

ATTACHMENT 1

**ECONOMIC REVIEW OF BELL CANADA'S PETITION
TO THE GOVERNOR IN COUNCIL TO VARY
TELECOM REGULATORY POLICY CRTC 2015-326, *REVIEW OF
WHOLESALE WIRELINE SERVICES AND ASSOCIATED POLICIES***

MARKUS VON WARTBURG, PH.D.

ANALYSIS GROUP

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**Economic Review of Bell Canada's Petition to the Governor
in Council to Vary TRP CRTC 2015-326, *Review of Wholesale
Wireline Services and Associated Policies***

Markus von Wartburg, Ph.D.
Analysis Group

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I. Introduction

1. On October 20, 2015, Bell Canada filed a petition to the Governor in Council (“GIC” or “Cabinet”) pursuant to Section 12 of the *Telecommunications Act* requesting that the GIC vary Telecom Regulatory Policy CRTC 2015-326, *Review of wholesale wireline services and associated policies*¹ (“TRP CRTC 2015-326”). Specifically, Bell Canada requests that the GIC vary the Canadian Radio-television and Telecommunications Commission’s (“CRTC” or “Commission”) decision so that it “does not implement legacy wholesale regulation for fibre-to-the-home or next generation DOCSIS 3.1 cable networks. The decision would continue to apply to legacy broadband technology, such as digital subscriber line, fibre-to-the-node, and cable broadband based on DOCSIS 3.0 providing speeds up to 100 Mbps, where it exists today.”²
2. I was asked by counsel for Canadian Network Operators Consortium (“CNO”) to provide an economic review of TRP CRTC 2015-326 as it relates to fibre-to-the-home (“FTTH”) networks, and review and comment, as needed, on the economic reports filed as part of Bell Canada’s petition to vary TRP CRTC 2015-326.³
3. I am a Senior Economist at Analysis Group, Inc. in Montreal, an economic, strategic and financial consulting firm. I have co-authored a report titled *Economic Review of the Provision of Wholesale Telecommunications Services and Associated Policies in Canada*,⁴ which was filed as part of CNO’s intervention in the CRTC Proceeding 2013-551, *Review of wholesale services and*

¹ CRTC, *Telecom Regulatory Policy CRTC 2015-326, Review of wholesale wireline services and associated policies*, July 22, 2015, <http://www.crtc.gc.ca/eng/archive/2015/2015-326.htm> (“TRP CRTC 2015-326”)

² Petition of Bell Canada to the Governor in Council to Vary Telecom Regulatory Policy CRTC 2015-326, *Review of wholesale wireline services and associated policies*, 20 October 2015 (“Bell Canada’s Petition”, “Bell Canada Petition”, or “Petition”), at ¶64.

³ Bell Canada’s petition was accompanied by five attachments: Attachment 1: Hal Singer, *Economic Impact of FTTH Deployment in Toronto*; Attachment 2: Hal Singer, *Policy Brief: The Economic Impact of the CRTC’s Decision to Unbundle Fibre-to-the-Premises Networks*; Attachment 3: Hal Singer, Kevin Caves and Anna Koyfman, *The Empirical Link Between Fibre-to-the-Premises Deployment and Employment: A Case Study in Canada*; Attachment 4: Jeffrey A. Eisenach, *Broadband Market Performance in Canada: Implications for Policy*; Attachment 5: Andrea Renda, *Regulating Broadband: Lessons From the European Union, and Implications for Canada*.

⁴ Second Intervention of Canadian Network Operators Consortium Inc., Attachment A: Analysis Group, *Economic Review of the Provision of Wholesale Telecommunications Services and Associated Policies in Canada*, June 24, 2014, *Review of wholesale services and associated policies, Telecom Notice of Consultation CRTC 2013-551*.

associated policies (“TNC 2013-551”).⁵ I have a Ph.D. in Economics from the Vancouver School of Economics at the University of British Columbia, and specialize in industrial organization, antitrust and competition economics, and applied microeconomics. My curriculum vitae is attached as Appendix B.

4. The report is organized as follows: Section II provides an executive summary, Section III describes the wholesale wireline proceedings and the CRTC’s decision to mandate fibre-to-the-home access from an economic perspective, Section IV discusses Bell Canada’s Petition and examines economic analyses provided in support. Section V concludes the report, additional figures and tables are contained in Appendix A.

II. Executive Summary

5. In July 2015, following a year-long, multi-phase wholesale wireline proceeding, the CRTC released TRP 2015-326 determining the regulatory status of various wholesale services: Wholesale high-speed access (“HSA”) services will continue to be mandated, but the provision of aggregated HSA services will no longer be mandated and will be phased out in conjunction with the phased implementation of a disaggregated HSA service.⁶ The Commission determined that fibre-access facilities are included in the requirement to provide disaggregated wholesale high-speed services.⁷ Unbundled local loops will no longer be mandated and will be phased out,⁸ and Ethernet and high-speed competitor digital network services will remain forborne and not mandated.⁹ Furthermore, the disaggregated wholesale high-speed access service will be implemented in phases, starting in Ontario and Quebec,¹⁰ and the existing Phase II Costing approach will continue to be used for rate setting.¹¹
6. Bell Canada filed the Petition on October 20, 2015, asking the Governor in Council to vary TRP CRTC 2015-326 so that it does not mandate access to FTTH facilities or next-generation DOCSIS

⁵ *Review of wholesale services and associated policies*, Telecom Notice of Consultation CRTC 2013-551, 15 October 2013 (“TNC 2013-551”), as amended by *Review of wholesale services and associated policies*, Telecom Notice of Consultation CRTC 2013-551-1, 8 November 2013 (“TNC 2013-551-1”) (CRTC File No. 8663-C12-201313601). See <http://crtc.gc.ca/eng/archive/2013/2013-551.htm> and <http://crtc.gc.ca/eng/archive/2013/2013-551-1.htm>.

⁶ TRP CRTC 2015-326, *supra*, note 1, ¶151-155.

⁷ TRP CRTC 2015-326, *supra*, note 1, ¶143.

⁸ TRP CRTC 2015-326, *supra*, note 1, ¶190.

⁹ TRP CRTC 2015-326, *supra*, note 1, ¶212-214.

¹⁰ TRP CRTC 2015-326, *supra*, note 1, ¶152.

¹¹ TRP CRTC 2015-326, *supra*, note 1, ¶235.

3.1 cable networks, primarily based on the argument that mandated access to FTTH facilities reduces incentives to invest.¹² Under Bell Canada’s request, mandated wholesale access would continue to apply to digital subscriber line (“DSL”), fibre-to-the-node (“FTTN”), and cable broadband technology based on DOCSIS 3.0 providing speeds up to 100 Mbps, where it currently exists.¹³

7. An overview of the state of broadband markets in Canada reveals that capital investment to maintain, improve and expand broadband infrastructure is high, both in absolute terms and in comparison to other countries.¹⁴ Although wireline broadband services are widely available to Canadian households and subscription levels are comparatively high, the shift to faster speed tiers is relatively slow, and the deployment and adoption of next generation FTTH infrastructure falls short in international comparisons.¹⁵ Moreover, Canadian consumers generally pay higher prices for broadband access and average Internet connection speeds are slower than in leading broadband countries.¹⁶
8. In reaching its decision, the CRTC applied the essential facility test¹⁷ and determined that i) wholesale services provided over FTTH facilities constitute an input required by competitors to compete in the retail broadband market, ii) denying access to FTTH facilities would substantially lessen or prevent competition in the retail broadband market and iii) it is not practical or feasible for competitors to duplicate the access component of FTTH facilities. The Commission then considered the potential disincentive to invest and determined that any negative impact on investment is unlikely to occur to any significant degree, particularly in urban areas.¹⁸ Incumbents are expected to continue to invest in fibre access facilities to respond to consumer demand and effectively compete with cable companies.¹⁹
9. The CRTC policy established in TRP CRTC 2015-326 is based on sound economic principles which form the foundation of the essential facility test. It is technologically neutral and encourages facilities-based competition where feasible (e.g., transport component), and fosters competition

¹² Petition at section 2.2.

¹³ Petition, ¶18.

¹⁴ See section III.B.1 of this report.

¹⁵ See section III.B.2 of this report.

¹⁶ See section III.B.3 of this report.

¹⁷ TRP CRTC 2015-326, *supra*, note 1, ¶114-136.

¹⁸ TRP CRTC 2015-326, *supra*, note 1, ¶141.

¹⁹ TRP CRTC 2015-326, *supra*, note 1, ¶141.

through mandated wholesale access where pure facilities-based competition is insufficient or incapable of inducing vigorous retail competition and providing consumers with choice among innovative service offerings at reasonable prices (e.g., access component).

10. By removing the provision of aggregated wholesale HSA services in conjunction with the introduction of mandated disaggregated HSA services, in phases, the Commission exposes additional network elements to market forces without lessening or threatening effective retail competition. It thereby encourages negotiated agreements on data transport and investment in middle-mile facilities by competitors, and removes price regulation and contentious costing disputes from the transport segment of the network.
11. The narrow focus in Bell Canada's Petition on investment to the detriment of other telecommunication policy objectives is misplaced. Reliance on market forces is insufficient and would result in a substantial lessening of competition. Mandated disaggregated wholesale HSA service is a regulatory measure to enhance telecommunication policy objectives, namely the efficiency and competitiveness of downstream retail broadband markets.
12. The key assumption of the empirical framework in Bell Canada's Petition, based on which the estimate of the hypothesized impact on fibre-to-the-home investment is derived, is inherently problematic in the context of the telecommunications industry.²⁰ As illustrated by the application to Bell Aliant's investment in FTTN and FTTH technologies, its results are implausible and contradict economic reasoning and business realities.²¹ The analysis is misleading and does not provide a credible estimate of the investment effect of the CRTC's policy to mandate the provision of disaggregated wholesale high-speed access services, including FTTH facilities.²²
13. Announcements of sizable next generation broadband infrastructure investments following the release of TRP CRTC 2015-326, public statements and investor reports from incumbent broadband providers, as well as comprehensive financial analyses of FTTH networks in Canada are entirely consistent with the CRTC's assessment that incumbent carriers will continue to invest in FTTH infrastructure to respond to consumer demand and to compete with cable carriers, particularly in urban areas.²³

²⁰ See section IV.B of this report.

²¹ See section IV.B of this report.

²² See section IV.B of this report.

²³ See section IV.C of this report.

14. Table 1 summarizes the conclusions of this report regarding TRP CRTC 2015-326, the economic evidence submitted in support of Bell Canada's petition, and recent public statements, financial analyses, and market developments.

Table 1: Summary of Conclusions

Evidence / Source Materials	Conclusions of this Report
<p><i>Broadband Market Performance in Canada: Implications for Policy</i> (Bell Canada Petition, Attachment 4)</p>	<ul style="list-style-type: none"> • capital expenditures comparatively high • broadband widely available and subscription level relatively high • shift to faster connection speeds is slow; deployment and adoption of FTTH networks comparatively low but growing rapidly • consumers pay higher broadband prices and connection speeds are slower compared to leading broadband countries
<p>TRP CRTC 2015-326</p>	<ul style="list-style-type: none"> • policy is based on sound economic principles of the essential facility test • encourages facilities-based competition where feasible • fosters competition through mandated wholesale access where substantial lessening of retail competition would occur otherwise • transitioning to disaggregated HSA services exposes transport element of network to market forces, and encourages negotiated agreements and competitor investment in middle-mile facilities
<p><i>Economic Impact of FTTH Deployment in Toronto</i> (Bell Canada Petition, Attachment 1)</p> <p><i>The Empirical Link Between Fibre-to-the-Premises Deployment and Employment: A Case Study in Canada</i> (Bell Canada Petition, Attachment 3)</p>	<ul style="list-style-type: none"> • billion dollar capital investment have substantial employment and output effects • widespread adoption of next-generation connectivity fosters economic development and growth • reports do not address twin objective of wholesale framework: provide favorable conditions for investment and competitive retail markets and choice for consumers
<p><i>Policy Brief: The Economic Impact of the CRTC's Decision to Unbundle Fibre-to-the-Premises Networks</i> (Bell Canada Petition, Attachment 2)</p>	<ul style="list-style-type: none"> • key assumption of empirical framework is inherently problematic in this context • application to FTTN and FTTH investment of Bell Aliant gives implausible results that contradict economic reasoning and business realities. • does not provide credible estimate of effect of CRTC policy on investment
<p>Investments and Market Developments</p>	<ul style="list-style-type: none"> • large NGA investments following CRTC policy • public statements and financial analyses are consistent with CRTC finding that incumbents will continue to invest

III. Review of Wholesale Wireline Services and Associated Policies

III.A The Wholesale Wireline Proceedings (TNC 2013-551)

15. In October 2013, the CRTC initiated a review of the regulatory status of the wholesale services framework and pricing, and the appropriateness of mandating wholesale services (“TNC 2013-551”).²⁴ The Commission examined whether the regulatory wholesale framework provides sufficient incentives for innovation and network investment, and whether it fosters vigorous downstream competition to the benefit of the Canadian consumer.
16. The multi-phase wholesale wireline proceeding extended over a year, allowed for multiple rounds of interventions, requests for information, and replies, and culminated in a two-week hearing at the end of November 2014.²⁵ Over the course of the proceedings, many submissions and expert reports on various aspects of the wholesale wireline regime were filed by incumbent telecommunications and cable companies, smaller independent internet service providers, the Competition Bureau, municipalities and school districts, and various associations and consumers groups, among others.²⁶
17. The wholesale services regime is framed by objectives of Canadian telecommunications policy. The Telecommunications Act has as its statutory objectives, among others:²⁷
- “(b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada;”
 - “(c) to enhance the efficiency and competitiveness [...] of Canadian telecommunications;”
 - “(f) to foster increased reliance on market forces [...] and to ensure that regulation, where required, is efficient and effective;”
 - “(g) [...] to encourage innovation in the provision of telecommunications services;”
 - “(h) to respond to the economic and social requirements of users of telecommunications services.”

²⁴ TNC 2013-551, *supra*, note 5. In 2008, the CRTC had determined in Telecom Decision CRTC 2008-17 that it would review mandated wholesale services six years from the date of the decision (CRTC, Telecom Decision CRTC 2008-17, *Revised regulatory framework for wholesale services and definition of essential service*, March 3, 2008, <http://www.crtc.gc.ca/eng/archive/2008/dt2008-17.htm>).

²⁵ The documents filed and timeline for the associated proceeding are evident upon a review of the file of this proceeding (8663-C12-201313601) at <https://services.crtc.gc.ca/pub/instances-proceedings/Default-Default.aspx?lang=eng&YA=2013&S=C&PA=t&PT=nc&PST=a#2013-551>.

²⁶ *Ibid.*

²⁷ *Telecommunications Act*, S.C. 1993, c.38, S.7.

18. Furthermore, the Policy Direction on implementing the objectives set out in the Telecommunications Act instructs the CRTC to, among others:²⁸

“(a)(i) rely on market forces to the maximum extent feasible as the means of achieving the telecommunications policy objectives;”

“(a)(ii) when relying on regulation, use measures that are efficient and proportionate to their purpose and that interfere with the operation of competitive market forces to the minimum extent necessary to meet the policy objectives;”

“(b)(ii) [...] neither deter economically efficient competitive entry into the market nor promote economically inefficient entry;”

“(b)(iv) [...] ensure the technological and competitive neutrality of those arrangements or regimes, to the greatest extent possible, to enable competition from new technologies and not to artificially favour either Canadian carriers or resellers.”

19. The underlying purpose of the wholesale services framework is “to facilitate competition in retail markets to provide Canadians with increased choice.”²⁹ Incumbent local exchange carriers (“ILECs”) and cable companies often have market power over essential facilities in the upstream market. At present, incumbent providers are mandated to provide wholesale telecommunication services to competitors who can thereby extend their networks where it is not feasible or practical for them to build their own facilities and compete in the downstream retail markets. The motivation for wholesale regulation is not simply to restrain market power by large incumbents, but also to induce competitive entry into retail markets. A well-functioning regulatory wholesale services framework is integral to vigorous downstream competition leading to lower prices for telecommunication services, higher service quality, increased innovation, and expanded choice to the benefit of Canadian consumers and businesses.

20. Regulatory efforts in the telecommunications industry are similarly geared towards achieving the twin goals of introducing competition into quasi-monopolistic markets while providing favorable conditions for sufficient capital investments to sustain and innovate telecommunications network infrastructure. The regulatory environment influences the level and form of competition, which is considered a key driver of broadband adoption. There is an ongoing debate on what network elements are inherently amenable to competition, and under what conditions and to what extent they should be regulated to foster competition and broadband adoption.

²⁸ *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, P.C. 2006-1534, December 14, 2006, <http://laws.justice.gc.ca/PDF/SOR-2006-355.pdf>.

²⁹ TNC 2013-551, *supra*, note 5, at headnote.

21. Competition in broadband markets can be facility-based by means of separate network facilities, alternative technology platforms, or on the same network facility through wholesale access provisions for competitors at varying levels of the network infrastructure. The regulatory wholesale services framework in Canada promotes facilities-based competition wherever possible because it is considered an ideal setting for retail competition to develop. In the presence of essential (or bottleneck) facilities however, pure facilities-based competition may be difficult to achieve as it implies full duplication of access networks, which is not practical or feasible, and economically inefficient.³⁰ Mandated wholesale access for competitors to selected network elements can overcome the difficulties of facilities-based competition in achieving vigorous retail competition in the presence of essential facilities (bottlenecks).
22. Our report *Economic Review of the Provision of Wholesale Telecommunications Services and Associated Policies in Canada*, which was filed as part of CNOC's intervention in the CRTC wholesale wireline proceeding, provided a wide-ranging review and discussion of the economic literature on investment, innovation, and competition in telecommunications.³¹ An extensive and growing body of empirical studies has developed, and the debate on whether, and to what extent, access infrastructure should be subjected to ex-ante access regulation is ongoing.
23. The broad review contained in the report filed in the CRTC proceedings centers on published academic reviews of the literature, coupled with an extensive discussion of more recent empirical studies. It includes not only the effect of regulation on investment – an input measure commonly highlighted by incumbents – but also the effect of regulation on outcome measures such as broadband availability, adoption, price, and service quality (speed), measures which determine consumer welfare and are indicative of the functioning of telecommunications markets. The review found that no clear consensus view on the relationship between regulation and industrial policy has emerged yet; a particularly desirable market structure is far from established.

³⁰ Most generally, an essential facility is a “unique input to the production process that cannot be cheaply duplicated.” (Laffont, J.J. and J. Tirole (2000), *Competition in Telecommunications*, (Cambridge, Massachusetts: MIT Press), p. 282).

³¹ *Supra*, note 4.

III.B The State of Broadband

24. The wholesale regulatory regime for broadband should be based on a thorough analysis of telecommunications markets in Canada. This section presents an updated summary of the state of innovation and competition in broadband markets in Canada.³²

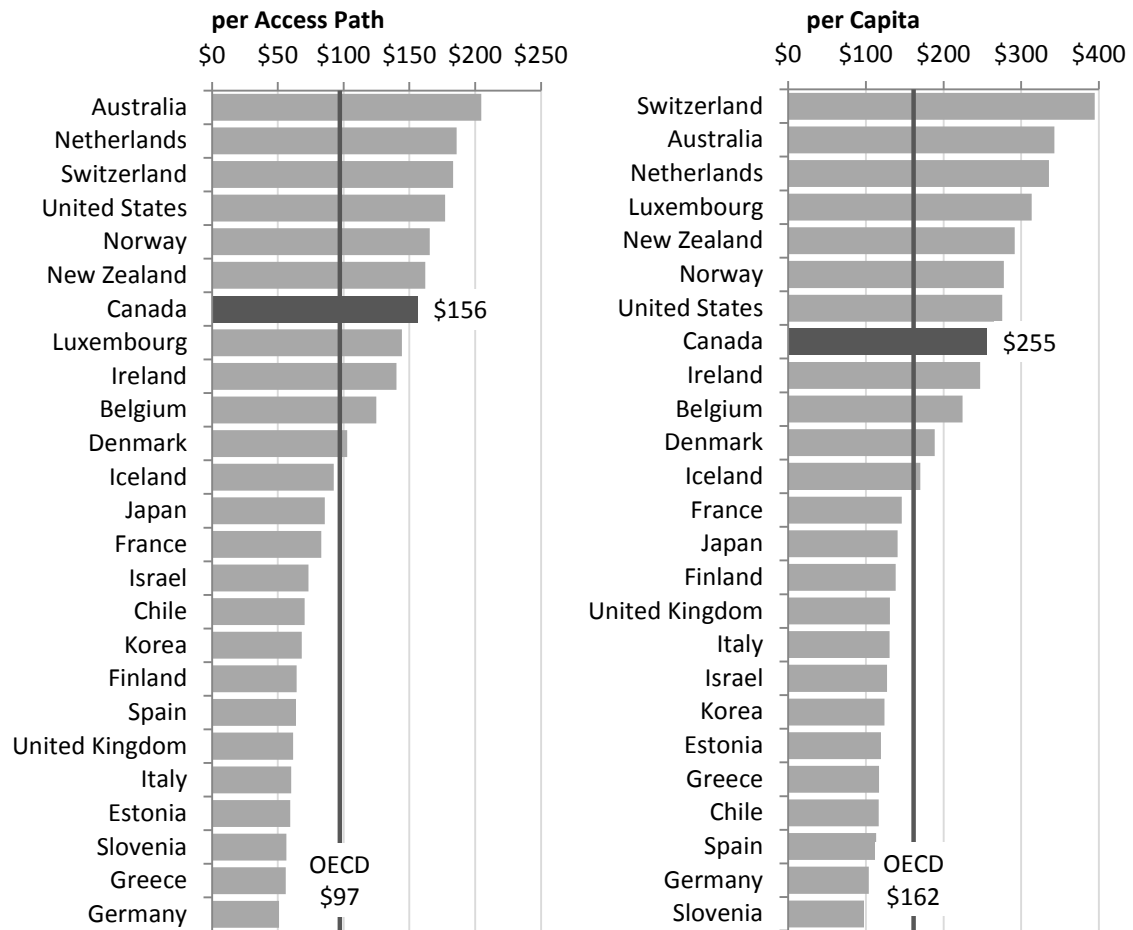
III.B.1 Investment in Broadband Networks

25. The provision of fixed broadband access requires billion-dollar capital investments in backbone and last-mile infrastructure. Creating favorable conditions for capital investments is a key element to sustain infrastructure and innovation. Canadian companies have made significant investments in upgrading cable infrastructure and in bringing fibre to the home or closer to end users.

26. Canada ranks favorably among OECD countries in terms of public telecommunications investment per access path (including wired lines and mobile subscribers) and per capita in 2013.

³² A more detailed assessment of the Canadian broadband market is contained in our report *Economic Review of the Provision of Wholesale Telecommunications Services and Associated Policies in Canada* filed in the CRTC wholesale wireline proceedings (*Supra*, note 4).

Figure 1: Public Telecommunications Investment, OECD Countries, 2013 (US Dollars)



Note: Access paths include wired lines and mobile subscribers.

Source: OECD Communications Outlook 2015, Table 2.30 and 2.31.

27. Capital investment in telecommunications infrastructure in Canada is high, among the highest internationally.

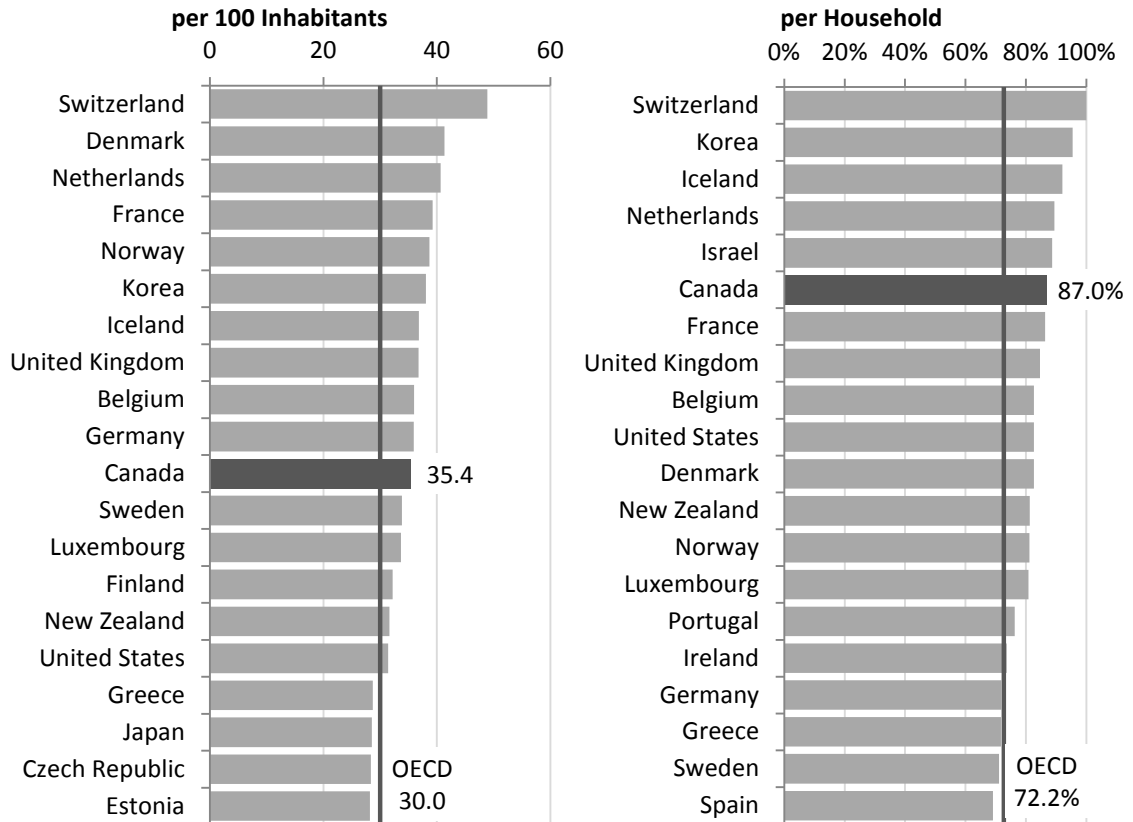
III.B.2 Broadband Availability and Penetration

28. According to the latest CRTC Communications Monitoring Report, 82% of Canadian households in 2014 subscribed to broadband services, and 77% of households subscribed to broadband service at download speeds of at least 5 Mbps. Such download speeds of 5 Mbps are available to 96% of households, and the vast majority can access these speeds using either landline or fixed-wireless facilities.³³

³³ CRTC, *Communications Monitoring Report*, October 2015, Table 5.3.10, <http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2015/cmr.pdf>, p. 2, 187.

29. While Canada’s rank has fallen over the years, it still ranks above average among OECD countries as shown in Figure 2:

Figure 2: Fixed (Wired) Broadband Subscriptions, Top 20 OECD Countries, December 2014³⁴



Note: Fixed broadband connections at download speeds greater than 256 kbit/s.
 Source: OECD Broadband Portal, <http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm>.

30. Broadband at various speed tiers is widely available to households in Canada. The availability of connection speeds higher than 100 Mbps has increased from 35% of households in 2012 to 71% of households in 2014 (Appendix Figure A-1). Although the share of Canadian Internet subscriptions with lower speeds has been steadily declining over the last few years as end users switch to higher speed tiers (Appendix Figure A-2), the shift towards next-generation broadband speed tiers in Canada has been slow and Canada lags leading OECD countries in the share of broadband connections with speeds in excess of 15 Mbps (Appendix Figure A-3).

³⁴ Normalizing the number of broadband subscribers by the population provides an idea of relative penetration of subscriber lines. The average household size in Canada is larger than most European countries. However, because business connections are included, expressing the number of subscriptions in terms of households could be misleading as it consistently overestimates broadband penetration.

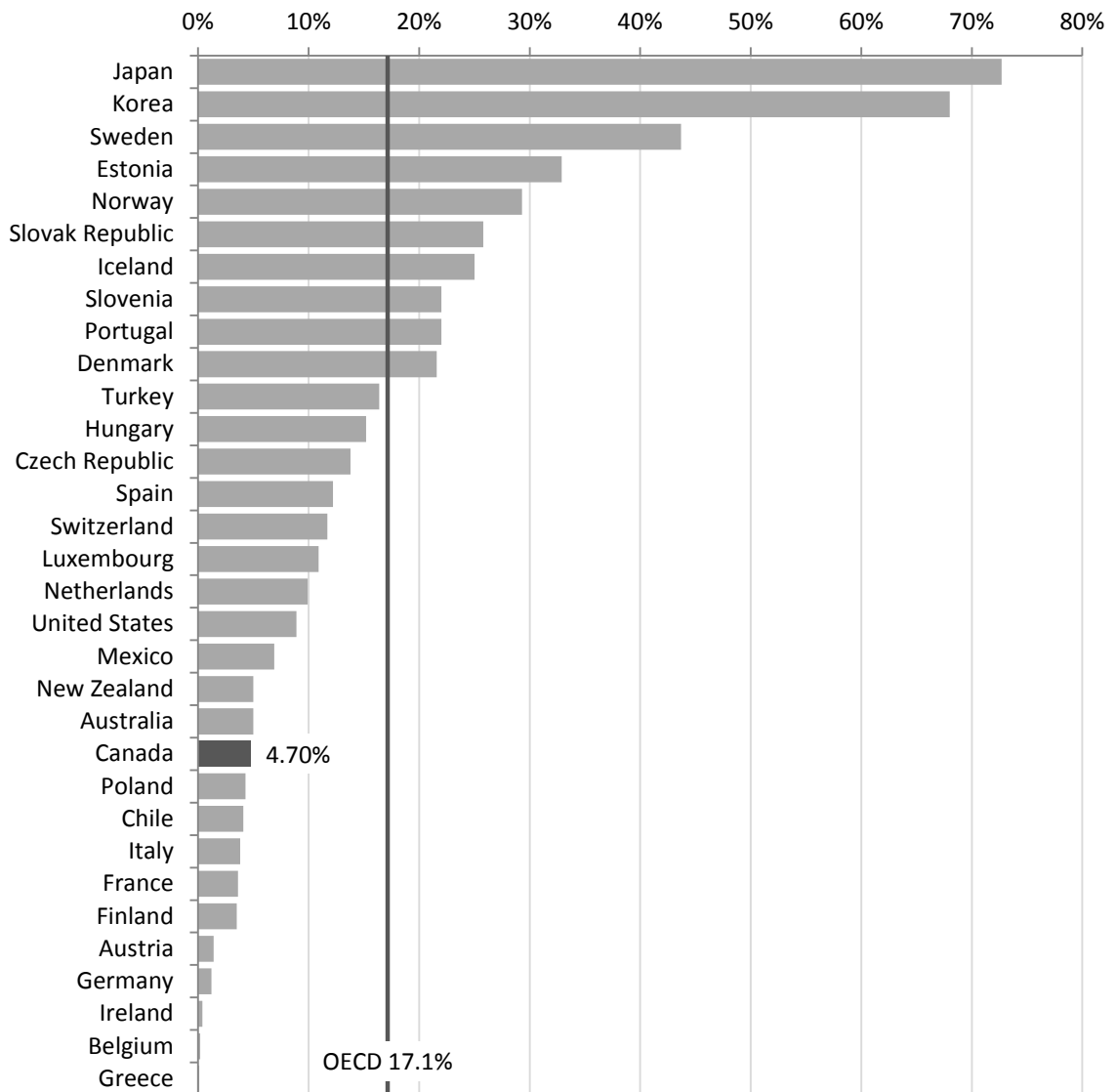
31. FTTH is a next generation technology, a purely fibre-optic delivery system from the servicing office to the end user, with significant advantages in terms of capacity, reliability, (symmetric) speed, and the provision of new services to the customer. It requires large investments but is considered “future-proof”: in the longer term, FTTH connections can achieve vastly higher capacity and speeds relative to DSL, FTTN, and cable connections.³⁵
32. The deployment of next generation FTTH infrastructure in Canada lags behind: As of December 2014, only 4.7% of fixed broadband connections were purely fibre, compared to 8.9% in the United States, and well below the OECD average of 17.1% of fibre broadband connections (see Figure 3). However, the annual growth of fibre subscriptions in Canada in 2014 was 52.2%, substantially exceeding the growth in the United States (15.5%) and among OECD countries (13.1%).³⁶ This finding is consistent with the accelerated level of FTTH investment reported by Bell Canada, which grew by \$660 million from 2009 to 2013, an overall increase of 617% and equivalent to a compound annual growth rate (CAGR) of 64% (See Figure 7).³⁷

³⁵ Pure fibre-optic infrastructure can deliver consistent, very high speeds, is highly scalable and exhibits low signal loss. It is the likely end-state for wired connections to the home since it is straightforward to change equipment connected to the endpoints of an optical fibre to take advantage of technological advances (Review of Wholesale Mobile Wireless Services, *Telecom Notice of Consultation CRTC 2014-76*, Intervention of Canadian Network Operators Consortium Inc., Appendix A: “Wireless Substitutability” Report by Nordicity, May 9, 2014, pp. 18-20, <https://services.crtc.gc.ca/Pub/ListeInterventionList/Documents.aspx?ID=215481&en=2014-76&dt=i&lang=e&S=C&PA=t&PT=nc&PST=a>).

³⁶ Note that the growth of fibre connections begins from a lower level in Canada. Growth of fibre connections in the United States has slowed down, incumbent telecommunications provider Verizon for example has effectively stopped building out next-generation fibre networks (Wall Street Journal, “Verizon to End Rollout of FIOS”, March 30, 2010, <http://online.wsj.com/news/articles/SB10001424052702303410404575151773432729614>).

³⁷ This includes FTTH investment by Bell Aliant (See Bell Canada’s Petition, Attachment 2: Hal Singer, *Policy Brief: The Economic Impact of the CRTC’s Decision to Unbundle Fibre-to-the-Premises*, p. 8).

Figure 3: Percentage of Fibre Connections, OECD Countries, December 2014



Note: Fibre connections include fibre-to-the-home (FTTH) and fibre-to-the-building (FTTB), but exclude fibre-to-the-node (FTTN) connections.

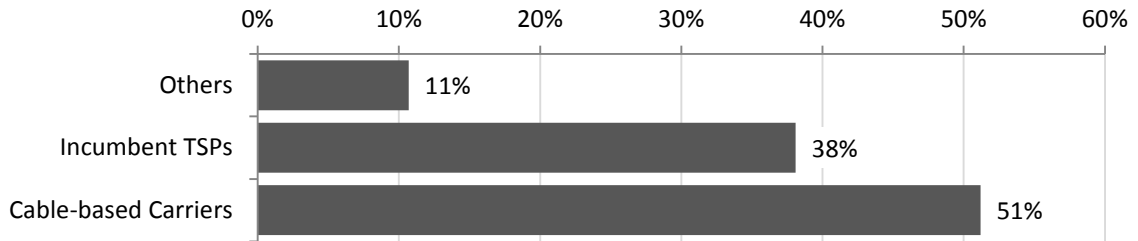
Source: OECD Broadband Portal, <http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm>.

III.B.3 Competition, Pricing, and Performance of Fixed Broadband Networks

33. Besides broadband availability and penetration, choice, price and quality (speed) are important indicators of the existence of a competitive marketplace and the experience of Canadian broadband consumers.
34. Canada has one of the highest cable broadband penetration rates among OECD countries. Incumbent telecommunications companies broadly face facilities-based competition, typically from a (single) cable provider using alternative last-mile infrastructure. Although Canadians consumers and businesses are served by hundreds of Internet service providers (“ISPs”), the

large majority of broadband subscribers primarily choose broadband access from regional duopolies consisting of an incumbent telecommunications and cable provider.

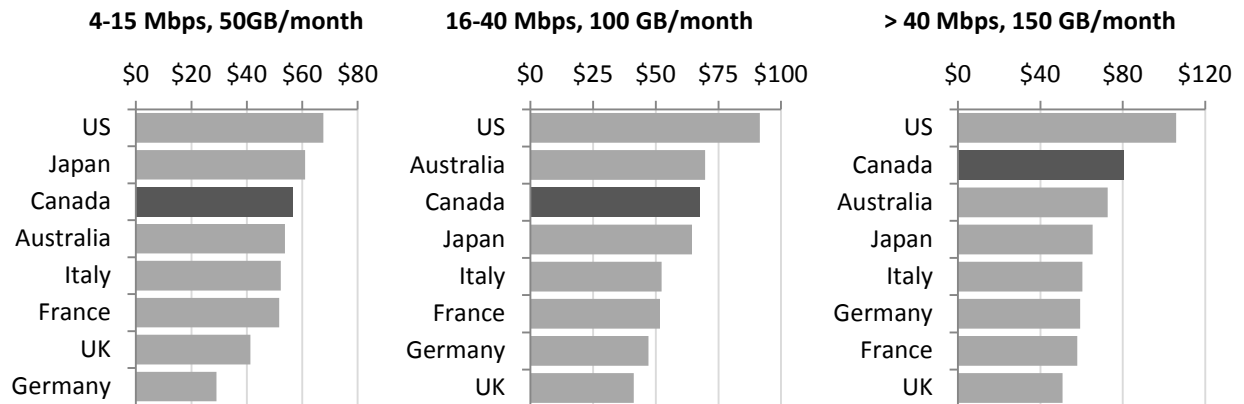
Figure 4: Residential Internet Subscriber Shares by Type of ISP, 2014



Source: CRTC Communications Monitoring Report 2015, Table 5.3.4.

35. Limited consumer choice and dominant regional duopoly players affect broadband pricing of incumbent providers. The most recent annual telecommunication price comparisons study by Wall Communications, conducted for the CRTC and Industry Canada, found that broadband access in Canada is typically more expensive than in the comparison countries surveyed, with the exception of the United States. As Figure 5 demonstrates, higher prices in Canada are particularly prevalent for higher-tier broadband services.

Figure 5: Wireline Broadband Prices for Selected Countries, 2015, CDN\$ PPP



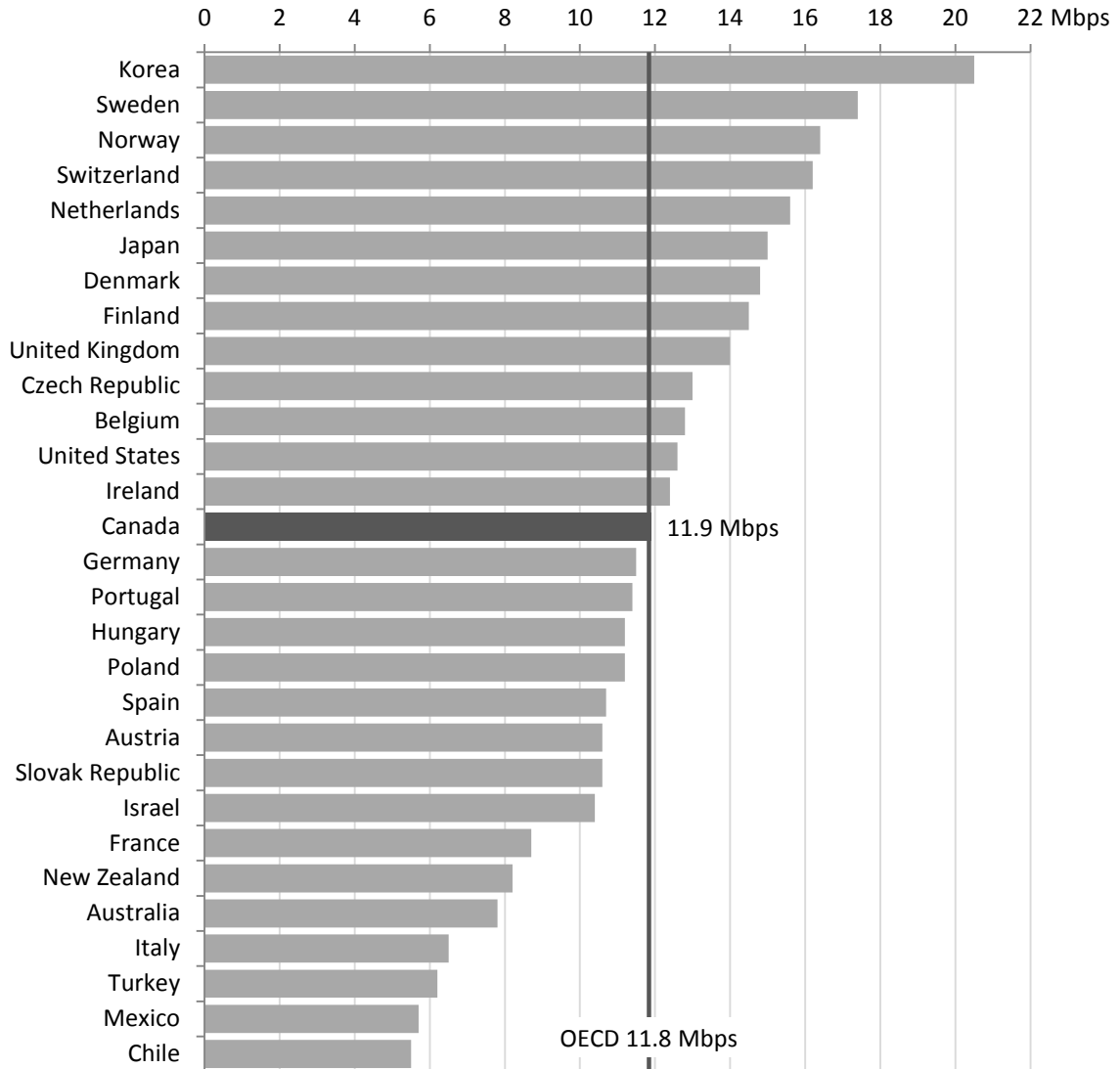
Note: Pricing for the lowest service basket (4-15 Mbps, 50 GB/month) is adjusted if service basket with higher download speed and data usage (16-40 Mbps, 100 GB/month) has lower prices (e.g. France, Italy).

Source: Wall Communications (2015), Price Comparisons of Wireline, Wireless, and Internet services in Canada and with Foreign Jurisdictions, 2015 Update, March 30, 2015, <http://www.crtc.gc.ca/eng/publications/reports/wall2015/rp150618.htm>.

36. Broadband pricing should be assessed in conjunction with broadband quality. Comparing Canada’s broadband quality in terms of speed of service to other countries reveals that average broadband speed ranks barely above the OECD average, and well behind leading Asian and

European countries as shown in Figure 6. Alternative download speed methodologies show a similar ranking for Canada (Appendix Figure A-4).

Figure 6: Akamai Average Download Speeds, OECD Countries, Q3 2015



Note: Average speed is based on requests made to Akamai's HTTP/S platform over the 3rd quarter of 2015 and includes both business and residential connections. Data for Iceland, Luxembourg and Greece are not reported by Akamai.

Source: Akamai, State of the Internet Report Q3 2015, <https://www.stateoftheinternet.com/resources-connectivity-2015-q3-state-of-the-internet-report.html>.

37. In summary, this overview of the state of broadband markets in Canada reveals that capital investment to maintain, improve and expand broadband infrastructure is high, both in absolute terms and in comparison to other countries. Although wireline broadband services are widely available to Canadian households and subscription levels are comparatively high, the shift to

faster speed tiers is relatively slow, and the deployment and adoption of next generation FTTH infrastructure falls short in international comparisons. Moreover, Canadian consumers generally pay higher prices for broadband access and average Internet connection speeds are slower than in leading broadband countries.

III.C TRP CRTC 2015-326

38. Following the public proceeding, the CRTC released its wholesale wireline regulatory policy TRP CRTC 2015-326 in July 2015. Regarding the regulatory status of various wholesale services, the Commission determined that

- wholesale high-speed access services will continue to be mandated,³⁸
- the provision of aggregated services will no longer be mandated and will be phased out in conjunction with the (phased) implementation of a disaggregated service,³⁹
- fibre-access facilities are included in the requirement to provide disaggregated wholesale high-speed services,⁴⁰
- unbundled local loops will no longer be mandated and will be phased out,⁴¹ and
- Ethernet and high-speed competitor digital network services will remain forborne and not mandated.⁴²

39. Furthermore, the disaggregated wholesale high-speed access service will be implemented in phases, starting in Ontario and Quebec, to account for demand and minimize regulatory intervention.⁴³ Regarding rate setting for mandated wholesale services, the Commission will continue to use the existing company-specific, forward-looking, incremental costing approach (Phase II Costing), with a markup contribution to the incumbent carrier's fixed and common costs.⁴⁴

³⁸ TRP CRTC 2015-326, *supra*, note 1, ¶151-155.

³⁹ TRP CRTC 2015-326, *supra*, note 1, ¶151-155.

⁴⁰ TRP CRTC 2015-326, *supra*, note 1, ¶143.

⁴¹ TRP CRTC 2015-326, *supra*, note 1, ¶190

⁴² TRP CRTC 2015-326, *supra*, note 1, ¶212-214.

⁴³ TRP CRTC 2015-326, *supra*, note 1, ¶148-152.

⁴⁴ TRP CRTC 2015-326, *supra*, note 1, ¶233-237. Any additional markups for wholesale services (including risk premiums) will be determined on a case-by-case basis.

40. To determine which network components are essential for competition at the retail level, the CRTC applied the essential facility test outlined in Telecom Decision CRTC 2008-17.⁴⁵ To be essential, a facility, function, or service has to satisfy all of the following conditions:
- a) The facility is required as an input by competitors to provide telecommunications services in a relevant downstream market;
 - b) The facility is controlled by a firm that possesses upstream market power such that denying access to the facility would likely result in a substantial lessening or prevention of competition in the relevant downstream market; and
 - c) It is not practical or feasible for competitors to duplicate the functionality of the facility.
41. Aside from the essential facility test, the CRTC may use public good, interconnection, and innovation and investment as policy considerations in deciding whether to mandate the provision of a wholesale service.⁴⁶ The analysis of policy considerations will include an assessment of the implications of such outcomes for the specific services under consideration.⁴⁷
42. The Commission found that i) wholesale services provided over FTTH facilities constitute an input required by competitors to compete in the retail broadband market, ii) denying access to FTTH facilities would substantially lessen or prevent competition in the retail broadband market and iii) it is not practical or feasible for competitors to duplicate the access component of FTTH facilities, but the transport component can be practically and feasibly duplicated. Thus, all three conditions of the essential facility test are satisfied for the access component of FTTH facilities.⁴⁸
43. Given that the essential facility test supports mandating the access component of FTTH facilities, the CRTC in its analysis of policy consideration regarding investment and innovation examined the potential disincentive to invest when access to FTTH facilities is mandated.⁴⁹ The Commission deemed any negative impact on investment unlikely to occur to any significant

⁴⁵ CRTC, *Revised Regulatory Framework for Wholesale Services and Definition of Essential Service*, Telecom Decision CRTC 2008-17, March 3, 2008, ¶36-37, <http://www.crtc.gc.ca/eng/archive/2008/dt2008-17.htm>.

⁴⁶ TRP CRTC 2015-326, *supra*, note 1, ¶49-52. Policy consideration may inform, support, or reverse a decision to mandate a wholesale service based on the essential facility test.

⁴⁷ TRP CRTC 2015-326, *supra*, note 1, ¶137.

⁴⁸ TRP CRTC 2015-326, *supra*, note 1, ¶118-136. The access component represents the connection from the customer to the central office/head-end, the transport component consists of the incumbent's network that carries end-customer traffic between the central offices/head-ends and a point of interconnection with a competitor. The transport component has previously found to be duplicable based on a high incidence of competitor self-supply or alternative supply of fibre-based transport facilities (Telecom Decision CRTC 2008-17), but mandated aggregated wholesale HSA service has impeded potential investment in transport facilities by competitors.

⁴⁹ TRP CRTC 2015-326, *supra*, note 1, ¶141.

degree, particularly in urban areas.⁵⁰ It expects incumbents to continue to invest in fibre access facilities to respond to consumer demand and effectively compete with cable companies.⁵¹ Furthermore, rates for disaggregated wholesale HSA services over fibre access facilities would be compensatory and provide a reasonable rate of return.⁵²

44. The discontinuation of mandated aggregated wholesale HSA services in conjunction with the mandated disaggregated wholesale HSA services lessens independent ISPs' dependence on regulated wholesale services and provides them with increased control over cost and service offerings which could encourage middle-mile investment in transport facilities.⁵³ Disaggregated service will be implemented in phases, starting with Ontario and Quebec based on existing demand for wholesale HSA services. FTTH access facilities and download speeds in excess of 100 Mbps will not be mandated over aggregated wholesale HSA service.⁵⁴
45. The CRTC policy established in TRP CRTC 2015-326 is based on sound economic principles which form the foundation of the essential facility test. It is technologically neutral and encourages facilities-based competition where feasible (e.g., transport component), and fosters competition through mandated wholesale access where pure facilities-based competition is insufficient or incapable of inducing vigorous retail competition and providing consumers with choice among innovative service offerings at reasonable prices (e.g., access component).
46. It is unrealistic to expect that non-incumbent providers will duplicate last-mile access facilities on a broad scale outside of smaller and densely populated areas and multi-dwelling units due to limited market size, costs, and lack of economies of scope.^{55,56}

⁵⁰ TRP CRTC 2015-326, *supra*, note 1, ¶141.

⁵¹ TRP CRTC 2015-326, *supra*, note 1, ¶141.

⁵² TRP CRTC 2015-326, *supra*, note 1, ¶141.

⁵³ TRP CRTC 2015-326, *supra*, note 1, ¶139-141. Independent ISPs incur high costs transporting large amounts of data over incumbents' facilities under aggregated HSA service, costs that are expected to rise further with anticipated increases in data consumption in the future.

⁵⁴ TRP CRTC 2015-326, *supra*, note 1, ¶152-154.

⁵⁵ This holds in particular if the expectation extends to multiple non-incumbents providers. Generally, only firms with prior access investments in networks such as incumbent telecommunications and cable companies, or in ducts such as municipal utilities, have successfully invested in last-mile access facilities on a large scale.

47. By removing the provision of aggregated wholesale HSA service in conjunction with the introduction of mandated disaggregated service, in phases, the Commission exposes additional network elements to market forces without lessening or threatening effective retail competition. It thereby encourages negotiated agreements on data transport and investment in middle-mile facilities by competitors, and provides a path to the removal of price regulation and contentious costing disputes from the transport segment of the network.⁵⁷

IV. Bell Canada's Petition to Cabinet

IV.A Bell Canada's Request

48. Bell Canada filed its Petition on October 20, 2015, asking the Governor in Council to vary TRP CRTC 2015-326 so that it does not mandate access to fibre-to-the-home (FTTH) facilities or next-generation DOCSIS 3.1 cable networks. Under Bell Canada's request, mandated wholesale access would continue to apply to DSL, FTTN, and cable broadband technology based on DOCSIS 3.0 providing speeds up to 100 Mbps, where it currently exists.

49. Arguments advanced by Bell Canada against mandating access to FTTH facilities rely for the most part on reduced incentives to invest in FTTH networks.⁵⁸ This narrow focus on investment to the detriment of other policy objective outlined in the *Telecommunications Act* and the Policy

⁵⁶ A production process is characterized by economies of scope if joint production is less costly than producing the products individually." (Church, J.R. and R. Ware, *Industrial Organization: A Strategic Approach*, (San Francisco: McGraw-Hill-Irwin), 2000, p. 782). Mobile data consumption grows rapidly and FTTH networks can be used for Wi-Fi offloading, mobile backhaul, and the integration of small-cell networks. "[W]e've got pretty sexy economies of scope to leverage. It's no longer just about fibre for TV and HSIA, but it's fibre to backhaul, the small cell topology that we're building within our neighborhoods. And it's fibre to backhaul things like home health monitoring," (Darren Entwistle (CEO), *TELUS Q3 2015 Investor Conference Call*, November 5, 2015, Transcript p. 9; <http://about.telus.com/servlet/JiveServlet/downloadBody/5798-102-1-6437/TELUS%20Q2%202015%20conference%20call%20transcript.pdf>) "95% of our [wireless] network traffic now is being backhauled on fibre. That is core to providing the speed we are providing on the wireless network. [...] One of the hidden strategic values for Bell Mobility is having the wireline business as part of that cost structure we take to market." (George Cope, President and CEO of Bell Canada, *Scotia 16th Annual Telecom & Cable Conference*, November 12, 2015, Webcast, <http://www.bce.ca/investors/investorevents/all/show/Scotia-16th-annual-Telecom---Cable-Conference>).

⁵⁷ Competitors rely almost entirely on incumbent's network under aggregated wholesale HSA service and are dependent on appropriate regulatory rules, accurate wholesale rates, and an efficient and timely rate setting process.

⁵⁸ Petition at section 2.2.

Direction is unwarranted from an economist perspective.⁵⁹ Moreover, the CRTC is instructed to consider all objectives, and balance them appropriately, in the event a conflict or trade-off between policy objectives arises.⁶⁰ The Commission determined – based on economic principles embodied in the essential facility test – that reliance on market forces is insufficient and would result in a substantial lessening of competition, and established mandated disaggregated wholesale HSA service as a regulatory measure to enhance the efficiency and competitiveness of downstream retail broadband markets.⁶¹

50. Furthermore, Bell Canada’s Petition challenges a specific part – mandated wholesale access to FTTH facilities and DOCSIS 3.1 cable networks – of the comprehensive regulatory wholesale framework outlined in TRP CRTC 2015-326. Granting the Petition would have reverberations and change economic incentives within the wholesale access framework. It is therefore essential to assess the economic consequences of TRP CRTC 2015-326, including incentives to invest in infrastructure, in its entirety.

51. For example, TRP CRTC 2015-326 does not provide for mandated access to FTTH facilities and download speeds in excess of 100 Mbps over aggregated wholesale HSA service in order to encourage migration to a disaggregated wholesale HSA service and provide an incentive for competitors to invest in middle-mile infrastructure (transport segment). The discontinuation of aggregated wholesale HSA service provides a path towards eventual forbearance from wholesale rate regulation of the transport component. In the absence of mandated access to FTTH facilities however, there exists little incentive for wholesale competitors to invest in middle-mile transport facilities to gain increased control over cost and service offerings; they would likely continue to rely almost entirely on incumbents’ networks. Moreover, continued wholesale rate regulation of the transport segment – a network element the Commission

⁵⁹ From an economist’s perspective, investment is an input, and like any factor of production is not something to be maximized. Investment is not an end in itself, but rather a means to the end of a competitive telecommunications market providing high-quality services at competitive prices. An overemphasis on investment can lead to welfare-reducing and inefficient network duplication, or lead to stranding as evidenced in the telecommunications industry downfall in 2000.

⁶⁰ The inherent possibility of competing objectives is well acknowledged: “The Bureau recognizes the complex and multi-dimensional character of the problems and objectives that the telecommunications regulatory framework must attempt to resolve and achieve. These objectives often compete with one another and it is almost always difficult, and sometimes impossible, for the regulator to reconcile or balance them.” (*Telecommunications Policy Review Panel, Comments of the Commissioner of Competition, August 15, 2005, ¶138, [http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapj/bureaucomments-tpr-2005.08.15.pdf/\\$file/bureaucomments-tpr-2005.08.15.pdf](http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapj/bureaucomments-tpr-2005.08.15.pdf/$file/bureaucomments-tpr-2005.08.15.pdf)*)

⁶¹ *Supra*, note 27, S.7(c).

determined could be exposed to market forces without lessening retail competition – would continue to lead to contentious costing disputes.⁶²

52. Next-generation connectivity offered by FTTH and DOCSIS 3.1 networks are the future of broadband and hold the promise to enhance productivity, stimulate new digital technologies, and foster economic development and growth. Current demand for broadband speeds greater than 50 Mbps is limited,⁶³ but expected to grow substantially as consumers and businesses adopt recent advances in technology and future applications for which high-end broadband speed is an important factor.
53. Telecommunication and cable companies are well-aware of the demand for higher broadband speeds in the near future. Guy Lawrence, President and CEO of Rogers, recently stated that “the majority of our new customers are now asking for speeds of 100 megabytes [sic], so it is clear the need for speed is now becoming the norm.”⁶⁴ Looking further ahead, George Cope, President and CEO of Bell Canada, stated regarding Gigabit speeds that “[i]t is very clear to us as we look out over the next five, 10 years the market is going to demand these type of speeds and so we have to start it now so that as broad a footprint as we have when we complete it as those demands grow.”⁶⁵
54. Exempting FTTH facilities and next-generation DOCSIS 3.1 cable networks from mandated access will eliminate wholesale competitors from an important and rapidly growing customer segment in the near future. Reduced choice and the substantial lessening of competition will lead to higher broadband prices and lower adoption of next-generation connectivity deemed to be critical for productivity enhancements and economic growth in the digital economy.

IV.B Hypothesized Impact of Mandated FTTH Access

55. In support of its Petition, Bell Canada provided an economic impact study by Hal Singer measuring the economic impact in terms of employment (jobs) and economic activity (output)

⁶² These disputes over regulatory rules and rate setting in the transport segment would likely continue until consumer demand has predominantly shifted to broadband speeds over 100 Mbps, i.e., when wholesale competitors have lost any ability to constrain the market power of incumbent carriers in retail broadband markets.

⁶³ A majority of residential customers in 2014 subscribed to broadband service with advertised download speeds of 15 Mbps or less (CRTC, *Communications Monitoring Report*, October 2015, Table 5.3.10, <http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2015/cmr.pdf>).

⁶⁴ *Q3 2015 Rogers Communications Inc. Earnings Call*, October 22, 2015, Edited Transcript p. 3, <http://netstorage-ion.rogers.com/downloads/IR/pdf/transcripts/Rogers-2015-Q3-Transcript.pdf>.

⁶⁵ *BCE Q2 2015 Results Conference Call*, August 6, 2015, Transcript p. 13, <http://www.bce.ca/investors/financial-reporting/2015-Q2/2015-q2-transcript.pdf>.

of Bell Canada's planned FTTH deployment in the City of Toronto.^{66,67} This large infrastructure project announced in June 2015 will bring FTTH service to 1.1 million homes and businesses and involves an investment of over \$1 billion over the next two years.⁶⁸ Bell Canada additionally provided a report by Hal Singer, Kevin Caves, and Anna Koyfman which measures the association of FTTH deployment and employment.⁶⁹

56. These reports emphasize two main characteristics of next-generation telecommunication networks: First, the build-out of fibre-to-the-home, or upgrade to DOCSIS 3.1 networks will necessitate billion-dollar capital investments over the coming years. Economic activity associated with the construction of these networks alone is likely to have a substantial employment and output effect on local economies. Second, the widespread adoption of next-generation connectivity by Canadian consumers and businesses has the potential to enhance productivity, allow for innovative business models, strengthen telecommunications infrastructure, stimulate new digital technologies, reshape the nature of work, and foster economic and social growth.
57. From a regulatory perspective, the relevant question is how the wholesale framework can provide favorable conditions for sufficient capital investments to enhance the telecommunications network infrastructure, while also providing Canadian consumers and businesses with competitive retail markets and choice among innovative broadband offerings at affordable prices. Balancing the twin objectives ensures that Canadian consumers and business can take full advantage of new digital opportunities.
58. The construction and build-out of next-generation broadband networks in urban areas, such as Bell Canada's billion-dollar FTTH investment in Toronto, are expected to continue following the CRTC decision to mandate fibre-to-the-home access. This is acknowledged by Bell Canada in its

⁶⁶ Bell Canada Petition, Attachment 1: Hal Singer, *Economic Impact of FTTH Deployment in Toronto*.

⁶⁷ Economic impact studies are based on the input-output methodology, and are commonly used tools for measuring the economic effects generated directly or indirectly due to a change in economic activity, in this case the construction of Bell Canada's FTTH network in Toronto. These studies examine backward inter-industry linkages within an economy to determine which industries supply the required intermediate production inputs, and may also include spillover effects on other industries in the region.

⁶⁸ BCE, "Bell Gigabit Fibe bringing the fastest Internet to Toronto residents with a billion-dollar+ network investment, creation of 2,400 direct jobs," June 25, 2015, <http://www.bce.ca/news-and-media/releases/show/Bell-Gigabit-Fibe-bringing-the-fastest-Internet-to-Toronto-residents-with-a-billion-dollar-network-investment-creation-of-2-400-direct-jobs-1>.

⁶⁹ Bell Canada Petition, Attachment 3: Hal Singer, Kevin Caves and Anna Koyfman, *The Empirical Link Between Fibre-to-the-Premises Deployment and Employment: A Case Study in Canada*.

Petition,⁷⁰ and further manifested by billion-dollar investments in next-generation broadband networks by Telus (Vancouver) and Rogers (entire footprint across Ontario and Atlantic) announced subsequent to the release of TRP CRTC 2015-326.⁷¹

59. Possible marginal investments affected, if any, are likely rural and much smaller in size. Broadband investments in rural areas and in smaller communities are challenging primarily for reasons other than mandated wholesale access. Private sector incentives to invest in broadband networks tend to be low in rural regions, due to a combination of factors such as low population density and challenging terrains.⁷² Provincial and federal governments have implemented a variety of programs (e.g. subsidies, direct investment) to address situations in which markets failed to provide adequate broadband service in rural regions.⁷³
60. Excluding FTTH facilities from mandated access is no panacea to ignite next-generation infrastructure investment in rural area. Despite the absence of mandated FTTH access in the United States, incumbent telecommunications provider Verizon has effectively stopped building out next-generation fibre networks, limiting its FiOS (FTTH) network to densely populated areas

⁷⁰ “Certain large committed investments, typically in the largest urban areas like the investment we have already announced in the City of Toronto, will eventually proceed.” (Bell Canada Petition, ¶123).

⁷¹ “TELUS investing \$1 billion to make Vancouver the world’s next gigabit-enabled city,” October 2, 2015; https://about.telus.com/community/english/news_centre/news_releases/blog/2015/10/02/telus-investing-1-billion-to-make-vancouver-the-world-s-next. “Rogers announces gigabit internet and world’s largest commitment to live sports broadcasting in 4K with HDR,” October 5, 2015; <http://rogers.mediaroom.com/2015-10-05-Rogers-announces-gigabit-internet-and-worlds-largest-commitment-to-live-sports-broadcasting-in-4K-with-HDR>.

⁷² See for example Alcatel-Lucent (2011): *Rural Broadband Financial Modeling*, http://www3.alcatel-lucent.com/belllabs/advisory-services/documents/Rural_Broadband_Financial_Modeling_EN_Market_Analysis.pdf, or Nayan, N., R. Zhao, N. Zhelev, W. Knospe, W., and C. Mas Machuca (2012): “Techno-economic Analysis for Rural Broadband Access Networks,” *AICT 2012: The Eighth Advanced International Conference on Telecommunications*, https://www.thinkmind.org/download.php?articleid=aict_2012_6_10_10039.

⁷³ Rajabiun, R. and C. Middleton (2013): “Rural Broadband Development in Canada’s Provinces: An Overview of Policy Approaches,” *Journal of Rural and Community Development*, 8(2), p 7-22. Canada is not the only country to initiate policies to address rural market failures. In 2009, the United States implemented the Broadband Technology Opportunities Program to accelerate the deployment of advanced broadband networks in unserved and underserved regions of the country and reduce disparities between rural and urban broadband service. The program awarded grants with terms and regulations designed to deepen competition in broadband access markets beyond incumbent service providers (LaRose, R., J.M. Bauer, K. DeMaagd, H.E. Chew, W. Ma, and Y. Jung (2014), “Public Broadband Investment Priorities in the United States: An Analysis of the Broadband Technology Opportunities Program,” *Government Information Quarterly*, 31(1), p.53-64).

in the Northeast and Mid-Atlantic, areas with high spending power.⁷⁴ Following deregulatory decision in 2003 and 2005, many other incumbent telecommunications providers did not invest in FTTH networks until more recently on a limited scale when faced with competition from Google Fiber and municipal networks.^{75,76}

61. The CRTC is currently conducting a proceeding to review basic telecommunications services to examine, among other things, i) its role in ensuring the availability of basic telecommunications services in rural and remote regions, ii) whether a mechanism is required for rural and remote areas to support the provision of modern telecommunications services by funding capital infrastructure investment in transport facilities, including maintenance and enhancement of these facilities.⁷⁷ Rather than excluding FTTH networks from mandated access, thereby substantially lessening retail competition and denying consumers and businesses the benefit of competitive choice among innovative service offerings at affordable prices in urban areas, it is preferable to address challenges in rural broadband deployment with a targeted remedy as considered in the CRTC review of basic telecommunications.
62. In support of its petition to Cabinet, Bell Canada also provided a Policy Brief by Hal Singer ("Policy Brief"), which estimated that the mandate to unbundle fibre-to-the-home access facilities in TRP CRTC 2015-326 will lead to a likely short-run decline in Bell Canada's FTTH investment of 6 to 32 percent (or \$72 to \$384 million) per year in Ontario and Québec, triggering between 2,880 to 15,360 lost jobs, and between \$225 million and \$1.2 billion in reduced economic output per year.⁷⁸

⁷⁴ Wall Street Journal, "Verizon to End Rollout of FiOS", March 30, 2010, <http://online.wsj.com/news/articles/SB10001424052702303410404575151773432729614>; The Buffalo News, "Verizon Still Can't Justify Expanding its FiOS Service", April 21, 2014, <http://www.buffalonews.com/business/verizon-still-cant-justify-expanding-its-fios-service-20140421>). Verizon CEO Fran Shammo stated: "I have been pretty consistent with this in the fact that we will spend more CapEx in the Wireless side and we will continue to curtail CapEx on the Wireline side. Some of that is because we are getting to the end of our committed build around FiOS, penetration is getting higher," Jon Brodtkin, "Verizon nears 'the end' of FiOS builds," January 23, 2015, <http://arstechnica.com/business/2015/01/verizon-nears-the-end-of-fios-builds/>

⁷⁵ CNET, Marguerite Reardon, "Google's fiber effect: Fuel for a broadband explosion," April 30, 2014, <http://www.cnet.com/news/googles-fiber-effect-fuel-for-a-broadband-explosion/>.

⁷⁶ Broadband prices in the United States though are substantially higher compared to Canada or Europe (see Figure 5).

⁷⁷ CRTC, *Telecom Notice of Consultation CRTC 2015-134*, Review of basic telecommunications services, April 9, 2015, ¶133-34, <http://www.crtc.gc.ca/eng/archive/2015/2015-134.htm>.

⁷⁸ Bell Canada Petition, Attachment 2: Hal Singer, *Policy Brief: The Economic Impact of the CRTC's Decision to Unbundle Fibre-to-the-Premises*.

63. The empirical estimates presented in the Policy Brief are based on the difference-in-differences methodology frequently used by economists. This methodology compares the difference in outcomes (before-after) within the market of interest against the difference in outcomes in a benchmark market, i.e. a counterfactual state of the world which is characterized by the absence of the policy intervention.⁷⁹ The key identifying assumption – often referred to by economists as the *common trends* assumption⁸⁰ – assumes that but-for the policy intervention, the two markets would have developed identically. The difference-in-differences methodology controls for changes in common factors affecting both markets, but fails to account for time-varying factors that have a different impact on the two markets unless such factors are explicitly included in the analysis.⁸¹
64. To better understand the underlying methodology used to develop estimates of investment effects, it is revealing to focus on the natural experiment in Canada discussed in the Policy Brief since it is recent and most closely related to the policy of mandated FTTH access. In August 2010, the CRTC determined in Telecom Regulatory Policy CRTC 2010-632, *Wholesale high-speed access services proceeding* (“TRP CRTC 2010-632”) that ILECs and cable carriers are required to provide wholesale high-speed access services to competitors at speeds that match all speed options offered to their own retail customers.⁸² The facilities subject to this wholesale obligation include fibre-to-the-node and DOCSIS 3.0 facilities, fibre-to-the-home facilities were exempted from the mandated access services obligation.⁸³ The Policy Brief employs this distinct treatment of mandated access to aggregated wholesale HSA services using FTTN versus FTTH facilities since 2010 to obtain an estimate of the reduced FTTN investment associated with TRP CRTC 2010-632.

⁷⁹ The methodology can readily be expanded to include additional covariates and allow for regressors other than indicator variables in a regression framework, i.e. Regression-DD (See Angrist, J.D. and J.-F. Pischke, *Mostly Harmless Econometrics: An Empiricist’s Companion* (Princeton: Princeton University Press), 2009).

⁸⁰ See Angrist, J.D. and J.-F. Pischke, *Mostly Harmless Econometrics: An Empiricist’s Companion* (Princeton: Princeton University Press), 2009; Angrist, J.D. and J.-F. Pischke, *Mastering ‘Metrics: The Path from Cause to Effect*, (Princeton: Princeton University Press), 2014.

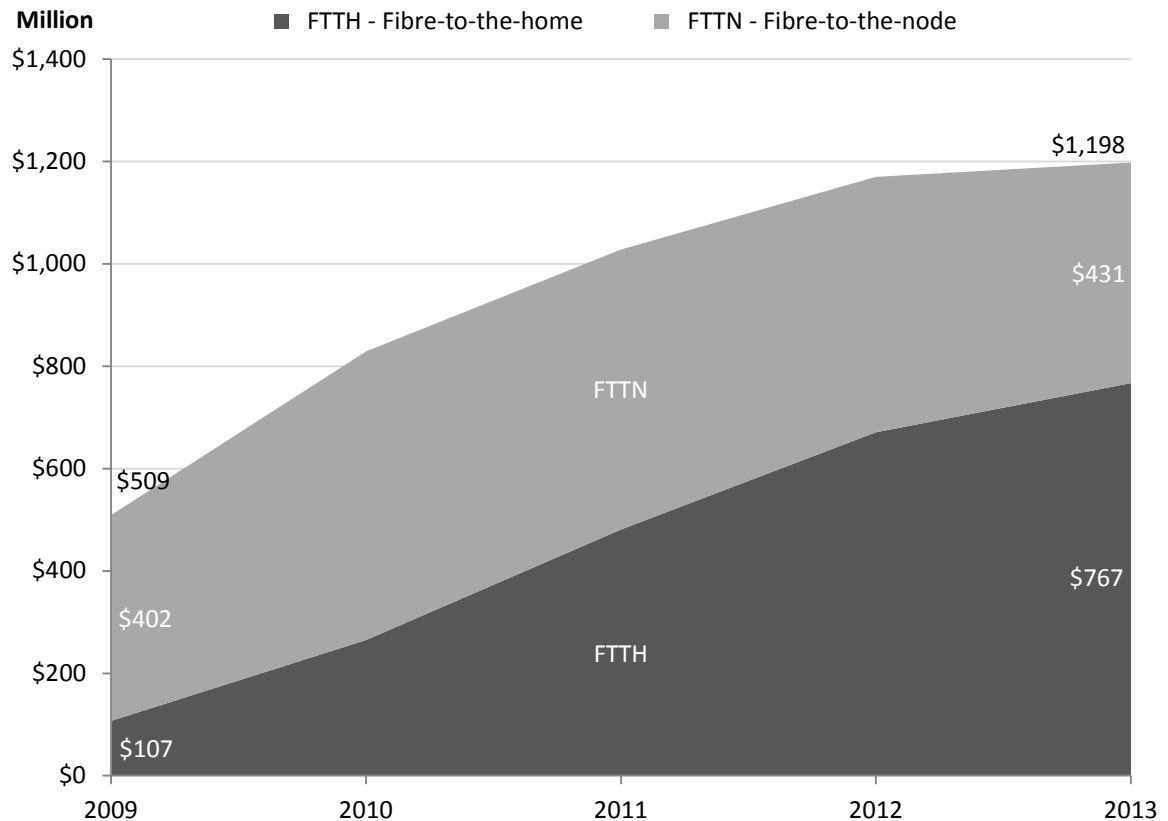
⁸¹ The entire effect is attributed to the policy intervention. Any omitted time-varying factor that has a differential impact on the two markets will bias the difference-in-differences estimate. Biases are a matter of degree, but may be so huge that estimates are completely wrong, including of opposite sign. The common trends assumption could be difficult to verify and might quite commonly be violated in policy evaluation. Additional data on the time period before or after the policy intervention could be used to test the common trends assumption.

⁸² CRTC, *Telecom Regulatory Policy CRTC 2010-632*, Wholesale high-speed access services proceeding, August 30, 2010, <http://www.crtc.gc.ca/eng/archive/2010/2010-632.htm>.

⁸³ *Supra*, note 82, ¶121.

65. For the analysis of this natural experiment, Bell Canada provided annual investment data related to its fibre network deployment by technology for Bell Canada and Bell Aliant (collectively “Bell”) from 2009 through 2013.⁸⁴ Figure 7 shows that total annual fibre investment by Bell Canada and Bell Aliant grew from 509 million in 2009 to 1,198 million in 2013, an increase of over 135% and equivalent to a compound annual growth rate (CAGR) of 24%. Annual investment over this period increased for both fibre technologies: Annual FTTH investment grew by 660 million, an increase of 617% (CAGR: 64%), annual FTTN investment grew by 29 million, an increase of 7% (CAGR: 2%) over this period. Bell’s investment in fibre infrastructure has increased significantly since 2009, and continued to grow following mandated access to FTTN facilities in 2010.

Figure 7: Annual Investment by Technology (Bell Canada and Bell Aliant), 2009 - 2013



Source: Bell Canada, *Policy Brief: The Economic Impact of the CRTC's Decision to Unbundle Fibre-to-the-Premises Networks* (by Hal Singer).

⁸⁴ Bell Aliant provides telecommunication services in Atlantic Canada and various communities in Northern Ontario and rural Quebec. Bell Canada had been its largest shareholder and took full ownership of Bell Aliant in late 2014. The use of the term Bell Canada in this section refers exclusively to the remainder of Bell’s footprint not served by Bell Aliant.

66. In stark contrast, the Policy Brief estimates that the CRTC's policy to mandate access to FTTN facilities in 2010 is associated with a decrease of FTTN investment of \$248.5 million for Bell Aliant, and a decrease of FTTN investment of \$381.3 for Bell Canada.⁸⁵

67. The common trends assumption in this natural experiment described in the Policy Brief supposes that in the absence of the CRTC's policy to mandate access FTTN facilities, FTTN and FTTH investment by Bell Aliant and Bell Canada would have grown at the same rate.⁸⁶ This key identifying assumption is inappropriate in this context and omits important factors relevant to investment decisions and fibre deployment. There exist a multitude of reasons why investment in two different fibre technologies is not expected to grow at same rate, thereby violating the common trends assumption. Many of these reasons have been stated publicly by Bell Canada:

- i. Deployment Cost: The relative cost of deploying FTTN versus FTTH infrastructure and how it changes over time has a significant impact on relative investment growth. While the cost of deploying FTTH for Bell Canada in 2007 was eight to ten times as large as FTTN per home,⁸⁷ the cost differential now is 33%-186%,⁸⁸ in part of Bell Aliant's footprint the cost of deploying FTTH and FTTN is comparable.⁸⁹ Opportunities for increased aerial deployment are associated with substantially lower cost of FTTH deployment as aerial FTTH can be up to 80% less expensive to deploy compared to buried FTTH.^{90,91}

⁸⁵ Policy Brief, p. 9.

⁸⁶ "In the absence of disparate treatment, one would expect investment in the two fibre-based access technologies to grow at the same rate; even if one technology were more popular than the other, the difference should manifest in the levels of investment as opposed to the growth." (*Supra*, note 78, p.7).

⁸⁷ Michael Sabia, chief executive of BCE stated in regards to delivering IPTV over FTTH that "Today we don't see it. [...] When we look at it on a per-home basis, it is eight to ten times on a cost basis what FTTN is ... it's not an option we would be thinking about." (Greg O'Brien, *CARTT* "Commentary: Is fibre-to-the-node good enough?" February 22, 2007, <https://cartt.ca/article/commentary-fibre-node-good-enough>).

⁸⁸ Bell Canada Petition, p. 27.

⁸⁹ "In these particular markets [Fredericton, Saint John], the combination of virtually 100 percent aerial infrastructure and lower population density make the cost of fibre to the home and fibre to the node very comparable." (Bell Aliant, *Q2 2009 Results Conference Call*, Transcript, p.2, http://www.bell.aliant.ca/english/ir/pdf/2009_Q2_transcript.pdf).

⁹⁰ Estimated cost of aerial FTTH deployment are approximately \$400-\$700/premise while buried FTTH deployment is estimated to cost \$1,500-\$2,000/premise; cost per load is estimated at \$900-\$100. (RBC Capital Markets, "Fibre-to-the-home: Playing the long game," *RBC Telecom Scenario Report*, August 19, 2015, p.11, 17, <http://profile.rbcwealthmanagement.com/pictures/account-barnaby.ross/rbc%20telecom%20scenario%20report%20-%20rbc%20cm%20-%2008%2019%202015.pdf>).

- ii. Operating Cost: FTTH infrastructure is associated with lower operating costs through a reduction of customer calls and truck rolls which represent the majority of variable cost for an operator, and lower network maintenance due to lower cost of copper grooming.⁹² For Bell Canada, this has resulted in 40% fewer truck rolls and a 50% reduction in preventative maintenance in FTTH areas compared to FTTN areas.⁹³ Moreover, early experience gained with FTTH deployment leads to increased efficiencies in a phased roll-out.
- iii. Demand and Quality: Consumers prefer FTTH broadband service and are willing to pay for better quality. Bell stated that customer churn is lower (improved customer satisfaction), and broadband usage and average revenue per user (“ARPU”) is higher in areas served by FTTH technology.⁹⁴ As household demand for data and speed increases, FTTH’s quality advantages become increasingly dominant.
- iv. Status of network deployment: Investment in fibre technology can enlarge the footprint covered by FTTx⁹⁵, or it can extend fibre to the home in areas that already have FTTN infrastructure, i.e. overlaying FTTN footprint with FTTH technology. The stage of fibre expansion will affect relative investment growth and a natural shift in investment towards FTTH is expected.⁹⁶ Bell Canada builds exclusively FTTH since at least April 2015.⁹⁷

⁹¹ The ability of deploying 70% aerial using Toronto Hydro poles rather than 50-50 is expected to save Bell Canada more than 200 million of capital and allows for faster build-out of its FTTH infrastructure in Toronto (BCE, Q2 2015 Results Conference Call, August 6, Transcript p.8, <http://www.bce.ca/investors/financial-reporting/2015-Q3/2015-q3-presentation.pdf>).

⁹² Average annual maintenance cost savings for FTTH are estimated to be up to \$100/home (*Supra*, note 90, p. 12).

⁹³ BCE Q3 2015 Results Conference Call, November 5, Transcript p.9, <http://www.bce.ca/investors/financial-reporting/2015-Q3/2015-q3-presentation.pdf>.

⁹⁴ “[I]n the markets where we have fibre right to the home, churn is better, the ARPU is even better, the usage is higher” (BCE Q4 2014 Results Conference Call, February 5, 2015, Transcript p.17, <http://www.bce.ca/investors/financial-reporting/2015-Q3/2015-q3-presentation.pdf>).

⁹⁵ Fibre-to-the-x (FTTx) is a generic term used for different fibre deployment configurations and includes FTTH and FTTN.

⁹⁶ “[T]he footprint expansion is continuing, but the pace of the footprint expansion is clearly less given how far we are and also given now we are taking some of our capital for fibre-to-the-home and overlaying some of our FTTN footprint.” *Supra*, note 93, p.18.

⁹⁷ “[W]e do not do any neighborhoods now that are not Fibre to the home. If it is—if we are building, it is Fibre directly to the home.” (BCE Q1 2015 Results Conference Call, April 30, Transcript p.16, <http://www.bce.ca/investors/financial-reporting/2015-q1-transcript.pdf>).

- v. Competitive environment: The competitive threat from cable companies using DOCSIS 3.x technology capable of delivering Internet speeds not achievable with FTTN is often a key determinant of the timing and type of fibre technology deployed by telecommunications providers. Surging household data demand and the risk of market share losses to cable companies are likely to increase the deployment of FTTH networks capable of Gigabit speeds, particularly in relation to FTTN.⁹⁸

68. All these economic factors have been identified as important drivers of FTTH investments and explain a gradual shift in investment towards FTTH. Without accounting for these relevant economic factors, estimates from the difference-in-differences methodology are misleading and biased.⁹⁹ Yet, the analysis in the Policy Brief does not provide any evidence in support of the common trends assumption, and furthermore ignores all these primary reasons for the shift in investment from FTTN to FTTH and wrongly attributes it to mandated FTTN access.¹⁰⁰ As shown in Figure 7, the combined total fibre investment of Bell Canada and Bell Aliant over this period was substantial, and continued to grow following mandated FTTN access, including its investment in FTTN network infrastructure.

69. To illustrate the critical deficiencies and implausible implications of the common trends assumption in the context of FTTH and FTTN investment, consider for example the estimated decrease in FTTN investment for Bell Aliant. Figure 8 displays actual FTTH and actual FTTN investment by Bell Aliant, as well as the implied FTTN investment in the absence of wholesale obligation on FTTN facilities as estimated by the Policy Brief.

70. The difference-in-difference methodology with the common trends assumption used in the Policy Brief predicts that Bell Aliant's FTTN investment in 2013 would have been \$248.5 million higher in the absence of wholesale obligation on FTTN facilities,¹⁰¹ over 40 times larger than its actual FTTN investment and equivalent to 93% of its actual FTTH investment in that year.

⁹⁸ Cable companies are able to provide speeds up to 250 Mbps over 95% of their footprint, with the rollout of DOCSIS 3.1 to further boost Internet speeds on cable networks. This compares to 50 Mbps for the typical FTTN network, 100 Mbps in some areas (*Supra*, note 90, p. 13).

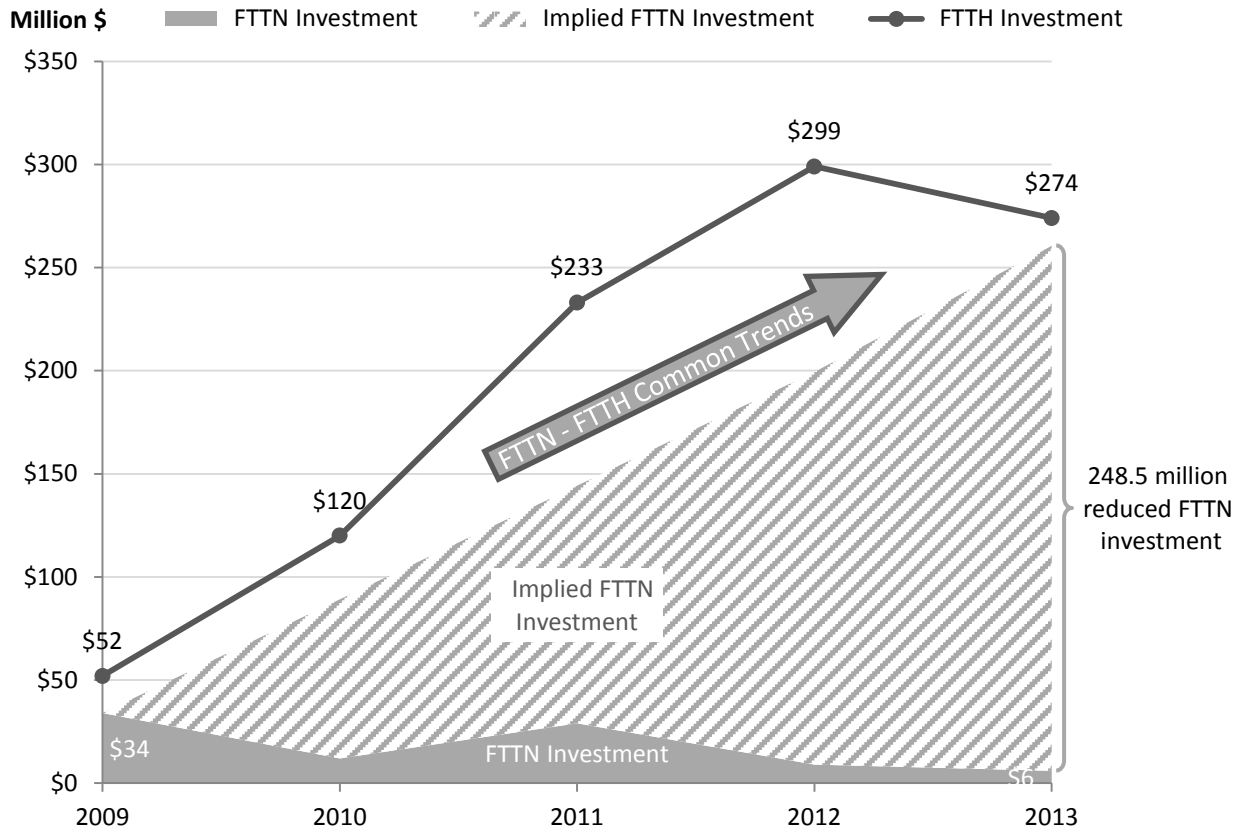
⁹⁹ "An econometrician using such a difference-in-differences model must be prepared to discuss the relevance of any benchmark markets or products, whether such a model controls for all appropriate factors that may confound the comparison, whether the pre-period is relevant and representative, and so forth." (ABA Section of Antitrust Law, *Econometrics*, 2nd Edition, 2014, p.74).

¹⁰⁰ While the Policy Brief acknowledges that there are other factors that affect the relative benefits of FTTH and FTTN investment, the analysis makes no attempt to control for any of these factors commonly identified to affect the deployment of fibre technologies (Policy Brief, p.9).

¹⁰¹ Policy Brief, p.9.

Besides, Bell Aliant would have invested over 500 million from 2009 to 2013 building a technologically inferior FTTN network in its service area.

Figure 8: Bell Aliant's FTTN and FTTH Investment Assuming Common Trend, 2009-2013



Source: Bell Canada, *Policy Brief: The Economic Impact of the CRTC's Decision to Unbundle Fibre-to-the-Premises Networks* (by Hal Singer), pp. 9-10.

71. This estimate is nonsensical, implausible, and entirely unrelated to the CRTC's policy to mandate access to FTTN facilities in 2010. In June 2009, *before* the CRTC mandated FTTN access, Bell Aliant commenced its FTTH build in Fredericton and Saint John. Bell Aliant continued to focus on FTTH deployment after 2009 instead of FTTN as the cost of moving straight to FTTH was only three percent (3%) more than moving to FTTN and FTTH was perceived to be a better long-term investment than FTTN.¹⁰²

72. More specifically, the FTTH build was preferable because low population density, a predominantly aerial footprint (80-85%), and long loop lengths accounted for the fact that the costs of deploying FTTH, the superior and future-proof technology, were similar to deploying

¹⁰² Examination of Bell witnesses at the hearing initiated by TNC 2013-551, *supra*, note 5, on November 26, 2014. See volume 3 of the transcript of the hearing at lines 3665 through 3674 and 3897 through 3905, <http://www.crtc.gc.ca/eng/transcripts/2014/tt1126.htm>.

FTTN.¹⁰³ Nine month into its FTTH build and *before* the CRTC mandated FTTN access, Bell Aliant indicated that all internal targets were met or exceeded, and announced an *accelerated* FTTH network build-out.¹⁰⁴ At the end of 2014, subscriber penetration tracked ahead of Verizon's penetration curve in the US, television and triple play attach rates of 90-95% were higher than expected, subscriber consistently migrated to higher tiers, subscriber churn was lower, and demand consistently outstripped Bell Aliant's installation capacity.¹⁰⁵

73. Given this business environment, an assumption that the growth of FTTN investment would have been similar to FTTH investment growth in the absence of mandated FTTN access – either for Bell Aliant or its corporate parent Bell Canada – is untenable, and leads to misleading estimates and erroneous policy implications.

74. The Policy Brief describes a second natural experiment in the United States where the Federal Communication Commission (“FCC”), following the Telecommunications Act of 1996,¹⁰⁶ required telecommunications companies to share network elements with competing carriers, a requirement not imposed on cable providers.¹⁰⁷ Following extensive litigation, the FCC in 2003 declared DSL an “information service” with fewer regulatory restrictions, and in 2005 entirely abolished mandated unbundled network elements (“UNEs”) and placed all wireline broadband service providers under the same regulatory regime.

¹⁰³ “In these particular markets [Fredericton, Saint John], the combination of virtually 100 percent aerial infrastructure and lower population density make the cost of fibre to the home and fibre to the node very comparable. These factors and the support of the New Brunswick government made this the right time and the right place for us to launch FTTH to entire communities. The response from customers and businesses to our announcements in these areas has been tremendous.” (Bell Aliant, *Q2 2009 Results Conference Call*, Transcript, p.2, http://www.bell.aliant.ca/english/ir/pdf/2009_Q2_transcript.pdf).

¹⁰⁴ “The capabilities of FTTH and our largely aerial infrastructure make it the ideal architecture to address the growing bandwidth needs of our customers. With our competitive environment increasing in size and intensity and the early success we’ve had in our Fredericton and Saint John markets, we believe that now is the time to accelerate our FTTH investment. FTTH will help us grow revenue, retain and gain customers, provide more and better services and reduce future costs. Most importantly, it can meet the technology demands of the future, giving us a clear, competitive advantage; that’s why we call it future-proof.” (p.2) “[W]e are meeting or exceeding every target that we’ve put in place for fibre to the home on both the sales side, the mix side, how much television we’re selling, as well as costs. (p.7) (Bell Aliant, *Q1 2010 Results Conference Call*, Transcript, http://www.bell.aliant.ca/english/ir/pdf/2010_Q1_transcript.pdf).

¹⁰⁵ *Supra*, note 90, p. 15.

¹⁰⁶ Pub. L. No. 104-104 (US).

¹⁰⁷ While cable broadband was treated as “information services” with less regulatory restrictions, DSL services provided by telecommunications companies were regulated as “telecommunications services”. This asymmetric treatment made little sense as cable providers gained a dominant share in the broadband market.

75. The difference-in-differences methodology, comparing the growth rate of capital expenditures of telecommunications companies to that of cable companies, suffers from the same underlying analytical deficiency in the common trends assumption. This assumption is inappropriate in the context of comparing investment in two dissimilar technologies as it does not control for factors likely to affect investment growth such as the state of network roll-out, changes in operating or deployment cost, the competitive environment, or differences in the technology upgrade path.¹⁰⁸ Assuming that the investment growth of two technologies with fundamentally different technological characteristics, demand, and cost conditions would be equal is inherently problematic, more so in the telecommunications industry which is characterized by rapid technological innovation.¹⁰⁹
76. Aside from the two natural experiments, the Policy Brief lists a few selective studies that do not reflect the breadth of empirical findings published in the academic literature, nor do the studied regulatory policies resemble regulatory measures implemented in TRP CRTC 2015-326. In contrast, a recent comprehensive survey of the academic literature concluded: “While there is a sizeable empirical literature on the relationship between bottleneck access regulation and telecommunications infrastructure investment, there exist enough data problems and enough heterogeneity in the results to prevent clear-cut conclusions.”¹¹⁰ Inferences from a few selective studies – based either on a comparison of wireline to wireless investment in the United States, or on European cross-country comparisons of an index of regulatory intensity in the late 1990s and early 2000s – provide little guidance in assessing the potential policy implications of TRP CRTC 2015-326.

¹⁰⁸ For example, the analysis does not account for the overinvestment and unsustainable capital expenditures of telecommunications companies in the run-up to the telecom crash in 2000 (See for example E.A. Couper, J.P. Hejkal, and A.L. Wolman (2003): “Boom and Bust in Telecommunications”, *Economic Quarterly*, Federal Reserve Bank of Richmond, 89(4), pp. 1-24). Excessive capital expenditures in the telecommunications sector in the late 1990s coupled with a prolonged recovery period following the bust implies that the pre-period is not representative of telecommunications investment and an estimate based on difference-in-differences biased and misleading.

¹⁰⁹ The assumption of equal investment growth implies that investment in a new, superior technology can never overtake and outgrow investment in an older, inferior technology as costs of the superior technology decrease or technological limits of the inferior technology become insufficient to satisfy consumer demand.

¹¹⁰ Vogelsang, I. (2013): “The Endgame of Telecommunications Policy? A Survey,” *Review of Economics*, 64(3), pp. 193-269, at 215. For a comprehensive overview of the literature, see also Cambini, C. and Y. Jiang (2009): “Broadband Investment and Regulation: A Literature Review,” *Telecommunications Policy*, 33, pp. 559–574; or Bourreau, M., C. Cambini, and P. Doğan (2013): Access Regulation and the Transition from Copper to Fiber Networks in Telecoms, *EUI Working Paper*, RSCAS 2013/52, July, Robert Schuman Centre for Advanced Studies, Florence School of Regulation, http://cadmus.eui.eu/bitstream/handle/1814/27597/RSCAS_2013_52.pdf?sequence=1.

77. The key identifying assumption of the empirical framework used in the Policy Brief is untenable, unsound from both an economic and business perspective, and the derived estimate of the hypothesized impact on FTTH investment is deeply misleading.¹¹¹ Neither the natural experiments nor the few selective studies discussed in the Policy Brief provide credible estimates of the investment effect of the CRTC's policy to mandate the provision of disaggregated wholesale high-speed access services (including FTTH), particularly given TRP CRTC 2015-326 is technology neutral and implemented in conjunction with the removal of wholesale rate regulation for the transport component of HSA services.

IV.C Investments in Next-Generation Broadband Networks

78. Following the release of TRP CRTC 2015-326 on July 22, 2015, incumbent broadband providers have issued public statements and reports to their shareholders and investors commenting on the CRTC decision and its impact on their investment plans and capital expenditures associated with fibre-to-the-home or next generation cable networks (DOCSIS 3.1).

79. Bell has stated that its billion-dollar FTTH investments in urban areas will proceed,¹¹² and that its "overall capital intensity in 2016 will again be in the range of 16% to 17%, as we continue our fiber build out throughout Ontario, Quebec, and Atlantic Canada."¹¹³ Telus also continues to invest and expand its fibre-to-the-home network.¹¹⁴ In June 2015, Telus announced a \$1 billion investment in Edmonton to connect 90 percent of homes and businesses in the city directly to its fibre optic network over the next six years.¹¹⁵ Subsequent to the release of TRP CRTC 2015-

¹¹¹ Any subsequent conversion of investment effects into employment and output effects is of little meaning if it is based on an implausible estimate of the policy's effect on investment.

¹¹² *Supra*, note 70.

¹¹³ *BCE Q3 2015 Results Conference Call*, November 5, Transcript p.7, <http://www.bce.ca/investors/financial-reporting/2015-Q3/2015-q3-transcript.pdf>. "Although it is not possible at this time to assess the financial impact of Telecom Decision 2015-326, it could have a negative effect on our business and financial performance as it is progressively implemented over the next few years. However, the nature of such effect, if any, will only be ascertainable once the CRTC has completed its costing models and set the wholesale access rates to be charged by the incumbent telephone companies and cable carriers." (*BCE 2015 Second Quarter Shareholder Report*, August 5, 2015, p.32, <http://www.bce.ca/investors/financial-reporting/2015-Q2/2015-q2-shareholder-report.pdf>).

¹¹⁴ As of September 2015, Telus's gigabit-capable fibre-optic network covered approximately 0.64 million homes and businesses (*TELUS Quarterly Report*, Q2 2015, p. 18; <http://about.telus.com/community/english/investor-relations/financial-documents/quarterly-reports-archive>).

¹¹⁵ "New TELUS fibre optic network will help spur the next wave of social and economic opportunity for Edmonton," June 19, 2015; <http://about.telus.com/community/english/news-centre/news-releases/blog/2015/06/19/test>.

326, Telus announced in October 2015 a \$1 billion investment to connect more than 400,000 homes and businesses in Vancouver directly to its fibre network over the coming five years.¹¹⁶

80. Regarding TRP CRTC 2015-326, Telus stated in its Q2 2015 Quarterly Report that it “anticipates no material adverse impact from the CRTC’s decision in the short term. Given the phased implementation of certain aspects of the decision (including the introduction of a disaggregated wholesale high-speed Internet access service for competitors), it is too early to determine what impact this decision will have on TELUS in the longer term.”¹¹⁷

81. On the investor conference call on August 7, 2015, then Executive Chair and now President and CEO Darren Entwistle remarked on Telus’s fibre deployment: “I look at the regulatory window of opportunity and I think it’s attractive. Over the last 15 years, that hasn’t always been the case. But, I think smart companies leverage windows of opportunity. And, I think we have that on the regulatory front. We’ve seen a buttressing of infrastructure-based competition in recent decisions. I think that’s a good thing.”¹¹⁸ On November 5, 2015, Darren Entwistle further stated: “In terms of wholesale wireline, there is an area where I think we’ve got a terrific window of opportunity as it relates to our fibre build in Western Canada. We’ve got great technology. We’ve got a great TV product. We’ve got a favorable regulatory environment. We’ve got a strong competitive juxtaposition versus our competitive peer in this particular industry right now and we’ve got pretty sexy economies of scope to leverage.”¹¹⁹

82. Following the release of TRP 2015-326, Rogers announced in October 2015 that it will start to roll-out next generation internet speeds in downtown Toronto and the GTA, with gigabit internet available to over four million homes in its entire footprint across Ontario and Atlantic Canada by the end of 2016.¹²⁰

83. During the company’s second quarter earnings call on July 23, 2015, Guy Lawrence, President and CEO of Rogers, stated that the CRTC decision “appears to create a more level playing field

¹¹⁶ “TELUS investing \$1 billion to make Vancouver the world’s next gigabit-enabled city,” October 2, 2015; https://about.telus.com/community/english/news_centre/news_releases/blog/2015/10/02/telus-investing-1-billion-to-make-vancouver-the-world-s-next.

¹¹⁷ *Supra*, note 114, p. 43.

¹¹⁸ *TELUS Q2 2015 Investor Conference Call*, August 7, 2015, Transcript p. 11; <http://about.telus.com/servlet/JiveServlet/downloadBody/5798-102-1-6437/TELUS%20Q2%202015%20conference%20call%20transcript.pdf>.

¹¹⁹ *TELUS Q3 2015 Investor Conference Call*, November 5, 2015, Transcript p. 9; <http://about.telus.com/servlet/JiveServlet/downloadBody/5798-102-1-6437/TELUS%20Q3%202015%20conference%20call%20transcript.pdf>.

¹²⁰ “Rogers announces gigabit internet and world’s largest commitment to live sports broadcasting in 4K with HDR,” October 5, 2015; <http://rogers.mediaroom.com/2015-10-05-Rogers-announces-gigabit-internet-and-worlds-largest-commitment-to-live-sports-broadcasting-in-4K-with-HDR>.

between cableco and telco providers of high-speed Internet offerings in that it won't exempt telco fiber to the home from wholesale requirements. Assuming the CRTC gets the cost models right, we see little risk that the overall regime will hinder continued network investment by incumbent providers. Over time it also seems that the decision will require resellers to invest more in infrastructure which is a fairer sharing of the required costs as more consistent with a facilities-based competition model."¹²¹

84. The sentiment that incumbent providers will continue to invest and deploy fibre-to-the-home following mandated access is shared by financial analysts. For example, the RBC Telecom Scenario Report *Fibre-to-the-home: Playing the long game* – a comprehensive 30-page report on FTTH networks in Canada issued on August 19, 2015 – states with respect to TRP CRTC 2015-326: “While mandated access to FTTH could act as a disincentive for FTTH deployment, we expect the incumbents to largely proceed with current FTTH plans as the impact of this decision should be manageable for three reasons: (i) the use of Phase II costing, which should prevent an “unfair” tariff regime from being implemented; (ii) the requirement under the disaggregated wholesale HSA services model for competitors to invest in interconnection (which requires scale and is consistent with facilities-based competition); and (iii) the ability for incumbents to more aggressively push the quadplay as well as other services in the bundle should Internet re-sellers gain greater traction over time.”¹²²

85. Announcements of sizable next generation broadband infrastructure investments, public statements and investor reports from incumbent broadband providers, as well as a comprehensive review of FTTH networks in Canada by financial analysts subsequent to the release of TRP CRTC 2015-326 are consistent with the CRTC’s expectation that incumbent carriers will continue to invest in FTTH to respond to consumer demand and to compete with cable carriers, particularly in urban areas.¹²³

V. Conclusion

86. The CRTC policy established in TRP CRTC 2015-326 is based on sound economic principles embodied in the essential facility test. The policy is technologically neutral, encourages facilities-based competition where feasible, and fosters competition through mandated wholesale access where pure facilities-based competition is insufficient or incapable of inducing

¹²¹ Q2 2015 Rogers Communications Inc. Earnings Call, July 23, 2015, Edited Transcript p. 4, <http://netstorage-ion.rogers.com/downloads/IR/pdf/transcripts/Rogers-2015-Q2-Transcript.pdf>.

¹²² *Supra*, note 90, p. 14.

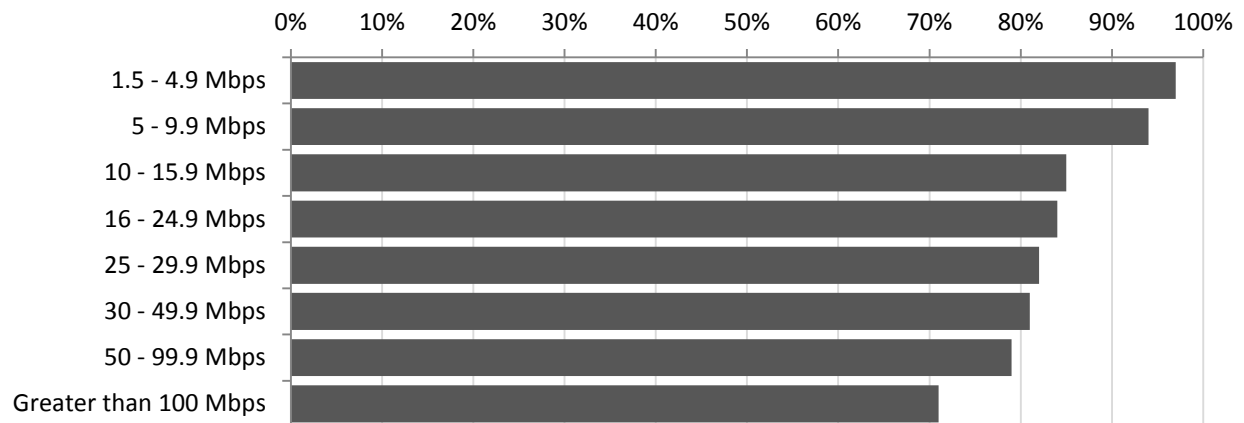
¹²³ *Supra*, note 1, ¶141.

vigorous retail competition and providing consumers with choice. With the transition to mandated disaggregated wholesale HSA service, the Commission exposes additional network elements to market forces, and encourages investment in middle-mile facilities by competitors.

87. Next-generation connectivity offered by FTTH and DOCSIS 3.1 networks are the future of broadband and hold the promise to enhance productivity and foster economic development and growth. Exempting FTTH facilities and next-generation DOCSIS 3.1 cable networks from mandated access will eliminate wholesale competitors from an important and rapidly growing customer segment in the near future, reduce choice, and substantially lessen retail broadband competition, which would likely lead to higher prices and lower adoption of next-generation connectivity.
88. The Commission examined the potential disincentive to invest when access to FTTH facilities is mandated. It deemed any negative impact on investment unlikely to occur to any significant degree and expects incumbents to continue to invest in fibre access facilities. Bell Canada's Petition does not provide credible estimates of the investment effect of the CRTC's policy. Furthermore, recent announcements of next generation broadband investments, public statements by incumbent broadband providers, and a comprehensive financial analysis of FTTH networks in Canada support the CRTC's expectation: Incumbent carriers will continue to invest in FTTH infrastructure to respond to consumer demand and to compete with cable carriers, particularly in urban areas.

Appendix A Additional Figures and Tables

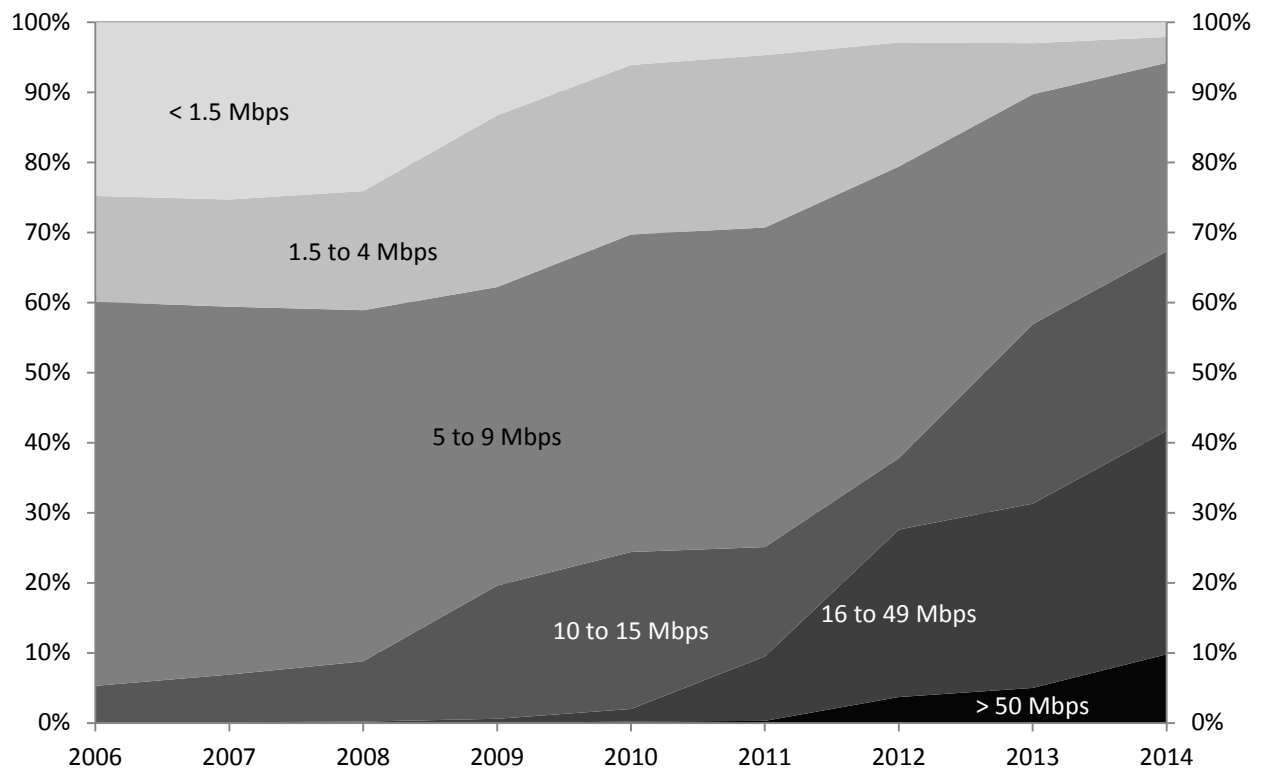
Figure A-1: Broadband Availability by Speed, 2014 (Percentage of Households)



Note: Excludes satellite and mobile technologies.

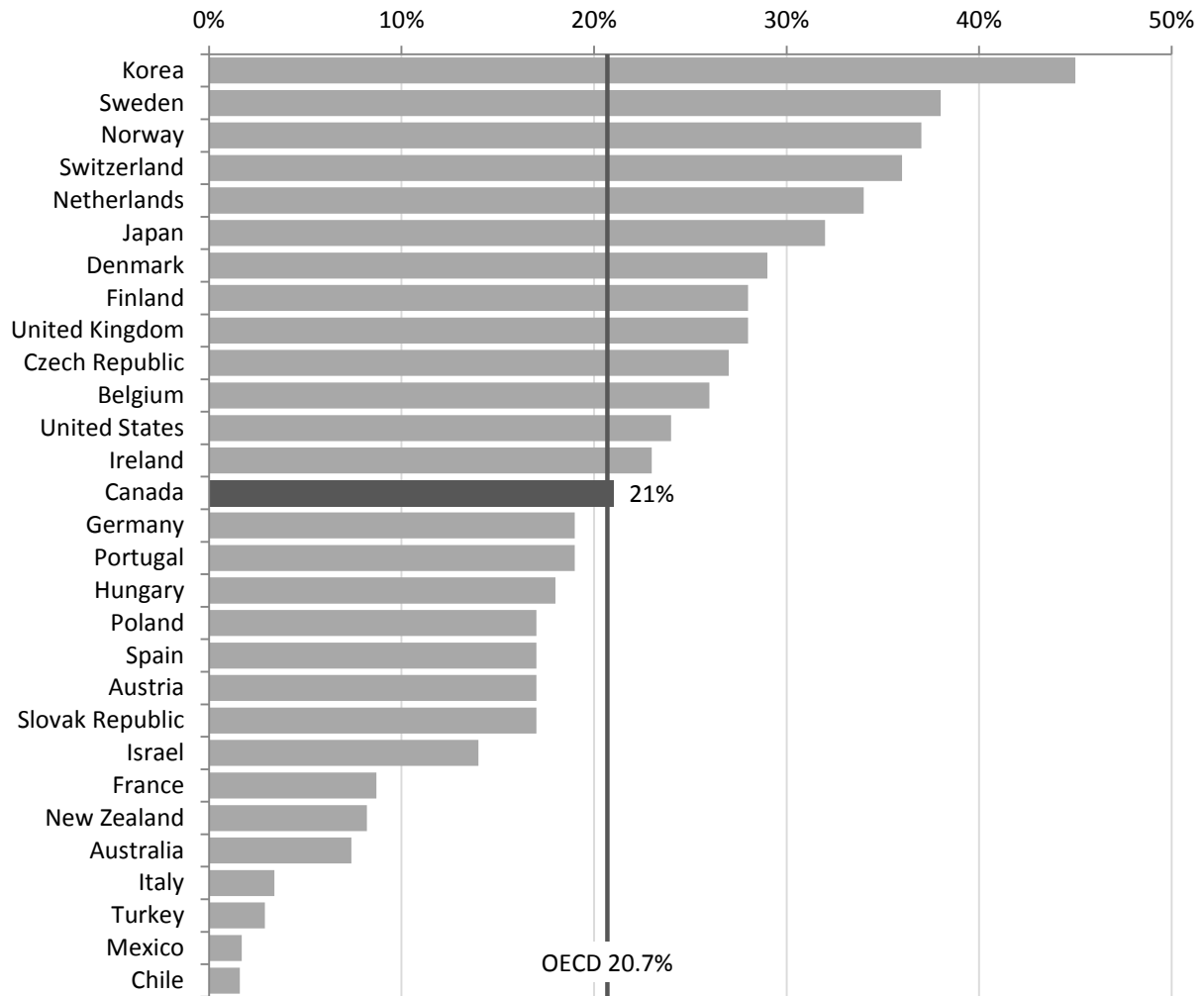
Source: CRTC Communications Monitoring Report 2015, Figure 5.3.16.

Figure A-2: Residential Internet Subscription, by Speed Tier (2006-2014)



Source: CRTC, Communications Monitoring Reports 2011-2015.

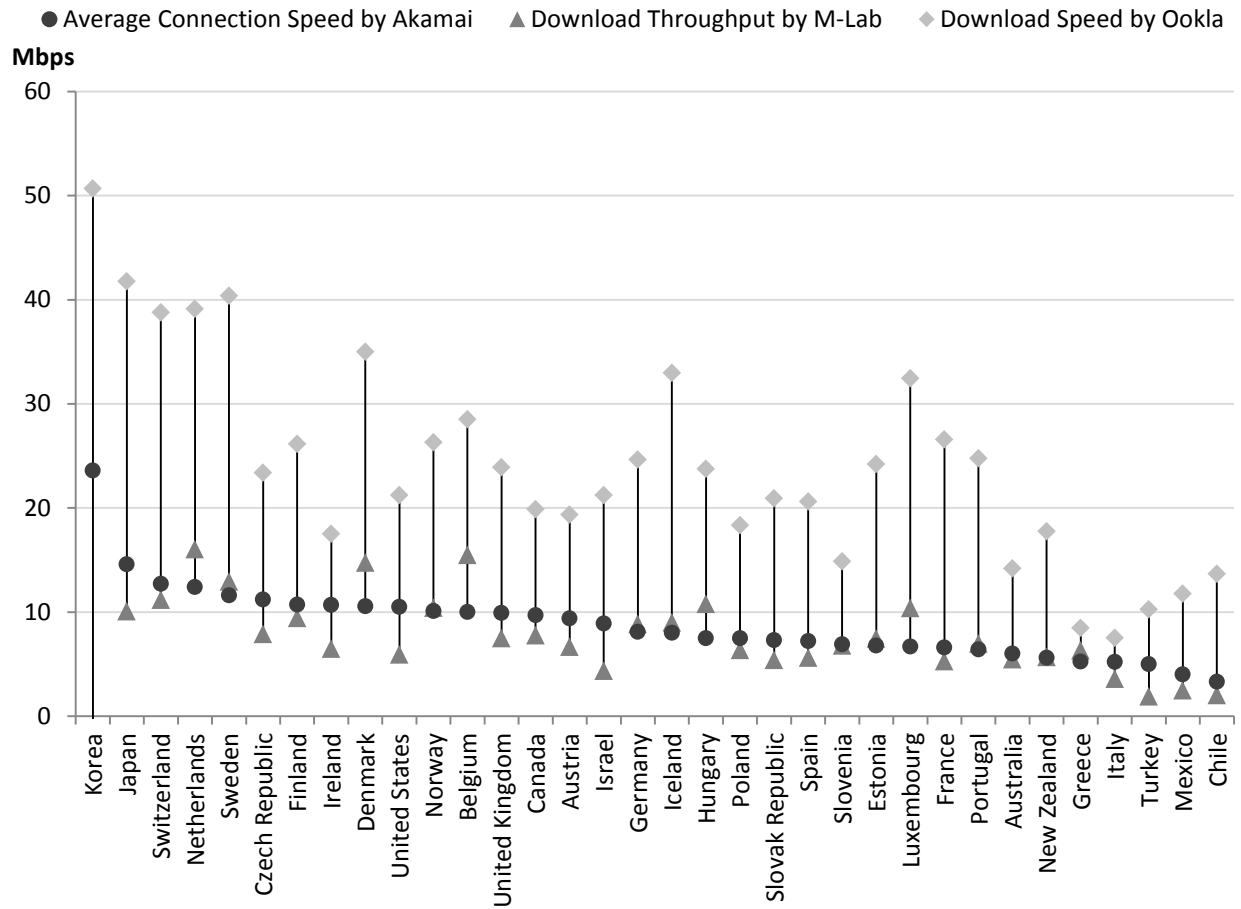
Figure A-3: Percentage of Broadband Connections Above 15 Mbps, OECD Countries, 2015



Note: Includes connections to Akamai at speeds greater than 15 Mbps. No data available for Estonia, Greece, Iceland, Luxembourg, and Slovenia.

Source: Akamai, State of the Internet Report Q3 2015, <https://www.stateoftheinternet.com/resources-connectivity-2015-q3-state-of-the-internet-report.html>.

Figure A-4: Actual Fixed Broadband Download Speeds, Akamai, M-Lab, and Ookla, Q1 2014



Source: OECD Digital Economy Outlook 2015, Figure 2.30, <http://www.oecd.org/internet/oecd-digital-economy-outlook-2015-9789264232440-en.htm>

Appendix B Curriculum Vitae of Dr. Markus von Wartburg

MARKUS VON WARTBURG, Ph.D.

Senior Economist, Analysis Group

Phone: +1 (514) 394-4489

1000 de la Gauchetière Ouest, bureau 1200

E-mail: mvonwartburg@analysisgroup.com

Montréal, QC, H3B 4W5, Canada

Dr. von Wartburg specializes in the application of econometric methods and microeconomic theory to complex problems in antitrust, finance, commercial litigation, intellectual property and pharmacoeconomics. His primary expertise is in the theory of industrial organization, antitrust and competition economics, and applied microeconomic theory. He assisted testifying experts in engagements as diverse as the assessment of class certification claims in technology and financial services industries, the quantification of the economic impact of price-fixing conspiracies, the competitive assessment of horizontal and vertical mergers, the estimation of damages from breach of contract, and the analysis of clinical trial data in patent infringement cases. Dr. von Wartburg has served as an economic expert on investment and competition in the telecommunications industry. Prior to joining Analysis Group, Dr. von Wartburg lectured on strategy and game theory at the University of British Columbia.

CITIZENSHIP

Dual Swiss and Canadian citizenship

LANGUAGES

German (Native), English (Fluent), French (Elementary).

EDUCATION

Ph.D. Economics, Vancouver School of Economics, University of British Columbia, Vancouver, Canada.

Specialization: Industrial Organization

M.A. Economics, University of Toronto, Toronto, Canada.

B.A. Economics, Simon Fraser University, Burnaby, Canada.

PROFESSIONAL EXPERIENCE

- 2008 - present Analysis Group, Montreal, Canada
Senior Economist (2013 – present)
Economist (2008 – 2012)
- 2006 - 2007 University of British Columbia, Vancouver, Canada
Sessional Lecturer (Department of Economics)

SELECTED CASEWORK AND CONSULTING EXPERIENCE

Antitrust

- Assisted affiliate expert Prof. Edward A. Snyder on behalf of a group of TFT-LCD panel manufacturers accused of operating a global price-fixing cartel in preparation of reports assessing class certification claims and quantifying economic damages of indirect purchasers of TFT-LCD panels.
- Supported a testifying expert in quantitatively assessing the likelihood and the economic impact of alleged price-fixing conspiracies in a multidistrict class action matter in the chemical industry.
- Assisted a testifying expert on behalf of the U.S. Department of Justice in assessing market power and substitutability in the payment card industry.

Mergers and Acquisitions

- Supported Prof. Roger Ware on behalf of a media and communications company through Canadian Radio-Television and Telecommunications Commission (CRTC) hearings concerning the potential for anti-competitive behavior by vertically integrated firms in the broadcasting/distribution market.
- Assisted an affiliate expert on behalf of an agricultural commodities manufacturer in the dialogue with competition authorities with the identification of relevant antitrust issues, product and geographic market delineation, and spatial competition analyses arising from an acquisition in the agricultural sector.
- Provided consulting support to counsel in analyzing the incentives and the potential effects of input foreclosure associated with a vertical merger of industrial equipment manufacturers under review by competition authorities.
- Assisted an internal expert on behalf of the Competition Bureau in assessing the competitive effects of a large merger in the newspaper industry in Canada.

Telecommunications

- Supported Prof. Roger Ware on behalf of a media and communications company through Canadian Radio-Television and Telecommunications Commission (CRTC) hearings concerning the

potential for anti-competitive behavior by vertically integrated firms in the broadcasting/distribution market.

- Assisted Dr. Marc Van Audenrode on behalf of Ontario Energy Board staff in evaluating the level of competition and Toronto Hydro's market power in the provision of pole access for wireless telecommunication attachments in the City of Toronto.
- Supported Prof. Roger Ware on behalf of a cable company in regulatory hearings determining wireline pole attachment rates in different provinces.
- Filed an expert report on investment and competition in the wholesale telecommunications services market and testified before the Canadian Radio-Television and Telecommunications Commission (CRTC) in the hearing on the review of wholesale services and associated policies.

Patents and Intellectual Property

- Assisted an expert with meta and post-hoc analyses of clinical trial data through expert reports, depositions and trial testimony in connection with a patent infringement arising from an ANDA filing by generic drug manufacturers seeking approval to market a generic version of the brand-name drug.
- Supported a testifying expert on behalf of a technology company in assessing the value of specific mobile phone features and evaluating damages originating from patent infringement claims employing a demand estimation model based on eBay auctions.
- Conducted a multi-stage forward and backward patent citation analysis to assess the value and technological impact of a donated patent portfolio within its technical field in the context of IP technology transfers at universities.

Securities and Finance

- Implemented financial simulations to analyze the economics of 401(k) retirement plans and their fee structure in an arbitration matter regarding a breach of contract in the sale of a retirement plan business.
- Assisted an expert witness in evaluating management fees and economies of scale on behalf of a mutual fund company against allegations it charged excessive management fees in violation of Section 36(b) of the Investment Company Act of 1940.
- Supported different testifying experts on behalf of a large US bank in a series of securities lending actions concerning allegations that the defendant had potential conflicts of interest, and that its investment managers did not follow cash collateral investment guidelines during the 2008 financial crisis.
- Developed financial market simulations of implied market risk during the 2008 financial crisis to estimate fair price valuation of collateral securities in a bankruptcy case.

Health Outcomes Research and Pharmacoeconomics

- Implemented discrete-event simulations and Markov simulation models to assess the cost-effectiveness of pharmacotherapies.

- Prepared budget impact analyses, pharmacoeconomic analyses, and net impact analyses for submission to public health authorities in support of formulary listing of prescription medications.
- Employed innovative statistical methods on behalf of a non-profit organization to analyze efficacy data from double-blind placebo controlled clinical trials for rare diseases.

Strategy

- Implemented detailed economic impact studies based on the input-output methodology on behalf of two of the largest US technology companies to assess their economic contribution and employment impact on the US economy (including specific states) and European economies.

PROFESSIONAL AFFILIATIONS

Canadian Economic Association (Member)

American Economic Association (Member)

Canadian Bar Association (Affiliate, Competition Law Section)

American Bar Association (Associate, Antitrust Law)