

Review of Wholesale Services and Policies

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Expert Report

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1 Introduction

1. Regulation of telecommunication services traditionally involved retail regulation. There were regulatory barriers against entry and the rates of the incumbent supplier were set such that it recovered its costs of service. The basis of this regulation was the twin objectives of minimizing costs of production and controlling market power. Because the technology of production was characterized by large sunk investments and thought to be a natural monopoly, using markets to organize production was thought to be inefficient, resulting in either the exercise of market power, higher than necessary costs of production, or both. Regulation aimed to strike a balance between the cost efficiency of a “natural monopoly” and the social harm that would result from allowing monopolies to charge monopoly prices. End-user prices—retail rates—were the focus of this traditional regulation.
2. In the 1980s and 1990s, technological changes led regulators and economists to question the natural monopoly theory. Some services such as long-distance services were opened up to facilities-based competition. Local services were also opened up to competition in the 1990s. “Wholesale regulation” or “mandated access” was conceived of at this time. The core idea was that the entire local network of the incumbent local exchange carriers (ILEC) was not a natural monopoly, but only certain elements or functions. Hence the inefficiencies of regulation and the benefits from competition not realized when regulation was inadvertently extended to functions where competition were possible. The focus of the inefficiency was on the benefits lost from not having competitive entry, with its attendant investment and innovation.
3. Wholesale regulation involved identifying which facilities were essential for competition and then offering competitors access to those inputs at regulated rates. At the same time entry into all aspects of local telecommunications services, in particular downstream markets, was enabled by eliminating regulatory barriers to entry. The premise was that such regulation and liberalization would result in competitive entry, investment, and innovation, resulting in lower costs, new services, and product differentiation. It might even be possible to eventually deregulate retail rates as competition in retail markets, supported by wholesale access, developed sufficiently. In the long run there was also the possibility that even wholesale

regulation would be phased out as competition developed between end-to-end network carriers.

4. The Commission's wholesale regime rests on identifying essential facilities and mandating access to those essential facilities. In practice, the Commission mandates access to "conditional essential" and "conditional mandated non-essential" services, and indeed to services that combine "conditional essential" and "non-essential" inputs. The importance of wholesale access appears to have shifted from promoting competition in voice—local exchange services¹—via encouraging unbundling of the local loop to promoting competition in the provision of retail broadband services via allowing entrants the ability to offer "matching speeds" by utilising a wholesale product that consists of the loop and a transport service.
5. The Commission's wholesale regime of mandated access coincides, now, with ubiquitous end-to-end competition between ILEC and cable networks for voice, broadband and video services, or bundles of these services. Wireless providers are also becoming a more and more significant constraint on any market power that fixed-line voice providers might have. Wireless and satellite providers have also increased their broadband capabilities significantly. LTE wireless services already offer actual speeds comparable to ILECs' traditional DSL offerings, and with investments in technologies such as small cells, wireless operators are poised to overcome traditional coverage challenges such as indoor reception or reception in dense urban areas. Competition between cable and ILEC broadband services is robust, and often takes the form of competition for providing "double play" or "triple play" bundles.
6. The empirical record is clear: for voice services it is cable companies and wireless providers through platform competition, not unbundled local loops or resale, that have provided sufficient competition to discipline the market power of the ILECs in the provision of voice in many if not most areas of Canada. In terms of voice services, it is clear that copper local loops are no longer an essential facility in areas where there is competition from cable networks and wireless providers. Although no firm can or will duplicate an ILEC's copper

¹ Local exchange service provides access to the public switched telephone network. Local exchange service provides residences with the ability to, at least, make and receive calls (voice).

local loop network, Bell and Bell Aliant's copper loops do not meet the necessary test for being an essential facility.

7. The necessary conditions for a facility to be essential, as determined by the Commission, are that:²
- the service or function provided by the facility is required as an input by competitors to provide telecommunications in a relevant downstream market.
 - the facility is controlled by a firm that has upstream market power and withdrawal of access to the facility by competitors would likely result in a substantial lessening or prevention of competition in the relevant downstream market.
 - it is not practical or feasible for competitors to duplicate the functionality of the facility.
8. In implementing the Commission's definition to determine if any facility is essential involves the following four steps:
- Defining the relevant upstream market that includes the services or functionality provided by the facility. This involves identifying reasonable substitutes for the facility, including the possibility of self supply and duplication.
 - Defining the relevant downstream market. This involves determining the set of reasonable substitutes for telecommunications services that use the input.
 - Assessing the vertically integrated firm's market power in both the upstream and downstream market *in the absence of mandated access*.

² See CRTC, Telecom Decision 2008-17, *Revised Regulatory Framework for Wholesale services and Definition of Essential Service*, Telecom Decision 2008-17, March 3, 2008 at paragraph 36. Hereafter "2008-17" or "CRTC Telecom Decision 2008-17."

- Assessing the potential for entry in the downstream market if mandated access is implemented and the effect of that entry on the market power of the vertically integrated firm.
9. The issue of market power downstream in the absence of mandated access is a key consideration. If there is not significant and durable market power downstream in these circumstances then there were already be effective facilities based competition. In this case it is unlikely that that there will be a significant impact on competition from mandating access or a substantial lessening of competition from withdrawing access. Only if the vertically integrated firm is dominant downstream is it then necessary to consider whether that dominance is attributable to its control of the essential facility. The facility may not be essential if there are substitutes available or the facility can be economically duplicated.
 10. Bell and Bell Aliant's copper loops are not essential in areas in which there is effective competition from cable. The relevant geographic market in these cases is the overlapping region between the footprint of the ILEC's network and the footprint of the cable network.³
 11. The evidence suggests that the upstream market for ILEC loops is broader than those loops. Reasonable economic substitutes that discipline the exercise of market power in the provision of loops include direct substitution to other facilities and, especially, indirect substitution to downstream services that use other networks. The extent of indirect substitution depends on the cost share of the input in downstream services and the willingness and ability of residential consumers to substitute to residential local exchange services provided by other suppliers who do not use local loops provided by the ILEC. The cost share of local loops in residential local exchange service is significant as is the willingness and ability of residential consumers to substitute.
 12. The extent of platform competition in residential local exchange services in particular means it is unlikely that an ILEC (in the relevant geographic market) is dominant upstream or

³ With due allowance that locations not on the cable network might be easily connected or the areas without cable coverage are so small that they do not affect ILEC pricing.

downstream. Without significant market power downstream it is unlikely that mandated access to local loops will have a significant effect on market power downstream.

13. The evidence bears out that the effect of mandated access to local loops is not presently having anything but a negligible effect (if that) on market power or competition in the downstream market. Presently alternative telecommunications providers use an extraordinarily insignificant number of unbundled loops.
14. The wholesale access regime for broadband, if it is based on the principle of mandating access to essential facilities at all, is justified on the proposition that the entire network of the ILEC (and the cable provider) is essential. The existing regime with its matching speed requirement is very close to resale: except that instead of being priced at a discount to retail, it is cost based. It amounts to access for independent internet service providers (ISPs) to network wide transport and access—the local network—that when combined with investment in information processing at the edge of the network allows the independent internet service provider to supply essentially the same service that the ILECs and cable companies provide.
15. Aggregated ADSL, in Bell and Bell Aliant's case Gateway Access Service (GAS) and High-Speed Access Service (HSA) are not essential facilities based on the Commission's definition of an essential facility. Bell and Bell Aliant's GAS/HSA are not essential in areas in which there is effective competition from cable. The relevant geographic market in these cases is the overlapping region between the footprint of the ILEC's network and the footprint of the cable network.⁴
16. The evidence suggests that the upstream market for GAS/HSA is broader than these services provided by Bell and Bell Aliant. Indeed it seems unlikely that Aggregated ADSL service provided by an ILEC is a relevant upstream market. There is considerable scope for substitution upstream and indirect substitution downstream. In particular it seems difficult to conclude that cable provision of an equivalent, if not better service, potentially at wholesale,

⁴ With due allowance that locations not on the cable network might be easily connected or the areas without cable coverage are so small that they do not affect ILEC pricing.

but certainly and especially at retail, is *not* sufficient to discipline the exercise of market power of an ILEC in the supply of Aggregated ADSL.

17. The extent of competition in residential broadband services in particular means is it unlikely that an ILEC (in the relevant geographic market) is dominant upstream or downstream. Without significant market power downstream it is unlikely that mandated access to Aggregated ADSL will have a significant effect on market power downstream.
18. The downstream market for broadband access exhibits considerable rivalry, consistent with oligopoly and not consistent with dominance or the inefficient exercise of market power. The experience in Canada clearly shows the importance and extent of platform competition in terms of declining real prices per megabyte per second and the availability and adoption of high speed services. Both of these are attributable to the active rivalry between the ILECs and the cable companies that manifests itself through high capital expenditures and network enhancements.
19. The extent of residential subscribers provided with broadband by independent ISPs using Aggregated High Speed Access services is very small, both absolutely and relatively. The very small market share is not consistent with the independent ISPs providing a significant constraint on the market power of the ILEC and cable carriers. Their small market share indicates an inability to expand at low cost or an unwillingness of consumers to substitute.
20. The price, quality, and investment dynamics of the broadband market are a result of competition between the cable carriers and the ILECs. The availability of Aggregated ADSL such as GAS/HSA has essentially no discernable effect on the decrease in the real price per Mbps, the increase in the quality of networks, and the shift up in adoption of higher speed services. These dynamics are the result of competition between the cable carriers and the ILECs, in particular the result of that competition on investment levels.
21. The competitive insignificance of the independent ISPs that utilize either Aggregated ADSL or TPIA should not be surprising. Their capacity to innovate, reduce costs, or differentiate their products or otherwise add value is limited. The avenues in which they can add value are limited by their dependence on the network capabilities and services of the ILECs and cable

carriers. Investment by the network carriers has averaged \$6.6 billion per year recently while , the investment by the resellers has averaged zero.

22. Given that the purported competition advantages from requiring GAS/HSA service to be offered by the ILECs (and similar third party access by the cable companies) are negligible and likely to remain so, then continued mandated access to these services is not likely in the public interest if there are costs associated with mandated access.
23. Conditions in the telecommunications industry in Canada suggest that there are no essential facilities, not even the copper loop, in the provision of residential telecommunications services. The lack of justification is even stronger for new networks such as Fibre-to-the-Home (FTTH networks).
24. Fundamentally, an ILEC is very unlikely to have significant and durable market power in the downstream market for services provided by the FTTH network. If it will not, then there cannot be a significant increase in competition from mandating access. The analysis indicates that market power downstream is unlikely to be significant and durable because of interplatform competition from cable (coaxial with DOCSIS 3.0, or the next generation, and FTTH), and, potentially, both competitors with access to current-generation copper or FTTN networks and wireless.
25. The fact that FTTH networks are new or substantially new networks means that even if the ILEC is the first to roll out an FTTH network in a given area barriers to entry are less than with legacy networks. In some geographic markets this may mean that multiple (non-cable) fibre networks will be rolled out in addition to perhaps a fibre cable network. Because FTTH networks are new, it may also be the case that in some areas the first mover is not an ILEC and if there are barriers to entry the ILEC may be deterred from building a second FTTH network.
26. Mandated access to FTTH networks of the ILEC or the cable companies before they are deployed is likely to be particularly costly in terms of incentives to invest. Such asymmetric treatment is unwarranted, since in areas where the economics suggest a limited number of FTTH networks will be constructed, the competition for the market may well be constrained

by regulation. The rewards to deployment will be different if there is mandated access to the ILEC or cable FTTH deployments, but not to the deployment by others. In particular the rewards to the ILEC and cable company will be less and hence it will have reduced incentives to compete aggressively for the market. This harms consumers by delaying when FTTH becomes available and possibly the geographic coverage over which it is available.

27. The Commission should recognize, as it did in Telecom Decision 2008-17, that the private incentives for risky investment in next generation networks are likely less than the social incentives. The reason is the non-appropriability of surplus: the firm incurs all of the cost of the investment, but does not receive all of the benefits. Some of the benefits accrue to consumers. Mandated access further reduces the appropriability of surplus and increases the wedge between private and social returns. Mandated access thus reduces the likelihood that private investors will make investments that generate high social returns. As a result access to NGN networks should not be mandated. Instead the Commission should recognize that it is competition between platforms that promotes investment in NGN networks, including FTTH, and it should encourage this competition and investment by not sharing the benefits with independent ISPs.
28. The fundamental trade-off facing Canada's telecommunications regulators is not one between oligopolistic competition and perfect regulation. Regulation is not perfect, or perfectible. Regulation also carries costs. Regulation impacts upon the incentives of market participants and can seriously distort these incentives. The costs of mandated access are well known and evident. The failure to price access efficiently means that investment incentives for *all* platform providers are impaired; a complicated and costly regulatory regime is required, especially because mandated access provides incentives—at least in theory—for anticompetitive discrimination by the vertically integrated supplier of the mandated input and for complaints by entrants of such behaviour; and the existence of a regulator gives rise to the possibility of lobbying, rent seeking and capture, with the attendant inefficient meddling to create and redistribute rents.
29. The Commission's current wholesale regime promotes highly duplicative forms of competition, if it promotes any. This distinguishes Canada from the United States, which has

largely abandoned wholesale mandated access. It also distinguishes Canada from countries such as the United Kingdom, which maintain mandated access, but where regulators have concerned themselves extensively with promoting local loop unbundling. The majority of empirical studies of the European broadband market tend to show that mandated access policies produce few benefits, with some showing that they harm incentives to invest by the incumbent, and may also harm competition between platforms. These studies also find that within the types of competition that mandated access in Europe permits, competition based upon local loop unbundling provides the maximal opportunities for service and product improvements. The Commission's current regime requires minimal investment by new entrants. Minimal investment corresponds to minimal benefits from competition, and maximises the likelihood that the costs of access regulation exceed its benefits.

1.1 Organization of this Report

30. The remainder of this report is organized as follows:

- Section 2 provides some basic antitrust economic concepts used extensively in the analysis of market power;
- Section 3 discusses the economics of network restructuring and the evolution of regulatory approaches to telecommunications services. It also presents evidence on the rise of platform competition and the theoretical and empirical evidence on the effect of wholesale regulation on investment incentives.
- Section 4 discusses the Commission's essential facility definition and what is involved in its application.
- Section 5 applies the Commission's essential facility definition to loops and Aggregated ADSL services.
- Section 6 applies the Commission's essential facility definition to all fibre networks, i.e., fibre to the home (FTTH).

1.2 Background and Qualifications

31. I am a Full Professor in the Department of Economics at the University of Calgary. I received a Ph.D. in economics from the University of California, Berkeley in 1989, and have been continuously employed in the Department of Economics at the University of Calgary thereafter, teaching courses in industrial organization, competition policy, regulatory economics, and microeconomics. I am also the Program Director of the Digital Economy Program (DEP) in the School of Public Policy at the University of Calgary. The focus of DEP's research program is on policy and regulation of telecommunications and broadcasting in Canada. I am the coauthor of a book on the regulation of natural gas pipelines in Canada, a text in industrial organization, and a monograph on the competitive implications of vertical and conglomerate mergers. A complete list of my publications is included in my curriculum vitae, which is marked and attached hereto as Exhibit 1B. I have acted as an expert on a wide range of regulatory and competition policy matters. I have been accepted as an expert in proceedings before the National Energy Board, the Alberta Energy Utilities Board, the Canadian Radio-television and Telecommunications Commission ("CRTC"), the Competition Tribunal, the Federal Court of Australia, the Federal Court of Canada, and the Supreme Court of British Columbia.

32. I have extensive experience with telecommunications issues in Canada. For more than ten years I was involved in the preparation of numerous submissions with the Competition Bureau in regulatory proceedings before the CRTC on issues such as restructuring local telecommunications, forbearance, and wholesale access. I recently submitted reports to Industry Canada on spectrum policy and foreign ownership in the telecommunications sector, as well as an expert report on the economics of usage based billing for the CRTC.

2 Context and Key Economic Concepts

33. In this section some key concepts are defined that are relevant to understanding the costs and benefits of mandated access. The section begins with a discussion of market power and related concepts, in particular principles of market definition and the distinction between the exercise of market power and conduct that creates, maintains, or enhances market power.

2.1 Market Power

34. Market power is typically defined as the ability of a firm to profitably raise price above competitive levels.⁵ Firms with market power may exercise it by being able to profitably alter characteristics of their products or other aspects of their behaviour away from competitive levels. For instance a firm with market power may find it profitable to not only raise price above competitive levels, but to reduce the quality of its products, its product variety, its level of customer service, or expenditure on research and development below competitive levels.⁶

35. The substitution alternatives available to the customers of a firm determine its market power. The extent of demand substitution depends on whether consumers can, and will, switch to other products in response to a price rise (or other manifestation of market power) or alternative suppliers in a different geographic location. In addition, the set of demand-substitutable products may increase as firms not currently producing demand-substitutable products respond to a price rise (or other manifestation of market power) by changing their product offerings and introducing a demand substitute.⁷ Supply substitution involves other firms expanding the set of demand substitutes when a firm attempts to exercise market power and raise its price. The extent to which a firm can unilaterally exercise market power depends on the extent of demand and supply substitution. If these possibilities for substitution are

⁵ See the Competition Bureau, *Merger Enforcement Guidelines* March 2011 at 2.3 or more generally G. Niels, H. Jenkins, and J. Kavanagh (2011) *Economics for Competition Lawyers*, Oxford University Press at p. 116 or D. Carlton and J. Perloff (2005) *Modern Industrial Organization*, Pearson at p. 783. Economists typically define market power as the ability to profitably raise price above marginal cost, the price that would prevail in perfectly competitive markets. However the definition used by economists is less useful for policy analysis since many firms will be able to exercise market power based on this definition—indeed any firm whose demand curve is downward sloping—but they will not be able to raise price above average cost levels, i.e., earn greater than a competitive return. Indeed if a firm’s unit cost declines as it expands output, the firm will have to be able to profitably raise price above marginal cost in order to break even. The ability to profitably raise prices over competitive levels implies the ability to raise prices above average cost, a level that reflects the requirement of firms to break even and is a useful definition of a competitive market even when firms are not perfectly competitive. An alternative, and equivalent distinction, is to adopt the economic definition of market power and distinguish between the inefficient and efficient exercise of market power. Only the exercise of market power that raises the price above long run average cost levels is inefficient. The exercise of market power should also be durable if there is to be regulation. Durable means that a firm can exercise market power without attracting entry and hence its exercise can persist in the long run.

⁶ See Competition Bureau, *Merger Guidelines* March 2011 at 2.2 or the U.S. Department of Justice/Federal Trade Commission, *Horizontal Merger Enforcement Guidelines* August 2010 at p. 2.

⁷ See F. Fisher, (2008), “Economic Analysis and ‘Bright-Line’ Tests,” *Journal of Competition Law and Economics* 4: 129 at 134.

limited, and are likely to remain so, for an extended period of time, a firm will be able to exercise market power.

36. Fundamental to the exercise or market power is demand substitution. Customers discipline, and thereby constrain, the exercise of market power by a firm by substituting away from a firm's products when it raises its price. When a firm increases its price, it gains increased revenues from its higher price on infra-marginal sales (sales it continues to make), but loses the profits on marginal sales (sales no longer made). A price increase will be profitable if the gain in revenues from the infra-marginal units exceeds the loss on marginal units. The loss on marginal units equals the product of the reduction in volume from consumers substituting to other alternatives and the profit margin. When these losses at the margin are sufficient, substitution by consumers will limit the ability of the firm to raise its price. The decrease in sales of a product when a firm increases its price is determined by its elasticity of demand.⁸
37. Even if demand substitution is initially limited, a firm may not be able to exercise market power if there is supply substitution. In response to higher prices, if suppliers can easily enter and produce substitutes, then the demand substitution alternatives available to its consumers could expand sufficiently that the market power of a firm is limited.

2.2 Market Definition

38. The reason to define markets is usually to identify market power and to identify if the conduct at issue harms competition in a market. The relevant market has both a product and a geographic dimension. The product dimension involves identifying competing products, while the geographic dimension involves identifying the location and identity of competing suppliers of the relevant product.
39. The functional dimension of the market involves identifying the levels of the supply chain or the different vertical levels of production that are relevant for assessing market power. The functional dimension is often taken into account, either implicitly or explicitly, when defining the product and geographic dimensions of the market. However, in the case of

⁸ The own price elasticity of demand (which when there is no possibility of confusion with cross price elasticity is sometime referred to as the elasticity of demand) for a firm is the percentage decrease in its sales volume (quantity) from a one percent increase in its price. The smaller is the change in sales volume, the more inelastic is demand.

markets for inputs, the ability to exercise market power at an upstream level may well depend on the substitution alternatives of downstream consumers. Hence explicit consideration of the supply chain and the functional dimension may well be warranted. In any event, the potential for market power in an upstream stage of a vertical chain of supply will typically be informed by, and depend on, demand considerations in downstream stages.

40. One of the roles of market definition is to identify alternative suppliers and products that constrain the exercise of market power by the supplier of a product in a particular location. Too narrow a market definition excludes substitutes that impose important competitive constraints. Too broad a market definition will lead to the inclusion of products or suppliers from other regions that are not close substitutes and do not exert significant competitive constraints. Antitrust markets are an attempt to define markets appropriately so that they include substitutes and alternative suppliers that are important in constraining the exercise of market power by a supplier, but exclude those that are not. As a consequence in an antitrust market, market shares are potentially reflective of market power. Proper market definition enables market shares and statistics on concentration to be used as proxies for market power.
41. Concentrated markets will only be a necessary condition for the inference of market power. Whether they are in fact indicative of market power depends on barriers to entry. The combination of high barriers to entry and high market shares is often presumed to indicate market power.

2.2.1 Principles of market definition

42. In this section principles of market definition are considered. The discussion of those principles is organized around the Hypothetical Monopolist Test, the product dimension, the geographic dimension, and derived demand.

Hypothetical Monopolist Test (HMT)

43. A common method to determine the boundaries of antitrust markets for sellers which emphasizes demand substitution is the hypothetical monopolist test (“HMT”). The Competition Bureau’s *Merger Enforcement Guidelines* defines the HMT as:⁹

Conceptually, a relevant market is defined as the smallest group of products, including at least one product of the merging parties, and the smallest geographic area, in which a sole profit-maximizing seller (a “hypothetical monopolist”) would impose and sustain a small but significant and non-transitory increase in price (“SSNIP”) above levels that would likely exist in the absence of the merger. In most cases, the Bureau considers a five percent price increase to be significant and a one-year period to be non-transitory. Market characteristics may support using a different price increase or time period.

44. In principle the HMT can be adapted to other conduct, besides a merger, that raises concerns that it created, enhanced, or maintained market power. This is done, conceptually, by redefining the HMT to be the smallest group of products and the smallest geographic region such that a hypothetical monopolist of those products in that region would find it profitable to raise prices by a small, but significant and non-transitory (a “SSNIP”) amount over competitive levels.¹⁰

45. Following the HMT, the process of defining the relevant market begins by choosing an initial product and an initial production location. Products and locations are progressively included that are “next-best” substitutes for the initial product choice and geographic locations from which “production is the next-best substitute” for production in the initial location until the HMT is satisfied. The relevant antitrust market is defined (typically) as the smallest set of products in the smallest geographic region that includes the initial product and location such that a hypothetical monopolist of those products in that region would find it profit-maximizing to implement a SSNIP.

46. If for a group of products in a region the HMT does not hold, that means the substitution possibilities for consumers are—in aggregate—sufficient to make the imposition of a SSNIP

⁹ See Competition Bureau, *Merger Enforcement Guidelines*, March 2011, at 4.3, footnote omitted.

¹⁰ See Competition Bureau, *The Abuse of Dominance Provision Enforcement Guidelines: Sections 78 and 79 of the Competition Act*, September 2012 at p. 3.

not profit maximizing. Consumers can discipline the hypothetical monopolist sufficiently by substituting to either other products or sourcing the same product from suppliers in other geographic regions.

Product Dimension

47. The product dimension of the relevant market is found by considering the willingness and ability of customers to substitute to different products in response to a SSNIP. Products to which it appears that consumers are readily willing to substitute in the face of higher prices are included in the market. Substitutes are often identified by the requirement of functional interchangeability, which means that substitute products have similar qualities that enable the same end use. The issue of whether products are reasonable substitutes, in aggregate, is resolved by the HMT and the threshold for the SSNIP.

48. The key to implementing the hypothetical monopolist test is determining the costs and benefits from exercising market power. When the hypothetical monopolist increases its price, it gains increased revenues from a higher price on inframarginal sales—sales it continues to make—but loses profits on marginal sales—sales no longer made to consumers that substitute away, and for which there was a positive margin over marginal cost. The question of whether the extent to which consumers can, and will, substitute is enough to constrain a profit-maximizing hypothetical monopolist to raise its price by less than a small, but significant and non-transitory increase in price (the SSNIP) depends on both the own price elasticity of demand and the price-marginal cost margin at prevailing prices.

49. Recall from the previous discussion that the own price elasticity of demand summarizes all substitution possibilities: it shows for a one percent increase in price the percentage loss in quantity. Hence it measures the extent to which sales are lost at the margin.¹¹ The firm's

¹¹ As indicated the own price elasticity of demand summarizes all of the substitution possibilities available to consumers. The cross-price elasticity of demand shows, in the case of substitutes, the percentage increase in the quantity demanded of good *X* when the price of good *Y* increases by 1%. The market power of a firm does not depend on any single cross-price elasticity of demand. Pair-wise comparisons based on a cross-price elasticity do not give the right answer because cross-price elasticity is the answer to the wrong question. Instead of how demand will shift to consumption of a substitute when the price of a good increases, the relevant question for the ability of a firm to exercise market power is how much will its consumers reduce their demand. As indicated in the text, the own-price elasticity summarizes all of the substitution possibilities of consumers when a product's price increases. However, there is a close relationship between the own price and cross-price elasticities. The greater the number of

price-cost margin determines the implications for profits of the reduction in demand: it determines the lost profit per unit of sales no longer made.

50. In the context of an essential facility, as discussed below, the assessment of market power upstream in the relevant input market will depend on the willingness of two sets of customers to substitute to alternative products. The downstream product market will be defined by the willingness and ability of consumers in that market (residential consumers in this report) to substitute away from services that use the input. The upstream product market will be defined by the willingness and ability of suppliers of that downstream residential telecommunications service to substitute to other inputs in place of the services or functionality supplied by the vertically integrated firm.

Geographic Dimension

51. When defining the geographic dimension, it is usual to begin by selecting the initial location of production and/or sales and then examining the ability of a hypothetical monopolist to profitably implement a SSNIP in that region. Whether it is profitable depends on the ability of consumers to substitute to other regions. The location of sellers is typically an important consideration where, for example, transportation costs are significant; there is a need for localism (e.g., after-sales care) in the provision of products or services; or where institutional barriers (tariffs, national boundaries etc.) impede the flow of goods from one region to another. Geographic market definition, starting from the location of production and sales, identifies a set of locations for suppliers that must be under the control of the hypothetical monopolist for a SSNIP to be profit maximizing. Without control of all of the suppliers at these locations, consumers would be willing and able to substitute sufficiently to the excluded regions to make a SSNIP non-profit maximizing.
52. Less typically there are cases where buyers or customers require delivery of the product to their location: the sellers must come to the buyers. In these circumstances the ability to deliver the product to the geographic location of the customers defines the set of relevant

products for which a firm has high cross-price elasticities, the greater the own price elasticity. Hence, especially in the absence of information regarding own price elasticity, cross-price elasticities can provide useful information regarding the substitution possibilities for consumers.

suppliers. In these circumstances it is not the region in which the supplier is located that is identified by the geographic dimension, but instead the ability of the supplier to supply at the particular location of a buyer. The geographic market dimension in this case identifies the set of suppliers that can provide the good or service at the location of a buyer.

53. An example of when consumers require delivery of a product at their location is broadband internet access. They are unlikely to substitute to broadband access at a different location when the price of service at their existing location rises by a SSNIP—at least not in the short run. Of course this might mean that each location in a city is a unique market. However, the competitive conditions at many, if not most of the locations in a city are likely identical, allowing for aggregation.

54. Markets may be aggregated together if the choices faced by consumers across different geographic markets are very similar—for example, the market for telephone service might be local since consumers may not substitute telephone service at another location for service that they receive at their own location. Yet if the choices facing consumers at location *A* are identical to the choices that they face at location *B*, then location *A* and location *B* can be aggregated into a single market. However, what this means is that the competitive conditions in those markets are the same and hence the analysis of market power and competitive effects is likely identical, not that consumers at location *A* will substitute to location *B* for service.

Derived Demand

55. In input markets, where the product is not sold to consumers, but other firms that use the product as an input, the demand for the input is said to be derived. It is said to be derived because the demand for the input by firms depends upon the demand for the product it is used to make or the service provided.

56. In general the benefit to a firm of employing another unit of an input is its marginal revenue product. The marginal revenue product of an input equals its marginal product (the increase in output from using another unit of the input) multiplied by the change in the firm's revenues from selling that output, i.e., its marginal revenue. Its marginal revenue is the price it receives in the downstream market where it participates less any reduction in revenue

received on infra-marginal units. The revenue from infra-marginal units might fall if the firm has to lower its price to induce sales of the marginal unit.

57. The price the firm receives for the output produced from using more of the input depends on demand in the downstream market, as does the reduction in price (if any) required to induce buyers to purchase the additional input. Hence demand downstream for the product produced by the firm that uses an input is a key determinant of its demand for that input.

Elasticity of Derived Demand

58. The ability of an input supplier, therefore, to exercise market power in its supply—an upstream market—will depend on the elasticity of derived demand. The elasticity of derived demand will reflect all of the avenues through which an increase in the price of the input will result in a decrease in sales of the input and hence the potential for the input suppliers exercise of market power to be disciplined or curtailed.

59. The elasticity of derived demand for an input is usually characterized as depending on four factors. These four factors, known as Marshall’s four rules, are: ¹²

- (i) the extent to which substitution to other inputs is possible.
- (ii) the demand elasticity of the good for which it is an input.
- (iii) the elasticity of supply of other inputs.
- (iv) the share of the input in total cost.

60. Intuitively, the idea is to identify factors that imply a large change in the amount of the input used when its price increases. For a product that is an input there are two sources of substitution that are relevant to disciplining its exercise of market power. The direct source of

¹² The elasticity of derived demand was initially discussed by A. Marshall (1920), *Principles of Economics* 8th edition, MacMillan, at Book VI, Chapter 5 pp. 385-386. It was refined by A. Hicks (1963), *The Theory of Wages* 2nd edition, MacMillan, at pp. 241-247. Modern textbook discussion can be found in M. Trebilcock, R. Winter, P. Collins, and E. Iacobucci (2002) *The Law and Economics of Canadian Competition Policy*, University of Toronto Press at pp. 84-85 and M. Katz and H. Rosen (1994) *Microeconomics*, 2nd Irwin at pp. 375-376. A modern formulation and discussion is R. Chirinko and D. Mallick (2011), “The Elasticity of Derived Demand, Factor Substitution and Product Demand: Corrections to Hicks’ Formula and Marshall’s Four Rules,” *Labour Economics*, 18: 780.

substitution is by firms in the downstream market who substitute to alternative inputs when the price of an input rises. The second, indirect, source of substitution occurs when the rise in the price of an input raises the costs of downstream firms, downstream firms pass that cost increase onto their customers by raising prices in the downstream market, to which downstream customers respond by reducing their demand in the downstream market. With less demand for the output, downstream firms respond by utilizing less of the input.¹³

61. In the case of easy substitution between inputs, demand for the input will fall as the user of the input substitutes to other inputs.¹⁴ For instance, if the price of peanuts purchased by airlines for snacks rises, their demand for peanuts is likely to fall significantly as airlines can easily substitute to other snacks to serve passengers.

62. If demand for the final product is relatively elastic (small changes in its price result in large changes in the quantity demanded), then for a given increase in marginal cost of production downstream from a rise in an input price:

- the firm that uses the input will find that when it passes this cost on in the form of increased prices for its product, demand will fall relatively substantially;
- resulting in much less need for the input;
- resulting in a reduction in demand for the input;

¹³ The elasticity of derived demand was initially discussed by A. Marshall (1920), *Principles of Economics* 8th edition, MacMillan, at Book VI, Chapter 5 pp. 385-386. It was refined by A. Hicks (1963), *The Theory of Wages* 2nd edition, MacMillan, at pp. 241-247. Modern textbook discussion can be found in M. Trebilcock, R. Winter, P. Collins, and E. Iacobucci (2002) *The Law and Economics of Canadian Competition Policy*, University of Toronto Press at pp. 84-85 and M. Katz and H. Rosen (1994) *Microeconomics*, 2nd Irwin at pp. 375-376. A modern formulation and discussion is R. Chirinko and D. Mallick (2011), “The Elasticity of Derived Demand, Factor Substitution and Product Demand: Corrections to Hicks’ Formula and Marshall’s Four Rules,” *Labour Economics*, 18: 780. Marshall’s four rules for the elasticity of demand for an input are (i) the greater the extent to which substitution to other inputs is possible; (ii) the more elastic the supply of other inputs; (iii) the greater the elasticity of the good downstream; and (iv) the higher the share of input in total cost, the greater the elasticity of derived demand. However these results depend on the cost share of an input being fixed.

¹⁴ Though see R. Chirinko and D. Mallick (2011), “The Elasticity of Derived Demand, Factor Substitution and Product Demand: Corrections to Hicks’ Formula and Marshall’s Four Rules,” *Labour Economics*, 18: 708 with regard to the generality of the ease of substitution. They show that if the cost share of the factor were to rise significantly when the ease of substitution decreases, the elasticity of demand for the input could actually rise if the price elasticity of demand downstream exceeds the elasticity of substitution.

- and hence demand for the input will also be relatively elastic.

63. For instance, if the downstream products are differentiated in part by their use of different inputs, then the extent of competition between differentiated products downstream will be an important determinant of the elasticity of demand downstream, and hence derived demand for an input. As explained in detail in Section 5, this analysis is necessary and critical to determining whether the only supplier of copper loops to a location has market power.

64. The third factor is the supply elasticity of other inputs used by the firm. The greater the inelasticity of supply of the other factors, the greater the inelasticity of derived demand for an input. Following Marshall, an increase in wages to plasterers, to the extent this raises the price of construction because of increased costs, will reduce demand. The fall in demand for construction will reduce the demand for other inputs, e.g., bricklayers. If the elasticity of supply of bricklayers is inelastic, the reduction in demand for their services will substantially decrease their wages, reducing the costs of construction, the price of construction and partially, therefore, restoring the demand for plasterers. The net result could be that the demand for plasterers is not very sensitive to their wage.

65. Fourth, if the input accounts for a large share of the production cost, then its demand will be relatively elastic provided downstream demand elasticity is greater than the elasticity of substitution of inputs. The greater the share in cost of the input, then the greater the affect on costs and hence the downstream price when its price rises. The greater the effect on downstream price, *ceteris paribus*, the greater the reduction in demand for the downstream product and hence the input. Increases in the price of in-flight snacks are unlikely to result in much of an effect on airfares, but an increase in the price of aviation fuel might well.

66. Suppose that the output good z can be produced by combining two inputs, x and y . The two inputs are potentially substitutable. It is possible to use a little more x and a little less y and keep the output of z unchanged. For instance in the case of oil pipelines, an increase in the diameter of the pipeline requires more steel, but reduces the relative amount of oil in contact with the inside of the pipe, reducing the amount of horsepower required.¹⁵ An airline

¹⁵ See L. Cookenboo, (1955), *Crude Oil Pipelines*, Harvard University Press.

example is the substitution by air carriers of other inputs for jet fuel when its price increases. In the short run they can wash their planes more frequently to reduce wind resistance and fuel consumption, effectively substituting soapy water for jet fuel.¹⁶ In the longer run aircraft can be built from more expensive but lighter weight materials, thus reducing fuel requirements.

67. The link between the elasticity of derived demand and the downstream market is reasonably simple in this case if it is assumed that the elasticity of the other input is perfectly elastic, i.e., as more of the other input is demanded, its price does not change. In this case the elasticity of derived demand for input x is given by the following formula:¹⁷

$$\lambda = \sigma + \kappa(\eta - \sigma)$$

where λ is the elasticity of derived demand for input x , σ is the elasticity of substitution (how easily input y can be substituted for input x), κ is the share of input x in total cost, and η is the elasticity of downstream demand. If inputs are used in fixed proportion, i.e., it is not possible to substitute y for x , then the elasticity of derived demand for input x depends only on the share of input x in total cost and the elasticity of demand downstream:

$$\lambda = \kappa\eta$$

since in this case $\sigma = 0$. An example of a product with fixed proportions for some of its inputs is a compact disc player, which requires a laser. It is not possible to substitute other inputs for a laser.

68. In Section 5 this market definition framework is applied to facilities for which access is mandated. In simple terms the two inputs used to supply residential telecommunications services to households are “access” and “transport”. Both of these elements are required to provide service and the ability to substitute between the two is limited. As a consequence this means, assuming the elasticity of other inputs is relatively elastic, that the elasticity of derived demand, the elasticity of demand for access in particular, will be determined by the

¹⁶ This example is from M. Katz and H. Rosen, (1994), *Microeconomics*, Irwin at 376.

¹⁷ This formula assumes that the downstream market is competitive.

elasticity of downstream demand for services that use access and its share in costs downstream.

Pass Through

69. The extent of indirect substitution depends on the extent of pass through. The rate of pass through is the extent to which downstream firms increase their prices when their costs increase. The greater the rate of pass through, the greater indirect substitution, holding the elasticity of downstream product demand constant.
70. The pass through if the downstream firms do not have market power depends on the elasticity of downstream demand and the elasticity of supply.¹⁸ Pass through will be very high if downstream demand is inelastic or supply downstream is very elastic. It will be complete when demand is perfectly inelastic or supply perfectly elastic.
71. If the market downstream is imperfectly competitive, i.e., the downstream firms have market power, then the pass-on rate depends not just on the elasticity of demand and the behaviour of marginal costs, but also on the extent to which the elasticity of downstream demand increases as the downstream price rises.¹⁹ If the elasticity of demand rises very quickly as price increases—indicating that consumers are becoming much more price sensitive—then firms will find it optimal to lower their mark-ups as price increases and their pass through will be less than that of a competitive firm. If the elasticity of demand does not rise as quickly, then the pass through rate of firms with market power will be greater than it is for competitive firms.

2.3 Substantial Lessening of Competition

72. The ability of firms to exercise market power depends on the substitution alternatives of their customers, as explained above. Conduct that enhances, creates or maintains market power—the usual definition of a substantial lessening of competition—has this effect only if it reduces the extent to which its customers are willing or able to substitute. Only by

¹⁸ See T. Van Dijk and F. Verboven, (2008), "Quantification of Damages," W. Collins, eds., *Issues in Competition Law and Policy*, Vol. 3, American Bar Association: 2331 at 2342.

¹⁹ See T. Van Dijk and F. Verboven, (2008), "Quantification of Damages," W. Collins, eds., *Issues in Competition Law and Policy*, Vol. 3, American Bar Association: 2331 at 2341-2343.

reducing the attractiveness of some firm or firms' products in the downstream market; raising the costs of some firm or firms; or both, will a firm's conduct create, enhance, or preserve market power. Increases in a firm's marginal cost will typically make it less willing to expand output in response to a reduction in output or increase in price by its rivals.

73. The harm from conduct that enhances, creates, or maintains market power flows from the effects of exercising market power (as discussed above). The essential facility framework is intended to identify when providing access to an input controlled by a vertically integrated firm will discipline its market power in a downstream market. Alternatively, its denial of access creates, maintains, or enhances its market power in the downstream market. A denial of access has this effect if it raises the costs of its downstream rivals. The costs of its downstream rivals are raised relative to the costs of the vertically integrated firm in the downstream market if they are not able to replicate (at similar cost) the facility, obtain access to the same service from other suppliers at a price similar to the internal cost of supply of the vertically integrated firm, or substitute to another input without an increase in their costs.
74. Raising the costs of rivals reduces their ability to expand their output when the vertically integrated firm raises its price or otherwise exercises market power in the downstream market. By reducing the profitability of output expansion, increases in a firm's marginal cost will typically make it less willing to expand output in response to a reduction in output or increase in price by its rivals.
75. A denial may also have this effect if it reduces the quality of the rivals' products. Consumers may be less willing to substitute to the product of a rival if its quality is reduced by denial of access to the input. Such a reduction may lessen the ability of consumers to discipline the exercise of market power by the vertically integrated firm in the downstream market.

3 Economics of Network Restructuring

76. This section reviews the rationale for regulation, and the evolution of regulation from retail regulation of natural monopolies to wholesale regulation of network elements that are used as inputs in downstream production. This evolution has occurred in the context of growing inter-platform competition between cable, wireless and wireline networks, and the rapid

diffusion of broadband Internet services. The focus of regulation has also shifted from voice services to broadband services in recent years.

3.1 Why Regulate?

77. “Traditional” economic regulation (prior to the 1990s) recognized that natural monopoly—defined as occurring when production by a single firm minimized costs of production—meant that using markets to provide service might be very inefficient.²⁰ In competitive markets, competition results in both allocative efficiency and cost efficiency, both at the level of the firm and the level of the industry. Allocative efficiency means that the right level of output is produced—as discussed above the value of society’s resources is maximized. Firms must be efficient or they cannot compete and the market structure also minimizes costs in the sense that the minimum aggregate resources are used to produce the efficient level of output. In competitive markets there is not a trade off between cost efficiency and allocative efficiency.
78. When there is a natural monopoly, there is such a trade off. Allocative efficiency requires competition but that leads to cost inefficiency. Cost efficiency requires a single producer, but that maximizes market power and allocative inefficiency. Using markets to organize production might be a particular poor choice if it results in many small inefficient products or a monopolist. Instead regulation might be an option: a single firm is given the “right” to produce in return for regulatory control over its rates to control market power.
79. Network industries such as telecommunications are highly capital-intensive, the construction and capital costs are sunk, and they are characterized by economies of scale and scope. Economies of scale arise from long run fixed costs associated with construction and indivisibilities associated with the components of the network (the average cost of capacity of network components declines as capacity increases). Economies of scope arise because the network can be used to provide multiple services. In some cases, production costs might be minimized if all production is done by a single firm. In this case, a “natural

²⁰ For a textbook treatment of the issues in this section, see J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Section 24.2.2. (Hereafter, “Church and Ware”).

monopoly” is said to exist. In cases of natural monopoly, entry by additional competitors will be inefficient from a cost perspective.

80. Traditional regulation was applied to Incumbent Local Exchange Carriers (ILECs) in the U.S and Canada for several decades, in the form of “cost plus” regulation at the retail level. ILECs were regulated utilities, allowed to recover, through prices that they charged consumers, their prudently incurred costs of production and a reasonable return on invested capital. While at one point, ILECs in North America were also providers of long-distance telephone services, this began to change starting in the 1970s. Also starting in the 1970s and in the 1980s, the focus of regulation began to shift from regulating prices charged to end users towards regulating “stages of production.” In telecommunications, local exchange and long-distance services were separated out and competition introduced in long-distance services. Long-distance services were no longer held to exhibit economies of scale that would justify a natural monopoly. However, long-distance firms needed access to local networks, because it was still felt that replication of the local network was inefficient and infeasible. Such access was provided at regulated rates.²¹

81. The rationale for wholesale regulation, when it was first introduced in the 1990s, was that regulation could be confined merely to those “bottleneck” or “essential” inputs that were inherently very economically costly and technically difficult to replicate (and whose replication would constitute an inefficient use of society’s resources) and that the provision of end-user services—the “downstream” market—could be opened up to competition provided essential or bottleneck inputs were available to firms wishing to serve that downstream market.²²

82. The critique of retail regulation was based on the observation that not all of the activities of the regulated firm were likely natural monopolies. Those activities that were not might be susceptible to competition. Hence retail regulation involved extending regulation to activities that might be competitive. The cost of this was the induced inefficiencies of

²¹ For example, originating access and terminating access services were regulated. See, for example, N. Economides, (2005) “Telecommunications Regulation: An Introduction”, R.Nelson, ed., *The Limits and Complexity of Organizations*, New York: Russell Sage.

²² See Church and Ware, Section 26.3.

regulation in terms of lost productive efficiency and reduced incentives to invest and innovate.

83. Wholesale regulation was therefore predicated on the premise that competition in the downstream market supported by regulation of only those activities which were truly natural monopolies was superior to retail regulation that prohibited competitive entry in the downstream market. Competitive entry in the downstream market would be enabled if competitors had access to essential or bottleneck inputs. But by limiting access to just those inputs, entrants would be encouraged to supply their own infrastructure in competitive activities. The result would be enhanced consumer welfare from investment, innovation, lower costs, and product differentiation. It might also be the case that retail regulation of the incumbents could, eventually, be eliminated.

84. Wholesale regulation, therefore, involved identifying upstream essential inputs, inputs over which without access competitors could not compete in downstream markets. The question of essentiality for competition would become a discussion about the ability of the vertically integrated incumbents to exercise market power in the provision of the input to competitors. Hence wholesale regulation is fundamentally about controlling the market power of the incumbent firms in input markets and the effect of that market power on downstream competitors.

85. Network restructuring within the local exchange network is an example. The premise was that local services, such as residential voice service, could be beneficially opened up to competition but that competitors would require access to “bottleneck inputs” such as the copper local loop infrastructure connecting local exchanges to customer premises, certain types of switching facilities, and the like. The logic was outlined in the CRTC’s initial decision opening up local services to competition (Telecom Decision 94-19):

The Commission is of the view that the potential exists for meaningful local competition in basic telecommunications and in many of the information-based telecommunications markets. The Commission also considers that encouraging that potential will lead to benefits, such as productivity improvements and the introduction of even more innovative services. *In the short term, competition may be concentrated on access to facilities-based interexchange carriers (IXCs) and emerging information services of an interactive or transactional nature; in the*

*longer term, as contribution is reduced and services unbundled, competition should result in the creation of switched network alternatives. What ultimately emerges will be determined by the demands of users and the willingness of suppliers to take risks. The role of the Commission should be to ensure that the right economic and technical conditions for open access are in place, while ensuring that access remains affordable wherever local markets are not workably competitive. (Emphasis added).*²³

86. Telecom Decision 94-19 articulated a preference for markets and entry at retail rather than strict cost of service regulation and regulatory entry barriers at the retail level, even though this retail competition meant instituting regulation at the wholesale level. Regulation of access to such bottleneck inputs—wholesale regulation or “mandated access”—would allow competitors to provide competing services in the downstream market to those of the incumbent. If such regulation were confined to just these essential inputs, then this regulation would have the benefit of promoting investment by competitors in their own facilities. Such facilities-based investment would offer opportunities for competitors to differentiate their product offerings from those of the incumbent (as well as spurring service-level innovation and productivity improvements) and would thus improve consumer welfare in the downstream market.

87. To the extent that all essential facilities were correctly identified and access mandated, then once competition in downstream markets was established, it might be possible to forebear from retail regulation altogether. Indeed, wholesale regulation was even sometimes seen as a potential pathway to full end-to-end competition between competing switched networks (eliminating both retail and wholesale regulation), although this “stepping stone” or “ladder of investment” justification for wholesale regulation was less important in Canadian regulation than in U.S. or European regulation.²⁴

²³ CRTC, Telecom Decision CRTC 94-19, *Review of Regulatory Framework*.

²⁴ For a discussion of the U.S. belief in the “stepping stone” theory, see Hazlett, Thomas and Coleman Bazelon (2005), *Regulated Unbundling of Telecommunications Networks: A Stepping Stone to Facilities-Based Competition*, George Mason University Working Paper.

See also Borreau, M., P. Dogan, and M. Manant (2010), “A Critical Review of the Ladder of Investment Approach”, *Telecommunications Policy*, 34:1: 683-96.. This discusses how the “ladder of investment” concept was initially embraced by regulatory authorities in Europe.

88. As the next sections discuss, technological dynamism and the development of inter-platform competition between end-to-end networks pose significant challenges to wholesale regulation, and suggest that such regulation—by inhibiting investment by regulated firms—carries significant costs. In the light of wholesale regulation imposing potentially significant costs, the benefits of wholesale regulation above and beyond the mere control of market power are relevant considerations. These benefits are particularly likely to be small (and outweighed by costs) when wholesale regulation promotes entry that involves minimal use of competitors’ own facilities and thus minimal opportunities for product differentiation.

3.2 Dynamic Markets and Inter-Platform Competition

89. Wholesale regulation was initially developed in the context of promoting competition in wireline telephony. But it is now being discussed almost exclusively in connection with preserving competition in retail broadband markets in Canada. The past fifteen years have seen remarkable technological developments. Most Canadian homes have three networks that can reach them—the ILEC wireline network of old, cable TV networks, and wireless networks.²⁵ Cable TV networks and more recently wireless networks have become robust alternative paths for providing broadband service. The ILEC networks have themselves gone through a process of significant upgrading. They were first upgraded to provide “DSL” broadband service in the late 1990s. Bell Canada began constructing fibre-to-the-node (FTTN) networks as early as 2005. Bell’s FTTN footprint already passed over 2.5 million homes at the end of 2008.²⁶ Bell Canada today has two “FTTx” networks, consisting of deployment of FTTN and also some deployments of Fibre-to-the-Home (FTTH). Bell Canada’s IPTV network, which utilizes these FTTx networks now passes over 4.1 million households with such technology, an increase of 173% over the last 2 years alone.²⁷ The number of homes passed by Bell’s FTTx networks exceeds this 4.1 million figure, as homes passed by the IPTV network are a subset of homes passed by the FTTx networks in

²⁵ Indeed most homes will have four, five or more networks that can provide broadband service at their locations. This is because there are multiple wireless broadband networks available in most of Canada. Further, “wireless” technologies are not merely “cellular” wireless technologies, but include technologies such as Wi-Fi, which can be deployed as an alternative to fixed-line networks on a local level. In addition, there are also satellite networks that can be used to provide broadband services among other services.

²⁶ Bell Canada 2009 Annual Report, page 13.

²⁷ Bell Canada Quarterly Reports.

aggregate. Bell Aliant’s FTTH footprint alone currently passes 770,000 households up from 178,000 households in Q1 2011.²⁸ The development of networks has accommodated the development of a range of applications that were unforeseen fifteen years ago—these range from streaming services such as Netflix to social networking, gaming and file-sharing sites.

90. The development of end-to-end competition between “platforms” (i.e., cable, ILEC and wireless), as well as the technological dynamism of the telecommunications industry, challenge the role of and scope for mandated access or wholesale regulation. End-to-end competition between competing platforms means that the need for any kind of regulation to curb the exercise of market power needs to be re-examined—for example, an ILEC controlling the “local loop bottleneck” might still have very little market power in the downstream market because of competition from other platforms. Thus the necessity of wholesale regulation must be questioned. Second, the dynamic nature of the industry and the value added by networks that support innovative new services means that to the extent that wholesale regulation creates trade-offs between dynamic efficiency (i.e., benefits from investment in new network technology) and short-run price competition, the trade-off must be carefully examined.

91. Figure 1 describes the major evolutions in ILEC, cable and wireless technology over the past fifteen years.²⁹ Figure 2 shows the growth in IPTV coverage (a proxy for FTTX coverage) in Canada. Figure 3 shows the number of residential wired internet subscribers in Canada (split between dial-up and high speed as defined by the CRTC) since 1998. Figure 4 shows the share of cable and ILECs in residential high speed subscriptions since the late 1990s. Figure 5 shows the number of wireless broadband subscriptions since 2009. Figure 6 illustrates the growth of “applications” that rely upon various levels of broadband connectivity.

92. Taken together, these figures convey the rapid diffusion of different kinds of broadband technology. Initially this growth was focused on wireline broadband, but more recently there has been substantial growth in wireless broadband. The capacity and speed capabilities of

²⁸ Bell Aliant Quarterly Reports.

²⁹ All figures and tables are found in Exhibit 1A.

wireless broadband networks are being updated continually. The figures always convey that inter-platform competition between competing wireline network technologies—cable and ILEC broadband networks—has been very strong in Canada, with cable networks having the majority of subscribers. The initial focus of the CRTC’s unbundling regime was on local loop unbundling to promote competition in local exchange (then voice) services.³⁰ The days of monopoly provision of local exchange voice services are long gone. Such services face competition from Voice-over-IP (VOIP), cable telephony and wireless telephony. The focus of regulation has shifted towards ensuring competition in the provision of broadband services, which have always been provided (in Canada) by a multiplicity of networks. If there is any rationale for regulation, it is no longer based on any theory of natural monopoly, but on a fine judgement of whether oligopolistic competition is “sufficient” and whether regulation can improve upon oligopolistic competition. Regulation, however, is not perfect and often creates unintended consequences and carries costs. The costs of wholesale regulation are discussed next.

3.3 Wholesale Regulation and Investment Incentives

93. Regulation creates costs. These costs include poor regulatory design, excessive burden on regulated firms, the potential for regulatory capture by lobbies or special interest groups (i.e., regulators are unduly influenced by regulated firms, consumers or, in the case of wholesale regulation, entrant firms that utilise the network of the regulation),³¹ and the problem of perverse incentives for investment and competition. This last problem has been associated with wholesale regulation in the context of a broadband market characterised by rapidly evolving technologies. At the same time, the growth of platform-based competition, even if there are relatively few competitors, means that the potential for any single platform owner

³⁰ Telecom Decision 98-9 mandated access to cable provider’s high speed broadband networks at a time when such networks had 1% of the total market for Internet access. The CRTC forbore from regulating Internet services at the retail level because at the time the majority of access was “dial-up” access (DSL technology offered by the ILECs was then in its infancy), which could be provided by a plethora of Internet Service Providers (ISPs). Internet service has never been regulated at the retail level (at least for service provided by the major ILECs and cable companies), although regulation of wholesale inputs into providing broadband Internet service has continued since Telecom Decision 98-9. See CRTC, Telecom Decision CRTC 98-9, *Regulation Under the Telecommunications Act of Certain Telecommunications Services Offered by Broadcast Carriers*.

³¹ See the discussion in Section 24.2 of Church and Ware.

to exercise excessive market power is much more limited than is the case with the classic natural monopoly situation.

94. The competition agencies in the U.S. have acknowledged that competition might never be perfect in the real world of broadband markets. But the essential trade-off in the current broadband market environment in Canada is between platform competition (even if such competition is not “perfect”) and imperfect regulation, not between monopoly and perfect regulation.

We do not find it especially helpful to define some abstract notion of whether or not broadband markets are “competitive.” Such a dichotomy makes little sense in the presence of large economies of scale, which preclude having many small suppliers and thus often lead to oligopolistic market structures.³²

95. In implementing a wholesale regulatory regime, regulators face two pressing problems. They must identify which facilities are essential and they must set access prices correctly. As the Commission noted in its *Local Competition*, decision too restrictive a definition of essential facilities or too broad a definition will impair development of investment and facilities based competition.³³ Similarly the effectiveness and efficiency of mandated wholesale access depends on the price of access. If the access price is too high, entrants will be disadvantaged their costs too high and they will have incentives for inefficient bypass. If the access price is too low, then it subsidizes entrants and provides incentives for them not to build their own facilities and more importantly it reduces the incentives of the incumbents to invest in their network.

96. The ability of regulators to get the access price correct such as to not impair the incentives for investment—of either entrants or the incumbents—should not be overestimated. In

³² See Ex-Parte Submission of the United States Department of Justice, Before the Federal Communications Commission, *Re: In the Matter of Economic Issues in Broadband Competition*, GN Docket No. 09-51, available at <http://www.justice.gov/atr/public/comments/253393.pdf>, at p.11.

³³ See CRTC, Telecom Decision CRTC 97-8, *Local Competition*, May 1, 1997 at Paragraph 5.

practice pricing access efficiently to provide the appropriate set of incentives is extraordinarily difficult given the information requirements.³⁴

97. The difficulties of access pricing are exacerbated when the incumbent’s investments are risky. In this case, wholesale regulation based on the costs of providing the regulated input creates asymmetries between the regulated firm and its competitors. Investment in new technologies such as FTTH involves taking risks. The principal risk is that demand for the investment might not arise. Applications that really require the higher speeds that FTTH supports might be slow to materialise. Other technologies, such as cable and wireless, might offer either similar speeds at lower cost to deploy (cable), or they might offer different functionalities that the user values more than sheer speed (wireless broadband). For example, Verizon in the United States stopped expanding its FTTH footprint (although this is still a very extensive deployment of the technology) in part because the demand was not strong enough to justify the costs (including costs of negotiating franchises to serve new areas) of the originally planned deployment.³⁵ Entrants, however, have a free option to delay their entry and avoid incurring large sunk costs, until demand for the new service has been firmly established.

98. There is no easy way to account for this “free option” (which is valuable) that entrants are offered, but that the regulated firm lacks.³⁶ Looked at another way, the incumbent firm bears all the “downside” risk associated with betting on the wrong technology, but that it must share any success with its competitors.³⁷ In other words, regulation truncates the distribution of returns available to investors in the incumbent regulated firm. The upside is limited by the need to share successful new infrastructure at cost-based rates. In an unregulated

³⁴ For discussion on the complexity of devising optimal access prices, see Armstrong, M., C. Doyle, c. and J. Vickers, “The Access Pricing Problem: A Synthesis”, *Journal of Industrial Economics*, 44: 131-150. See also, Armstrong, Mark, “Theory of Access Pricing and Interconnection”, (2002), in *Handbook of Telecommunications Economics*, eds. M. Cave, S. Majumdar, and I. Vogelsang, North-Holland Publishers.

³⁵ See Cheng, Roger “Verizon to End Rollout of FIOS”, *Wall Street Journal*, March 30th, 2010, at <http://online.wsj.com/news/articles/SB10001424052702303410404575151773432729614>. Verizon achieved Internet penetration rates of less than 30% in communities where FTTH was deployed.

³⁶ See R. Pindyck. (2004), “Mandatory Unbundling and Irreversible Investment in Telecom Networks”, NBER Working Paper 10287. Available at <http://www.nber.org/papers/w10287.pdf>.

³⁷ See J. Hausman (2002), “Regulated Costs and Prices in Telecommunications”, In *The International Handbook of Telecommunications Economics* (Madden and Savage, Eds.), North-Holland. Available at

competitive market, these investors would bear all the downside risk, but they would also be able to appropriate the entire upside reward. This potential upside reward is what justifies the risk in the first place. There may be no regulatory pricing formula that is capable of successfully accounting for the idiosyncratic risks associated with network investment. In most cases, efforts to resolve this pricing dilemma have concentrated on adjustments to the cost of capital in the regulatory pricing formula. However, the cost of capital is typically based on models such as the Capital Asset Pricing Model (CAPM) that do not capture idiosyncratic risks associated with a particular investment, but at best capture the degree to which the risk associated with a firm (e.g., an ILEC) is correlated with market risk.

99. Another potential “incentive” issue associated with the pricing of wholesale access is its impact on the incentives of firms seeking wholesale access to invest in their own facilities. Regulated prices that are too low might invite entry, but they might also encourage permanent reliance on cheaply available regulated inputs. The relative pricing of different forms of wholesale access might also be relevant. For example, firms that use unbundled local loops to provide retail broadband services will need to build or lease facilities (and not at regulated rates) up to the main distribution frame (MDF) at the central office

100. But firms might not choose to make these investments if they can simply resell the ILEC’s service using mostly or entirely facilities that they lease from the ILEC at regulated rates. If this “resale” option is cheap relative to the option of fully unbundled local loops, then the greater is the likelihood that the entrant ISP will simply provide the same service as the ILEC, and perhaps be given a cost advantage by regulation relative to the ILEC. The benefits of such merely duplicative entry are not the same as the benefits of entry that increases product variety and offers significant differentiation.

101. This discussion links back the original rationale for wholesale regulation: unleashing investment and innovation in competitive activities, the benefits of which too consumers are significant. Even in the European Union, which has persisted with access regulation for more than a decade, regulators have been mindful of the end result of wholesale regulation. For example, the U.K. regulator, OFCOM, instituted major policy changes primarily to encourage migration from simple resale and bit-stream, which involved relatively little

entrant investment in their own facilities, to local loop unbundling, which required entrants to use their own facilities to a greater degree.³⁸

3.4 Empirical Evidence on The Benefits and Costs of Wholesale Regulation

102. Recent empirical evidence on the impact of wholesale regulation on incumbent incentives to invest and on inter-platform competition has focussed on Europe. Regulators in European Union (EU) member states and the European Commission continue to maintain policies providing entrants with the option to lease unbundled local loops, or to use bit-stream access or simple resale. Across the European Union as a whole, only some 40% of homes are reached by cable broadband networks, although the level of coverage varies greatly by country.³⁹ Across the EU, cable network operators account for only some 17% of broadband lines, and DSL technology accounts for 74%.⁴⁰ However, across the EU, cable operators appear to account for 57% of total “next-generation access” lines⁴¹, indicating the greater ease with which cable operators (where they are present) are able to rollout very high speed broadband services to customers, relative to wireline incumbents. The evidence on cable’s much higher share of “next-generation” very high speed broadband lines relative to its share of overall broadband lines suggests that inter-platform competition between cable and incumbent wireline firms is a more obvious spur to investment in next-generation networks than competition based on leasing the incumbent firm’s wireline infrastructure. (Canada has ubiquitous platform competition between cable and ILEC firms).

³⁸ OFCOM, for example, stated the following in 2004, just before it implemented the functional separation of BT. “Ofcom believes that Local Loop Unbundling offers the greatest potential for downstream service and price competition; but requires substantial facilities and network investment by competitors.” See Ofcom’s Broadband Framework – Stephen Carter speech at Ofcom, (2004), available at <http://media.ofcom.org.uk/2004/05/13/ofcoms-broadband-framework-stephen-carter-speech-at-ofcom/>. The major change in the U.K. market following BT’s functional separation was not that BT’s market share declined (it increased slightly), but that competitors using BT’s infrastructure migrated from bit-stream and resale to full and shared local loop unbundling.

³⁹ Source: European Commission, Digital Agenda Scoreboard, Chapter 2 available at <https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/DAE%20SCOREBOARD%202013%20-%20202-BROADBAND%20MARKETS%20.pdf>, at PDF page 2.

⁴⁰ *Ibid.*, PDF page 9.

⁴¹ *Ibid.*, PDF page 10.

103. Empirical papers based on econometric studies of European broadband markets tend to suggest that the effect of mandated access on broadband penetration and broadband quality is (at best) modest and that its effects on incumbent investment (particularly) are negative.
104. Nardotto et al. (2013) perform an econometric study conducted within the U.K. at the level of individual local exchanges.⁴² The U.K. provides an interesting unit of analysis as the availability of cable coverage (i.e., inter-platform competition) varies from locality to locality. The authors find that the presence of a cable operator in a local exchange significantly increases the broadband penetration rate within that exchange and that cable operators provide higher speeds than the incumbent firm or any of the firms that use local loop unbundling. The authors find that local loop unbundling has no effect (or even a negative effect in some of their models) on broadband penetration, but that entrants who utilise the full unbundled local loop do offer quality improvements (e.g., higher speeds) relative to the incumbent whose loop they lease. However, entrants who utilise bit-stream access or resale offer the slowest speeds.
105. The evidence from this paper suggests that inter-platform competition provides the greatest level of competition and innovation, but that within the different modes of intra-platform competition, resale and bit-stream access are the most duplicative and thus the most likely to be socially wasteful forms of entry.
106. Bouckaert et al (2011) find that inter-platform competition is by far more effective at stimulating broadband penetration than is any form of intra-platform competition. They do so using a cross-national (European) sample of 20 countries for the years 2003-2008. In some specifications of their econometric model, they find that pure “services-based” competition (bit-stream and resale) may have negative effects on broadband penetration, and that partial facilities-based competition (i.e., LLU) has a statistically significant effect. Even

⁴² M. Nardotto, T. Valletti, and F. Verboven, (2012), "Unbundling the incumbent: evidence from UK broadband," CEPR Discussion Papers 9194, available at <http://www.aueb.gr/conferences/Crete2013/papers/Valletti.PDF>.

in those specifications of the econometric model where all forms of competition appear to boost penetration rates, the effects of inter-platform competition are significantly greater.⁴³

107. The two studies discussed previously emphasize the modest benefits of mandating wholesale access. They also suggest that to the extent that access regulation produces benefits, these benefits are more likely to arise through full local loop unbundling than through highly duplicative forms of competition such as bit-stream and resale.

108. Other evidence suggests that the “ladder of investment” or “stepping stone” theory is misguided. Services-based entry does not lead to facilities-based entry at a later date. At best, one observes some movement from the most duplicative forms of competition towards local loop unbundling. Further, some studies find that the effect of mandated access regulations on entrant investment in countries with strong inter-platform competition to be negative, suggesting that in these contexts, entrants are more likely to cling to “buying” rather than “building” their own infrastructure.⁴⁴ Grajek and Roeller (2012) find that increasing the intensity of mandated access regulation—i.e., increasing the scope and duration of mandated access—retards investment by incumbent firms. The study also finds that mandated access leads to more duplicative entry and overall more investment by a greater number of entrant firms (but not more investment by individual entrant firms). The study finds that mandated access policies led to cumulative under-investment of more than 16 billion Euros across the European Union over a ten-year period.⁴⁵

109. These recent studies are far from being outliers. A body of previous work from the United States (during the period in which unbundling policies were in place, roughly 1996 to

⁴³ J. Bouckaert, T. Van Dijk and F. Verboven, (2010), "Access Regulation, Competition, and Broadband Penetration: An International Study," *Telecommunications Policy* 34: 661-671.

⁴⁴ See Garrone, P., M. Zaccagnino (2012), “A too short ladder? Broadband Investment and Local Loop Unbundling in EU countries”, Working Paper, Polytechnic University of Milan, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2109423. See also Bacache, M., M. Bourreau and G. Gaudin (2013), “Dynamic Entry and Investment in New Infrastructures: Empirical Evidence from the Telecoms Industry” , Forthcoming in Review of Industrial Organization. Working paper available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1750217.

⁴⁵ Grajek, M. and L-H Roeller (2012). "Regulation and Investment in Network Industries: Evidence from European Telecoms," *Journal of Law and Economics*, University of Chicago Press, 55 (1): 189-216.

2003) found similar results, as did previous studies from Europe.⁴⁶ These studies are well summarized in the survey by Cambini and Jiang (2009).⁴⁷ Cambini and Jiang conclude that “the majority [of empirical evidence] concludes that local loop unbundling based on forward-looking cost methodologies discourages both ILECs and CLECs from investing in networks.” Although Cambini and Jiang cautioned that many of the empirical studies that they reviewed covered only a short time-period, similar results regarding the modest, minimal or even negative impact on broadband penetration and quality, and the negative effects on investment (especially, it seems, by incumbents) have been found by the studies cited above, which have all been published since 2009.

110. The empirical literature also establishes the strong positive effects of inter-platform competition on investment, penetration and quality. It is immediately obviously from the European data that the most powerful incentives for incumbent wireline firms to invest in next-generation networks arise because cable operators currently have the majority of very high-speed connections across the continent, despite reaching only 40% of all homes. Mandated access likely only complicates the incumbent wireline firms’ response to the challenge of cable. For example, incumbent firms may not wish to invest in next-generation networks before they gain regulatory certainty about the regulatory regime for such networks. If mandated access policies are applied to next-generation investment, the problem of appropriate access pricing must be solved, but this problem may be inherently resistant to solutions. The one-sided nature of the risks of failure (borne by the incumbent alone) and the sharing of “rewards” from successful next-generation investment (shared between the incumbent and the access-dependent entrants) would likely act as a powerful disincentive to invest. Even to the extent that strong competition from cable compels some level of next-generation investment, the marginal effects of mandated access regulations could still be negative—i.e., mandated access reduces the amount of investment that actually happens. Lastly, “mandated access” contains within itself simple resale, bit-stream access, and local

⁴⁶ See, for example, Hazlett and Bazelon, *supra.*, and Crandall, R., A. Ingraham and H. Singer (2004), “Do Unbundling Policies Discourage CLEC Facilities-Based Investment?” *Topics in Economic Analysis and Policy* 4 (1).

⁴⁷ Cambini, C. and Y. Jiang (2009), “Broadband Investment and Regulation: A Literature Review”, *Telecommunications Policy* 33: 559-74.

loop unbundling. The empirical evidence seems to confirm that there is particularly little value from resale and bit-stream competition.

3.5 Summary

111. In evaluating the effects of policies or conduct of a firm, their effect on three aspect of efficiency are often considered. These are allocative efficiency, dynamic efficiency, and productive efficiency. Allocative efficiency is a short-run or “static” concept of efficiency that requires that society’s resources be put to their best possible use at any given moment in time. Dynamic efficiency refers to the improvement over time in products and production techniques. Productive efficiency refers to whether output is being produced at the lowest possible cost.⁴⁸
112. The evidence suggests that wholesale regulation is problematic from a dynamic efficiency perspective. The allocative efficiency benefits depend on the extent to which, absent wholesale regulation, significant and enduring market power would exist and be exercised. They also depend on the extent to which entry is not duplicative, but produces enhanced product variety and differentiation. Wholesale regulation that promotes entry that merely allows competitors to replicate—but not improve upon—incumbent service offerings likely adds very little allocative efficiency benefit, but instead may discourage investment (by entrants and incumbents alike) in new networks.
113. Given the dynamism of the telecommunications market, investment in new networks enables new services and applications, which in turn generate significant benefits for consumers. The dynamic efficiency costs of wholesale regulation loom large in the context of a dynamic industry. Further, the costs and benefits of wholesale regulation must be measured relative to the alternative of not regulating.
114. The benefits of wholesale regulation as a tool to control market power are much less obvious in the presence of ubiquitous inter-platform competition than in the “natural monopoly” paradigm. Ubiquitous end-to-end platform competition in Canadian residential telephony and broadband markets undermines the premise of regulation in the first place.

⁴⁸ See Church and Ware, pp.750-51, for further discussion on the types of economic efficiency.

4 Essential Facility Framework

115. The essential facilities framework is an antitrust concept that was developed to determine when refusal by a vertically integrated incumbent to provide access could be an antitrust violation. The focus of an essential facilities analysis is on the effect on competition in the downstream market if access is mandated to the facility, where the services the facility provides are in an upstream market. The analysis involves a comparison between the outcome in the downstream market with and without mandated access.

116. The extent of the benefit to providing access, or alternatively the harm to denying access, in the downstream market will depend upon the extent of the vertically integrated firm's market power in the upstream market. The greater its market power in the upstream market the more disadvantaged its rivals in the downstream market will be if they are denied access. The reason for this is that the market power in the upstream market depends on the willingness and ability of suppliers downstream to substitute to other inputs. If those substitution alternatives are poor or not existent, then even if the vertically integrated firm does not supply the downstream firms (there is no market upstream) the effect of this refusal to supply on them is captured by considering their alternatives. But that is identical to a consideration of substitution upstream, i.e., market power. Of course the market power of the input supplier will depend not just on the possibilities for direct substitution by the purchasers of its input, but also indirect substitution in the downstream market.

4.1 The Commission's Definition of an Essential Facility

117. The Commission revised its definition of an essential facility in CRTC 2008-17. The prevailing definition of an essential facility adopted by the Commission has three elements. Those elements are:⁴⁹

- The service or function provided by the facility is required as an input by competitors to provide telecommunications in a relevant downstream market.

⁴⁹ Telecom Decision 2008-17 at paragraph 36.

- The facility is controlled by a firm that has upstream market power and withdrawal of access to the facility by competitors would likely result in a substantial lessening or prevention of competition in the relevant downstream market.
- It is not practical or feasible for competitors to duplicate the functionality of the facility.

118. In determining whether mandated access to a facility will be ordered to a presently unregulated facility, the Commission requires that the *denial* of competitors' access to "the facility would likely result in a substantial lessening or prevention of competition in the relevant downstream market."⁵⁰

119. The Commission's definition is based upon, but not identical, to the definition advanced by the Competition Bureau. The Competition Bureau defined a facility as essential if the services provided by the facility are an input to a product, where the input is in an upstream market and the product is in a downstream market, and⁵¹

- the firm that provides the input is dominant in both an upstream and a downstream market.
- the withdrawal of access to the input results in exit or contraction of competitors from the downstream market [or alternatively that providing access would result in entry or expansion of competitors in the downstream market].
- the exit or contraction results in a substantial lessening of competition [or alternatively that entry or expansion results in a substantial increase in competition] in the downstream market.

⁵⁰ Telecom Decision 2008-17 at paragraph 37.

⁵¹ This is the definition of an essential facility developed by the Competition Bureau in its submissions to the Canadian Radio-television and Telecommunications Commission ("CRTC") in response to CRTC PN 2006-14. See *Evidence of the Commissioner of Competition*, March 15th, 2007, in response to CRTC Telecom Public Notice PN 2006-14 ("Review of Regulatory Framework for Wholesale Service and Definition of Essential Facility") at pp. 22-23.

120. The dominance requirement means that the vertically integrated firm has significant and durable market power both in the market for the input and the market downstream (the market for the product that uses the input). The inability to economically duplicate the facility or otherwise find substitutes for the services provided by the facility must result in a substantial cost disadvantage for competitors in the downstream product market. Finally, the cost disadvantage and its effect on competitors in the downstream market must substantially and negatively affect competition in that market. Within the essential facilities framework a substantial lessening of competition means a substantial increase in market power for the vertically integrated firm from denying access. This is consistent with the first bullet above: the vertically integrated firm is able to exercise market power in the downstream market when access to competitors is denied.
121. The issue of significant and durable market power downstream in the absence of mandated access is a key consideration. If there is not significant and durable market power downstream in these circumstances then there was already effective facilities based competition. In this case it is unlikely that there will be a significant impact on competition from mandating access or a substantial lessening of competition from withdrawing access. Only if the vertically integrated firm is dominant downstream is it then necessary to consider whether that dominance is attributable to its control of the essential facility. But even then the facility may not be essential if there are substitutes available or the facility can be economically duplicated.
122. The definition adopted by the Commission in 2008-17 is similar except that the Commission did not explicitly adopt the requirement of dominance in the downstream market.⁵² The CRTC appears not to have adopted the downstream dominance requirement because of concerns regarding a potential inconsistency with the criteria for forbearance of local exchange services set down in Telecom Decision CRTC 2006-15.⁵³ The inconsistency is that one of the forbearance criteria imposed by the *Order in Council* that required a finding

⁵² See Telecom Decision 2008-17, March 3, 2008 at paragraphs 20-27 and paragraphs 36-37.

⁵³ See CRTC, *Forbearance from the regulation of retail local exchange services and Order Varying Telecom Decision CRTC 2006-15, Order in Council P. C.*, Telecom Decision 2007-532. See also CRTC Telecom Decision 2008-17 at paragraphs 21-22.

of forbearance was if a wireline competitor *could* reach 75% of residences in a local exchange and there was a wireless service provider in that exchange. A wireline competitor was deemed able to provide service to a residence in a local exchange if it *could* in theory provide service by using unbundled local loops. Hence the wireline competitor deemed sufficient for forbearance was based on the belief that with unbundled loops service could easily be commenced to discipline market power—not that service was actually being provided using unbundled loops. Consequently if loops were determined not to be essential then the forbearance criteria would no longer be applicable and a potential regulatory vacuum created *if the Order in Council’s condition for forbearance was correct*.

123. This regulatory vacuum is not an issue today. If the market power of the incumbent local exchange provider is disciplined by facilities based competition from the cable company and wireless service providers forbearance is appropriate. As shown in Section 5, the market has evolved such that competition from the cable companies and wireless—interplatform competition— is sufficient to justify retail voice forbearance and the ability to access unbundled loops is irrelevant to the control of market power of the ILECs.

124. In assessing the suitability of substituting wholesale access and regulation for retail regulation, it is important to understand the limits of wholesale regulation. The essential facilities doctrine focuses on the role of control of an input by a vertically integrated firm in maintaining its market power in a relevant downstream market. The market power in the downstream market is maintained by denying access to competitors access to the essential facility. For this to be true requires that the vertically integrated firm have market power in the upstream market that includes the essential facility. The key linkage is that it is access to the essential facility that is the key barrier to entry or expansion by competitors downstream, and, finally, that allowing access will provide a significant constraint on the market power of the vertically integrated firm in the downstream market. Hence the essential facility and its implied wholesale access regime is applicable as a substitute to control market power under very specific circumstances.

125. If the vertically integrated firm is not dominant downstream *in the absence of mandated access*, then this means that there must be facilities based competition that disciplines its

market power downstream. As a result it is very unlikely that there will either be a significant increase in competition from mandating access or that the vertically integrated firm has significant and durable market power upstream. None of its inputs are therefore essential. If providing access does not result in entry or expansion by competitors downstream, then the facility cannot be essential. Even if there is entry or expansion of competitors downstream, what matters is that they provide a measureable discipline on the market power of the vertically integrated firm. That is there must be a significant impact on competition, in particular the exercise of market power in the downstream market.

126. It may be the case, therefore, that the difference between the Competition Bureau and the Commission's definition of an essential facility is not particularly substantive. This will be so if any finding that mandated access has a significant effect on competition also means that the vertically integrated firm is dominant downstream.⁵⁴ In practice, using dominance or the effect on competition downstream as an initial screen may prove particularly useful in reducing the administration costs of assessing whether a facility is essential.

127. The components of the essential facility definition developed by the Commission and the Competition Bureau are intended to make sure that in conditions of uncertainty and imperfect information mandated access does lead to an increase in consumer welfare and efficiency. This is because of the recognition that mandated access has costs as well as benefits. Hence the essential facilities test advanced by the Competition Bureau and adopted by the Commission is intended to make sure that the benefits are material and is informed by an appreciation of the benefits associated with competition between TSPs that use their own facilities.

128. Effective competition at the retail level, and the resultant benefit to consumers, is most likely to come from facilities-based providers that operate and control their own networks. These service providers have the incentive, ability and capacity to discipline the exercise of

⁵⁴ If there is not dominance downstream, then it is unlikely that there is a benefit to consumers from mandating access or that mandated access will be efficiency enhancing, as well it is unlikely that the effect on market power in the downstream market will be accurately assessed. This is so for four reasons: (i) without dominance downstream it is unlikely that there will be an SLC; (ii) it will be difficult to determine in this situation if in fact there is an SLC; (iii) mandated access by the Commission is unlikely to ultimately improve the welfare of consumers because of the costs of mandating access; and (iv) it is unlikely that there is upstream dominance.

market power by the incumbent at both the retail and wholesale levels of the industry. This in turn will allow for the eventual removal of both retail and wholesale regulation, letting market forces drive service and investment considerations. In addition, service providers that control their own end-to-end networks have greater incentives for investment, innovation and cost efficiency than do those that rely on the ILECs' networks to provide retail services.

4.2 Access Policy: An Optimizing Framework

129. The Commission makes its determinations under conditions of uncertainty and asymmetries of information. As a result the Commission should be aware of the potential for error and the costs of errors. There are two possible errors, (i) mandating access to facilities that are not essential and (ii) failing to mandate access to facilities that are essential. The costs of mandating access to facilities that are not essential arise if mandated access undermines the incentives of competitors to enter with their own facilities and/or the incentives of the ILECs to upgrade and maintain their networks.⁵⁵

130. Relative to competition between firms that have duplicated the facility (resulting in competition in both the upstream and downstream market), mandated access is inferior to the alternative policy choice of not mandating access for the following reasons:⁵⁶

- the Commission will have to continue to regulate the price and terms of access to the facility;
- the benefits of competition are restricted to the downstream markets for which the essential facility is an input and the nature of the competition is restricted since the firms in that market share a common input and cost;
- the Commission has to be concerned about the potential for vertically integrated owners of essential facilities to engage in anticompetitive practices;

⁵⁵ This depends on the ability of the Commission to set optimal access prices. As discussed above this ability is undercut by the complexity of access prices and imperfect and uncertain information.

⁵⁶ See Competition Bureau, Supplementary Material, in *Review of Regulatory Framework for Wholesale Service and Definition of Essential Facility* (Response to CRTC Telecom Notice PN 2006-14), July 5, 2007, paragraphs 13-15.

- the incentives for investment and innovation by the owner of the essential facility will be negatively affected.
- the incentives for investment and innovation in competing facilities will be negatively affected.
- ongoing costs of regulation.
- the potential for the adoption of inefficient regulatory policies because of rent seeking and lobbying.

131. The cost of not mandating access to a facility that is essential is the potential for limitation or elimination of competition in the relevant downstream market and the harm to consumers in the downstream market from the market power maintained by the vertically integrated firm if access is not mandated.

132. Since the Commission will be making its determination under conditions of uncertainty and asymmetries of information, the Commission must be aware of the potential for error and the costs of undermining incentives for investment. This implies that it should be suitably cautious in assessing the benefits of mandated access. As a result it is important the benefits from mandated access—the increase in competition in the downstream market or its preservation—be substantial or significant.

4.3 Essential Facility vs. Retail Regulation

133. The Commission did acknowledge in Telecom Decision 2008-17 the dangers of expanding wholesale access to control market power downstream beyond essential facilities.⁵⁷ When wholesale regulation is substituted for retail regulation to control the market power of the incumbent it may be inappropriate. This will be the case if there are other barriers to entry in downstream markets which cannot be reduced by wholesale regulation. One consequence of this is that the Commission ends up focusing on the

⁵⁷ Telecom Decision 2008-17 at paragraph 22.

existence and health of competitors dependent on mandated access rather than on their effect on competition, efficiency, and on mandated accesses effect on investment and innovation.

134. Second, in response to market power at the retail level, the adjustments available to the Commission are to lower the price of essential facilities or mandate access to non-essential facilities. In either case, to be effective the Commission will be forced into a position where, in an attempt to control for market power downstream, it will have to impose a mandatory wholesale access regime that subsidizes entry downstream. This occurs because reductions in the price of essential facilities will be below the efficient level and costs of the ILEC will not be recovered. For non-essential facilities, mandating access to them will not promote entry unless they too are priced below the cost of the CLEC, which, given that they are not essential, will likely be below the cost of the ILEC.

135. The difficulty with subsidized entry is that it negatively and significantly affects the incentives for investment and maintenance by the ILECs in their networks. This scenario likely results in wholesale prices set so low that entry is confiscatory since the incumbent's capital investment is expropriated. It is hard to imagine under these circumstances that ILECs would continue to maintain their facilities, let alone invest in new facilities or upgrade existing ones. If non-essential facilities are priced below costs, CLECs will have very little incentive to invest in their own facilities. The outcome is a monopoly network with deteriorating quality.⁵⁸

4.4 Essential Facility Implementation: A Summary

136. Determining whether a facility is essential requires:

- Defining the relevant upstream market that includes the services or functionality provided by the facility. This involves identifying reasonable substitutes for the facility, including the possibility of self supply and duplication.

⁵⁸ See Reply Argument of the Commissioner of Competition, December 7, 2007 in *Re: Review of Regulatory Framework for Wholesale Services and Definition of Essential Service*, (Response to Telecom Public Notice 2006-14) at paragraph 43.

- Defining the relevant downstream market. This involves determining the set of reasonable substitutes for telecommunications services that use the input.
- Assessing the vertically integrated firm's market power in both the upstream and downstream market *in the absence of mandated access*.
- Assessing the potential for entry in the downstream market if mandated access is implemented and the effect of that entry on the market power of the vertically integrated firm.

5 Application of Essential Facilities Framework to Copper

137. In this section the essential facilities framework is applied to existing network elements for which the Commission has mandated access, in particular loops and GAS/HSA service. This involves recognizing that each of the elements of the Commission's definition are *necessary: if any one of them does not hold then the facility cannot be essential*. In applying the elements of the Commission's definition the four steps that properly implement the definition (discussed at the end of Section 4) are applied to loops and GAS/HSA service in this section. These involve (i) assessing market power from control of the facility and (ii) assessing the effect on access both on the viability of entrants, but also on market power of the vertically integrated firm in the relevant downstream market. The preliminary analysis required before either of these two steps is identifying the relevant upstream and downstream markets.

5.1 Relevant Downstream Markets

138. The starting point for market definition is to identify the services provided to residential users that utilize the facilities for which there is mandated access, and in particular ILEC facilities to which there is mandated access. There are two "candidate" markets based on the distinctive downstream services that utilise ILEC facilities to which there is mandated access. These are local exchange services (LES) or voice services and residential high-speed Internet access, today synonymous with broadband services.

139. The provision of each of these services involves the provision (whether self-provision or through mandated access) of an access link between the network of the provider and the location of the residence where service is demanded, as well as appropriate customer premise equipment and the ability of the network to deliver the service over the access link. Each service is therefore provided by a bundle of complementary inputs, of which the access link is one.

140. The starting point for the analysis of each of the two services involves identifying relevant downstream markets for each by applying the hypothetical monopolist test. The application of the hypothetical monopolist test begins by considering the supply of these services to end customers of each of the services (LES and Broadband) using the facilities of the ILEC. The objective is to identify the extent to which residential consumers of services that use these facilities are able and willing to substitute to similar services that do not use the facilities of the ILEC.⁵⁹ In this case, the “hypothetical monopolist” is the only provider of LES using ILEC facilities (in the absence of mandated access, it would be the ILEC itself).

5.1.1 Local Exchange Services

141. When faced with a price increase, customers of LES that use the facilities of the ILEC network have the option of instead switching to providers of local exchange services that are not provided using the network of the ILEC. Alternative providers of local exchange services include: (i) the local cable company; (ii) wireless providers; and (iii) access independent providers of VOIP.

⁵⁹ Consistent with estimates in the literature on the inelasticity of local exchange services, we assume that substitution to non telecommunications services is unlikely to discipline the exercise of market power by a hypothetical monopolist of LES or broadband. But that should not be the starting point for market definition downstream that assists in identifying an essential facility.

Cable Provision

142. The Commission in 2006 determined that LES provided by CLECs, including the cable companies, are in the same market as ILEC LES.⁶⁰ This is consistent with the evidence since its local forbearance decision:

- the functionality of the local exchange services offered by the cable companies, as well as its quality and reliability are similar to those offered by the ILECs.
- the prices of the ILEC and cable companies local exchange services are similar.
- there is not a capacity constraint or other impediment (such as increasing costs) that inhibits the ability of a cable company to provide service to consumers who would switch if the ILEC raised its price of local exchange services.
- the short run marginal cost of both the ILEC and cable companies appear to be of similar relative magnitude, with most of the costs of provision sunk capital costs.

143. The market share evidence in Figure 7 and Table 1 provides empirical support for the conclusion that the local exchange services provided using cable operators' facilities are in the same market as LES provided by the ILECs or using the ILECs' facilities. The cable providers have been able to capture significant market share since 2006 and they have been able to sustain their market position.

144. The evidence and experience strongly suggests that a hypothetical monopolist of LES provided using ILEC facilities would not find it profit-maximizing to raise the price of those services above competitive levels by a SSNIP. The reason is that there would be significant substitution by residential consumers to cable provision of local exchange services. The elasticity of demand for all access dependent local exchange services (i.e., all local exchange services that utilise a local access network of any kind, whether cable or ILEC) might be relatively inelastic, but the elasticity of demand for access dependent local exchange services provided by the ILEC is likely fairly elastic.

⁶⁰ See CRTC, Telecom Decision 2006-15, *Forbearance from the Regulation of Local Exchange Services* at 44. Hereafter referred to as "Telecom Decision 2006-15."

Other Alternatives

145. There are two other downstream alternatives that would, in addition, contribute to disciplining a hypothetical monopolist of local exchange services provided by either the ILEC or cable carriers (wired providers). These alternatives constitute a potential discipline on access dependent LES, that is all local exchange services provided using “wired” facilities (i.e., including those that depend on cable access networks). The two main alternatives are wireless and access independent VoIP. Whether these services should be included in the relevant market for access dependent local exchange service depends on the own price elasticity of demand of access dependent service, the extent of the market for access dependent service, and the profit margin of wired access dependent service.

146. The Commission determined in Telecom Decision 2006-15 that wireless services were not in the same market as wired access dependent service.⁶¹ The Commission pointed to differences in how the services were priced, with wireless being priced on a usage basis instead of a flat rate;⁶² wireless services were not marketed as replacements for wired access dependent service, but instead could be obtained in a bundle suggesting they were complements;⁶³ and only 2.7% of households were wireless only, relative to the 67% of households that had at least one wireless subscriber.⁶⁴ On this basis the Commission concluded that “while some consumers are substituting mobile wireless services for wireline service, at present, the level of substitution is not significant enough to provide a constraint on the market power of the ILEC in a relevant market.”⁶⁵

147. Wireless and wired services are still marketed as part of bundles to those who view them as complements. But it also seems clear that with increasing capabilities for broadband service and plans with large bucket of minutes (including some with unlimited voice) that the option of cutting the cord has become more attractive to some consumers. This is borne out by the data. The number of wireless only households in Canada had increased to 12.8%

⁶¹ Telecom Decision 2006-15 at paragraph 62.

⁶² Telecom Decision 2006-15 at paragraph 58.

⁶³ Telecom Decision 2006-15 at paragraph 59.

⁶⁴ Telecom Decision 2006-15 at paragraph 60.

⁶⁵ Telecom Decision 2006-15 at paragraph 61.

in 2011, with 79.4% of households having at least one wireless subscriber.⁶⁶ Bell internal estimates are that the share of wireless holds in its service areas is 21%.

148. It is an empirical question whether the increase in willingness to substitute suggested by developments in wireless makes the elasticity of demand for wired LES sufficiently elastic that a SSNIP by a hypothetical monopolist of wired LES would not be profit maximizing. This depends on the willingness of consumers at the *margin* to substitute when the price of wired access dependent LES service increases.

149. The increased prevalence of wireless only subscribers suggests a reduction in demand for wired access dependent LES. In terms of market definition, what matters, however, is the effect of the reduction in demand on the pricing incentives of a hypothetical monopolist of wired access dependent LES.⁶⁷ A decrease in demand likely has two effects: (i) it reduces the size of the market, that is for any price less is demanded; and (ii) it affects the responsiveness of the quantity demanded to price.⁶⁸ Both changes affect the pricing incentives of a hypothetical monopolist of wireline. When demand decreases the effect of the first is to reduce the profit maximizing price of a hypothetical monopolist in wired access dependent LES. The effect of the second depends on how the change in demand affects the responsiveness of demand. If the effect of the decrease in demand is to increase the responsiveness of quantity demanded to price then it would be unambiguous that the effect of the decrease in demand would be to reduce the profit maximizing price of the hypothetical monopolist, making it less likely that a hypothetical monopolist of wired access dependent LES would find it profit maximizing to impose a SSNIP. That is the greater the extent of wireless only households, the more competitive the constraint wireless substitution has on the pricing of LES.

150. The difficulty is that it might be the case that the reduction in demand reduces the responsiveness of the quantity demanded to price. That is those who have not “cut the cord” may be less likely to substitute to wireless than those who no longer have wireline LES

⁶⁶ CRTC, Communications Monitoring Report, (hereafter referred to as “CMR”) 2013 at Table 2.2.3, p. 25.

⁶⁷ For the analysis in this paragraph it is assumed that marginal cost is constant.

⁶⁸ As measured by the rate of change of quantity sold as price increase, i.e., the slope of the demand curve.

service. If this is the case, and the effect is sufficiently large, the effect would be to increase the profit maximizing price of a hypothetical monopolist in wired access dependent LES, making it more likely that a hypothetical monopolist of wired access dependent LES would find it profit maximizing to impose a SSNIP. Hence the significance of the increase in wireless only households is an empirical matter, except that the stock effect will dominate at some point. When it does, the loss in market size will dominate the effect on demand elasticity and make it less likely that a SSNIP for an access dependent LES provider will be profit maximizing, in which case wireless LES will be in the relevant market for access dependent (wired) LES.

151. The Commission also determined in Telecom Decision 2006-15 that access independent VoIP services are in the relevant market defined around local exchange services provided by the ILEC.⁶⁹ An option for consumers who have broadband access is to switch from access dependent LES to access independent VoIP service if the price of access dependent LES increases. Even consumers without broadband access might consider, at the margin, acquiring broadband service and local exchange service from a VoIP provider.

152. The Commission has estimated that in 2012 there were 700,000 retail VoIP lines provided to residences, up from 326,000 in 2011.⁷⁰ The 700,000 VoIP lines is 5.6% of total access dependent and access independent residential lines. Whether access independent VoIP should be included in the market with access dependent service provided by the ILEC and the cable companies depends on the extent of diversion at the margin to VoIP services without access in the face of a SSNIP for access dependent service.

Winner Takes All

153. An additional factor that impacts on the profitability of a SSNIP by a provider of access dependent LES is that competition may be not between services at a residential location, but to provide access to all services at that location. Competition is not between services but between whose “wire” is going to provide service, i.e., access competition. While it may have been true that traditionally a household would be connected to both the cable network

⁶⁹ Telecom Decision 2006-15 at paragraph 45.

⁷⁰ CMR 2012, Figure 5.2.4 and CMR 2013, Figure 5.2.2.

(for video) and the ILEC network (for telephony), the trend has been for more and more households to receive all of their services from a single network. Many residences (the significance of which is likely to grow with the importance of bundles) will utilize only one wired link over which they receive not just LES, but also broadband and video from the provider of access. Hence an increase in the price of LES that results in a residence switching access providers will be very costly in terms of lost profit. The lost margin will be across all services, not just LES. This is a factor that indicates a broader market than access dependent ILEC LES and perhaps even broader than wired access dependent LES service.

Conclusion on Local Exchange Services Product Market

154. The analysis suggests the following

- LES using ILEC facilities is not a relevant downstream product market. Cable telephony services are in the same market.
- LES using all types of “fixed” wire infrastructure (i.e., cable and ILEC facilities) may potentially be a relevant downstream product market, but the importance of competition, and hence substitution to wireless and VoIP will be an ever increasing competitive constraint on the exercise of market power by a firm that controls all types of fixed wire infrastructures.

5.1.2 Broadband Services

155. The determination of the downstream market with respect to broadband services involves similar considerations to those for LES. In particular, the evidence on the nature of the service, its pricing and quality, and the observed behaviour of residential adoption is that cable supplied broadband internet access is in the same relevant market as ILEC supplied broadband internet access. Figure 4 and Table 2 show that the market share of cable in the provision of high-speed internet exceeds that of the ILECs.

156. Figure 8 and Table 3 shows the extent to which Canadians have access to, and subscribe to, wireless broadband internet access. For similar reasons indicated in the discussion of local exchange service the extent of the competitive constraint is not known, but it is not zero. There are good reasons, such as data caps and usage-based pricing, that for some users

wireless access is not a good substitute for wireline. However, for other users, wireless may be a very good substitute to cable broadband or ADSL service from the ILEC. Consumers who have already cut the cord for telephony and who have limited demand for video are an example.

157. The analysis suggests the following

- Broadband services provided by the ILEC is *not the relevant downstream product market*.
- Wireline broadband services using all types of “fixed” wire infrastructure (i.e., cable and ILEC facilities) may potentially be a relevant downstream product market, but the importance of competition, and hence substitution to wireless is a growing competitive constraint on the market power of wireline broadband service providers.

158. This is consistent with, and a result of, the elasticity of broadband services provided by the ILEC being elastic, but the elasticity of demand for wired broadband being substantially less so.

5.1.3 Bundles

159. The Commission’s *Communication Monitoring Report* indicates that in 2012 10 million residential subscriptions comprised more than one service, i.e., were a bundle.⁷¹ A bundle involves at least two services being provided with the price of the bundle less than the price of the sum of the stand-alone prices for each service. That is, bundles are priced at a discount.

160. A hypothetical monopolist that controls all fixed wire infrastructure may be able to exercise market power over a bundle of the services, but for individual elements may face competition from wireless platforms and other modes of delivery. For example, assuming that that cellular wireless broadband services are not close economic substitutes to wired broadband services, this hypothetical monopolist might have market power in the market for stand-alone broadband services and for any bundled services that include broadband. The

⁷¹ CMR 2013 at p. 28.

hypothetical monopolist will not necessarily, however, have market power in the provision of voice (where substitution to wireless is already underway), or have market power in the provision of video (where satellite and other delivery modes are available).

161. It is necessary to consider, for the purposes of this report, if bundles of services provided by the ILEC are a relevant downstream market. They might be if other providers, including the cable companies, are not able to match the bundles of the ILEC. This might be the case if they cannot replicate, or otherwise have access, to an essential facility of the ILEC *wired network*. The bundles relevant to this proceeding are those that contain downstream services that use elements of the ILEC or cable companies' wired networks. Bundles relevant to this proceeding may contain wireless services, but the market power (if any) in the provision of those bundles *cannot* be attributable to control of an essential facility used by the ILEC in the provision of wireless services.

162. Given the analysis above, it should be clear that if the cable companies can match each of the individual components in the bundle (local exchange services, broadband, and video), then they can match the bundle. Hence if there are relevant markets defined around bundles provided by the ILEC, it is not limited to the bundle of the ILEC, but also contains the matching bundle provided by the cable provider.⁷² Again the elasticity of demand for the ILEC bundle will be substantially greater than the market elasticity for bundles as a whole given the willingness and ability of consumers to substitute to matching bundles provided by the cable providers. If the provision of wireless services is competitive, then the inability of a cable provider to include wireless in its bundles is unlikely to preclude it from providing a competitive constraint on the ILEC that has a quadruple play.⁷³

5.2 Upstream Markets

163. As discussed in the antitrust framework section above the key determinant for assessing the potential for the exercise of market power upstream depends on direct substitution and

⁷² As a result similar considerations regarding the ability of the ILEC to exert downstream market power for voice and broadband discussed below in Sections 5.4.1 and 5.4.2 will apply to any relevant markets involving bundles.

⁷³ For evidence on the competitive nature of wireless service provisions in Canada see J. Church and A. Wilkins, (2013), *Wireless Competition in Canada: An Assessment*, School of Public Policy, University of Calgary Research Paper, 6(27). Available at <http://www.policyschool.ucalgary.ca/sites/default/files/research/j-church-wireless-online.pdf>.

indirect substitution for the input. Direct substitution refers to the ability of downstream firms to utilize other inputs instead of the candidate essential facility of the ILEC. Indirect substitution refers to the extent to which customers in the downstream market will substitute to services in the downstream market that do not use that input. The importance of this substitution depends on the cost share of the input in the downstream product and the elasticity of demand for the product that uses the input in downstream. In this section the upstream market for two inputs of the ILEC for which access is mandated is considered: local loops and GAS/HSA.

5.2.1 Local Loops

164. The local loops of the ILECs will be the relevant market if the ILEC finds it profit maximizing to raise their price above competitive levels by a SSNIP. The two sources of substitution which would make this unprofitable are, as indicated above, direct substitution (switching to other inputs by providers of downstream services that use local loops) and indirect substitution. Indirect substitution occurs when pass through of the SSNIP by downstream providers that use local loops to provide service induces residential consumers to substitute to other services in the downstream product market that do not use local loops provide by the ILEC.

165. In terms of direct substitution, the market definition exercise upstream involves identifying whether there are other inputs for copper local loops provided by the ILEC that competitors could utilize, including self provision. The conventional wisdom suggests, and the Commission has concluded, that the possibilities for substitution are limited.⁷⁴

166. The possibilities for substitution are thought to be limited because the costs of creating a new access network, copper or otherwise, are thought to be so high as to preclude duplication. That is, the local loop portion of the ILEC network is thought to be a positive natural monopoly. However, while it may be true that there will not be duplication of the copper network of the ILEC, that does not mean that there are not substitutes for the ILEC's copper infrastructure used to provide access. Proper market definition requires assessing not

⁷⁴ See, for example, Telecom Decision 2008-17 at paragraphs 63-65.

just whether there other suppliers of the same “product”, but whether there are alternative “products” upstream to which downstream suppliers could substitute. Even though a firm is an exclusive supplier of its product, it may not have market power if it competes with differentiated products supplied by other firms. Whether it competes with differentiated products depends on the ability and willingness of its customers to substitute to the products of other suppliers.

Direct Substitution to Alternative Forms of Access

167. There is evidence that some competitive service providers are able to substitute to other alternatives that provide functional access similar to local loops (and colocation) on other facilities besides those of the ILEC. The substitution possibilities available for competitive service providers to provide local exchange services without using the local loops of the ILEC include self provision and broadband access:

- *Self Provision.* Figure 9 and Table 1 indicate that in 2012 there were 674,000 residential subscribers whose service was provided by competitive TSPs (non-cable). Only 2% of total Alternative TSPs’ lines (including cable providers) were provided by resale. If the resellers are assumed to be all competitive TSPs then total resale lines are 98,640 and the remainder had their own facilities, equal to just more than 575,000 residential lines. This is 4.8% of total access dependent residential service. The number of such lines increased by 13.4% from 2011 levels, after an increase of more than 50% between 2010 and 2011.⁷⁵ In addition Table 4 shows that there were 348,000 high-speed subscribers whose service was provided over facilities owned by independent providers (excluding cable providers).
- *VoIP over the Internet.* In 2012 there were also 700,000 residential subscribers to access independent VoIP.⁷⁶ This is 5.6% of total residential lines (access dependent plus access independent). The increase from 2011 is 115%, from 326,000.⁷⁷ In 2009 the total number

⁷⁵ CMR 2013, Table 5.2.6. provides total number of alternative TSP lines over the past several years. Figure 5.2.4 the share of resale in 2013. The share of resale for previous years is from the equivalent figure from previous CMRs.

⁷⁶ CMR 2013, Figure 5.2.2.

⁷⁷ CMR 2012, Figure 5.2.2.

(including business and residential subscribers) of access-independent subscribers was only 161,000.⁷⁸

168. In 2012, therefore, total access independent VoIP and other facilities based (non cable) residential local service provision accounted for over 10% of total residential lines (access dependent plus access independent). That is, for 10% of residential lines in 2012, the (non-cable) provider of LES services was able to substitute an alternative to the copper loops of the ILEC to obtain access.

Indirect Substitution by Residential Consumers Downstream

169. The possibilities for substitution away from access provided by the ILEC are considerably enhanced when indirect substitution is considered. To see this intuitively consider an ILEC that wholesales its local loops and is the only supplier in a geographic region. Demand by entrants for access may be quite elastic if they face competition in retail markets from providers who use other networks. In these circumstances, demand for wholesale access may be elastic if residential homeowners are sufficiently able and willing to substitute to services that use access over an alternative network, such as a cable television network or a wireless network. An increase in the wholesale price, to the extent it is passed on by entrants to downstream consumers, will raise the entrants' price, and result in consumers substituting to the other networks.

170. As indicated above in Section 2.2.1,⁷⁹ when there are fixed proportions—in this case no ability to substitute away from some access link—the elasticity of derived demand is based upon the *product* of the cost share and the elasticity of demand for the residential product that uses the input. As a result indirect substitution is likely a very important discipline on the market power of ILEC provision of local loops:

- First, the cost share of access is likely a substantial portion of the costs of provision by independent TSPs of residential service. The CRTC's Telecom Decision 2012-628 set out monthly rates for unbundled local loops across different rate bands.

⁷⁸ CMR 2012, Table 5.2.1.

⁷⁹ See discussion of derived demand above.

Rates for the unbundled local loop vary from \$5.69 in Band A to \$26.31 in Band E.⁸⁰ Based on Bell’s forecasts of the number of unbundled loops in each rate Band submitted in previous proceedings, the weighted average loop rate (i.e., the weighted average price entrants are actually paying for using Bell’s loop) is \$10.84 per month.⁸¹ Bell’s standard home phone “lite” package costs \$29.95 per month in Ontario.⁸² The price of this package is likely an upper bound for the total cost of providing the package. Yet the loop input cost is around 33% of the price of the basic package and probably a higher share of the actual total cost to the provider of providing service.

- Second, as discussed above the willingness and ability of consumers provided with residential access to substitute or divert their demand from residential services provided by the ILEC using its network to that of the cable providers appears to be elastic. This extends to diversion away from service provided by independent TSPs using wholesale access provided by the ILECs.

171. In applying the HMT to the supply of access using copper loops by the ILEC, what is relevant is the aggregate extent of substitution when it raises its price, not whether substitution to one alternative would provide sufficient discipline. It is the own price elasticity of derived demand that is relevant, not the cross price elasticity with any single alternative that determines the discipline exerted on an ILEC when it considers the profitability of raising the price of its copper loops.

⁸⁰ See CRTC Telecom Decision 2012-628, at Table 2.,

⁸¹ This weighted average is based on weighting the loop rates in each rate band with the forecast number of loops in each rate band. The forecast is based on Table 3 in Appendix 1 of the Attachment filed in support of Bell Aliant Tariff Notice 260 and Bell Canada Tariff Notice 7205, 2 June 2009. The weighted average rate of \$10.84 is calculated using the 2013 CLEC unbundled loop demand forecast, and based on Bell Canada loop rates.

⁸² This price is as part of a Bell bundle. The stand-alone price appears to be \$33.95 per month, including Touch-Tone and 911 service. All customers appear to receive a discount of \$5 per month for the first three months. The Bell bundle saving is \$4 per month. Given that all customers receive an initial discounted rate and that many (or perhaps even most) customers purchase the service as part of a bundle, and further given that a retail price for a product likely exceeds the actual cost of making that product, a cost share of at least 30% seems reasonable to assume. See http://www.bell.ca/Home_phone/Products/Home_phone_Lite?promo=true.

172. Figure 10 shows that the number of independent ISPs that use ILEC local loops to provide downstream service is zero. Demand at regulated rates is sufficiently small that it rounds to zero in 2012 for local exchange service provision to households. This indicates that at the regulated rate the extent of substitution identified in our analysis is sufficient that demand for access to loops is minimal at present. It is hard to square the ability to exercise market power and increase prices from existing levels with zero demand at regulated rates.

173. In conclusion, the evidence suggests that the upstream market for ILEC loops is broader than those loops. Reasonable economic substitutes that discipline the exercise of market power in the provision of loops include direct substitution to other facilities and indirect substitution to downstream services that use other networks.

5.2.2 High Speed Wholesale Services [GAS and HSA]

174. The other Bell services of relevance for which access is mandated are Gateway Access Service (GAS) and High Speed Access (HSA). Both are available over legacy facilities (copper only) and FTTN. The difference is in the speed provided: legacy speeds are less than 6 Mbps, FTTN speeds are greater than 6 Mbps. Both services provide the following capabilities:

- high speed access path from the residence of a customer to a wire centre
- transport and aggregation to an aggregated high speed service provider interface (AHSSPI).

The difference between the GSA and HSA is whether there is a dedicated permanent virtual circuit (PVC) between the residence and Bell's wire centre.⁸³ In terms of residential services, GAS is provided primarily to independent internet service providers (ISPs) as a wholesale product that enables them to provide high speed internet (broadband) access to the premises of their residential retail customers.

⁸³ Given the relative predominance of GAS for residential service provided by independent Internet Service Providers, the focus of the analysis is on GAS, not HSA. Nothing is lost by narrowing the focus.

175. GAS/HSA involve mandatory bundling of access and aggregated transport. Indeed GAS/HSA essentially amounts to mandated access to the local network of the ILEC. It provides a wholesale service to independent ISPs that provides them with access to all residential locations, as well as aggregation and transport of their customers' data traffic to a single point of interconnection. It thus minimizes the extent of network investment required by independent ISPs. GAS/HSA are Bell and Bell Aliant's Aggregated ADSL services. Similar services are required to be provided by other ILECs. For convenience reference to GAS/HSA provided by an ILEC should be understood to mean Aggregated ADSL service provided by that ILEC.

176. GAS/HSA service provided by an ILEC will be a relevant market if the ILEC finds it profit maximizing to raise GAS/HSA prices above competitive levels by a SSNIP. The two sources of substitution which would make this unprofitable are, as indicated above, direct substitution by providers of downstream services that use GAS/HSA as an input when they provide service and indirect substitution. Indirect substitution occurs when pass through of the SSNIP by downstream providers that use GAS/HSA to provide service induces residential consumers to substitute to other services in the downstream product market that do not use GAS/HSA provided by the ILEC.

Direct Substitution by Independent ISPs to Other Inputs

177. In terms of direct substitution, the market definition exercise upstream involves identifying whether there are other alternatives to GAS/HSA provided by the ILEC that competitors could utilize. The two alternatives are self provision, which might include some combination of owned facilities and facilities and services purchased in wholesale markets, and purchase of an equivalent wholesale product from another network.

- *Self Provision.* Table 4 indicates that in 2012 there were 348,000 residential high-speed subscribers whose service was provided by competitive TSPs (non-cable) who utilized their own facilities. So there is some provision of local broadband service where both loops and transport utilized by independent ISPs are not mandated.
- *TPIA.* The cable carriers provide a similar resale service to GAS/HSA, third-party Internet access service (TPIA). That is, there is another wholesaler with a service that is

very similar to that of GAS/HSA. Table 4 indicates that 183,000 residential subscribers in Canada were provided with broadband service by independent ISPs using TPIA. Of course TPIA is mandated: the issue is whether it would be available as a substitute if it was not mandated. The answer depends on whether it would be profitable. It might be true that both the ILEC and the cable provider would prefer that neither supply wholesale aggregate high-speed access. However, this is likely a prisoner's dilemma. If the ILEC is not going to supply it, the profits of the cable provider may will go up if it supplies it and vice versa. Moreover, if one is supplying it, the other will likely find it profitable to do so.⁸⁴

Indirect Substitution

178. The possibilities for substitution away from service provided by the ILEC are considerably enhanced when indirect substitution is considered. As indicated above, there are two considerations that suggest that indirect substitution is an important discipline on the market power of ILEC provision of GAS/HSA:

- First the cost share of access is likely a substantial portion of the costs of provision by independent TSPs of residential broadband service. For example, just the monthly access “flat rate” charge that a competitive ISP in Alberta or British Columbia pays for matching Telus’ 15 Mbps service is \$32.72. Telus’ own retail price for that service is \$55 per month as part of a bundle and \$60 per month on a stand-alone basis. The “wholesale” input thus costs over 50 % of Telus’ own retail price. For Bell, for the matching speed wholesale product on the 16 Mbps service, the monthly access charge alone is \$24.98. The corresponding Bell retail price is \$52.95, when purchased as part of a bundle. Competitors ISPs also pay a capacity

⁸⁴ See J. Church, (2008), “Vertical Mergers,” in W.D. Collins, ed., *Issues in Competition Law and Policy*, Volume II, Chicago: American Bar Association, 1455 at 1475 for a similar analysis of the incentives for vertically integrated firms to foreclose downstream sales: “Given that sales to unintegrated downstream firms are going to occur, the integrated firm would like to make them.” Available online at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1280505

charge of \$2213 per month for every 100 Mbps. Thus the cost share of the wholesale input in this case could well approach or exceed 50%.⁸⁵

- Second, as discussed above the willingness and ability of consumers provided with residential access to substitute or divert their demand from residential broadband services provided by the ILEC using its network to that of the cable providers appears to be elastic. This extends to diversion away from broadband services provided by independent TSPs using wholesale access provided by the ILECs. Indeed cable provision dominates provision of broadband in Canada and always has. See Figure 4.

179. In applying the HMT to GAS/HSA supplied at wholesale by an ILEC, what is relevant is the aggregate extent of substitution when its price is raised, not whether substitution to any single alternative would provide sufficient discipline. It is the own price elasticity of derived demand that is relevant, not the cross price elasticity with any single alternative that determines the discipline exerted on an ILEC when it considers the profitability of raising the price upstream of its GAS/HSA service.

180. Taken together, it seems unlikely that Aggregated ADSL service provided by an ILEC is a relevant upstream market. There is considerable scope for substitution upstream and indirect substitution downstream. In particular it seems difficult to conclude that cable provision of an equivalent, if not better service, potentially at wholesale, but certainly and especially at retail, is *not* sufficient to discipline the exercise of market power by a hypothetical monopolist of Aggregated ADSL by an ILEC. That is, a hypothetical monopolist of Aggregated ADSL would not find it profit maximizing to implement a SSNIP above competitive levels.

⁸⁵ Source: The “flat rate” for Telus is based on its Alberta and British Columbia flat rate as determined in CRTC Telecom Regulatory Policy 2011-703, *Billing Practices for Wholesale Residential High-Speed Access Services*, Appendix 1. Bell’s access rate and its monthly capacity charge are also listed in the same appendix. Data on Bell and Telus retail prices can be found on their respective websites and reflect “ongoing” prices. For example, Bell’s 15 Mbps (download speed) “Fibe” service costs just \$34.95 per month for an initial six-month period, before reverting to \$52.95.

5.3 Geographic Market Definition

181. As discussed in Section 2 above, the relevant geographic market for local telecommunications services is defined by the location at which services are demanded. Thus the relevant geographic market is the location of services provided by the ILEC's network, i.e., its network coverage or footprint.
182. Consumers of fixed access residential telecommunications services are unlikely to substitute to those services provided at a different location when the price of service at their existing location rises by a SSNIP—at least not in the short run. Of course this might mean that each location serviced by the network of the ILEC is a unique geographic market. However, the competitive conditions at many, if not most of the locations where the ILEC's network provides service are likely identical, allowing for aggregation at those locations.
183. If the choices facing consumers at location *A* are identical to the choices that they face at location *B*, then location *A* and location *B* can be aggregated into a single market. However, what this means is that the competitive conditions in those markets are the same and hence the analysis of market power and competitive effects is likely identical, not that consumers at location *A* will substitute to location *B* for service.
184. As a result the relevant geographic markets for local loops and GAS/HSA service are defined by the extent of facilities based competition at a location. At the very least there will be (i) locations where there is overlapping coverage provided by a cable network capable of providing the relevant downstream services and (ii) locations where this is not true, the cable network cannot provide service or the location is not on the cable network.
185. Where it is true that the cable network cannot *presently* provide service to a location, there will be coverage “holes”. The issue of such coverage holes was considered extensively in the *Local Forbearance Proceeding*.⁸⁶ The Competition Bureau submitted that it was

⁸⁶ See Telecom Decision 2006-15 at paragraphs 82-168.

important to distinguish between temporary coverage holes and sustained pockets of missing coverage in a local exchange area.⁸⁷

186. The Bureau also observed that the importance of such coverage holes will depend on their extent and whether the ILEC can identify them and profitably engage in geographic price discrimination. If the coverage holes are small, then it is likely that the ILEC will not be able to identify them as such and will not be able to selectively raise the price at these locations, suggesting that these coverage holes are irrelevant for geographic market definition. It is important to note that the ILEC and cable companies typically price their service on the basis of their network coverage or province wide.

5.4 Dominance and the Effect of Access on Competition

5.4.1 Local Loops and Local Exchange Service

187. In this section the evidence on the exercise of market power downstream by the ILECs in the market for residential local exchange services is considered as is the effect on that exercise of mandated access to local loops. As discussed above significant and durable market power in the downstream market is necessary for finding an essential facility. Without such a finding the inquiry into whether a facility is essential can be stopped.

Market Power in Residential Local Exchange Services

188. In assessing market power in residential local exchange services, it is important to recognize the importance of economies of scale and scope on the exercise of market power. As defined in Section 2 market power is the ability to raise prices above competition levels. But that does not mean that market power can be inferred from high gross margins (prices above short run variable or marginal cost). The reason is that when there are economies of scale and scope, long run marginal costs will typically be less than long run average cost. As

⁸⁷See Reply Argument of The Commissioner of Competition, in Re: Forbearance from Regulation of Local Exchange Services, Response to Telecom Public Notice CRTC 2005-2, October 7th, 2005. At page 3 the Bureau states: “The Bureau believes that there is some confusion as to the types of holes that are possible. This arises out of the distinction between whether a competing network passes a home or not and whether that network is capable of providing service to the homes passed. . . . If the competitor's network: (i) passes homes; (ii) has sufficient capacity to serve the homes passed; (iii) has been upgraded to provide service to the homes passed or could be upgraded within a two year timeframe and at an economically viable incremental cost to provide service, then the Bureau would not consider this to be a coverage hole.”

a result firms will have to exercise some amount of technical market power in order to break even. Industries with substantial network economies will likely be concentrated and have relatively few competitors. Firms will require gross margins (prices above short run costs) to cover their fixed and sunk capital costs. The issue with respect to market power then becomes whether concentration is too much, not whether it is high. It will be high by the nature of the technology. Hence when considering market power measures downstream it is important to recognize that the traditional measures of competition policy (gross margins and concentration) cannot recognize when concentration and high gross margins are consistent with competition, rather than the exercise of significant, or inefficient, market power, i.e., prices greater than average cost. For regulation to be warranted, a necessary condition is that there should be compelling evidence that firms are exercising significant market power and earning monopoly profits. Typically regulation would require dominance or monopoly in the market: it would not be justified on the basis of oligopolistic competition. This point ties back to the necessity of significant and durable market power, in the downstream market, i.e., dominance.

189. The evidence on competition in local exchanges services, none of which suggests dominance by the ILECs (or any other provider for that matter), is as follows:

- Figure 7 and Table 1 show the decline in the market share of the ILECs in residential exchange services. Figure 7 shows it by major city in Canada since 2002. Table 1 shows it nation-wide. Nation-wide the share of local residential exchange service has fallen from 98.6% in 2002 to 58.3% in 2012. If access independent VoIP is included in the market, the share of the ILECs in 2012 falls to 55.1%.
- Table 5 shows the real price of three different consumption baskets of local service tracked by Wall Communications for the Commission over the period 2008 to 2013. The annual compound growth rate for Level 1 and Level 2 is 1.22% and 1.58%. The annual compound growth rate for Level 3 is -1.06%. Level 1 is basic service, with no calling features and limited long distance. Level 2 has limited long distance and some calling features. Level 3 includes substantial long distance calling and all calling features. The significance of the small price increases for Level 1 and Level

2 depends on their relative importance, and whether that has increased or decreased over the last five years. If Level 3 is the predominant service level chosen by Canadians, then its decrease in real terms is suggestive of the extent of inter-platform (ILEC, cable, and wireless) competition since forbearance.

- The focus on the Level 3 basket is validated by considering the real average revenue per residential line by the ILECs, alternative TSPs (non-cable), Cable BDUs, and overall. Table 6 shows these for the period 2008 to 2012. In all cases the real average revenue per residential line has declined. The compound annual rates of **decline** are 0.54%, 1.00%, 1.88%, and 1.96%.
- Table 7 shows the real price of the three different bundles tracked by Wall Communications for the Commission. The compound annual **decrease** in the price of Bundle 1 and 3 are 2.93% and 1.96%. The increase in the Bundle 2 price is 0.77%.
- Table 8 and Figure 11 show the importance and extent of rivalry between the cable carriers and the ILECs in terms of investment. Table 8 shows that from 2008 to 2012 the share of investment by ILECs averaged just more than two-thirds, whereas cable carriers and other facilities-based alternative providers account for one-third. It also shows the increase in investment by the alternative facilities-based carriers (presumably mostly cable) from 2009 to 2012: it increases by more than 50%. The significant share of investment by the ILECs in this period reflects the intensity of their effort to increase the quality of their networks to match the quality of the cable companies. This is reflected in the higher average capital intensity (investment as a share of revenues) by the cable companies prior to 2008 and the closing of the gap by the ILECs thereafter—see Figure 11. The intensity of investment competition is reflected as well in the positive correlation in capital intensity from 2009 onwards.

Competitive Effects on Local Exchange Services

190. Table 9 shows the extent to which alternative TSPs have used unbundled local loops to provide residential local exchange services in Canada. The high water mark was 80% in 2004, when alternative TSPs provided 418,000 lines in total. The use of unbundled loops

decreased rapidly, in large part due to the acquisition of Call-Net, the largest user of unbundled loops in the provision of residential service, by Rogers who switched them to its cable network.⁸⁸ By 2009 the percentage was 3% or approximately 115,000 lines, in 2010 it was 1% and 44,000 lines. As of 2011 and 2012 the number of unbundled local loops used by alternative TSPs to provide local LES rounds down to 0%.

191. The evidence in the previous section also indicates that there is not a dominant provider of local exchange services. Consistent with the analysis in Section 4, the failure to find dominance downstream means that it is very unlikely that mandated access will result in a significant effect on competition.

192. There is no evidence that suggests that mandated access to local loops has increased competition and reduced the market power of the ILECs in residential markets for local exchange service. Entrants do not presently use more than a minimal number of local loops to provide service and there is no evidence of dominance in the relevant downstream market.

5.4.2 GAS/HSA Market Power and Effect on Competition of Mandated Access

193. In this section the evidence on the exercise of market power downstream by the ILECs in the market for broadband services is considered as is the effect on that exercise of mandated access to Aggregated ADSL and TPIA. As discussed above, significant and durable market power in the downstream market is necessary for finding an essential facility. Without such a finding the inquiry into whether a facility is essential can be stopped.

Market Power in the Downstream Market

194. The considerable evidence available is that market power in the downstream market is not consistent with dominance or indicative of the inefficient exercise of market power suggesting a necessary condition for a finding of essentiality is not satisfied. The evidence includes the following:

⁸⁸ Evidence of the Commissioner of Competition, *Review of Regulatory Framework For Wholesale Services and Definition of Essential Service*, Canadian Radio-Television and Telecommunications Commission, Telecom Public Notice 2006-14 at paragraph 40.

- Table 2 and Figure 4 show the evolution of market shares in the residential high-speed market. Starting in 1998, the market was dominated by the cable companies (market share over 90%), but this lead has been eroded by the ILECs, such that in 2012, the market share of the cable companies was just under 55%, with the share of the ILECs' just over 37.1%. In the residential market for high-speed internet, the ILECs are the entrants, playing catch up to the cable carriers.
- Figure 12 shows the ILEC and cable providers' share of *new residential broadband subscribers*. It shows considerable turbulence (yearly differences) that can be traced to differences in network quality. In the initial years 1999-2001, the cable carriers' network quality provides them with an advantage, but as the ILECs upgrade their networks, there is a period from 2002-2004 when the share of new subscribers is relatively even. But from 2005 to 2009 the cable carriers share of new additions rises to about 80%. With the role out of IPTV and network upgrades, the ILECs are able to not only match the number of new subscribers, but by 2012 the ILEC share is over 60%.
- The competition between the cable companies and the ILECs is reflected in their investment levels and capital intensity. As shown in Figure 11, the ILECs have closed the gap in terms of capital intensity with the cable companies over the period 2005 to 2012. Both of them at the end of the period are investing in excess of 22% of revenues. The capital intensity masks, however, the extent to which the absolute level of the investment by the ILECs exceeds that of the cable companies during this period. Table 8 shows that the ILECs outspend the cable companies almost 2 to 1 during this period. Total investment by both has increased from \$4.1 and \$1.7 billion in 2008 for the ILECs and cable carriers respectively (total \$5.8 billion), to \$4.4 billion and \$2.7 billion (\$7.1 billion). The cable carriers have responded to the investment expenditures of the ILECs by increasing their investment by \$1 billion a year.
- Table 10 shows the real prices of the four Levels of residential broadband service tracked by Wall Communications for the Commission. Over the period 2008 to

2013 the prices of three of the Levels in real terms has trended up slightly: the exception is Level 3 (10 Mbps—19 Mbps from 2008-2011) which has declined in real terms by 12%.

Table 10, however, is misleading, since it does not reflect that in 2012 the quality of the Levels was adjusted upwards significantly and hence the prices are not quality adjusted. For instance the range of speeds that define Level 3 increased to 16 Mbps—40 Mbps in 2012. Tables 11 and 12 normalize the prices on a Mbps basis.⁸⁹ Both show that the real price per Mbps was relatively flat prior to 2011, but decreased substantially in 2012 when the speeds defining the levels were increased.

- Figure 13 shows the evolution of the distribution of residential subscribers by speed tier from 2006 to 2012. The change that stands out, reflective of increasing quality of the networks and the results of investment, is the decrease in the share of subscribers with service in the range 5-9 Mbps and the increase in the share of subscribers with service in the range of 16-49 Mbps. The rise to a quarter of all subscribers having service in the range of 16-49 Mbps is a result of significant increases in adoption in 2011 and 2012.
- Table 13 shows that even with the change to higher speed service, the average monthly revenue per user per Mbps has fallen, with the largest decreases in 2011 and 2012, consistent with the increase in available speeds.

195. The empirical data available support the hypothesis of extensive rivalry between the cable carriers and the ILECs. This rivalry encompasses investment, network quality, and price. The results are summarized in Table 14. Table 14 shows the Wall Communications prices for 2013 for Australia, Canada, France, the U.K., and the U.S.A; the percentage of subscribers with service above 4 Mbps, the average download speed, the average monthly usage per user, the number of fixed broadband connections per 100 households, and the fixed investment per wired access line (where available).

⁸⁹ The tables differ based on whether the bottom of the speed range or the top of the speed range is used for the normalization.

196. The data in Table 14 suggests that the higher priced countries, including Canada, have a very different market dynamic than the two lower priced countries. In Canada, the rivalry between the cable companies and the ILECs results in competition over price and quality. The emphasis on quality (speed in particular) results in greater investment, higher demand, and higher usage. The greater demand and usage results in higher prices that supports the investment and cost for the higher quality.
197. The difference in outcomes is directly tied to the difference in the nature of competition. Interplatform competition between the cable network and the ILEC network enables service providers to more effectively differentiate their services through investments in their networks, relative to the opportunities available to competitors using the same network. When competitors are substantially restricted to provide service on the same network their ability to differentiate their services and innovate will necessarily be limited. The nature of the competition means that they will have relatively standardized products (determined by the characteristics of the monopoly network) and competition will be more on price than product characteristics.
198. In addition, Table 3 and Figure 8 demonstrate the prevalence of wireless broadband availability and subscription levels. Table 3 shows the percentage of Canadians that can access either HSPA+ or LTE wireless networks, capable of supporting broadband service. Figure 8 shows that in 2013 the number of wireless broadband subscriptions exceeded 50% of the Canadian population.
199. Table 4 indicates the limited role of GAS/HSA, both in total, and relative to other options that independent ISPs utilize to provide broadband service. Firms other than the ILECs and the cable operators account for around 8% of all broadband subscriptions in Canada. Among these firms, the share of DSL resellers is less than 40%, cable TPIA has a 21% share, with the remaining 40% accounted for by facilities based options. Hence upstream market power is constrained not just by competition downstream, but also by substitution to other inputs.

Effect on Competition Downstream

200. The effect of mandated access to Aggregated ADSL and TPIA on broadband competition has been negligible. There is no evidence that suggests that mandated access to these

services has resulted in a substantial increase in competition and reduced the market power of the ILECs and cable carriers in residential markets for broadband or that the withdrawal of mandated access would result in a substantial lessening of competition and increased exercise of market power by the ILECs and cable carriers in residential markets for broadband. The evidence is quite to the contrary.

201. The evidence that supports this assessment includes the following:

- Table 4 shows the small market shares of resellers of high-speed ILEC and cable carriers in 2012 and the small absolute number of residential subscribers that utilize resold services. This small market share is not consistent with the independent ISPs providing a significant constraint on the market power of the ILEC and cable carriers. Their small market share indicates an inability to expand at low cost or an unwillingness of consumers to substitute.
- The price, quality, and investment dynamics of the broadband market are a result, as documented in the previous section, of competition between the cable carriers and the ILECs. The availability of GAS/HSA has essentially no discernable effect on the decrease in the real price per Mbps, the increase in the quality of networks, and the shift up in adoption of higher speed services. These dynamics are the result of competition between the cable carriers and the ILECs, in particular the result of that competition on investment levels.
- The competitive insignificance of the independent ISPs that utilize either Aggregated ADSL or TPIA should not be surprising. Their capacity to innovate, reduce costs, or differentiate their products or otherwise add value is limited. The avenues in which they can add value are limited by their dependence on the network capabilities and services of the ILECs and cable carriers. Table 8 shows that while the investment by the network carriers has averaged \$6.6 billion per year, the investment by the resellers has averaged zero.

202. Table 4 makes clear that the number of residential high-speed consumers who receive broadband service from independent ISPs using unbundled local loops and installation of

their own DSLAMs at the wire centers of the ILEC is negligible. Table 4 indicates that the combined total of independent ISPs that either use their own fibre or use unbundled loops and their own DLSAMs totalled 35,000 in 2012, just 0.3% of all broadband subscriptions.

5.5 Unbundled Local Loops and the Commission

203. The Commission determined that unbundled local loops were conditional essential and mandated access in Telecom Decision 2008-17.⁹⁰ A finding of conditional essential results in mandated access, according to the Commission:⁹¹

until it is demonstrated in an application that functionally equivalent wholesale alternatives are sufficiently present such that withdrawing mandated access would not likely result in a substantial lessening or prevention of competition in the relevant downstream market.

204. In order to implement this definition without error in the case of unbundled local loops requires not just counting to see if there are other providers of unbundled local loops or access with equivalent functionality. Instead it requires *determining if the ILEC has market power in the provision of the essential facility and considering the effect on competition downstream*. The Commission simply asserts that because duplication of copper loops involves significant impediments for competitors and there is no other source of supply of loops or an equivalent functional alternative, that withdrawal of access would likely result in a substantial lessening or prevention of competition.⁹²

205. Moreover the issue of “sufficient wholesale equivalents”, cannot be determined without a consideration of the relevant upstream market, the relevant downstream market, and whether the ILEC has market power in the upstream market. The determination of the effect of mandated access requires an assessment of market power and the effect on market power in

⁹⁰ Telecom Decision 2008-17 at paragraph 66.

⁹¹ Telecom Decision 2008-17 at paragraph 57.

⁹² Telecom Decision 2008-17 at paragraphs 64 and 65.

the relevant downstream market. The error here is presuming that conduct that may harm competitors is anticompetitive and that the conduct actually does harm competitors.⁹³

206. The Commission's application to local loops of its test was therefore incorrect in procedure and, therefore, substance. The Commission did not define the relevant upstream and downstream markets, did not assess market power in either upstream or downstream market, and did not assess whether the impact of mandated access to loops is significant.

207. In this evidence implementation of the Commission's essential facility test indicates that local loops are not essential:

- the ILECs do not have durable and significant market power in the relevant downstream market that includes LES.
- the upstream market is broader than the local loops of the ILEC and it is unlikely that in the relevant upstream market the ILEC has durable and significant market power.
- it is unlikely that the affect of mandated access to local loops has *any effect on competition in the relevant downstream market, let alone a substantial effect.*

208. If there is not significant and durable market power in the provision of the essential facility **or** a substantial effect on competition in the downstream market local loops are not essential facilities.

5.6 GAS/HSA and the Commission

209. The Commission also determined that mandated access to GAS/HSA would continue. The Commission recognizes that this is a peculiar outcome since GAS/HSA comprise access and transport, but while loops are determined to be essential, transport was not. Hence competitors should be able to combine mandated access with their own transport to

⁹³ Telecom Decision 2008-17 at paragraphs 63 and 66. The Commission reiterated its views in Telecom Decision 2011-24, *Bell Aliant Regional Communications, Limited Partnership, and Bell Canada—Monthly Recurring Rates and Service Charges for Unbundled Loops in Ontario and Quebec* at paragraph 24.

provide broadband service.⁹⁴ The Commission instead mandates access to GAS/HSA but classifies it as a non-essential service. The basis for mandated access is that competitors' costs would be too high to compete if they had to collocate at each central office and provide transport to their point of interconnection.⁹⁵ As a result withdrawal of mandated access would result in an SLC or SPC.⁹⁶

210. The Commission has also determined that GAS/HSA service must be available at the same speeds that the ILEC provides at retail in order to maintain the ability of the independent ISPs to compete.⁹⁷ Moreover, the requirement to provide GAS/HSA service at matching speeds has been extended to include not only service provided over copper loops, but also service over hybrid paths, i.e., involving fibre and copper facilities. To the extent that GAS/HSA service "is provided over a path that includes copper facilities" it must be provided at matching speeds to competitors.⁹⁸ A similar obligation was imposed on the cable companies TPIA.⁹⁹

211. The Commission has considered the extent of competition downstream for broadband service. In Telecom Regulatory Policy 2010-632 it came to the conclusion that wireless and satellite provision of retail broadband were not in the same relevant downstream market as services provided using wireline facilities because of differences in pricing and capacity limitations.¹⁰⁰

212. Hence without mandated access to GAS/HSA with a matching speed requirement, broadband service in the downstream residential market would be a duopoly.¹⁰¹ The Commission concluded based on the assertion that competitors used "existing wireline wholesale services" to provide retail internet services to a "significant extent" that without

⁹⁴ Telecom Decision 2008-17 at paragraph 84.

⁹⁵ Telecom Decision 2008-17 at paragraph 85.

⁹⁶ Telecom Decision 2008-17 at paragraph 85.

⁹⁷ Telecom Decision 2008-117 at paragraph 19.

⁹⁸ CRTC Telecom Order 2009-111, *Re: Cybersurf's Application Related to the Implementation of Telecom Decision 2008-117 Regarding the Matching Speed Requirement*, at paragraph 12.

⁹⁹ See, for example, CRTC Telecom Decision 2008-117 at paragraph 10, which refers to matching speed requirements applying to cable operators' infrastructure.

¹⁰⁰ Telecom Regulatory Policy 2010-632 at paragraphs 52 and 53.

¹⁰¹ Telecom Regulatory Policy 2010-632 at paragraph 55.

such mandated access “competition in retail Internet service markets would be unduly impaired.”¹⁰² The Commission concluded that without mandated access to GAS/HSA with matching speeds “retail Internet service competition would not continue to be sufficient to protect consumer’s interests.”¹⁰³

213. The evidence is inconsistent with the conclusions of the Commission, both on the exercise of market power by the “duopoly” and the effect that mandated access to GSA/HSA has on competition in the downstream market. The evidence in the previous sections which actually implements the Commission’s essential facility test indicates that GSA/HSA is not essential:

- the downstream market for broadband access exhibits considerable rivalry, consistent with oligopoly and not consistent with dominance or the inefficient exercise of market power. The competition is over price and quality of their networks, with the competition over speed resulting in high levels of investment and high quality services that Canadians utilize.
- the upstream market is broader than the Aggregated ADSL service of the ILEC and it is unlikely that in the relevant upstream market the ILEC has durable and significant market power.
- it is unlikely that the affect of mandated access to GAS/HSA has *any effect on competition in the relevant downstream market, let alone a substantial effect.*

214. If there is not significant and durable market power in the provision of the Aggregated ADSL service **or** a substantial effect on competition in the downstream market the Aggregated ADSL service is not an essential facility.

¹⁰² Telecom Regulatory Policy 2010-632 at paragraphs 54 and 55.

¹⁰³ Telecom Regulatory Policy 2010-632 at paragraph 55.

5.7 Conclusion on Existing Essential Facilities for Residential Services

215. For a facility to be essential all of the elements of the essential facilities definition are required. As the analysis above establishes these elements do not hold for local loops and Aggregated High Speed Access for residential services. For both of these facilities, the existence of cable alternatives at both wholesale and retail level means direct and indirect substitution is likely sufficiently strong so as to discipline the exercise of market power by an ILEC providing upstream inputs such as local loops or the aggregated GAS/HSA service. These inputs do not qualify as relevant upstream markets, and in the absence of mandated access, the provider of such inputs will not command a dominant position in a relevant downstream market (whether voice or broadband). In effect, the essential facilities framework requires a demonstration that mandated access results in a significant increase in competition in the relevant downstream market. The evidence does not suggest that mandated access to ILEC facilities has had any noticeable effect on competition relative to what could have been attained absent such regulation. This requirement for mandated access to result in a significant increase in downstream competition exists to ensure that the benefits of mandated access exceed its costs. If this requirement is not fulfilled, this signals a high likelihood that the costs of mandated access exceed its benefits.

216. The analysis in this section demonstrates that the benefits from the existing wholesale regime to the supply of inputs for residential telecommunication services are negligible. Against this it must be recognized the potential for significant costs. In particular, if the terms of “resale” change such that the importance of independent ISPs becomes more important downstream then concerns over the effect of mandated access on investment by incumbents and entrants alike, as documented by the European experience above, will be much more important.

217. Especially in the light of demand for investment for next generation networks, the Commission should be wary of any regulatory response that reduces expected returns on investment that is sunk. The mitigation of regulatory risk and regulatory hold up in order to incent investment is very important.

218. It is worth citing the following discussion on regulatory risk:¹⁰⁴

Regulatory discretion and sunk investments make a regulated firm subject to considerable **regulatory risk**. Ex ante, a regulator must promise firms that they will be compensated for their investment by setting prices equal to long-run average costs. That is, revenues are anticipated to be sufficient to allow for a return on, and a return of, investment. The problem is that, ex post, a regulator interested in maximizing total surplus has an incentive to renege. If the capital costs of the firm are sunk expenditures—they have no alternative use—then the regulator can reduce price to short-run average avoidable (variable) cost. This provides the firm with revenues sufficient to cover its variable cost of production, but not its capital costs. The lower prices increase demand, output, and total gains from trade. The regulator—on behalf of consumers—expropriates the firm’s capital investment. A more subtle mechanism available to a regulator, which has the same effect, is to allow competitive entry.

A firm that anticipates lower prices or competitive entry can protect itself by underinvesting. Underinvestment means that the firm will have higher costs and, potentially, binding capacity constraints, both of which result in a loss of efficiency. Alternatively, the firm must be compensated for regulatory risk ex ante through a higher rate of return, which raises the cost of capital and reduces efficiency.

An important regulatory objective is to foster commitment on the part of regulators not to “holdup” firms in this fashion. This can be done through legislative requirements that mandate “just and reasonable rates” and thereby provide firms with an avenue of appeal to the courts if the regulator acts opportunistically. The regulator can also try to develop a reputation for honoring its ex ante promise of fair recovery. By honoring its promise to not expropriate today, it encourages investment tomorrow. This exercise in reputation building is credible if investment requirements in the future are substantial.

219. Finally, the Commission should be concerned that a failure to follow a principled approach to the determination of essential facilities will make pressure from entrants for subsidized access more difficult to deny.

6 Application of Essential Facilities Framework to FTTH

220. This section applies the Essential Facilities framework to new networks—namely Fibre-to-the-Home (FTTH). According to public sources about 3.7 percent of Canadian homes are

¹⁰⁴See Church and Ware, pp. 768-769.

now connected via FTTH technologies.¹⁰⁵ Bell Aliant has the second-largest deployment of FTTH in North America, passing around 770,000 homes. Thus far, FTTH offerings have not been regulated. FTTH-based services offer very high broadband Internet speeds, and consequently also offer the potential to deploy high-definition IPTV services. This section considers whether regulation based on the “essential facilities” test is appropriate for such new infrastructure.

221. The analysis here does not consider the effect on downstream competition directly, as in Section 5, since mandated access to FTTH networks does not exist and FTTH deployment is limited. Instead it considers whether an ILEC is likely to have significant and durable market power in the downstream market for services provided by the FTTH network. If it will not, then there cannot be a significant increase in competition from mandating access. The analysis indicates that market power downstream is unlikely to be significant and durable because of interplatform competition from cable (coaxial with DOCSIS 3.0, or the next generation, and FTTH), and, potentially, both competitors with access to current-generation copper or FTTN networks and wireless.

222. To assess market power, the analysis begins with defining relevant downstream and upstream markets, since a firm that controls the putatively essential facility must in the absence of mandated access have market power both up and downstream. The market definition exercise and the market power exercise focuses on the potential for significant and durable market power in the downstream market.

6.1 Relevant downstream markets

223. The analysis parallels that in Section 5. It begins by first considering an ILEC FTTH network and whether downstream (retail) services provided using the facilities of this network—essentially services provided using an all-fibre “last mile” or an “all-fibre loop”—constitute a relevant product market. As in Section 5, the criterion used to determine

¹⁰⁵ “Fibre-to-the-Home Rollout Ramps up in Canada”, The Wire Report, January 5th, 2014. According to this report, roughly some half-a-million households are connected via FTTH and FTTH networks pass 1.7 million Canadian homes.

whether there is a relevant downstream market for services that use the FTTH facilities of an ILEC as an input is the Hypothetical Monopolist Test.

224. The key constraint on a hypothetical monopolist offering services based on ILEC FTTH infrastructure is the existence of alternative infrastructure. Cable networks have been able to deploy DOCSIS 3.0 technology at much lower cost and thereby provide speeds to end-users that ILECs can only match if they use FTTH. According to a 2008 paper by A.D. Little, the cost of deploying next-generation cable networks was only around 30% that of the costs of deploying fibre access networks.¹⁰⁶ Such is cable’s cost advantage that even in Europe, where cable reaches only 40% of homes and accounts for only 17% of overall broadband subscriptions, it accounts for over 57% of next-generation speeds. Cable broadband service—and bundles that include such service—are competitive constraints on broadband services using ILEC FTTH networks.¹⁰⁷

225. However, (a) cable operators are themselves selectively deploying FTTH in Canada¹⁰⁸, and (b) applications that require FTTH’s download and upload speed are (at least for residential users) difficult to discern. Even though FTTH services provide significant increases in speed over “current-generation” copper-based services, consumer willingness to pay for such increased speeds might be quite limited. For example, although consumers may be willing to pay a premium for FTTH services and the speeds they offer, a hypothetical monopolist that offers such services using ILEC facilities may be constrained in raising prices because above a certain price consumers will substitute back to current-generation cable and copper services. For example, a survey conducted by the regulator in New Zealand found limited enthusiasm among consumers to pay more for ultra-fast broadband: the survey found that fewer than 20% of consumers were willing to pay an additional NZ

¹⁰⁶ Arthur D. Little, “The Moment of Truth: Cable Infrastructure as a Competitive Next-Generation Access Platform in a Financial Crunch?”, http://www.adlittle.com/downloads/tx_adlreports/ADL_The_Moment_of_Truth_02.pdf

¹⁰⁷ It may be the case that at some point in the relatively distant future, applications may emerge that may only be effectively run on FTTH networks. This may be particularly true if the applications involve the provision of symmetrical bandwidth, which is a technical advantage that FTTH networks enjoy over cable DOCSIS 3.0 networks.

¹⁰⁸ For example, Rogers offers 350 Mbps symmetrical service in select areas. See <http://www.rogers.com/web/link/hispeedBrowseFlowDefaultPlans?setLanguage=en>. This is based on Rogers’ deployments of FTTH and not on Rogers’ cable network.

\$10 per month for ultra-fast speeds.¹⁰⁹ There may not be a separate relevant downstream retail market defined by very high-speed broadband services.¹¹⁰

226. Even if there *were* a separate downstream product market for broadband services of very high speeds (e.g., more than 30 Mbps), this does not mean that there is a relevant market corresponding to very high-speed downstream services that use *ILEC FTTH facilities*. Again, the reason is the widespread availability of an alternative broadband platform, in the form of cable, in Canada. The constraint this platform provides is especially strong since cable operators deploying DOCSIS are often able to match FTTH speeds and may well have a speed advantage when they deploy FTTH (which they are in selected areas).

227. Thus, a hypothetical monopolist that controlled all ILEC FTTH facilities would not be able to exercise significant or substantial market power because of constraints from platform competition. This platform competition includes next-generation cable, FTTH deployed by cable operators, and, potentially, competitors with access to current-generation copper or FTTN networks. Control of ILEC FTTH facilities cannot confer a dominant position in any relevant downstream market and hence they cannot be essential.

6.2 Relevant upstream markets

228. As with the analysis in Section 5, an ILEC “all-fibre” loop only constitutes a relevant upstream input market if it is the case that the ILEC can exercise significant market power by implementing an SSNIP. As the analysis in Section 5 discusses, direct and indirect substitution constrain the ILEC’s ability to exercise an SSNIP. This analysis is only relevant if the conclusion is that there will be significant and durable market power in the downstream market, a conclusion not consistent with the analysis in the previous section.

¹⁰⁹ See New Zealand Commerce Commission, “High-Speed Broadband Services Demand Side Study.” This paper is available at <http://www.comcom.govt.nz/regulated-industries/telecommunications/reviews-and-studies/high-speed-broadband-services-demand-side-study/>

¹¹⁰ The U.K. regulator, Ofcom, provisionally that very high-speed broadband services were part of a broader relevant downstream market for broadband services of all speeds, and did not constitute a separate product market in their own right. See Ofcom, *Review of the Wholesale Broadband Access Market*, Consultation published July 11th, 2013 at 3.52. Available at http://stakeholders.ofcom.org.uk/binaries/consultations/review-wba-markets/summary/WBA_July_2013.pdf.

229. The importance of competition in the downstream market for market power upstream arises from the potential for indirect substitution. Indirect substitution arises because of downstream competition between platforms. These platforms include (a) current-generation ILEC infrastructure, (b) FTTH infrastructure that is deployed by other telecom firms—e.g., out-of-territory deployments by ILECs and SILECs, (c) current-generation cable infrastructure using DOCSIS 3.0 technology. This last infrastructure has been used to offer very high download speeds (which are more relevant to most consumers, who consume content, rather than create it) that generally rival those provided by FTTH.

230. Again, if the cost share of the fibre loop in total costs of providing FTTH-based service is relatively high (as is the case for the copper local loop), then elastic downstream demand—which is implied by the abundance of alternatives listed above—likely implies elastic upstream demand as well.

231. Direct substitution by independent ISPs to other inputs to provide downstream services to residential consumers is possible:¹¹¹

- Current-generation copper local loops and bundles of copper loops and transport infrastructure, which ISPs can today purchase at regulated rates. Even if such infrastructure were not regulated, but a wholesale market existed for providing such infrastructure to third-party ISPs, such copper infrastructure (a category that, because of the CRTC’s inclusion of FTTN in “copper”, includes very high-speed VDSL services provided over FTTN networks) might represent a competitive constraint, if consumers’ willingness-to-pay for higher speeds such as enabled by FTTH is limited.
- Cable infrastructure, to which there is currently regulated access. Again, if cable operators offered access at wholesale even in the absence of mandated access regulation, the availability of this infrastructure would represent a competitive constraint on upstream market power of an ILEC selling its FTTH infrastructure to third-party ISPs.

¹¹¹ The issue again arises as to whether there would be a market for wholesale access if it was not regulated. As explained above competition is likely to ensure that there is such a market if it is profitable.

- Self-provided FTTH access infrastructure. The possibilities of competitive entrants self-providing FTTH access networks without facing insurmountable cost disadvantages relative to incumbent deployments of the same technology are higher than is the case for current-generation (copper) technology, as explained below. Self-provided FTTH infrastructures includes deployments by cable operators and small ILECs (SILECs).

232. The aggregate effect, as reflected in the probable own-price elasticity of demand for ILEC “all-fibre” loops (or bundles of such loops with transport), of all of these constraints implies a high likelihood that there is no separate relevant upstream market for ILEC FTTH facilities. Control of FTTH facilities is unlikely to result in a dominant position for ILECs in any relevant upstream market.¹¹²

6.3 FTTH is New

233. FTTH does not use the existing last mile infrastructure: it is a replacement for copper loops. It involves a fibre link to the home. Hence it does not involve upgrading the existing ILEC access network. Thus there is not an “incumbent” FTTH access infrastructure. For example, in new housing developments or “Greenfield” sites to which networks have yet to be built out, it would not appear that an entrant would have the same type of cost disadvantage that it might have faced had it been trying to compete with a long-established incumbent network. In addition, the fact that FTTH is not part of the existing copper based network means that the costs of deployment in existing residential communities will be much more similar for ILECs and entrants.

¹¹² The U.K. regulator, Ofcom, also has reached the provisional conclusion that there are no separate upstream markets defined by wholesale provision of next-generation local access networks using fibre access. Ofcom implemented the Hypothetical Monopolist Test (HMT) and considered both direct and indirect substitution. It concluded that copper networks and cable networks constituted a constraint on the exercise of upstream market power in the provision of next-generation local access services. Ofcom, *Fixed Access Market Reviews*, Consultation published July 3rd, 2013 at 7.57. Ofcom’s findings are interesting because cable networks have only partial coverage in the U.K., compared to their ubiquity in Canada. <http://stakeholders.ofcom.org.uk/binaries/consultations/fixed-access-market-reviews/summary/fixed-access-markets.pdf>

234. The fact that FTTH networks are new or substantially new networks means that even if the ILEC is the first to roll out an FTTH network in a given area barriers to entry are less than with legacy networks. This may mean that in some geographic markets there might be multiple FTTH networks rolled out. Densely populated areas with a large population base might be sufficient to support three or more such networks including fibre roll outs by the cable company and the ILEC.. Because FTTH networks are new, it may also be the case that in some areas the first mover is not an ILEC and if there are barriers to entry the ILEC may be deterred from building a second FTTH network.
235. Mandated access to FTTH networks of the ILEC or the cable companies before they are deployed is likely to be particularly costly in terms of incentives to invest. Such asymmetric treatment is unwarranted, since in areas where the economics suggest a limited number of FTTH networks will be constructed, the competition for the market may well be constrained by regulation. The rewards to deployment will be different if there is mandated access to the ILEC or cable FTTH deployments, but not to the deployment by others. In particular the rewards to the ILEC and cable company will be less and hence it will have reduced incentives to compete aggressively for the market. This harms consumers by delaying when FTTH becomes available and possibly the geographic coverage over which it is available.
236. The rewards to the ILEC or cable company will be less since they know that if FTTH is a success—applications are developed that require its speed and are demanded by residential subscribers—then they will have to share the gains with independent ISPs. The top of the distribution is cut off. But this will not be the case for non ILEC or cable networks not subject to mandated sharing ex ante. They would anticipate being able to retain the returns if demand for FTTH blossoms.

6.4 Combinations of Inputs that Include FTTH Access Links

237. Section 5 identifies GAS/HSA services that “third-party” ISPs utilise in order to provide end-user services. These services currently enable third-party ISPs to offer “matching speeds” to those offered by the ILECs. These services are comprised of an “access product”— a “last mile” link between the serving ILEC exchange or central office and the customer premises—and a transport product. An FTTH analogue to this product would

involve replacing the copper local loop (or more accurately, a part-copper local loop) with an all-fibre last mile, and then using the same Ethernet transport facilities as presently used between the central office and the ISP's point-of-presence.

238. Retail services similar to GAS/HSA services offered today, but using ILEC FTTH access networks instead of copper access networks, would not qualify as essential facilities. There is no separate relevant market defined by services that use ILEC FTTH inputs, whether those inputs are just the "access" link, or whether those inputs include access and transport. Downstream competition between services utilising next-generation platforms and potentially also competition with services that utilise current-generation platforms ensures this. Controlling all the facilities that would be required to provide an FTTH-equivalent of GAS/HSA would not confer a dominant position in the downstream market.

239. Indirect substitution arises from the same sources as discussed previously in this section. An ILEC selling a bundle of access to its FTTH-based last mile network as well as a transport link between its local exchanges and a competitor point of presence, cannot exercise significant or substantial market power because (even ignoring other upstream substitutes) doing so would transfer market share to downstream services using other platforms (e.g., FTTH deployed by SILECs, services using current-generation access networks, services using cable DOCSIS 3.0, and services using FTTH networks deployed by cable operators).

240. Further, in the upstream market, an ILEC cannot exercise market power because of the significant potential for direct and indirect substitution. Direct substitution arises because:

- Cable networks could offer an equivalent product at wholesale using coaxial and are required by regulation to provide TPIA;
- Incumbency advantages associated with copper networks may be less pronounced for ILEC FTTH networks than for copper networks, as discussed above;
- Under the status quo regulation applying to copper networks, ISPs can utilise the existing GAS/HSA services.

241. Thus, a hypothetical monopolist that controlled all ILEC FTTH facilities would not be able to exercise significant or substantial market power because of constraints from platform competition. This platform competition includes next-generation cable, FTTH deployed by cable operators, and potentially includes current-generation copper or FTTN networks.

6.5 Conclusion

242. ILEC control of FTTH facilities does not confer a dominant position in any relevant downstream market. Further, ILEC provision of such facilities as an upstream input is likely subject to significant direct and indirect competitive constraints. There is likely no relevant upstream market that corresponds to ILEC provision of FTTH facilities (essentially “all-fibre loops.”). Further, FTTH infrastructure has, at least in small scale deployments, already been duplicated. All of these factors indicate that ILEC FTTH facilities cannot qualify as essential.

243. Extending wholesale regulation to FTTH would adversely affect the incentives to invest in FTTH networks. The “business case” for costly new infrastructure investments that face uncertain demand, such as FTTH, is always inherently uncertain. The social case for building such networks might, however, be stronger than the business case. Consider an innovation that suddenly increases demand for FTTH networks ten years after such networks are built. That innovation might be too late from the perspective of private investors who have relatively high discount rates—i.e., they would tend to place greater valuations on income generated now or in the near-future, than income generated in the distant future. But from a social perspective, the existence of the FTTH network may facilitate that innovation and several others in the future. From society’s perspective, however, future economic benefits may not be discounted quite so heavily and the investment in FTTH networks might generate a very high social value.^{113 114} Wholesale

¹¹³ The discount rate used by private investors would be based on the opportunity cost of capital to those investors. For telecommunications, this might be 10% or higher. However, the social discount rate might be argued to be the rate at which consumer discount future consumption, which could be as low as 3%. See Treasury Board of Canada, *Canadian Cost-Benefit Analysis Guide: Regulatory Proposals*, p.38.

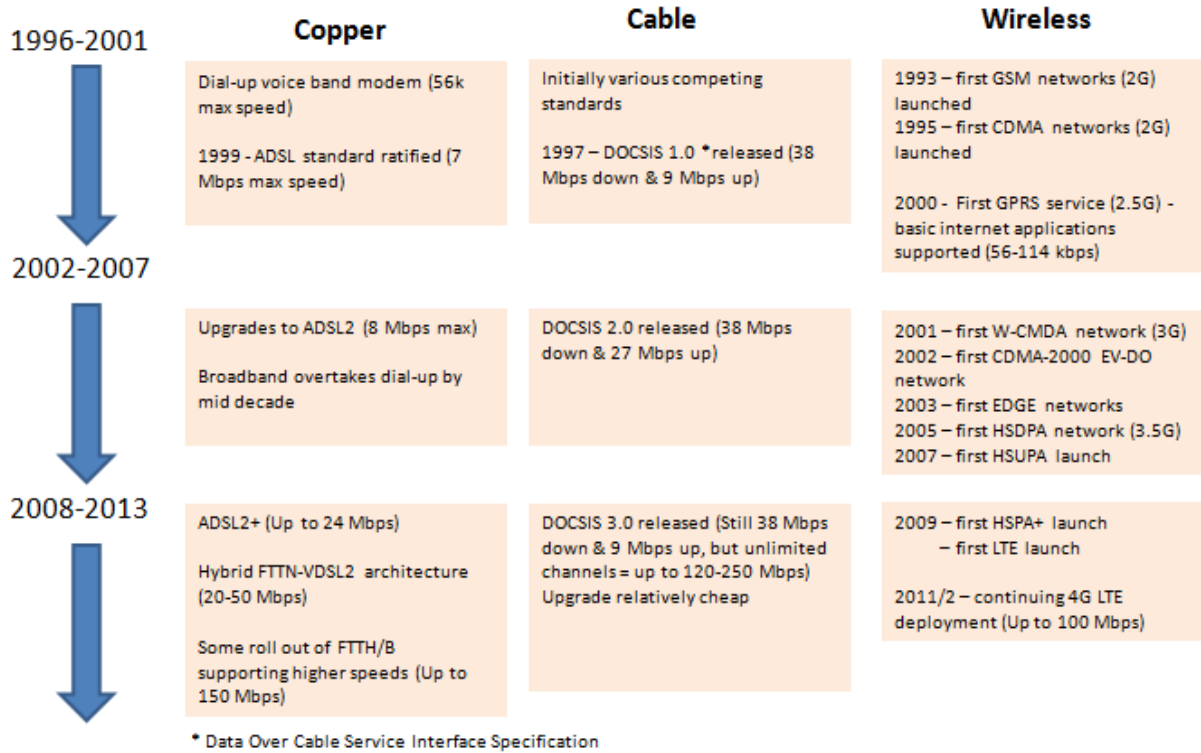
¹¹⁴ A similar point about the wedge between private and social returns is made by DotEcon, “Regulatory Policy and the Roll-Out of Fibre-to-the Home Networks” http://www.ftthcouncil.eu/documents/Reports/Dot-econ_Regulatory_Report.pdf, see PDF page 11.

regulation applied to FTTH will likely reduce the private incentives to invest, resulting in an ever higher probability that what proves to be socially valuable investment is never made.

244. The essential facilities analysis shows that mandated access to ILEC FTTH networks poses a substantial risk that its costs outweigh its benefits. Mandated access to ILEC FTTH networks is unlikely to result in a significant increase in competition downstream. This is for the same reasons as mandated access to local loops and GAS/HSA (discussed in Section 5) is unlikely to result in a significant increase in competition downstream. The barriers to entry that make it uneconomic to build another copper network are likely not nearly as significant as those to build another FTTH network. FTTH networks have already been built by non-ILECs—e.g., out-of-territory small ILECs or SILECs—in Canada. Mandated access regulation of FTTH thus is especially unlikely to produce benefits that exceed its costs. Further, even in countries where access to next-generation networks has been mandated, regulators have acknowledged that the traditional cost-plus wholesale regulatory paradigm cannot be applied. Such concessions by regulators call into question the validity of mandated access and the “essential facility” status of these next-generation networks.

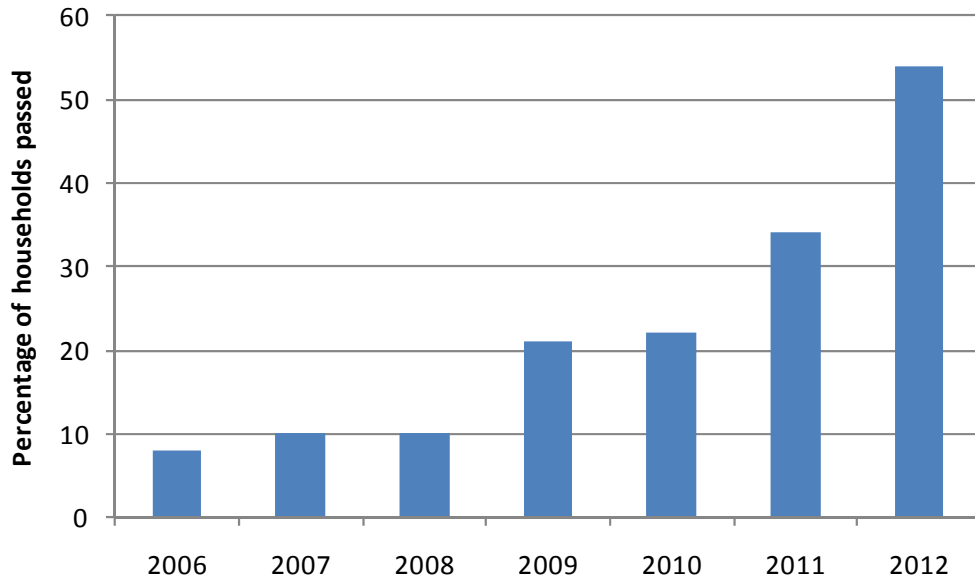
Exhibit 1A: Figures and Tables

Figure 1 – Major technological evolutions



Source: BRG analysis.

Figure 2 – Percentage of households passed by IPTV

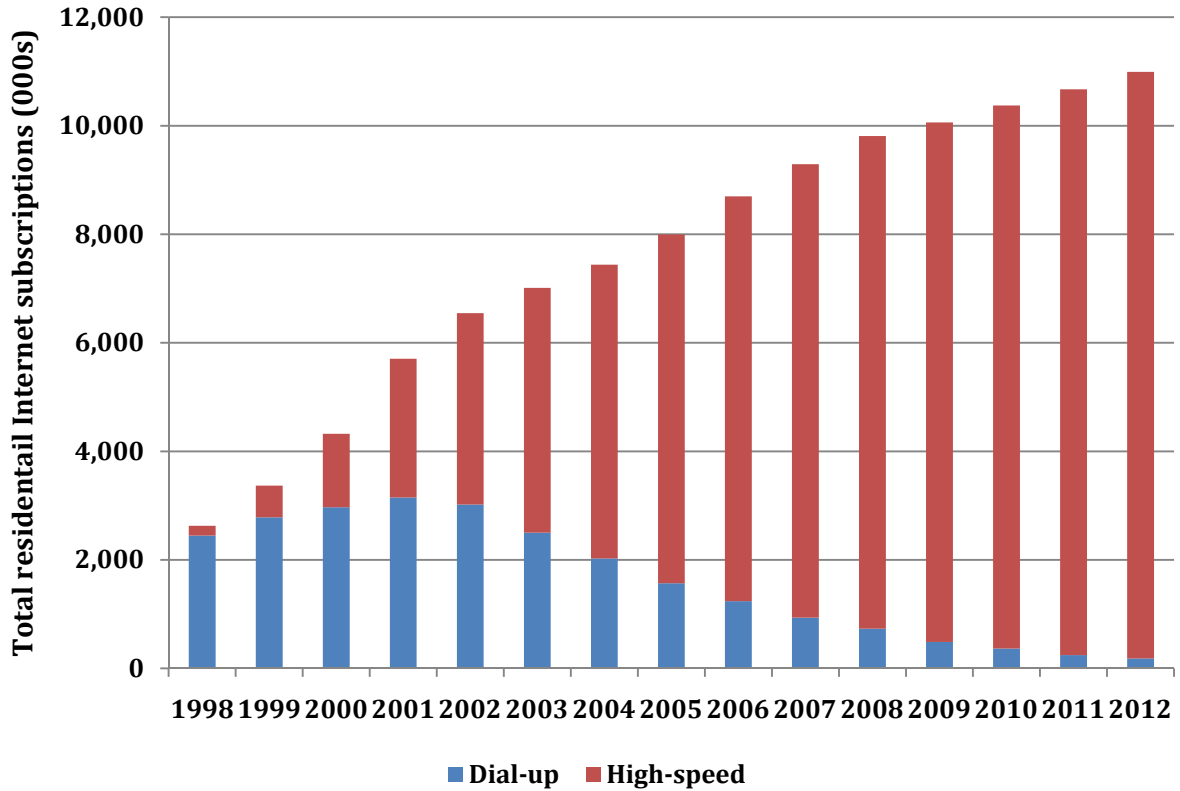


Sources:

Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report September 2013*, Table 6.1.3.

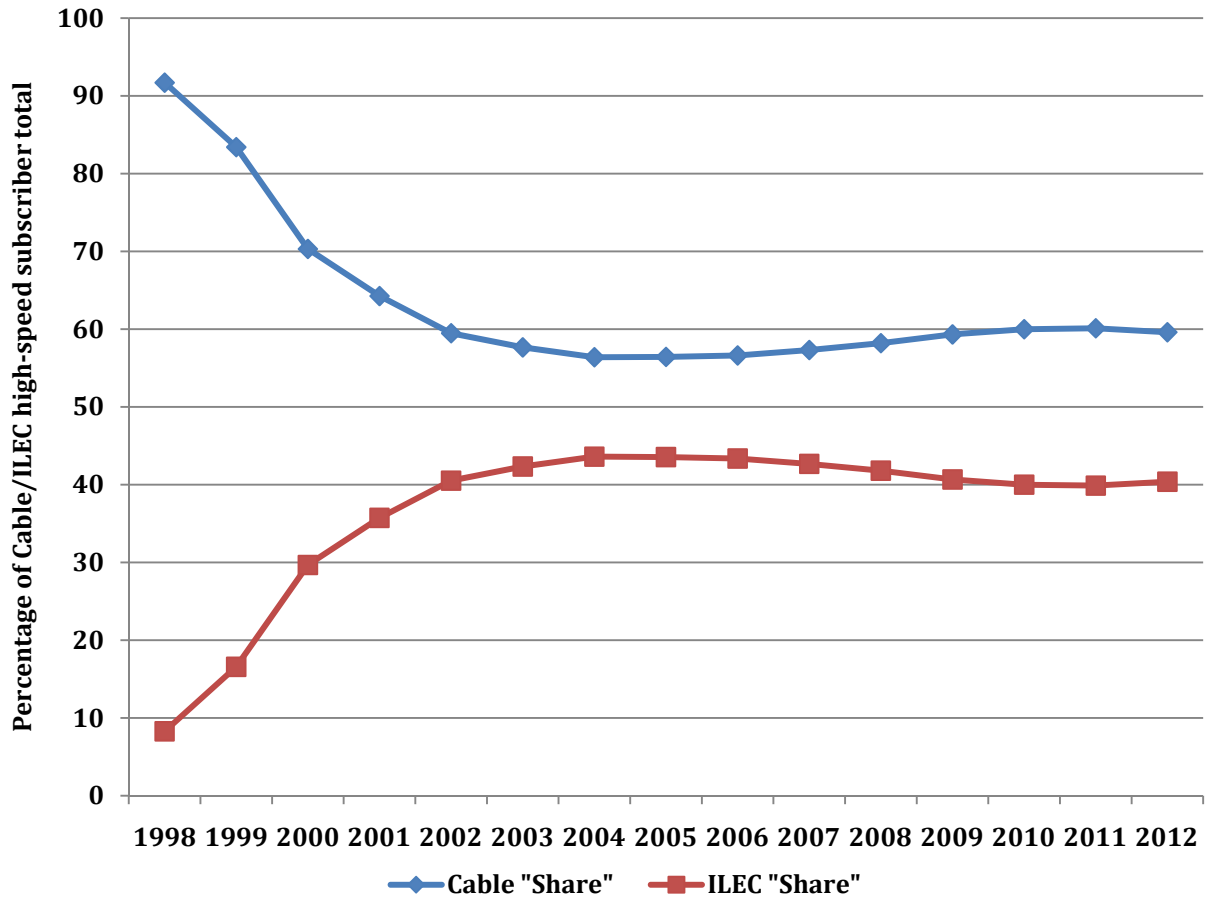
Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report*, July 2011, Table 5.3.4.

Figure 3 – Total residential internet subscriptions



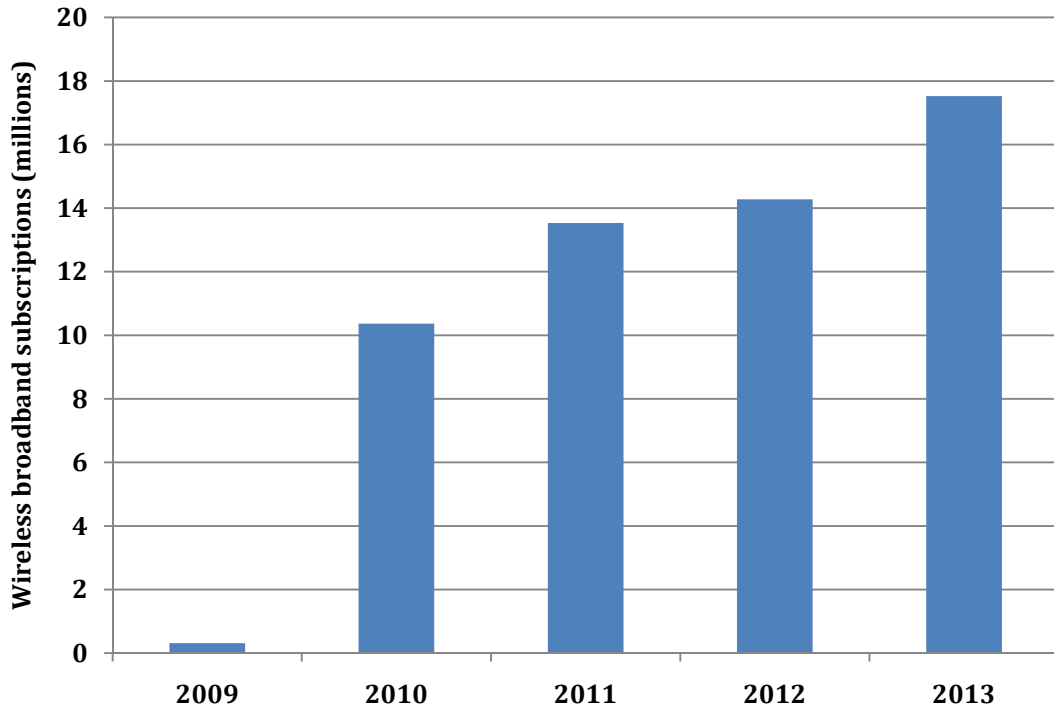
Source: J. Church and A. Wilkins, (2014), *Residential Wireline Telecommunications Services in Canada: Primary Exchange Services and Broadband*, Working Paper, Department of Economics, University of Calgary, Figure 2.2.1. Available online at http://econ.ucalgary.ca/sites/econ.ucalgary.ca/files/unitis/publications/1-4876092/Wireline_Database_January_2014.pdf. Hereafter Church and Wilkins.
Note: CRTC defines High Speed internet as 128 kbit/s and above.

Figure 4 – Market shares of cable and ILEC in residential high-speed subscriptions



Source: Church and Wilkins, Figure 2.3.1.

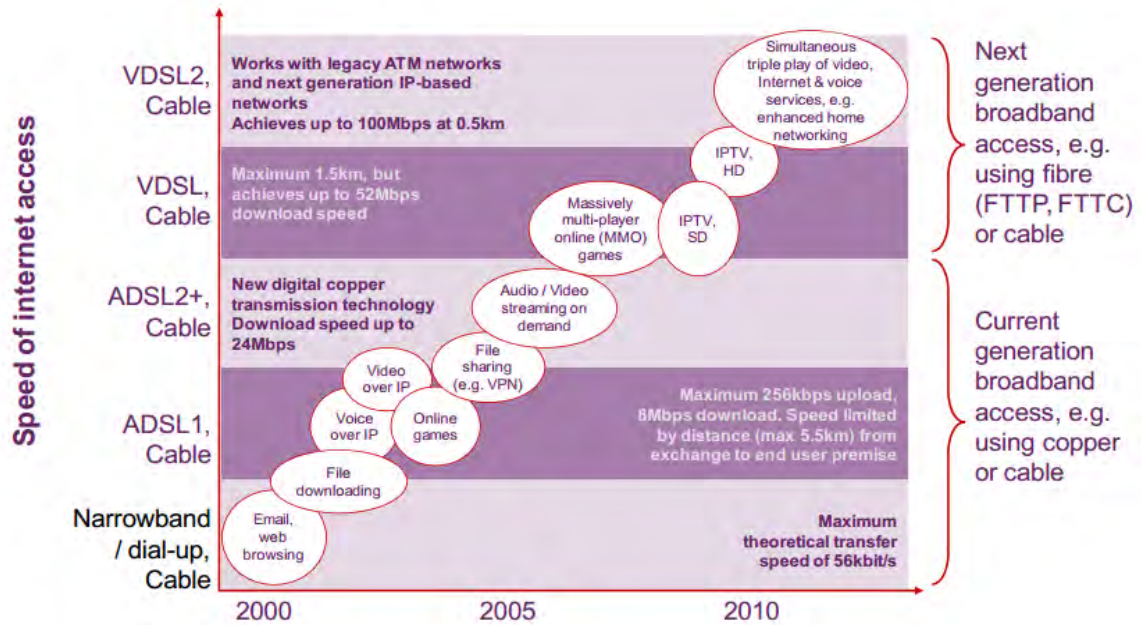
Figure 5 – Wireless broadband subscriptions (2009-13)



Source: Church and Wilkins, Figure 3.1.

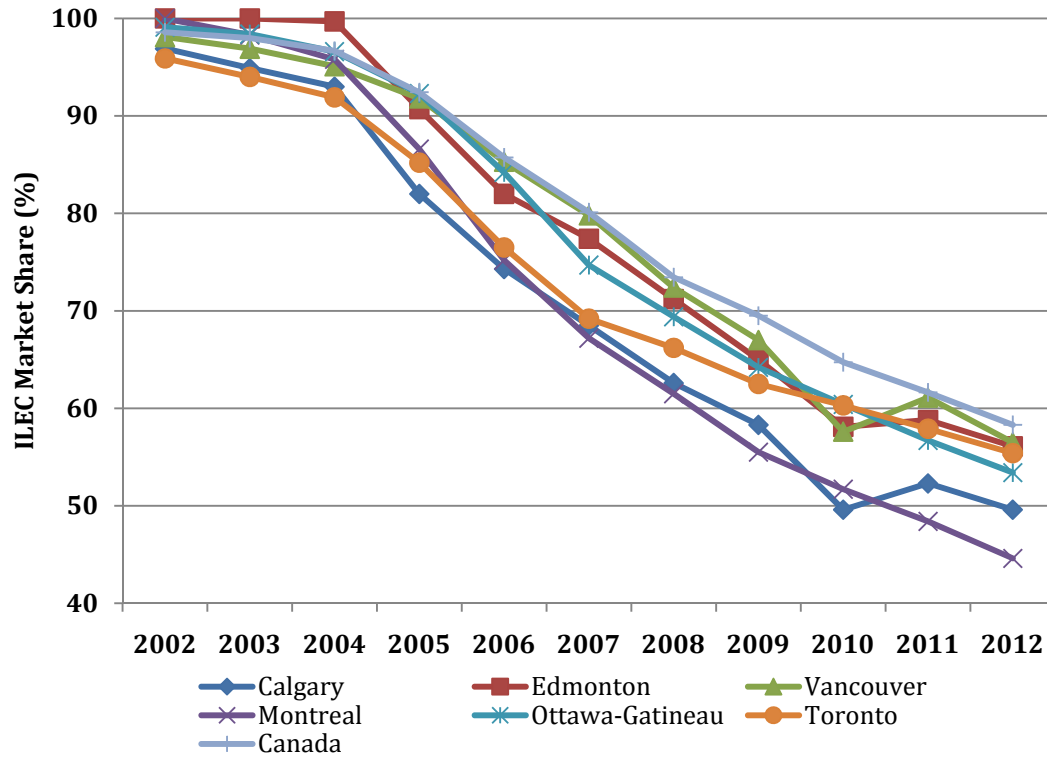
Note: Wireless broadband includes voice and data as well as data only subscribers. Wireless broadband take-up is likely to be significantly higher than fixed broadband take-up because the technology is consumed at the individual level rather than at the household level.

Figure 6 – Growth of internet applications



Source: Ofcom, "Review of the wholesale broadband access markets 2010".

Figure 7 –ILEC residential local market share



Sources: Church and Wilkins, Figure 1.3.1.

Table 1 – Total Residential Lines (000s) and Market Shares

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Incumbents	12,729	12,627	12,463	11,924	11,104	10,356	9,541	8,818	8,142	7,543	6,942
	98.6%	98.0%	96.7%	92.4%	85.7%	80.1%	73.4%	69.5%	64.7%	61.6%	58.3%
Incumbents (out-of-territory)	0	1	10	13	21	26	27	28	27	34	33
	0.0%	0.0%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%
Competitors (All)	184	258	418	963							
	1.4%	2.0%	3.2%	7.5%							
Competitors (Cable)					1,590	2,313	2,917	3,425	3,947	4,061	4,258
	0.0%	0.0%	0.0%	0.0%	12.3%	17.9%	22.5%	27.0%	31.4%	33.2%	35.8%
Competitors (Non Cable)					235	231	505	416	463	600	674
	0.0%	0.0%	0.0%	0.0%	1.8%	1.8%	3.9%	3.3%	3.7%	4.9%	5.7%
Total	12,913	12,886	12,891	12,900	12,950	12,927	12,990	12,687	12,578	12,238	11,907

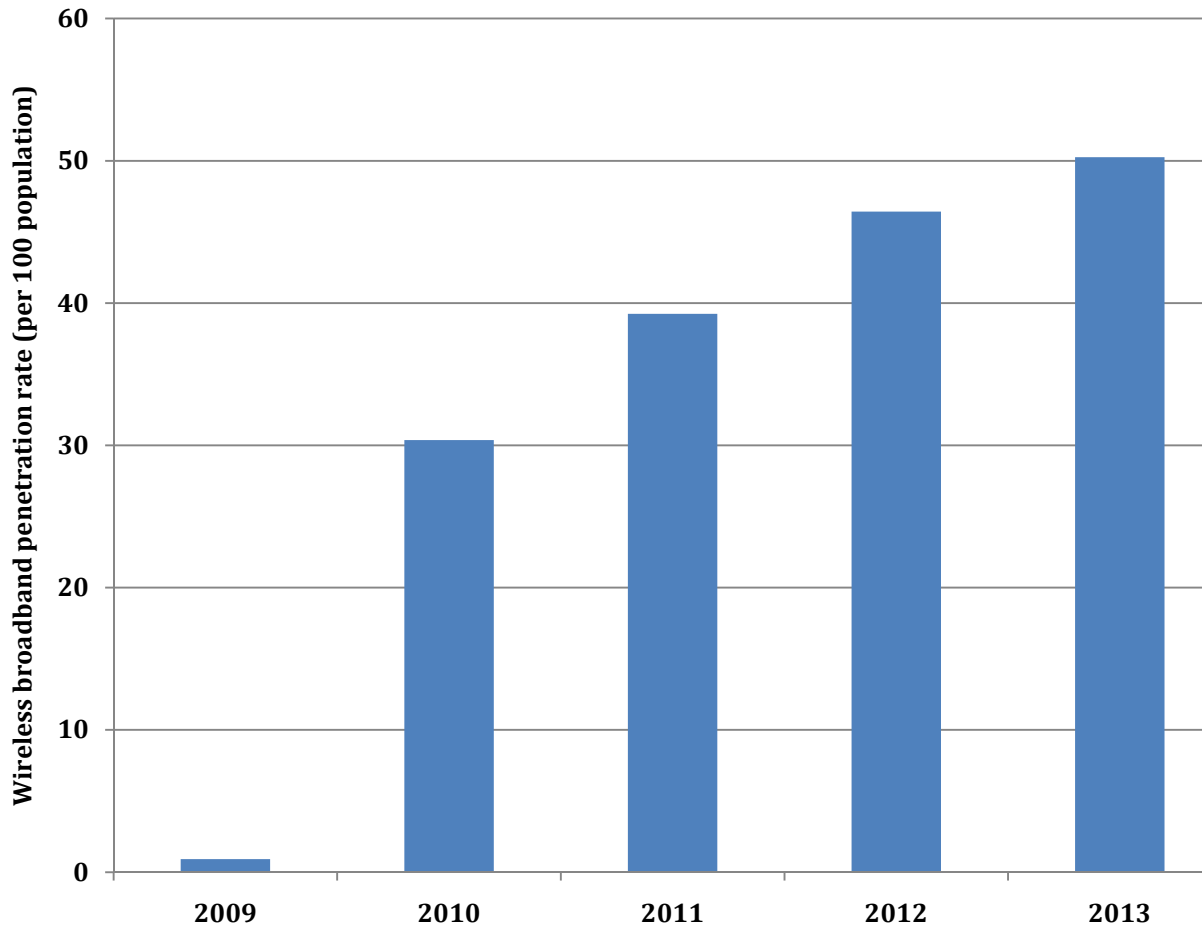
Source: Church and Wilkins, Table 1.3.2.

Table 2 – Residential high-speed Internet subscriptions by type of provider

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ILEC	15	95	398	903	1,400	1,859	2,268	2,676	3095	3,405	3,584	3,673	3,762	3,874	4,014
	8.2%	16.3%	29.4%	35.3%	39.7%	41.2%	41.9%	41.6%	41.5%	40.7%	39.5%	38.4%	37.6%	37.2%	37.1%
Cable	166	478	943	1,624	2,055	2,532	2,933	3,467	4041	4,573	4,990	5,358	5,642	5,839	5,925
	91.2%	82.1%	69.6%	63.5%	58.3%	56.1%	54.2%	53.9%	54.2%	54.7%	55.0%	56.0%	56.4%	56.0%	54.8%
Other	1	9	14	31	71	122	216	286	327	379	503	545	604	712	870
	0.5%	1.5%	1.0%	1.2%	2.0%	2.7%	4.0%	4.4%	4.4%	4.5%	5.5%	5.7%	6.0%	6.8%	8.0%
Total	182	582	1355	2558	3527	4513	5416	6429	7461	8356	9077	9576	10,008	10,426	10,809

Source: Church and Wilkins, Table 2.3.1.

Figure 8 – Canadian wireless broadband penetration (per 100 population)



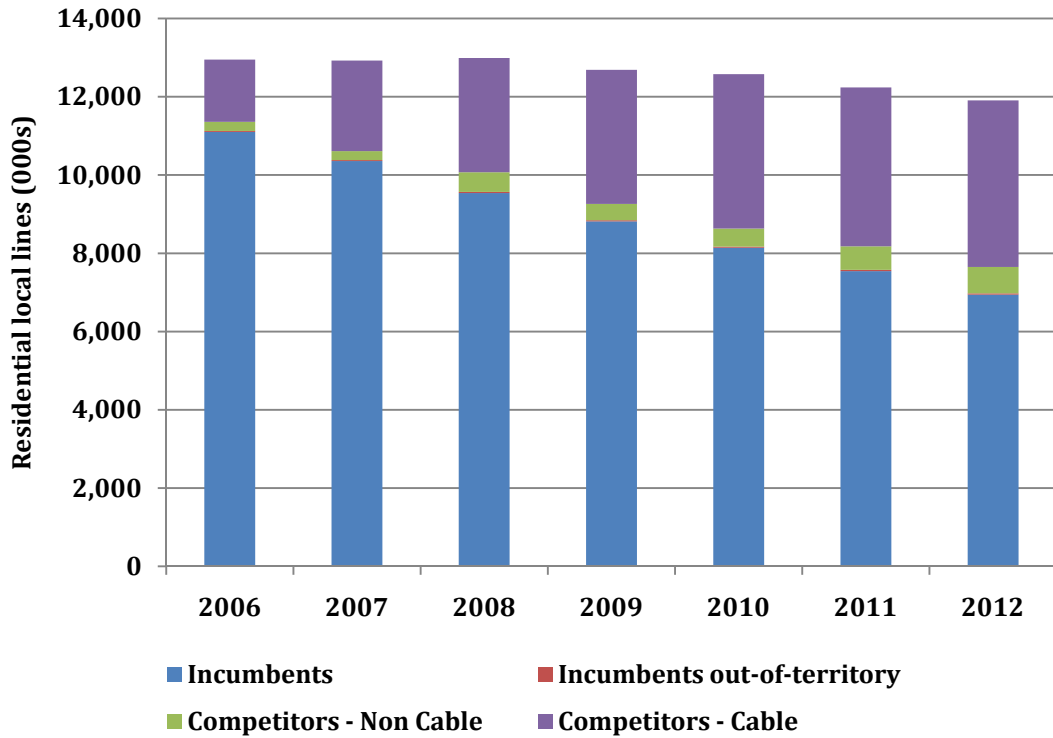
Source: Church and Wilkins, Figure 3.2.

Table 3 – Canadian Internet service availability

% households	2008	2009	2010	2011	2012
DSL	84	85	85	86	87
Cable	80	80	81	82	82
Fixed wireless	80	81	82	86	50
HSPA+	-	-	97	99	99
LTE	-	-	-	45	72
IPTV	10	21	22	34	54

Source: Church and Wilkins, Table 2.2.1.

Figure 9 – Residential Voice Lines by type of provider



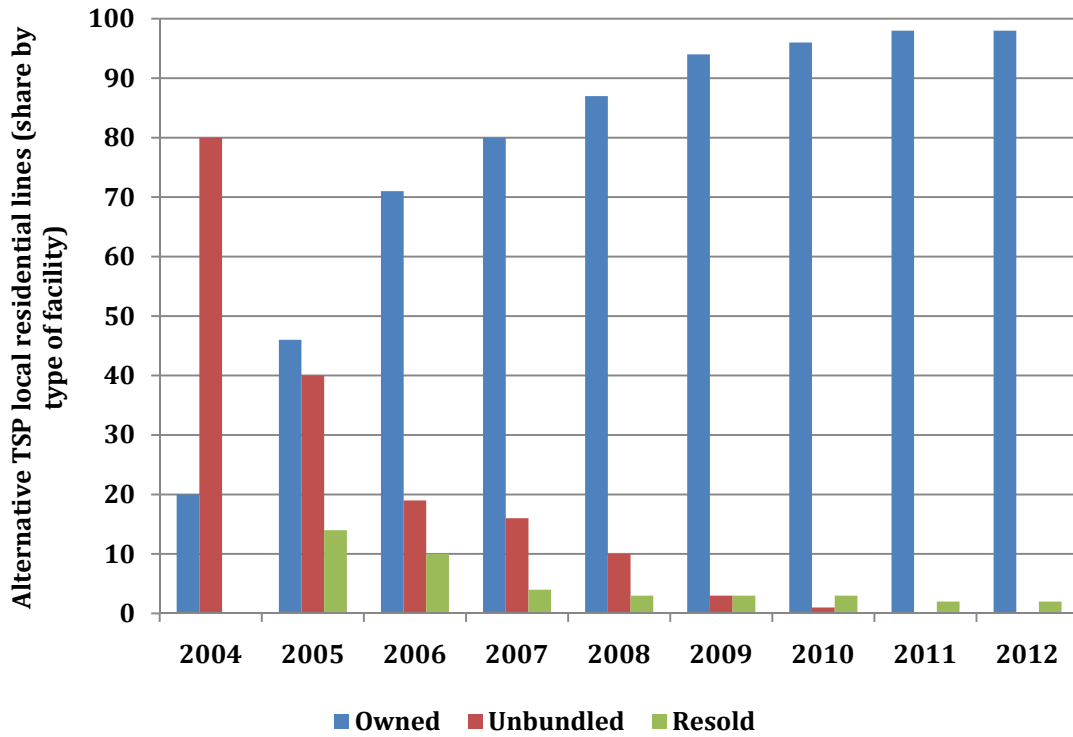
Source: Church and Wilkins, Table 1.3.2.

Table 4 – Other TSP residential high-speed Internet subscriptions (2012)

	Subscribers (000s)	Share of Other Subscriptions	Share of Total Subscriptions
Resellers – DSL	339	39%	3.1%
Resellers – Cable	183	21%	1.7%
Total Resellers	522	60%	4.8%
Fixed Wireless	226	26%	2.1%
Satellite	87	10%	0.8%
DSL/Fibre	35	4%	0.3%
Total Facilities	348	40%	3.2%

Source: Church and Wilkins, Table 2.3.2.

Figure 10 – Unbundled, Owned and Resold Residential Voice Lines of Non-Cable, Non-ILEC Competitors



Source: Church and Wilkins, Table 1.3.3.

Table 5 – Canadian Voice Services Bundle Prices in Constant Dollars

CDN\$ (2002)	2008	2009	2010	2011	2012	2013
Level 1	27.07	26.04	26.75	26.75	27.47	28.76
Level 2	41.99	43.74	44.15	41.56	42.50	45.41
Level 3	52.83	53.79	52.19	50.24	49.74	50.09

Source: Church and Wilkins, Table 1.1.1.

Note:

Level 1: 400 Total Minutes (22 Long Distance Minutes), No Features

Level 2: 1000 Total Minutes (110 Long Distance Minutes), Voice Mail and Caller ID

Level 3: 1600 Total Minutes (264 Long Distance Minutes), Voice Mail, Caller ID, and Additional Calling Features

Table 6 – Local and access retail monthly revenues (constant \$), per line

(2002\$/month)	2008	2009	2010	2011	2012
Incumbent TSPs (excluding out-of-territory)	29.30	29.28	29.42	28.84	28.67
Non-incumbent, alternative TSPs (excluding cable BDUs)	18.29	24.50	18.98	18.61	17.57
Cable BDUs	22.68	23.36	22.68	21.99	21.02
Total residential	27.38	27.52	26.92	26.06	25.31

Sources: Church and Wilkins, Table 1.1.3.

Table 7 – Bundle prices in constant dollars

CDN\$ (2002)	Old baskets				Revised baskets	
	2008	2009	2010	2011	2012	2013
Bundle 1	131.44	122.22	114.91	111.38	115.45	113.29
Bundle 2	105.12	106.99	101.67	102.51	105.56	109.25
Bundle 3	158.92	150.90	143.40	140.01	143.59	143.94

Source: Church and Wilkins, Table 1.1.4.

Bundle 1: Wireline Voice, Broadband, Wireless

Bundle 2: Wireline Voice, Broadband, Basic Digital TV

Bundle 3: Wireline Voice, Broadband, Wireless, Basic Digital TV

Each service included in the bundles is Level 2:

Wireline Voice Level 2: 1000 Total Minutes (110 Long Distance Minutes), Voice Mail, and Caller ID

Broadband Level 2:

2008-2011: 1.5-9 Mbps, 15 GB/month

2012-2013: 4-15 Mbps, 20 GB/month

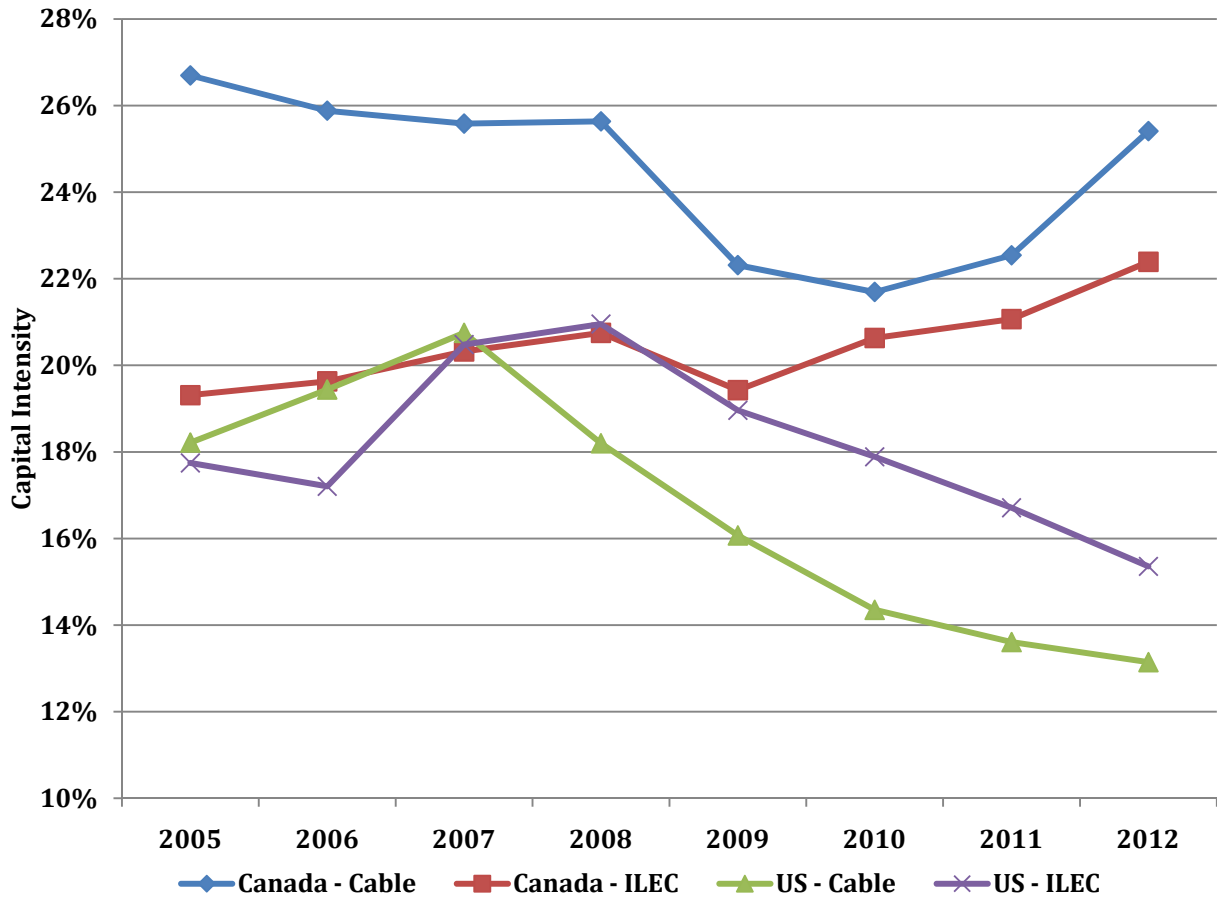
Wireless Level 2: 450 Total Minutes, 300 SMS, Voice Mail, and Caller ID.

Table 8 – Canadian wireline telecommunications capital expenditures

(billions \$)	2008	2009	2010	2011	2012
Incumbent TSPs	4.1	4.2	4.4	4.6	4.4
Share of Total Wireline	69%	74%	67%	64%	62%
Alternative - Facilities-based	1.7	1.5	2.1	2.6	2.7
Share of Total Wireline	29%	26%	32%	36%	38%
Alternative - Resellers	0.1	0.0	0.0	0.0	0.0
Share of Total Wireline	2%	0%	0%	0%	0%
Total Wireline	5.9	5.7	6.6	7.2	7.1

Source: Church and Wilkins, Table 2.3.3.

Figure 11 – Capital intensities of Canada and U.S. wireline service providers



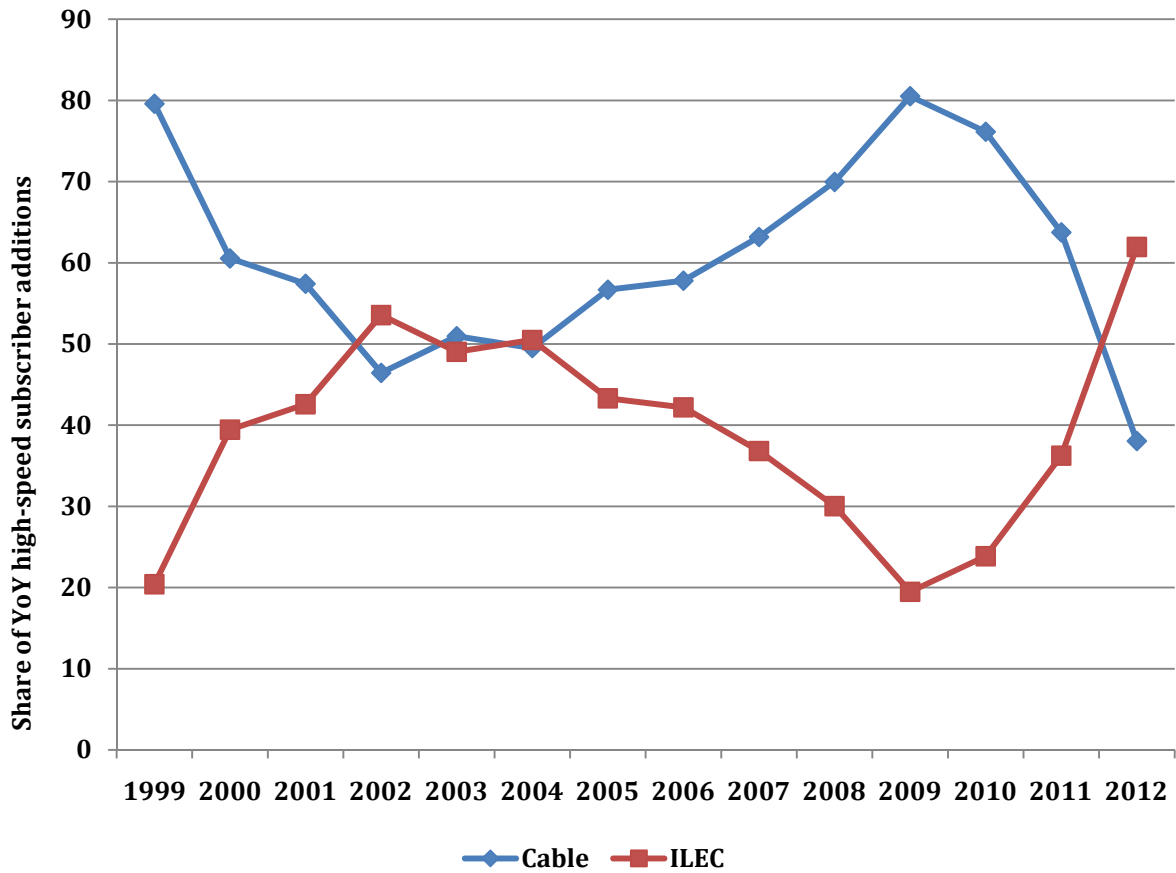
Source: Church and Wilkins, Figure 2.3.4.

Table 9 – Share of alternative residential TSP, by type of facility (%)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Owned	20	46	71	80	87	94	96	98	98
Unbundled	80	40	19	16	10	3	1	0	0
Resold	0	14	10	4	3	3	3	2	2

Source: Church and Wilkins, Table 1.3.3.

Figure 12 –Cable and ILEC shares of high-speed Internet subscriptions net additions



Source: Church and Wilkins, Figure 2.3.2.

Table 10 – Canadian broadband Internet price in constant dollars

CDN\$ (2002)	Old baskets				Revised baskets	
	2008	2009	2010	2011	2012	2013
Level 1	28.82	27.07	26.99	29.08	32.36	31.68
Level 2	40.83	41.30	40.87	41.54	44.64	41.68
Level 3	60.25	52.50	53.13	52.93	55.84	53.07
Level 4	-	-	-	64.83	77.58	67.48

Source: Church and Wilkins. Table 2.1.1.

Level 1:

2008-2011: Up to 1.5 Mbps, 2 GB/month

2012-2013: Up to 3 Mbps, 5 GB/month

Level 2:

2008-2011: 1.5-9 Mbps, 15 GB/month

2012-2013: 4-15 Mbps, 20 GB/month

Level 3:

2008-2011: 10-19 Mbps, 30 GB/month

2012-2013: 16-40 Mbps, 50 GB/month

Level 4:

2011: Above 20 Mbps, 50 GB/month

2012-2013: Above 40 Mbps, 75 GB/month

Table 11 – Broadband Internet price in constant dollars, normalized by Mbps (top of range)

Old baskets					Revised baskets	
CDN\$ (2002) per Mbps	2008	2009	2010	2011	2012	2013
Level 1	19.21	18.05	18.00	19.38	10.79	10.56
Level 2	4.54	4.59	4.54	4.62	2.98	2.78
Level 3	3.17	2.76	2.80	2.79	1.40	1.33

Source: Church and Wilkins, Table 2.1.3.

Level 1:

2008-2011: Up to 1.5 Mbps, 2 GB/month

2012-2013: Up to 3 Mbps, 5 GB/month

Level 2:

2008-2011: 1.5-9 Mbps, 15 GB/month

2012-2013: 4-15 Mbps, 20 GB/month

Level 3:

2008-2011: 10-19 Mbps, 30 GB/month

2012-2013: 16-40 Mbps, 50 GB/month

Level 4:

2011: Above 20 Mbps, 50 GB/month

2012-2013: Above 40 Mbps, 75 GB/month

Table 12 – Broadband Internet price in constant dollars, normalized by Mbps (bottom of range)

Old baskets					Revised baskets	
CDN\$ (2002) per Mbps	2008	2009	2010	2011	2012	2013
Level 2	27.22	27.53	27.25	27.69	11.16	10.42
Level 3	6.02	5.25	5.31	5.29	3.49	3.32
Level 4				3.24	1.55	1.35

Source: Church and Wilkins, Table 2.1.4.

Level 2:

2008-2011: 1.5-9 Mbps, 15 GB/month

2012-2013: 4-15 Mbps, 20 GB/month

Level 3:

2008-2011: 10-19 Mbps, 30 GB/month

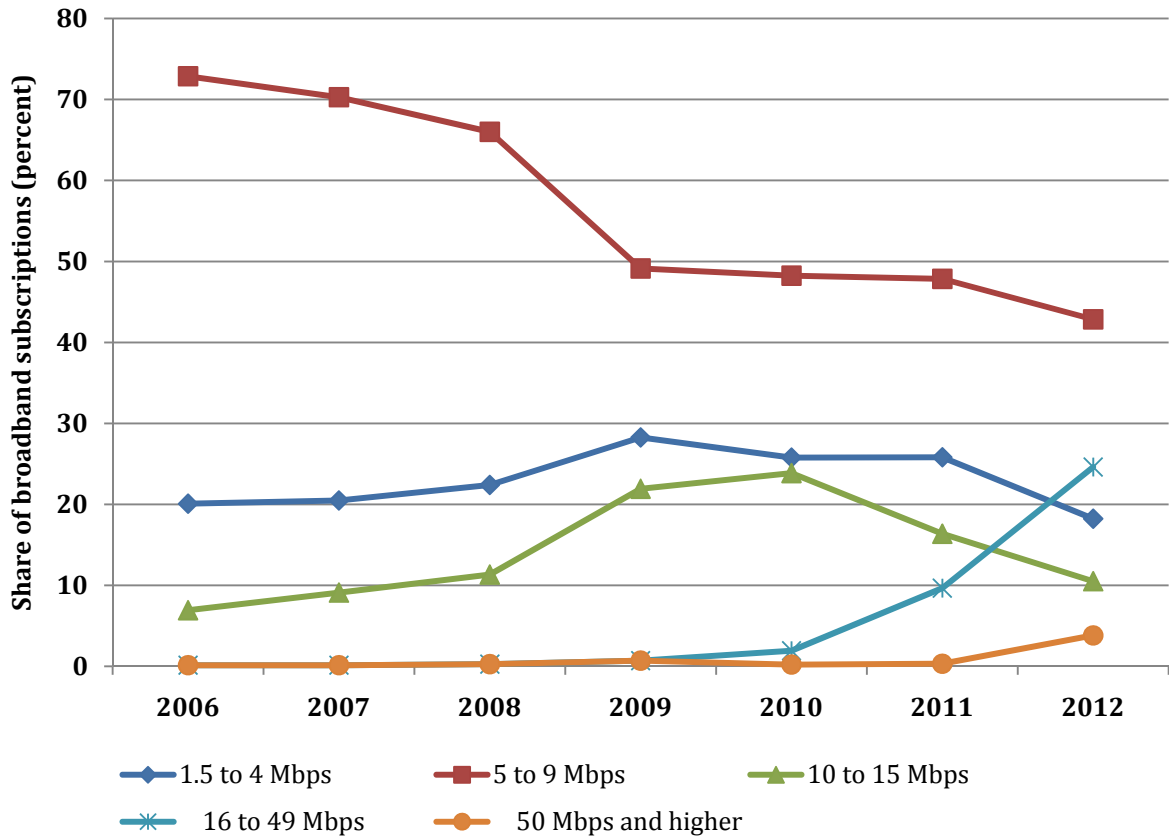
2012-2013: 16-40 Mbps, 50 GB/month

Level 4:

2011: Above 20 Mbps, 50 GB/month

2012-2013: Above 40 Mbps, 75 GB/month

Figure 13 – Canadian share of broadband subscriptions, by speed tier



Source: Church and Wilkins, Figure 2.2.9.

Table 13 – Average monthly revenue per user (constant \$) of broadband per Mbps

CDN\$ (2002) per Mbps	2006	2007	2008	2009	2010	2011	2012
Average	9.65	9.31	10.11	9.75	9.32	8.83	8.20

Source: Church and Wilkins, Table 2.1.5.

Table 14 – International broadband price and speed rankings (latest)

	Australia	Canada	France	UK	US
Wall CDN\$PPP Level 3 (2013)	57.10	65.18	49.34	43.01	99.10
Wall CDN\$PPP Level 4 (2013)	72.69	82.88	54.58	53.31	123.27
% Above 4 Mbps (2013)	41%	80%	62%	75%	72%
Average Connection Speed (2013)	4.8	8.2	5.7	8.4	8.7
Average Usage per Internet User (2012)	11.4	25.0	12.2	30.7	27.0
Fixed Broadband Connections per 100 Households (2013)	66.7	82.1	81.4	80.3	77.3
Cable Broadband per DSL Subscription (2013)	0.20	1.28	0.07	0.27	1.69
Fixed Telecommunications Investment per Access Path (2011)	*	246.2	*	123.9	213.0

Sources: Church and Wilkins, Table 2.3.4.

Exhibit 1B

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Education and Professional Qualifications

- Ph.D., Economics, University of California, Berkeley 1989, specialization in Industrial Organization and International Trade. Supervisory Committee Richard Gilbert, Michael Katz, and Jeffrey Perloff.
- B.A. First Class Honours (Economics), University of Calgary 1984.
- Qualified as an expert witness before the Competition Tribunal, the National Energy Board, the Alberta Energy Utilities Board, the Canadian Radio-Television and Telecommunications Commission, the Federal Court of Canada, the Federal Court of Australia, and the Supreme Court of British Columbia.

Positions Held

Academic Appointments

- Professor, Department of Economics, University of Calgary (since July 1, 2001).
- Program Director, Digital Economy Program, School of Public Policy, University of Calgary (from May 1, 2013).

- IAPR Professor, Institute for Advanced Policy Research, University of Calgary, *Coordinator of the Markets, Institutions, and Regulation Working Group* (July 1, 2006 to June 30, 2009).
- Associate Professor, Department of Economics, University of Calgary (1994-2001).
- Assistant Professor, Department of Economics, University of Calgary (1989-1994).

Other Appointments

- Chairperson, Terra Nova Reference Price Committee, Newfoundland (2007 and 2010-).
- Founding Academic Director, Centre for Regulatory Affairs in the Van Horne Institute for International Transportation and Regulatory Affairs, University of Calgary (1998-2001).
- T.D. MacDonald Chair in Industrial Economics, Competition Bureau, Industry Canada, Hull, Quebec (1995-1996).
- President, Church Economic Consultants Ltd. (1992-).
- Director, Berkeley Research Group (2010-2011).
- Member, C.D. Howe Institute Competition Policy Council (2011-).

Academic Awards and Distinctions

Teaching Awards

- Faculty of Social Science Distinguished Teacher Award, University of Calgary 1994 and 2004.
- Superior Teaching Award, Department of Economics, University of Calgary, 1997, 1999, 2000, 2002, 2003, 2004, 2011, 2013.
- Students' Union Teaching Excellence Award, University of Calgary 1994-95.

Major Academic Distinctions

- Faculty of Social Sciences Gold Medal, University of Calgary 1984.
- Listed as one of the leading competition economists in the world in the Directory of Competition Economists in *The International Who's Who of Competition Lawyers and Economists*. London: Global Competition Review annually from 1998-2014.

Research Interests

- Industrial Organization
- Economics of Regulation
- Competition Policy

Publications

Refereed Journal Articles

- “Direct and Indirect Network Effects are Equivalent: A Comment on “Direct and Indirect Network Effects: Are They Equivalent?” (with N. Gandal), *International Journal of Industrial Organization* 30: 708-712, 2012.
- “Indirect Network Effects and Adoption Externalities.” (with N. Gandal and D. Krause) *Review of Network Economics* 7: 325-346, 2008.
- “The Church Report’s Analysis of Vertical and Conglomerate Mergers: A Reply to Cooper, Froeb, O’Brien and Vita.” *Journal of Competition Law & Economics* 1: 797-802, 2005.
- "Specification Issues and Confidence Intervals in Unilateral Price Effects Analysis." (with O.Capps, Jr. and H.A. Love) *Journal of Econometrics* 113, 3-31, 2003.
- "Systems Competition, Vertical Merger, and Foreclosure." (with Neil Gandal) *Journal of Economics and Management Strategy* 9, 25-52, 2000.
- "Abuse of Dominance under the 1986 Canadian *Competition Act*." (with Roger Ware) *Review of Industrial Organization* 13, 85-129, 1998.
- “Strategic Entry Deterrence: Complementary Products as Installed Base.” (with Neil Gandal) *European Journal of Political Economy* 12, 331-354, 1996.
- "Delegation, Market Share and the Limit Price in Sequential Entry Models." (with Roger Ware) *International Journal of Industrial Organization* 14, 575-609, 1996.
- "Complementary Network Externalities and Technological Adoption." (with Neil Gandal) *International Journal of Industrial Organization* 11, 239-260, 1993.
- "Bilingualism and Network Externalities." (with Ian King) *Canadian Journal of Economics* XXVI, 337-345, 1993. Reprinted in *Economics of Language*. ed. D. Lamberton. International Series of Critical Writing in Economics, Vol. 150, Northampton, MA.: Edward Elgar Publishing, 2002.
- "Comment on ‘Energy Politics in Canada, 1980-81: Threat Power in a Sequential Game’." *Canadian Journal of Political Science* XXVI, 61-64, 1993.
- "Integration, Complementary Products and Variety." (with Neil Gandal) *Journal of Economics and Management Strategy* 1, 651-675, 1992.
- "Network Effects, Software Provision and Standardization." (with Neil Gandal) *Journal of Industrial Economics* XL, 85-104, 1992.

Invited Papers

- "Too Many Tweets: Internet Billing Practices in Canada," *Policy Options* May 2011: 54-59.
- "Trade-Dress and Pharmaceuticals in Canada: Efficiency, Competition and Intellectual Property Rights," (with Roger Ware) *Policy Options* 18: 9-12, 1997.

Books and Monographs

- *The Impact of Vertical and Conglomerate Mergers on Competition* Brussels: European Commission, 2004 at <http://bookshop.europa.eu/en/the-impact-of-vertical-and-conglomerate-mergers-on-competition-pbKD7105158/>. Published as European Commission, 2006, *The Impact of Vertical and Conglomerate Mergers on Competition* Luxembourg: Office for Official Publications of the European Communities.
- *Industrial Organization: A Strategic Approach* (with Roger Ware) San Francisco: IRWIN/McGraw-Hill, 2000. Second edition forthcoming from Cambridge University Press.
- *Traditional and Incentive Regulation: Applications to Natural Gas Pipelines in Canada* (with Robert Mansell) Calgary: Van Horne Institute, 1995.
- *Econometric Models and Economic Forecasts: A Computer Handbook Using MicroTsp* New York: McGraw-Hill, 1990.

Chapters in Books

- "Conglomerate Mergers." in W.D. Collins ed., *Issues in Competition Law and Policy* Volume 2 Chicago: American Bar Association, pp. 1503-1552, 2008.
- "Vertical Mergers." in W.D. Collins ed., *Issues in Competition Law and Policy* Volume 2 Chicago: American Bar Association, pp. 1455-1502, 2008.
- "Platform Competition in Telecommunications." (with N. Gandal) in M. Cave, S. Majumdar, and I. Vogelsang eds., *Handbook of Telecommunications* Vol. 2 Amsterdam: North-Holland, pp. 119-155, 2005.
- "Mergers and Market Power: Estimating the Effect on Market Power of the Proposed Acquisition by The Coca-Cola Company of Cadbury-Schweppes' Carbonated Soft Drinks in Canada." (with A. Abere, O. Capps, Jr. and H.A. Love) in D. Slottje ed., *Economic Issues in Measuring Market Power*, Contributions to Economic Analysis, Vol. 255, Amsterdam: North-Holland, pp. 233-294, 2002.
- "The Economics of Coordinated Effects and Merger Analysis." in D. Houston ed., *CBA Competition Law Conference 2000* Juris Publisher: Yonkers, N.Y., pp. 561-575, 2001.
- "Network Industries, Intellectual Property Rights, and Competition Policy." (with Roger

Ware) in N. Gallini and R. Anderson eds., *Competition Policy, Intellectual Property Rights and International Economic Integration* Calgary: University of Calgary Press, pp. 227-285, 1998.

Papers and Proceedings

- “The Interface Between Competition Law and Intellectual Property in Canada: An Uneasy Alliance or Holy War?” on CD-ROM, *2005 Annual Fall Conference on Competition Law*. Ottawa: Canadian Bar Association, 2005.
- “The Economics of Exclusionary Contracts and Abuse of Dominance in Canada.” on CD-ROM, *2003 Annual Fall Conference on Competition Law*. Ottawa: Canadian Bar Association, 2003.
- "Competition Policy and the Intercity Passenger Transportation System in Canada." in M. Duncan, ed. *Directions: A New Framework for Transportation* Calgary: Van Horne Institute, pp. 21-25, 1993.
- "Commodity Price Regulation in Canada: A Survey of the Main Issues." (with Robert Mansell) *Papers and Proceedings of the Fifth Annual Regulatory Educational Conference*, Canadian Association of Members of Public Utility Tribunals, 1991.

Public Reports

- *Wireless Competition in Canada: An Assessment* (with A. Wilkins). School of Public Policy, University of Calgary Research Paper, 6(27), 2013. Available at <http://www.policyschool.ucalgary.ca/sites/default/files/research/j-church-wireles-online.pdf>.
- *Transmission Policy in Alberta and Bill 50* (with William Rosehart and John MacCormack). School of Public Policy, University of Calgary Research Paper, 2009.
- *Buyer Power: Background Note*. Competition Committee, Directorate for Financial and Enterprise Affairs, OECD, Paris, 2009, Available at <http://www.oecd.org/dataoecd/38/63/44445750.pdf>.
- *Vertical Mergers: Background Note*. Competition Committee, Directorate for Financial and Enterprise Affairs, OECD, Paris, 2007. Available at <http://www.oecd.org/dataoecd/25/49/39891031.pdf>.
- *An Evaluation of Traditional and Incentive Regulation for Canadian Natural Gas Pipelines*. (with Robert Mansell) Study submitted to, and available from, the National Energy Board of Canada, 1992.
- *Methodology for Evaluating Natural Gas Transmission System Reliability Levels and Alternatives*. (with Robert Mansell) Study prepared for, and available from, the Canadian Petroleum Association, 1991.

Public Regulatory Interventions

- Submission of The Director of Investigation and Research to Industry Canada re: Canada Gazette Notice No. DGTP-008-95 Review of Canadian Overseas Telecommunications and Specifically Teleglobe Canada's Role October 27, 1995 (with David Smith).
- Reply Comments of The Director of Investigation and Research to Industry Canada re: Canada Gazette Notice No. DGTP-008-95 Review of Canadian Overseas Telecommunications and Specifically Teleglobe Canada's Role December 11, 1995 (with David Smith).
- Submission of The Director of Investigation and Research to The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice CRTC 95-36 Implementation of Regulatory Framework, Local Interconnection and Network Component Unbundling January 26, 1996 (with Cal Gundy and Patrick Hughes).
- Final Argument of The Director of Investigation and Research to The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice CRTC 95-36 Implementation of Regulatory Framework, Local Interconnection and Network Component Unbundling October, 1996 (with Cal Gundy and Patrick Hughes).
- Final Oral Argument of The Director of Investigation and Research to The National Energy Board in PanCanadian Petroleum Limited application dated 26 July 1996 for an order requiring Interprovincial Pipe Line Inc. to transport natural gas liquids for PanCanadian Petroleum Limited from Kerrobert, Saskatchewan (MH-4-96) November 1996 (co-author).
- Opening Statement to the Alberta Utilities and Energy Board in Federated Pipe Lines Ltd. Application to Construct and Operate a Crude Oil Pipeline from Valhalla to Doe Creek, Alberta Energy and Utilities Board March (Decision 98-12) March 1998.
- Final Argument of The Director of Investigation and Research to The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice CRTC 98-10 Local Competition Start-Up Proceeding November, 1998 (with Cal Gundy).
- *Commissioner of Competition Intellectual Property Enforcement Guidelines*, Hull, Quebec: Competition Bureau. External member Commissioner of Competition's Drafting Team, first draft released in June 1999, second draft released April 2000, final version released September 2000.
- Final Argument of The Commissioner of Competition to The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice Public Notice 2001-37 - Price Cap Review and Related Issues October 2001 (with Cal Gundy).
- Comments of The Commissioner of Competition to The Canadian Radio-Television and

- Telecommunications Commissions re: Telecom Notice Public Notice 2001-47
Framework for the expansion of local calling areas and related issues November 2001
(with Cal Gundy and Masood Qureshi).
- Written Comments of the Competition Bureau to the Alberta Electricity Industry Structure Review February 2002 (with David Krause and Mark Ronayne).
 - Final Submission of the Commissioner of Competition to the Ontario Energy Board's Natural Gas Forum Consultation on the Ontario Natural Gas Market November 2004 (with Mark Ronayne).
 - The Commissioner of Competition Evidence, Final, and Reply Argument, The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice Public Notice 2005-2, Forbearance from Regulation of Local Exchange Services June, September, and October 2005 (part of the Competition Bureau's drafting team).
 - *Market Power and the Mackenzie Gas Project*, Evidence filed before the National Energy Board, Mackenzie Gas Project, GH-1-2004, June 2005.
 - The Commissioner of Competition Evidence, Supplementary Material, Final Argument, and Reply Argument, The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice Public Notice 2006-14, Review of Regulatory Framework for Wholesale Services and Definition of Essential Service 2007 (part of the Competition Bureau's drafting team).
 - Commissioner of Competition, *Abuse of Dominance Provisions as applied to the Telecommunications Industry*, Hull, Quebec: Competition Bureau. External member Commissioner of Competition's Drafting Team, first draft released September 2006, final version released June 2008.
 - *Foreign Ownership Restrictions of Canadian Telecoms: An Analysis of Industry Canada's Proposals* (with assistance of BRG), re Industry Canada Consultation on Opening Canada's Doors to Foreign Investment in Telecommunications: Options for Reform, July 2010. Available online at [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Rogers.pdf/\\$file/Rogers.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Rogers.pdf/$file/Rogers.pdf).
 - Spectrum Policy as Competition Policy: A Good Choice for Canada? (with assistance of BRG) re Industry Canada Consultation on a Policy and Technical Framework for the 700 MHz Band and Aspects Related to Commercial Mobile Spectrum Gazette Notice SMSE-018-10, February 2011. Available online at [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-018-10-jeffreychurch-rogers.pdf/\\$FILE/smse-018-10-jeffreychurch-rogers.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-018-10-jeffreychurch-rogers.pdf/$FILE/smse-018-10-jeffreychurch-rogers.pdf).
 - *Economic Principles and Usage Based Billing*, The Canadian Radio-Television and Telecommunications Commissions re: Telecom Notice of Consultation CRTC 2011-77

- Review of billing practices for wholesale residential high-speed access services March 2011. Available online at <https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=156065&Lang=e>.
- *The Competitive Effects of Vertical Integration: Content and New Distribution Platforms in Canada* (with assistance of BRG), The Canadian Radio-Television and Telecommunications Commissions re: Broadcasting Notice of Consultation CRTC 2010-783 Review of the regulatory framework relating to vertical integration, April 2011. Available online at <https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=156953&Lang=e> [Documents.aspx?ID=156065&Lang=e](https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=156065&Lang=e).
 - *In the Matter of a Complaint by Imperial Oil with Respect to Enbridge Southern Lights GP (ESL) Tariffs No. 1 and 2 Expert Evidence* (with assistance of BRG), The National Energy Board, Hearing Order RH-1-2011, July 2011 and *Reply Evidence* September 2011. Available online at <https://www.neb-one.gc.ca/ll-eng/livlink.exe?func=ll&objId=704264&objAction=browse> and <https://www.neb-one.gc.ca/ll-eng/livlink.exe?func=ll&objId=718914&objAction=browse>.
 - *Western Alberta Transmission Line Application Evidence of Dr. Jeffrey Church and Mr. John MacCormack*, Application No. 1607067, Proceeding ID 1045, Alberta Utilities Commission, September 2011.
 - *Critical Transmission Review Committee Request for Information*, Submission of Dr. Jeffrey Church and Mr. John MacCormack, January 2012.
 - *In the Matter of The Ontario Energy Board Act, and in the Matter of an Application By Toronto Hydro- Electric System Limited for an Order Pursuant to Section 29 of The Ontario Energy Board Act, Expert Report of Jeffrey Church*, June 2013. Available online at http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/search/rec?sm_udf10=EB-2013-0234&sortd1=rs_dateregistered&rows=200.

Public Expert Competition Filings

- *Expert Report of Jeffrey Church in The Commissioner of Competition v. Visa Canada Corporation and MasterCard International Incorporated*, The Competition Tribunal CT-2010-010, April 2012. Available online at http://www.ct-tc.gc.ca/CMFiles/CT-2010-010_Expert%20Report%20of%20Jeffrey%20Church_239_45_4-10-2012_4211.pdf
- *Expert Report of Jeffrey Church in The Commissioner of Competition v. The Toronto Real Estate Board*, The Competition Tribunal CT-2011-003, July 2012. Available online at http://www.ct-tc.gc.ca/CMFiles/CT-2011-003_Expert%20Report%20of%20Jeffrey%20Church_202_53_7-27-2012_7764.pdf

Book Reviews

- *Competition Policy: A Game -Theoretic Perspective* (by Louis Phlips) for *The Economic Journal*, 107, 1590-1592, 1997.

Websites

- *Industrial Organization: A Strategic Approach*. URL: <http://www.econ.ucalgary.ca/iosa/>
- *Industrial Organization: A Strategic Approach Instructor's Manual*. URL: <http://www.econ.ucalgary.ca/iosa/IM/>

Research In Progress

- "Network Externalities, Technological Progress, and Competitive Upgrades." (with Michael Turner) Mimeo, Department of Economics, University of Calgary 2002.
- "Direct and Indirect Strategic Effects: A Taxonomy of Investment Strategies." (with L. Moldovan) Mimeo, Department of Economics, University of Calgary 2006.
- "Market Power in the Alberta Red Meat Packing Industry." (with D. Gordon) IAPR Technical Paper 07-004, Institute for Advanced Policy Studies, University of Calgary 2007.
- "Exclusive Provision and Standardization in a Two-Sided Market." (with J. Mathewson) Mimeo, Department of Economics, University of Calgary 2009.
- "Asymmetries, Simulation and the Assessment of Input Foreclosure in Vertical Mergers." (with A. Majumdar and M. Baldauf) Mimeo, Department of Economics, University of Calgary 2010.
- "Capacity Constraints in Durable Goods Monopoly: Coase and Hotelling." (with John Boyce and Lucia Vojtassak) Working Paper 2012-07, Department of Economics, University of Calgary 2012.

Presentations

- "How Competitive is Canada's Wireless Sector?" Panel Discussion, International Institute of Communications (Canadian Chapter), Ottawa, November 2013.
- "Presentation to the Critical Transmission Review Committee." Critical Transmission Review Committee, Calgary, January 2012.
- "Spectrum Policy as Competition Policy." Workshop on Auction Design and Competition in Canadian Wireless Markets, Centre for Digital Economy, University of Calgary,

Ottawa, September 2011.

- “Issues in the Economic Regulation of Pipelines in Canada.” Canada’s Pipeline and Energy Transportation Infrastructure, C.D. Howe Institute, Banff, June 2011.
- “Competition Issues in Network Industries.” CBA Competition Law Spring Forum 2011: Focus on Civil, Toronto, May 2011.
- “Regulatory Governance and the Alberta Integrated Electric System.” 11th Annual Alberta Power Summit, Calgary, November 2010.
- “Asymmetries, Simulation and the Assessment of Input Foreclosure in Vertical Mergers.” Bates White Seventh Annual Antitrust Conference, Washington, D.C., June 2010 and Annual Meeting of the Canadian Economics Association, Ottawa, June 2011.
- “The Competition Act and the Fair Efficient and Open Competition Regulation.” Workshop for the Alberta Utilities Commission, Calgary, April 2010 (with Barry Zalmanowitz).
- “Transmission Policy in Alberta and Bill 50.” School of Public Policy Workshop, Electricity Transmission Policies: Issues and Alternatives, Calgary, October 2009 and the National Energy Board, Calgary, February 2010.
- “Economics of Vertical Mergers.” British Institute for International and Comparative Law, 7th Annual Merger Conference, London, November 2008.
- “Telecommunications in Canada: Market Structure and the State of the Industry.” 2008 Telecommunications Invitational Forum, Landgon Hall, Ontario, April 2008.
- “Cartel Cases Under Section 45: Is Proof of Market Definition the Achilles Heel?” Panelist, Competition, Crime and Punishment, Canadian Bar Association National Competition Law Section Spring Conference, Toronto, April 2008.
- “Forbearance of Local Telecommunications in Canada: One Back, Two Forward?” Telecommunications and Broadcasting Current Regulatory Issues and Policy Insight Communications Conference, Ottawa, April 2007.
- “The Economics of Non-Horizontal Merger Guidelines.” ENCORE Workshop on the Assessment of Non-Horizontal Mergers, The Hague, April 2007.
- “Stumbling Around in No Man’s Land is Dangerous: Competition Policy, the CRTC, and Deregulation of Local Telecom in Canada.” Competition Policy in Regulated Industries: Principles and Exceptions, C.D. Howe Institute Policy Conference, Toronto, November 2006.
- “Competition in Local Telecommunications in Canada: Grading the CRTC.” Delta Marsh Annual Conference, Department of Economics, University of Manitoba, Winnipeg, October 2006.
- “Grading the CRTC: Forbearance from the Regulation of Retail Local Exchange Services

- Telecom Decision 2006-15.” part of the Panel on Local Competition at the Annual Meetings of the Canadian Economics Association, Montreal, May 2006.
- “The Interface Between Competition Law and Intellectual Property in Canada: An Uneasy Alliance or Holy War?” Presented at the Canadian Bar Association Annual Fall Conference on Competition Law, Gatineau, November 2005.
 - “Game Theory and Industrial Organization: An Introduction.” Competition Tribunal, Knowlton, Quebec, October 2005.
 - “The Impact of Vertical and Conglomerate Mergers on Competition: An Overview of the Survey And Implications for Competition Policy.” DG IV European Commission, Brussels, July 2004, UK Competition Commission, London, September 2005, British Institute of International and Comparative Law/Competition Law Forum, Brussels, September 2005 and Conference on Economics in Competition Policy, Ottawa, April 2006.
 - “The Economics and Competition Policy of Exclusionary Agreements.” Competition Bureau, Gatineau, April 24-25, 2005.
 - “Intellectual Property Issues and Abuse: The IP/Competition Policy Interface in Canada.” 2004 Competition Law and Policy Forum, Langdon Hall, Cambridge, Ontario, April 2004.
 - “Efficiencies Gained and Paradise Lost? Or the Inverse? Comments on the Propane Case.” Economics Society of Calgary Seminar Regulation vs. Competition: Different Shades of Grey, Calgary, October 2003.
 - “The Economics of Exclusionary Contracts and Abuse of Dominance in Canada” Presented at the Canadian Bar Association Annual Fall Conference on Competition Law, Hull, October 2003.
 - “Network Externalities, Technological Progress, and Competitive Upgrades” Presented at PIMS-ASRA Alberta Industrial Organization Conference, Calgary, November 2002.
 - Panelist, The Changing Competition Law Landscape, Osler, Hoskin & Harcourt, Calgary, June 2002.
 - Panelist, Efficiencies in Mergers Under the Competition Act, Annual Meeting of the Canadian Economics Association, Calgary, June 2002.
 - "Specification Issues and Confidence Intervals in Unilateral Price Effects Analysis" Presented at the Annual Meeting of the Canadian Economics Association, Calgary, June 2002.
 - “The Economics and Econometrics of Unilateral Effects Analysis.” Competition Bureau, Gatineau, January 7th and 8th, 2002 (with Oral Capps, Jr. and H. Alan Love).
 - “Economics and Antitrust of Network Industries.” Competition Bureau, Gatineau,

January 2001.

- "The Economics of Coordinated Effects and Merger Analysis." Presented at the Canadian Bar Association Annual Fall Conference on Competition Law, Ottawa, September 2000.
- "Network Externalities, Technological Progress, and Competitive Upgrades." Presented at the Annual Meeting of the Canadian Economics Association, Vancouver, June 2000.
- "Competition Policy for Network Industries." Presented at Centre for the Study of Government and Business New Challenges for Competition Policy Panel, Annual Meeting of the Canadian Economics Association, Vancouver, June 2000.
- "Applying Antitrust Concepts in IT Industries." Presented at Roundtable on Reassessing the Role of Antitrust in Mega-Mergers and IT Industries Faculty of Law, University of Toronto, June 2000.
- "The Economics of Electricity Restructuring: The Case of Alberta." Canadian Law and Economics Conference, Toronto, September 1999.
- "Refusals to License and the IP Guidelines: Abuse of Dominance and Section 32." McMillan Binch Symposium on Intellectual Property Rights and Competition Policy, Toronto, June 1999.
- "The Economics of Electricity Restructuring: The Alberta Case." presented at Economic Society of Calgary conference Alberta's Electricity Market—Moving Towards Deregulation, Calgary, May 1999.
- "Competition in Natural Gas Transmission: Implications for Capacity and Entry." presented at Van Horne Institute conference The New World in Gas Transmission: Regulatory Reform and Excess Capacity, Calgary, April 1999.
- "Bill 27: The Regulatory Framework." presented at Canadian Institute of Resources Law conference on Restructuring Alberta's Electricity System: How will It Work?, Calgary, June 1998.
- Panelist, Antitrust and Telecommunications, Global Networking '97 Conference, Calgary, June 1997.
- "Network Industries, Intellectual Property Rights, and Competition Policy." presented at Author's Symposium on Competition Policy, Intellectual Property Rights and International Economic Integration, Ottawa, May 1996.
- Panelist, Symposium on Barriers to Entry, Bureau of Competition Policy, Ottawa, March 1995.
- "Branded Ingredient Strategies," presented at the Summer Conference on Industrial Organization, University of British Columbia, Vancouver, August 1994.
- "Equilibrium Foreclosure and Complementary Products," the Annual Meetings of the European Association for Research in Industrial Economics, Tel-Aviv, September 1993, the

- Annual Meeting of the Canadian Economics Association, Ottawa, June 1993 and the Mini-Conference on Network Economics at Tel Aviv University, July 1992.
- "Competition Policy and the Intercity Passenger Transportation System in Canada," presented at the Van Horne Institute for International Transportation and Regulatory Affairs symposium on *The Final Report of the Royal Commission on National Passenger Transportation*, The University of Calgary, February 1993.
 - "Integration, Complementary Products and Variety," presented at the Annual Meeting of the Canadian Economics Association, Prince Edward Island, June 1992 and Telecommunications Research Policy Conference, Solomons Island, MA, September 1991.
 - "The Role of Limit Pricing in Sequential Entry Models," presented at the Twenty-Fifth Annual Meeting of the Canadian Economics Association, Kingston, June 1991.
 - "Commodity Price Regulation in Canada: A Survey of the Main Issues," presented at the Fifth Annual Regulatory Educational Conference, Canadian Association of Members of Public Utility Tribunals, May 1991.
 - "Complementary Network Externalities and Technological Adoption," at the Twenty-Fourth Annual Meeting of the Canadian Economics Association, Victoria, June 1990 and at the Fifteenth Canadian Economic Theory Conference, Vancouver, June 1990.

Invited Seminars

- Department of Economics, University of Montreal, June 2011.
- Faculty of Commerce and Business Administration, University of British Columbia, April 2002
- Department of Economics, University of Toronto, March 2002
- School of Business & Economics, Wilfred Laurier University March 2002
- Competition Bureau, January 2002
- Department of Economics, University of Laval, April 1996
- Department of Economics, Carleton University, Ottawa, January 1996
- Stern School of Business, New York University, December 1995
- Bureau of Competition Policy, Industry Canada, Ottawa, March 1994
- Department of Economics, Simon Fraser University, November 1992
- Department of Economics, University of Victoria, November 1992
- Department of Economics, University of Toronto, October 1991
- Department of Economics, Queen's University, Kingston, October 1991
- Department of Economics, University of Alberta, February 1990

Refereeing

American Economic Review, Canadian Journal of Agricultural Economics, Canadian Journal of Economics, Canadian Journal of Political Science, Canadian Public Policy, C.D. Howe Institute, Energy Journal, European Economic Review, FCAR, Information Economics and Policy, International Economics and Economic Policy, International Economic Review, International Journal of the Economics of Business, International Journal of Industrial Organization, Israel Science Foundation, Journal of Econometrics, Journal of Economic Behavior and Organization, Journal of Economic Education, Journal of Economic Psychology, Journal of Economics, Journal of Economics and Business, Journal of Economics and Management Strategy, Journal of Industrial Economics, Journal of International Economics, Journal of Law, Economics, & Organization, Management Science, Marketing Science, National Science Foundation, RAND Journal of Economics, Journal of Economic Surveys, Review of Industrial Organization, Review of Network Economics, Routledge, SSHRC, University of Cambridge Press.

Professional Service

- Chair, Canadian Bar Association National Competition Law Section Economics and Law Committee, 2005-2007.
- Vice-Chair Canadian Bar Association National Competition Law Section Economics and Law Committee, 2004-2005.
- Juror, James M. Bocking Memorial Award, Canadian Bar Association National Competition Law Section, 2006, 2007, 2008, 2009, 2010, 2011, 2012, and 2013.
- Co-Editor, *Journal of Economics & Management Strategy*, 2001-2007.
- Editorial Board, *Canadian Journal of Economics*, 1993-1996.
- Theme Head Economics Sessions and Programme Committee, International Telecommunications Society and the International Council for Computer Education Global Networking '97 Conference, Calgary, June 1997.
- Organizer, Roundtable on Vertical Mergers, Competition Committee, Directorate for Financial and Enterprise Affairs, OECD, Paris, 2007. See <http://www.oecd.org/dataoecd/25/49/39891031.pdf>
- Organizer, Roundtable on Buyer Power, Competition Committee, Directorate for Financial and Enterprise Affairs, OECD, Paris, 2008. See <http://www.oecd.org/dataoecd/38/63/44445750.pdf>

- External Examiner for E. Croft Ph.D., Policy Programme, Faculty of Commerce and Business Administration, University of British Columbia, April 1999, B. Isaacs Ph.D., Department of Economics, Simon Fraser University, May 2000, J. Landa Ph.D., Department of Economics Carleton University, May 2001, J. Latulippe Ph.D, Department of Economics, University of Montreal, June 2011.
- House of Commons Standing Committee on Industry, Science and Technology Roundtable Participant on Competition Policy, December 2001.
- House of Commons Standing Committee on Industry, Science and Technology, Deregulation of Telecommunications, February 2007.

Teaching Experience

Graduate

- Ph.D. Micro Theory
- Industrial Organization
- Regulatory Economics
- Markets and Public Policy (School of Public Policy)

Undergraduate

- Regulatory Economics
- Competition Policy
- Honours Micro Theory
- Industrial Organization
- Intermediate Microeconomics

Professional

- Regulatory economics through the Centre for Regulatory Affairs.
- Principles of Microeconomics, Industrial Organization and Competition Policy for the Competition Bureau.

Graduate Student Supervision/Examination

Completed

- Supervisor, M. Ec. Programme, Mark Larsen, "Calgary Crossfield Sour Gas: A Case Study in the Costs of Regulation," Department of Economics, University of Calgary, 1993.
- Supervisor, M. A. Programme, George Given, "The Dynamics of Industries Characterized by Complementary Network Externalities," Department of Economics, University of

- Calgary, 1994.
- Supervisor, M. Ec. Programme, R. Allan Wood, "Subsidies to Municipal Golfers in Calgary, AB. ," Department of Economics, University of Calgary, 1995.
 - Supervisor, M. A. Programme, Marcy Cochlan, "Branded Ingredient Strategies," Department of Economics, University of Calgary, 1995.
 - Supervisor, M. Ec. Programme, Shaun Hatch, "Optimal Pricing and the Allocation of Water Under Uncertainty: A Stochastic Nonlinear Programming Approach," Department of Economics, University of Calgary, 1995.
 - Supervisor, M. A. Programme, Denelle Peacey, "Priority Pricing," Department of Economics, University of Calgary, 1995.
 - Supervisor, M.A. Programme, Michael Turner, "Analysis of Product Upgrades in Computer Software," Department of Economics, University of Calgary, 1999.
 - Supervisor, M.A. Programme, Kurtis Hildebrandt, "Market Dominance and Innovation in Computer Software Markets," Department of Economics, University of Calgary, 1999.
 - Supervisor, M.A. Programme, Alex Harris, "Optimal Multiproduct Tolling on an Oil Pipeline," Department of Economics, University of Calgary, 2000.
 - Supervisor, M.A. Programme, Noelle Bacalso, "Conceptual Hazards Associated with Power Purchase Arrangements," Department of Economics, University of Calgary, 2000.
 - Supervisor, M.A. Programme, Laura Jolles, "Antitrust Logit Model," Department of Economics, University of Calgary, 2005.
 - Supervisor, M.A. Programme, Mohamed Amery, "The Procurement of Ancillary Services in Alberta," Department of Economics, University of Calgary, 2007.
 - Supervisor, M.A. Programme, Graham Thomson, "Optimal Price Cap Regulation," Department of Economics, University of Calgary, 2008
 - Supervisor, M. A. Programme, Kevin Wipond, "Market Power in the Alberta Electrical Industry," Department of Economics, University of Calgary, 2008.
 - Supervisor, M.A. Programme, Nicholas Janota, "Introducing Competition into Regulated Network Industries: From Hierarchies to Markets in Canada's Railroad Industry," Department of Economics, University of Calgary, 2009.
 - Supervisor, M.A. Programme, Cory Temple, "A Beggars' Banquet? Copyright, Compensation Alternatives, and Music in the Digital Economy," Department of Economics, University of Calgary, 2010.
 - Supervisor, M.A. Programme, Susan Baker, "Loyalty Programs: A Review of the Competition Commissioner versus Canada Pipe Case," Department of Economics, University of Calgary, 2011.
 - Supervisor, M.A. Programme, Michael Ata, "A Bayesian Approach to Antitrust Liability:

- Exclusive Dealing and Predation,” Department of Economics, University of Calgary, 2011.
- Supervisor, M.A. Programme, Richard Kendall-Smith, “An Analysis of Market Power in the Alberta Electricity Market ,” Department of Economics, University of Calgary, 2013.
 - Supervisor, Master of Public Policy Programme, Jennifer Rumas, “Economic Evaluation of Wind Power in Alberta,” School of Public Policy, University of Calgary, 2012.
 - Supervisor, Ph.D. Programme, David Krause, "Internalizing Network Externalities," Department of Economics, University of Calgary, 2002.
 - Supervisory Committee, Ph.D. Programme, Lucia Vojtassak, “Equilibrium Concepts in Exhaustible Resource Economics.” Department of Economics, University of Calgary, 2006.
 - Examination Committee Member, M. Ec. Programme, Murray Sondergard, "An Examination of the Efficient Markets Hypothesis for the Toronto Stock Exchange," Department of Economics, University of Calgary, 1992.
 - Examination Committee Member, M.A. Programme, Denise Froese, "Auctioning Private Use of Public Land," Department of Economics, University of Calgary, 1993.
 - Examination Committee Member, M.Ec. Programme, Merrill Whitney, "Economic Espionage as a Form of Strategic Trade Policy" Department of Economics, University of Calgary, 1994.
 - Examination Committee Member, M.Ec. Programme, Robert Richardson, "North-South Disputes Over IPRs" Department of Economics, University of Calgary, 1994.
 - Examination Committee Member, M. Ec. Programme, Eva Cudmore, "The Viability of New Entry into the Alberta Electrical Generation Industry," Department of Economics, University of Calgary, 1997.
 - Examination Committee Member, M. A.. Programme, Geok (Suzy) Tan, Course Based M.A, Department of Economics, University of Calgary, 1997.
 - Examination Committee Member, M.A. Programme, Kris Aksomitis, "Strategic Behaviour in the Alberta Electricity Market," Department of Economics, University of Calgary, 2002.

Current

- Supervisor, M.A. Programme, Greg Belyea, Department of Economics, University of Calgary.
- Supervisor, Ph.D. Programme, Hongru Tan, Department of Economics, University of Calgary.

University Service

- University Research Grants Committee 1994/95
- Dean's Academic Appointment Committee, Department of Mathematics and Statistics 2001
- ISEEE Tier II Chair in Energy and Climate Change Search Committee 2005/06
- Faculty of Social Sciences Academic Program Review Committee 2000/01
- Faculty of Social Sciences Executive Council 2002/03
- Department of Economics, Ad Hoc Outreach Committee 2001/02
- Curriculum Fellow, Department of Economics, 2001
- Department of Economics Representative on Van Horne Institute Sub-Committee on Centre for Regulatory Affairs 1997/98
- Department of Economics Advisory Committee 1997/98
- Department of Economics Undergraduate Curriculum Committee 1993/94, 1994/95, 1996/97, 1997/98, 1999/00, 2000/01, 2001/02, 2010/11
- Department of Economics Honours Advisor 1992/93, 1993/94, 1994/95, 2006/07
- Department of Economics Hiring Committee 1990/91, 1991/92, 1994/95, 1998/99, 1999/00, 2002/03, 2003/04, 2004/05, and 2005/06
- Department of Economics Computer Committee 1992/93, 1993/94, 1996/97, and 1997/98
- Department of Economics Ph.D. Ad Hoc Committee 1990/91 and 1992/93
- Department of Economics Ad Hoc Committee on the Status of Women 1991/92
- Department of Economics Striking Committee 1991/92
- Department of Economics Guest Lecturers Committee 1990/91 and 1991/92
- Department of Economics Graduate Curriculum Committee 1989/90
- Department of Economics Library Coordinator 2006/07
- Department of Economics Graduate Studies Committee 2007/08 and 2008/09
- Department of Economics Fund Raising Coordinator 2006/07, 2007/08, and 2008/09
- University of Calgary Appointment Appeals Committees 2008
- Haskayne School of Business, Academic Appointment Review Committee 2007/08, 2008/09
- Haskayne School of Business, Advisory Decanal Selection Committee for the Dean, 2012/2013
- General Promotions Committee, University of Calgary 2008/2009, 2010/2011

Consulting Experience

President of Church Economic Consultants Ltd., for whom I have written consulting reports and provided advice on issues in regulatory and antitrust economics for Alberta Beef Producers, Apotex, Australian Competition and Consumer Commission, Bell Canada Enterprises, Bayer CropScience, BC Ferries, BP Canada Energy Company, the Canadian Association of Petroleum Producers, the Canadian Cattlemen's Association, the Canadian Competition Bureau, The Coca-Cola Company, The Conference Board of Canada, Enbridge Pipelines, ENMAX, EPCOR, European Commission, Foothills Pipelines, Google Inc., James Richardson International Limited, Mackenzie Explorers Group, Maple Leaf Foods, MasterCard, Microcell, Nokia, Nova Gas Transmission, OECD Competition Division, Pacific Gas & Electric, Pan Alberta Gas, PanCanadian Petroleum, Peace Pipe Line, Perimeter Transportation, Rogers Communications, Superior Propane, Toronto Hydro-Electric System, Toronto Real Estate Board, TransAlta, TransCanada Pipelines, Williams Energy, Visa, and eight major motion picture film studios.

Other

- 3M National Coaching Certification Program Level 1 Softball January 2002
- 3M National Coaching Certification Program Coach Level Hockey November 2002
- 3M National Coaching Certification Program Level 1 Baseball September 2003