita, but higher broadband penetration than Sweden, cost around €20-30. In France and the UK, where GDP per capita and penetration levels are similar to Sweden, similar services cost around €25-30 per month.
- 282 Higher speed 'second generation' broadband services (that have been available in Sweden for longer than in many other European markets) are similar in cost to the 'first generation' services, ranging from around €25 to €45 per month for 8-24Mbps services. These are similar in cost to 'second generation' services in France and the UK, though cheaper than in the Netherlands, where these services cost around €60-80 per month.
- 283 In June 2005, PTS launched a new web service that makes it easier to compare the prices of telecommunication and Internet offers. The service combines the various charges that affect the total cost and combine them into a monthly cost, making them easier to compare in an equivalent manner.

#### **B.10.5 Other observations**

- 284 Government investment in a national high-speed infrastructure, high GDP per capita, high levels of ICT penetration and high levels of international bandwidth per inhabitant have resulted in Sweden having a mature and well developed broadband market. Although broadband penetration is not as high as some of the leading Western European nations, such as Denmark and the Netherlands, there are a high proportion of users who have a higher speed connection (Analysys Research estimated that 38% of residential subscribers had a 2Mbps or above service at the end of 2004).
- 285 A unique feature that separates the Swedish market from other countries was the early adoption of many operator neutral networks throughout the country that were built by municipalities and utilities. These allow ISPs and other service providers to offer their services without any investment in expensive infrastructure.
- 286 The high number of higher speed subscribers has come about from Sweden's uniqueness in having FTTx and DSL services available to residential customers, as well as businesses for some time.



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## B.11 SWITZERLAND

- 287 The Swiss broadband market is characterized by a high level of EFC. This has contributed towards high broadband penetration, placing Switzerland among the leading countries in the OECD. Access regulation for broadband access services has not existed in Switzerland although the incumbent has commercially offered a DSL resale product.<sup>182</sup>
- 288 The Swiss broadband market also performs well in terms of innovative products and speed. The relatively high prices can be explained by the low level of urbanisation.

### B.11.1 Headline data<sup>183</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	95%
	EFC (internet ready cable and incremental fibre)	76%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	LOW
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	35.5%
Broadband penetration	# broadband subscribers / 100 people	26.2
Price ...	(i) Price for the most commonly used BB plan per residential user (US\$ PPP)	5.54
Speed ...	Maximum Speed Available (Mbps)	10Mbps
	Average Speed (Mbps)	2.75 Mbps
Innovation	VOIP and/or IPTV uptake	Large uptake for VOIP on cable.

### B.11.2 Network competitors

- 289 SwissCom is the fixed line incumbent, with a network reach of 99.6% of the population.<sup>184</sup> It has a market share of around 45% of the Internet market.<sup>185</sup> SwissCom's predecessor was also a shareholder of the largest cable network operator CableCom until 2000, helping to upgrade cable networks so that Internet could be provided over cable.<sup>186</sup>

182 Bitstream products are also not available.

183 Refer to Appendix C for sources of all headline data

184 [http://erg.eu.int/doc/publications/erg\\_05\\_23\\_broadbd\\_mrkt\\_comp\\_annex\\_a\\_p.pdf](http://erg.eu.int/doc/publications/erg_05_23_broadbd_mrkt_comp_annex_a_p.pdf), p.21

185 See [http://www.swisscom.com/GHQ/content/Ueber\\_uns/Unternehmen/Markt\\_Wettbewerber/](http://www.swisscom.com/GHQ/content/Ueber_uns/Unternehmen/Markt_Wettbewerber/) website of SwissCom:



290 The Swiss cable operator market is very fragmented, with around 415 cable operators with many different sizes. Around three-quarters of the operators supply less than 5,000 customers (each) whereas CableCom supplies around 54% of all households. Around 19% of households are connected to cable operators who operate partner networks of CableCom.<sup>187</sup>

### B.11.3 Innovation

291 When it was started in 1996, cable was the first medium for the deployment of broadband television. The fixed-line incumbent that was also involved in the largest cable operator up to 2000 also contributed to the upgrade of the cable network for the provision of broadband Internet. The incumbent only began offering DSL-services four years after the first cable broadband connection, contributing to a larger proportion of cable-based broadband access in the past. Cable operators have considered themselves as “triple play” providers since 2003 and also offer voice telephony over their networks. The largest operator Cablecom was one of the first operators in Europe to offer digital TV, launching a service in 1999. It became a triple-play operator four years later following the introduction of VOIP in the German-speaking cantons of Switzerland and by the end of 2005 had over two million video, voice and data subscribers. Cablecom’s national local loop network is currently only one of two in the country, operating in 14 of the 16 largest cities. CableCom was the first Swiss company to offer quadruple-play.<sup>188</sup> The incumbent Swisscom reacted by an aggressive VDSL-investment and as well as the offer of IPTV since 2006.

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186 Kabelinternet in Deutschland (Cable-based internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.31.

187 Kabelinternet in Deutschland (Cable-based internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available at [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.34.

188 Kabelinternet in Deutschland (Cable-based internet in Germany), study commissioned by the German Association of Cable Operators, November 2006, available [http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14\\_Studie\\_Kabelinternet\\_in\\_Deutschland.pdf](http://www.deutscherkabelverband.de/web/cms/upload/pdf/06-12-14_Studie_Kabelinternet_in_Deutschland.pdf), p.34 and; <http://www.screendigest.com/reports/06eurobbcable/NSMH-6T8FY/sample.pdf>, p.7 and; [http://www.cablecom.ch/en/Cablecom\\_Medienmitteilung\\_Glarus\\_060816.pdf](http://www.cablecom.ch/en/Cablecom_Medienmitteilung_Glarus_060816.pdf)



#### B.11.4 Pricing and competitive dynamics

292 Prices in Switzerland are considered to be relatively high. Although neither Analysys nor Comreg report a price index for Switzerland, a comparison of the most commonly used broadband plan by residential users shows that prices in Switzerland are just below prices in Denmark. This is supported by Wairua's comparison of OECD markets.<sup>189</sup> One factor which could help to explain high prices in Switzerland is the relatively low percentage of the population living in urban areas – this is 68% in Switzerland compared to 90% in the Netherlands, 88% in Germany, 76% in France or 90% in the UK.<sup>190</sup> Interestingly, the largest cable operator CableCom offers a lower price for its triple-play than the incumbent and also allows the connection of more TVs than the incumbent.<sup>191</sup>

#### B.11.5 Other observations

293 Together with the Dutch and the Danish markets, the Swiss market shows a high level of broadband penetration and a high level of EFC. However, whereas the Dutch and the Danish incumbents have been forced to unbundle their local loops, SwissCom has not been subject to the same obligation to date.

#### B.12 UNITED KINGDOM

294 The UK incumbent, British Telecom (BT), network covers virtually 100% of the population, with all of the network DSL enabled (a separate incumbent network exists in the city of Hull).

295 Cable coverage is much more limited with 51% of homes being passed by cable, although most of this cable has been upgraded for Internet services. NTL/Telewest now owns 90% of the cable network following a long period of consolidation in the UK industry which was initially based on small regional franchises. The process of consolidation itself led to high levels of indebtedness of the cable operators.

296 Access based competition is significant with bitstream services of non-incumbent operators accounting for over half of the DSL connections. Despite significant access-based competition, UK broadband penetration is significantly below the leading countries in our case studies and broadband prices are not particularly cheap. Some innovative packages have been recently introduced though and average broadband download speeds are increasing.

297 The UK regulator, Ofcom, has also announced proposals to start removing some regulation of broadband access products.

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189 See p. 34 of Comparison of OECD Broadband markets, Wairua Consulting prepared for InternetNZ, May 2006.

190 See [http://devdata.worldbank.org/wdi/dfs/table3\\_10.pdf](http://devdata.worldbank.org/wdi/dfs/table3_10.pdf) for data on urbanisation.

191 See <http://www.cablecom.ch/tripleplay.htm>



**B.12.1 Headline data**<sup>192</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	51%
	EFC (internet ready cable and incremental fibre)	45%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	VERY HIGH
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	67.7%
Broadband penetration	# broadband subscribers / 100 people	19.4
Price ...	Price per 100 kbps for a basic connection (US\$)	30.7
Speed ...	Maximum Speed Available (Mbps)	24 Mbps
	Average Speed (Mbps)	2.1 Mbps
Innovation	VOIP and/or uptake	Both just recently launched

**B.12.2 Network competitors**

298 BT figures indicate that 99.9% of UK households and businesses are now served by exchanges that have been ADSL enabled. The high ADSL coverage in the BT network reflects its commitment to provide broadband coverage to most households connected to its exchanges by 2005. BT has faced competition from access-based DSL providers for some years. However, over the past year the company has managed to at least slow its decline in market share partly due to the introduction of new products.

<sup>192</sup> Refer to Appendix C for sources of all headline data



- 299 The UK was one of the earliest countries in which cable operators provided voice telephony through the supply of services over conventional twisted copper pairs that share the same duct as the hybrid fibre-coax network used to deliver cable television (“Siamese cable”). Cable operators were only given the right to offer telephony services in 1991, almost a decade after Mercury become the second fixed operator to receive a licence. Despite their later start and still limited geographic coverage, the UK cable operators remain the major competitors to BT accounting for over three times as many lines as are provided by non-incumbent fixed operators.<sup>193</sup> The majority of UK cable customers take telephony services from their cable operator.<sup>194</sup> Indeed, it is the cable telephony offer, rather than the cable TV or broadband service, which attracts most customers to be connected to cable in the UK.<sup>195</sup>
- 300 Cable coverage is nevertheless limited compared with countries such as the US, Canada and Korea. Cable services are available to 51% of UK households and 85% of UK businesses. There has been little increase in cable coverage over the last few years and significant further rollout of the cable networks is not expected. Most of the cable networks have now been upgraded for Internet services.

### B.12.3 Innovation

- 301 BT introduced a new combined broadband and wireless IP telephony product in June 2006 – the first time that a major UK broadband ISP has fully integrated voice over IP (VOIP) into its offering. BT also offers a bundle on broadband, VOIP and WiFi minutes and has launched its IPTV offering in partnership with Freeview, the UK DTT operator. The company hopes this will protect its market share further as well as create additional revenues.
- 302 BT has a large ongoing NGN program, which includes the move to ADSL2+ and the availability of ‘broadband dial-tone’ by 2009. BT was due to launch ADSL2+ in late 2007/ early 2008, but due to high-demand from its retail ISP customers, will bring this date forward to the first half of 2007.

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<sup>193</sup> Ofcom, *Communications Market 2006 - Telecommunications Market Data Tables Q3 2005*, February 2006, Table 2.

<sup>194</sup> See European Cable Communications Association, *Information on the European Broadband Industry* at [http://www.ecca.be/html/body/european\\_broadband\\_industry/general\\_info.htm](http://www.ecca.be/html/body/european_broadband_industry/general_info.htm)

<sup>195</sup> The UK main cable operator, ntl, had 4.2 million telephone subscribers, 3.3 million TV subscribers and 3.0m broadband subscribers in the third quarter of 2006 (NTL Q3 2006 financial statement, 8 November 2006).



303 In July NTL also acquired Virgin mobile, and has announced that it would launch the UK's first 'quad-play' service by the end of 2006. Through its interest in Virgin.net, a broadband ISP that wholesales services from BT Wholesale, NTL uses cable modem and DSL technologies to connect its customers. For some time, NTL has also been contemplating the move to LLU in order to expand its network footprint. However, the company has not made public any firm commitments on this decision as yet. With its acquisitions, NTL is now the largest broadband operator in the UK, and is likely to remain BT's main competitor for some years to come.

#### **B.12.4 Pricing and competitive dynamics**

304 Market pricing has recently been destabilized by new offers from access-based competitors. For instance, Carphone Warehouse introduced an 8Mbit/s broadband offer in 2006 which provided broadband as a 'free' addition if customers acquired telephony services from the provider. Other players are responding with new tariff offers. Orange (having re-branded its Wanadoo ISP to Orange Broadband in early 2006), launched a 'free broadband' offer in May 2006 to customers who took certain monthly-contract Orange mobile services. The other UK mobile operators are also pursuing arrangements to be able to compete with quad play offers.

#### **B.12.5 Other observations**

305 Price declines in the UK appear to reflect a combination of competition and other factors such as lower equipment costs, increased growth and scale. Recent announcements by Carphone Warehouse and Orange seem to indicate that price erosion is likely to continue, albeit as part of bundled triple-play and quad-play offers.

306 The UK regulator, Ofcom, has outlined an overall framework to gradually remove the regulation of multiple existing access products with the intention of limiting regulation to unbundled local loop services where such regulation is sufficient to deliver competitive outcomes.<sup>196</sup>

307 In particular Ofcom has assessed the continuing need for regulation of BT in some areas in the UK where the operator has significant market power. However, the regulator has also recognized that in many other areas recent changes in the wholesale market will result in over half of the UK population being served by four or more operators (including LLU operators) in the near future. This implies that regulation of this market must adapt to these changes in order to continue to ensure effective competition in the retail market. In particular, Ofcom needs to avoid a 'one size fits all' approach to regulation that treats all areas in the UK the same.

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<sup>196</sup> See Ofcom, *Review of the wholesale broadband access markets 2006/07*, November 2006.



### B.13 UNITED STATES

- 308 The US rate of broadband penetration was 19.2% as of June 2006 and has been growing rapidly.<sup>197</sup> This rate of penetration exceeds a number of European countries but is lower than the rate in Canada and the Asian countries studied here. There is active competition between cable and incumbent telecommunications operators for broadband subscribers, although cable modem users have represented the largest share of broadband users to this point.
- 309 EFC in the US operates in a similar fashion to Canada, in that the most significant competitive rivalries are between the cable companies and the ILECs. Both cable and telecom incumbents are competing aggressively on the basis of bundled service offerings. The Federal Communications Commission has recently rolled back a number of the avenues previously available to access-based entrants, including unbundling of the “platform” of network elements and DSL line-sharing. In light of this, there has been speculation that the few remaining access-based competitors will face a difficult challenge remaining in the market; even in the previous, more tolerant unbundling regime access-based competitors served only a small fraction of broadband users in the US. However, commentators view the incumbents’ remaining unbundling obligations as subject to substantial uncertainty, which may have a continuing effect on the incentives of the incumbents to invest.<sup>198</sup>

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197 Organisation for Economic Co-operation and Development, “OECD Broadband Statistics to June 2006”, June 2006. [online] [www.oecd.org/sti/ict/broadband](http://www.oecd.org/sti/ict/broadband)

198 See e.g., Robert W. Crandall, *Competition and Chaos: U.S. Telecommunications Since the 1996 Telecom Act*, Brookings Institution Press, 2005, p. 121: “Until recently, the FCC extended the unbundling requirements of the Telecommunications Act to elements required for broadband services. These obligations have applied not only to elements of the legacy network used to provide traditional voice services but also to parts of the network that are the result of new investments, which can be used to provide new services—even those that may not have been envisioned when the act was passed. Even though the FCC removed one of these responsibilities, “line sharing,” in its August 2003 decision, the entire network unbundling regime remains a source of considerable uncertainty. This uncertainty is clearly an obstacle to the ILECs’ decisions to upgrade their networks both to extend broadband services to more customers and to provide new services.”





**B.13.1 Headline data**<sup>199</sup>

Market Outcome Indicator	Measurement/Index	Result
Cable coverage	# homes passed by cable / total # homes	95%
	EFC (internet ready cable and incremental fibre)	80%
Wholesale Regulation	Classification based on wholesale regulation observed in broadband markets	MEDIUM
Wholesale access	% DSL lines subject to access, measures by [(LLU + LSS + resale DSL) / total # DSL lines]	3.7%
Broadband penetration	# broadband subscribers / 100 people	19.2
Price ...	Price per 100 kbps for a lower speed connection (US\$)	2.00
Speed ...	Maximum Speed Available (Mbps)	30Mbps
	Average speed (Mbps)	2Mbps
Innovation	VOIP and/or IPTV uptake	Yes

**B.13.2 Network competitors**

310 There are a number of incumbent telecommunications operators in the US, representing the remnants of the national Bell system that was broken up in 1984. Among the largest are Verizon Communications, Inc., AT&T Inc. (including the former BellSouth and SBC), and Qwest Communications International, Inc. Together, these companies own ubiquitous copper networks, with 78% of homes passed by DSL.<sup>200</sup> As of the end of 2005, there were 19.5 million DSL lines in service accounting for 39% of the broadband market, with the ILECs serving 96.3% of these lines.<sup>201</sup> The ILECs are increasingly offering pay television services over DSL and fibre (where available). Many are planning rollouts of IPTV in the near future.

<sup>199</sup> Refer to Appendix C for sources of all headline data

<sup>200</sup> Industry Analysis and Technology Division, Wireline Competition Bureau, "High-Speed Services for Internet Access: Status as of December 31, 2005", July 2006 Table 14. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-266596A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf)

<sup>201</sup> Industry Analysis and Technology Division, Wireline Competition Bureau, "High-Speed Services for Internet Access: Status as of December 31, 2005", July 2006 Tables 1, 14, 6. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-266596A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf)



311 There were 25.5 million cable broadband lines in service at the end of 2005, accounting for 51% of the broadband market, with virtually all of these provided by the cable incumbents.<sup>202</sup> The cable incumbents include Time Warner Cable Inc., Cox Communications, Comcast Corp., Adelphia Communications Corp., and Charter Communications. Their networks jointly pass 93% of homes.<sup>203</sup>

### B.13.3 Innovation

312 As noted above, many of the ILECs are deploying FTTH and are making increasing incursions into digital TV markets. This is partly in reaction to reduced unbundling obligations that do not require ILECs to lease fibre network elements at regulated prices as well as being a competitive step towards offering triple/quad-play options to their customers. The development of increased network expenditures—including a 15.9% year-over-year increase—is also in contrast to the situation over a period of several years in which ILECs had reduced capital expenditures, relative to the late 1990s.<sup>204</sup>

313 Currently, 322,700 homes are connected to fibre networks.<sup>205</sup> AT&T, as well as Qwest and other smaller ILECs, plan to offer services over NGN in the near future. Verizon is currently leading the way, with various IP based products already offered in the market and an infrastructure that includes over 270,000 domestic and 360,000 international route miles of fiber-optic cable providing next-generation IP network service access to over 140 countries.<sup>206</sup>

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202 Industry Analysis and Technology Division, Wireline Competition Bureau, "High-Speed Services for Internet Access: Status as of December 31, 2005", July 2006 Table 1. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-266596A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf)

203 Industry Analysis and Technology Division, Wireline Competition Bureau, "High-Speed Services for Internet Access: Status as of December 31, 2005", July 2006 Table 14. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-266596A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf)

204 TIA Advancing Global Communications, ".S. Network Equipment Market Rises 15.9 Percent in 2005 Reaching \$19.9 Billion -- Second Consecutive Double-Digit Increase Following Three Years of Decline", July 12, 2006. [online] [http://www.tiaonline.org/business/media/press\\_releases/2006/PR06-64.cfm;%20http://pcat.qwest.com/pcat/bundlesMain.do?salesChannel=re](http://www.tiaonline.org/business/media/press_releases/2006/PR06-64.cfm;%20http://pcat.qwest.com/pcat/bundlesMain.do?salesChannel=re)

205 Annual Assessment of the Status of Competition, "Market for the Delivery of Video Programming, The Twelfth Annual Report", Federal Communications Commission, MB Docket No. 05-255, March 3, 2006. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-11A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf)

206 "Telecom Services - U.S. – Helping You Respond to a Dynamic Market Place," Current Analysis, Competitive Response Newsletter, September 7, 2006. [online] <http://www.currentanalysis.com/r/2006/TelecomServices-US-09-1.htm>; Verizon 2005 Annual Report. [online] [http://investor.verizon.com/financial/quarterly/pdf/05VZ\\_AR.pdf](http://investor.verizon.com/financial/quarterly/pdf/05VZ_AR.pdf).



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314 In addition, cable operators have increased investment in local telephony markets, providing VOIP services to 1.2 million subscribers by the end of June 2005. VOIP subscriptions increased significantly from 600,000 at the end of 2004, and are expected to increase further over the next 5 years.<sup>207</sup> All of the major cable incumbents are now offering digital telephone service, although not all homes are able to access these services as networks still remain to be upgraded. As of 2005, 38% of homes passed by cable networks were able to subscribe to VOIP.<sup>208</sup> Availability of VOIP on cable has been increasing rapidly in recent years, and VOIP is now also available from non-cable providers over both cable and DSL broadband.

#### **B.13.4 Pricing and competitive dynamics**

315 The trend towards competition in bundled offerings has been most noticeable in recent years. As ILECs have entered the television market to compete with cable system operators and cable providers have entered the telephony market, competition on triple play offerings has intensified. This has the potential to bring large bundling discounts.

316 Traditionally, cable operators have been more aggressive than telephone companies in introducing broadband services to subscribers. However, the ability to offer bundled local and long-distance services has given ILECs an attractive platform to market DSL. As greater DSL penetration continues, cable prices are expected to continue declining. These fell below US\$40 in 2006 and are expected to fall to around US\$35 in 2008-2009.<sup>209</sup>

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207 Annual Assessment of the Status of Competition, "Market for the Delivery of Video Programming, The Twelfth Annual Report", Federal Communications Commission, MB Docket No. 05-255, March 3, 2006. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-11A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf)

208 Annual Assessment of the Status of Competition, "Market for the Delivery of Video Programming, The Twelfth Annual Report", Federal Communications Commission, MB Docket No. 05-255, March 3, 2006. [online] [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-11A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf)

209 Telecommunications Industry Association: Advancing Global Communications. "U.S. Broadband Market Reaches 41.2 Million Subscribers in 2005; Expected to Grow to 69.2 Million Subscribers by 2009", March 9, 2006 [online] [http://www.tiaonline.org/business/media/press\\_releases/2006/PR06-22.cfm](http://www.tiaonline.org/business/media/press_releases/2006/PR06-22.cfm)



## APPENDIX C: SUMMARY DATA AND SOURCES USED IN COUNTRY STUDIES

### C.1 SUMMARY DATA

317 This following table summarizes the key data for each country:

Country	EFC	Wholesale broadband regulation	Access-based competition	Broadband penetration	Performance-adjusted price
Hong Kong	90	L	3.0	23.6	1.3
Canada	85	H	9.7	22.4	1.4
Korea	80	M	13.9	26.4	1.0
United States	80	M	3.7	19.2	2.0
Netherlands	79	M	48.5	28.8	5.5
Switzerland	76	L	35.5	26.2	4.3
Sweden	50	M	45.5	22.7	6.9
Denmark	47	M	28.8	29.3	8.4
UK	45	VH	67.7	19.4	5.3
Australia	37	VH	36.0	17.4	17.4
Finland	25	M	32.0	25.0	12.3
France	25	VH	49.8	17.7	5.4
Germany	10	VH	38.4	15.1	4.8



## C.2 DATA SOURCES

### *Cable Coverage*

318 Cable coverage data (both Internet enabled and non Internet enabled) comes from the OECD Communications Outlook 2005 for all countries except Hong Kong. The OECD does not provide data on Hong Kong since it is not an OECD country. The Hong Kong cable coverage data comes from the Hong Kong cable operator's website<sup>210</sup> which provides information on the number of homes passed by its cable television network (both broadband enabled cable coverage and total cable coverage figures are provided). This data and data from the ITU on the total number of households in Hong Kong<sup>211</sup> were used to calculate the percentage of Hong Kong households passed by cable networks. Since the OECD data includes only homes passed by cable television networks, figures for Korea and Sweden have been adjusted to account for significant incremental fibre coverage. These are the only two countries where fibre substantially increases the level of EFC beyond the coverage of cable television networks. Fibre coverage data for Sweden is from Broadband Wales Observatory<sup>212</sup> and for Korea is from Hanaro.<sup>213</sup>

### *Broadband Wholesale Regulation Index*

319 The broadband Wholesale Regulation classification for all countries was based on the broadband Regulatory Index Number. The index reflects the degree of price, non-price and services regulation in broadband markets (specifically in EU markets 11, 12 and 14) and is based on research by Gilbert + Tobin. The methodology behind the calculation of this index is more fully explained in the companion Gilbert + Tobin report *International Comparison of Wholesale Regulation in Canada*.

### *Broadband Penetration*

320 Broadband Penetration data comes from the OECD Broadband Statistics (June 2006)<sup>214</sup> for all countries except Hong Kong. Since Hong Kong is not an OECD country, their penetration data comes from the ITU Internet Report 2006.<sup>215</sup>

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210 <http://www.i-cablecomm.com/ir/operating/index.php>

211 ITU World Telecommunications Indicators 2006

212 <http://www.bbwo.org.uk/broadband-3045>

213 Hanaro Form 20-F ([www.secinfo.com/d12Um2.vsp.htm#1stpage](http://www.secinfo.com/d12Um2.vsp.htm#1stpage)).

214 [http://www.oecd.org/document/9/0,2340,en\\_2649\\_34223\\_37529673\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/9/0,2340,en_2649_34223_37529673_1_1_1_1,00.html)

215 ITU Internet Report 2006: Digital Web Life



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### *Broadband Performance Adjusted Price*

321 The performance adjusted broadband price for all countries is calculated based on price data from the OECD Communications Outlook 2005. Incumbents' basic DSL offerings with unlimited downloads are used for all countries and a price per 100kbps is calculated. Since OECD data is not available for Hong Kong, an equivalent basic DSL offering from the incumbent is taken from their website.<sup>216</sup>

### *Wholesale Access*

322 Since no consistent cross-country source is available for wholesale access, this data is taken from a number of different sources. For European countries, it is taken from IDATE, however for Asia-Pacific and North American countries it is taken from individual regulators. For Australia this is the ACCC<sup>217</sup>, for Korea the MIC<sup>218</sup>, for Hong Kong OFTA<sup>219</sup>, for the US the FCC<sup>220</sup> and for Canada the CRTC<sup>221</sup>.

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216 [www.pccw.com/eng](http://www.pccw.com/eng)

217 ACCC (June 2005), 'Telecommunications Infrastructure in Australia 2004'

218 Ministry of Information and Communication Phone and Internet Subscriber Data

219 Au H, 'Competition in Broadband Markets: How Deregulation has been Possible in Hong Kong' (presented at the London Business School, 29 June 2006)

220 FCC, 'High Speed Data Services for Internet Access: Status as at 31 December 2005'

221 CRTC (July 2006), 'Telecommunications Monitoring Report' (<http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2006/tmr2006.htm#4.4>)



*Broadband Speed*

- 323 Maximum speeds for most countries are from Analysys.<sup>222</sup> For countries not included in the Analysys report (Hong Kong, the Netherlands and Switzerland), maximum speeds are the highest speeds currently available to consumers. These were found by reviewing operators' websites.
- 324 Average download speeds are from a Comparison of OECD Broadband Markets conducted by Wairu Consulting (2006).<sup>223</sup> The data is based on a survey of 2,586 broadband packages from 388 internet service providers in 26 OECD countries collected in the last week of April and the first week of May 2006.

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222 Analysys, 'Sophisticated Broadband Services' (Final Report for the Department of Trade and Industry, 12 May 2006)

223 Wairu Consulting (May 2006), 'Comparison of OECD Broadband Markets', taken from Figure 3, p.11 ([www.Internetnz.net.nz/pubs/other/2006-05-29-oecd-broadband-markets](http://www.Internetnz.net.nz/pubs/other/2006-05-29-oecd-broadband-markets)).



## APPENDIX D: CRA EXPERTISE

- 325 CRA is a leading provider of economic and business consulting services to clients in the public and private sector. Founded in 1965, the firm has over 700 consulting staff in its offices in Europe, North America and Asia-Pacific.
- 326 CRA undertakes assignments for international and local clients on the economic aspects of regulation, competition policy, trade practices, intellectual property rights and related issues. Much of this work requires developing and applying new ways to accurately model market behaviour and the effects of regulation and trade practices legislation on business transactions and growth strategies. CRA and its recently acquired businesses Lexecon LTD and the Network Economics Consulting Group (NECG, headed by Henry Ergas) have worldwide experience in telecommunications regulation and competition analysis.
- 327 CRA has very substantial experience in telecommunications competition, technology and other industry issues. We have telecommunications experts located in Europe, North America and Asia-Pacific, with a substantial dedicated Telecommunications/Media team of consultants in Australia.
- 328 We have worked with a large number of governments, leading companies and major law firms around the world. Our work with regulators includes the European Commission, the Office of Fair Trading and the Competition Commission in the UK, various European competition authorities, the Department of Justice and the Federal Trade Commission in the US, the Australian Competition and Consumer Commission in Australia, the Ministry for Economic Development in New Zealand and numerous national bodies responsible for regulation in the firm's areas of specialisation.
- 329 We differentiate ourselves from other economic consultancies by the depth and breadth of our expertise in specialist economic, analytical, and regulatory matters. Our experts bring substantive government and business experience across a wide range of industry areas.
- 330 CRA has an extremely powerful research capability, characterised by very strong analytical and quantitative skills. Our research staff includes many with advanced degrees, and covers a range of disciplines including economists, accountants, lawyers, former senior industry executives, engineers and technology experts and authorities in statistical and operations research. Further, we also maintain affiliations with a select group of internationally known academics and industry experts, and regularly work with professors at distinguished universities worldwide.
- 331 CRA brings to assignments an in-depth understanding of its clients' circumstances and the industry and regulatory environments in which they operate. Our consultants take a practical and commercial approach to often highly complex and technical issues that have a direct bearing on problems faced by industry, government and investors. They also understand the need for timely and cost-effective work that is easily accessible to both technical and general audiences.





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332 Author CVs are available by request.