Competition Bureau Canada
Market Study Notice: Competition in Broadband Services

Expert Report of Dr. Robert W. Crandall

I. Introduction and Qualifications

My name is Robert W. Crandall. I am an economist specializing in industrial organization, regulation, and competition policy. I was a Senior Fellow in Economic Studies at the Brookings Institution in Washington, DC, for thirty-nine years, where I authored or co-authored 16 books and numerous articles. Previously, I taught at the Massachusetts Institute of Technology, the University of Maryland, and George Washington University. I also taught a course in antitrust policy with Professor Phillip Areeda at the Harvard Law School. I am currently and Non-Resident Senior Fellow at the Technology Policy Institute in Washington, DC. I received my MA and PhD in Economics from Northwestern University.

In recent years, I have concentrated on regulatory policy and competition policy in the communications sector. I have written numerous books and journal articles on the effects of regulation and competition policy in telecommunications. I have provided consulting services to the Antitrust Division of the U.S. Department of Justice, the Federal Trade Commission, the Federal Communications Commission, and the Canadian Competition Bureau. In addition, I have consulted for several U.S. and Canadian companies on matters involving competition policy and economic regulation. A copy of my CV is attached to this report.

I have been asked by TELUS to prepare a report that responds to the Competition Bureau's (The Bureau's) Market Study Notice on Competition in Broadband Services. Specifically, my report will provide an analysis of the implicit assumptions in the Notice's "Purpose of the study" and respond to questions c) and d) in the Notice's "Scope of the study."

II. The Market Study

The Bureau's Market Study appears to be based on an assumption that the Canadian residential broadband "market" is comprised of just two wireline facilities-based carriers and a number of independent resellers and that, as result, Canadians may suffer from high prices for broadband Internet connections.[1] Given the data on wireless usage and the prospects for further expansion of wireless access as 5G technology is deployed, the Bureau should reexamine both of these assumptions as it proceeds with this Market Study. As I shall show, the relevant market for consumer broadband Internet services in Canada includes more than just broadband wireline

[1] Competition Bureau Canada, Market Study Notice: Competition in Broadband Services, §2.

services, and the prices of these broadband services are reasonable, particularly in a country of such low population density.

A. Market Definition

The Notice begins by observing that "[T]he Canadian Radio-television and Telecommunications Commission (CRTC) has historically taken action to increase the level of competition in Canadian broadband *markets* by allowing independent resellers to use existing telephone and cable networks to provide internet services to Canadians" and that "Most Canadian homes are served by two networks capable of providing broadband internet services: one owned by the local telephone company and the other owned by the local cable company." Finally, the Notice asserts that "The purpose of this Study is to better understand these *market* outcomes and the competitive dynamics of Canadian broadband markets more generally."[2] (emphasis added)

Taken together, these statements imply that the Bureau views the broadband market as comprised solely of fixed wireline broadband services. It would be inappropriate for the Bureau to proceed with any analysis of competitive dynamics of Canadian broadband markets without first justifying carefully considering whether this is an appropriate market definition. Given the incredible growth in the use of wireless devices to access the Internet, it is unlikely that the Bureau could support a conclusion that wireline broadband services are in a separate market from wireless broadband services.

1. The Identification of a Relevant Market

Conventional antitrust analyses of market power begin with the definition of the relevant market. Carlton and Perloff provide a succinct definition of the extent of a product market in their textbook, *Modern Industrial Organization.* They note that:

> "A proper definition of the product definition of a market should include all those products that are close demand or supply substitutes. Product B is a *demand substitute* for A if an increase in the price of A causes consumers to use B instead. Product B is a *supply substitute* for B if, in response to an increase in the price of A, firms that are producing B switch some of their production to the production of A."[3]

The determination of the relevant product market for the purposes of competition policy often involves using the "hypothetical monopolist test" advanced in the *Merger Enforcement Guidelines* developed by the Competition Bureau:

[2] Market Study Notice, §4-7.
[3] Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization.* Addison Wesley, 2000, p. 612.

> "Conceptually, a relevant market is defined as the smallest group of products, including at least one product of the merging parties, and the smallest geographic area, in which a sole profit-maximizing seller (a "hypothetical monopolist") would impose and sustain a small but significant and non-transitory increase in price ("SSNIP") above levels that would likely exist in the absence of the merger."[4]

If this hypothetical monopolist of a given product or service could raise price profitably because customers would not or could not shift sufficiently to substitute products or services to make the price increase unprofitable, this product or service would constitute an antitrust market. On the other hand, if customers shifted to other products or services in sufficient numbers to render such a price increase unprofitable, these substitutes would have to be added to the market definition.[5]

In practice, defining an antitrust market requires estimates of the price elasticity of demand for the product or service or of estimates of the *cross-price* elasticities of demand among products or services.[6] One common approach is to specify the "critical elasticity" of demand (ε) above which it would be unprofitable for the hypothetical monopolist to increase its price:

$$\varepsilon = 1/ (m + \Delta P/P)$$[7]

where m is the profit margin and $\Delta P/P$ is a small, but significant price increase. For example, if the industry profit margin for incremental subscribers to the broadband network is, say, 0.75 – because the network is largely built – and the small, but significant hypothetical price increase is

[4] Competition Bureau Canada, *Merger Enforcement Guidelines,* 2011, §4.3. This approach is also cited in the Bureau's, *Abuse of Dominance Enforcement Guidelines*, Draft for Public Consultation, March 2018, pp.8-9. "Typically, the initial candidate market considered is a product in respect of which the alleged abuse of dominance has occurred or is occurring and its closest substitute. If a hypothetical monopolist could not impose a small but significant and non-transitory price increase above the benchmark, assuming the terms of sale of all other products remained constant, the candidate market is expanded to include the next-best substitute (which could include the products of other firms). The analysis is repeated until the point at which the hypothetical monopolist would profitably impose and sustain such a price increase over the candidate market. Alternatively, the abuse of dominance may have impacts in several different product markets. If competitive conditions are similar across several product markets, the Bureau may aggregate them for analytical purposes. . ." fn. 9.
[5] *Id*., §4.4.
[6] For a concise discussion of these concepts, see Daniel Rubinfeld, "Product Market Definition," University of California, Berkeley, Department of Economics, Class Notes, available at https://www.law.berkeley.edu/wp-content/uploads/2015/04/Market-Definition-Notes.pdf.
[7] *Id.*

0.05, the critical elasticity is 1.25. If the price elasticity of demand for the service is greater than 1.25 (in absolute value), the proposed market is too narrow to be a relevant antitrust market.

Unfortunately, I am unaware of any published econometric studies of the demand elasticity for broadband Internet services based on recent data. Older studies of the demand for broadband do not reflect the modern realities of smartphones, laptops, tablets with wireless capabilities, the availability of 4G LTE wireless service, and the proliferation of Wi-Fi hotspots. Nor could they reflect the pending availability of wireless services delivered over new 5G networks. Thus, determining the relevant market definition for broadband services must depend on more indirect evidence of consumers' willingness to use substitute services.

2. Substitutability of Wireless and Wireline Broadband Services among Canadian Consumers

The 2017 *Communications Monitoring Report* issued by the CRTC concludes that:

> "Canada's wireless networks enable Canadians to access services that are comparable to wireline services. Wireless service providers (WSPs) provide voice, data, *Internet*, and video services. The differentiating factors for these services tend to be mobility and price. Based on MTM's [Media Technology Monitor's] 2016 statistics, the three most popular activities by Canadian smartphone owners were text messages, *Internet access*, and email."[8] (emphasis added)

Furthermore, the CRTC published data on the number of Canadian households subscribing to wireline only and wireless only services over the years 2004-16. (Table 1) These data show that Canadians are dropping wireline services rapidly and gravitating towards wireless. In just 12 years, the number of residential wireline subscribers per 100 households has declined by more than 30 percent while the number of mobile wireless service subscribers has increased by nearly 50 percent. Notably, fully 32.5 percent of households had only wireless service in 2016, while just 11.4 percent relied solely on wireline service.[9]

The data in Table 1 could simply reflect the substitution of wireless voice services for traditional wireline voice services, but more recent data suggest otherwise. Evidence of the substitution of wireless for wireline broadband access in Canada may be found in a 2018 report published by Deloitte, which finds that 25 percent of Canadian homes relied solely on cellular wireless for access to data over the Internet in 2017.[10] Moreover, Deloitte predicts that by 2022, an estimated 30-40 percent of all households in the seven countries it surveyed will rely solely on

[8] CRTC, *Communications Monitoring Report 2017*, p. 294.
[9] The share of "wireless-only" households in the United Sates is now over 52 percent. (National Center for Health Statistics, "Wireless substitution: Early release of estimates from the National Health Interview Survey," January–June 2017. December 2017. Available from: https://www.cdc.gov/nchs/nhis.htm.
[10] Deloitte, "TMT Predictions 2018: The future is here," p.56, available at https://www2.deloitte.com/ca/en/pages/technology-media-and-telecommunications/articles/tmt-predictions-2018.html.

fixed or cellular wireless services for access to data over the Internet. Since Canada had the second highest share of wireless-only households in its seven-country sample, this suggests that an even larger share of Canadian households will be wireless only by 2022. Deloitte stresses that this means that "These people will have no active wired data connection to their home –no coaxial cable, fiber-optic connection or copper DSL line. Instead, *they rely on radio technology for their entire home internet usage.*"[11] (emphasis added) This suggests that wireline and wireless broadband services are clearly substitutes.

Table 1
Canadian Landline and Mobile Service Subscribers per 100 Households

Year	Landline	Mobile	Landline and/or mobile	Landline only	Mobile only
2004	96.2	58.9	98.9	40.0	2.7
2005	94.0	62.9	98.8	36.0	4.8
2006	93.6	66.8	98.6	31.8	5.0
2007	92.5	71.9	98.8	26.9	6.3
2008	91.1	74.3	99.1	24.8	8.0
2009	89.3	77.2	99.3	22.1	10.0
2010	89.3	78.1	99.4	21.3	10.1
2011	86.6	79.1	99.3	20.2	12.7
2012	83.8	81.3	99.2	17.9	15.4
2013	79.1	84.7	99.3	14.6	20.2
2014	75.5	85.6	99.2	13.6	23.7
2015	71.9	86.1	99.3	13.2	27.5
2016	66.8	87.9	99.3	11.4	32.5

Source: CRTC, *Communications Monitoring Report 2018, Communications Services in Canadian Households: Subscriptions and Expenditures 2012-2016,* Table 1.1.

One of the major reasons for the continuing shift from wireline to wireless broadband will be the deployment of 5G millimeter wave technology, using much higher frequencies than those currently used in cellular networks. These new 5G technologies will permit carriers to deploy small digital antennas on the outside of homes, which will allow the homes to connect by line of sight to small microcell transmitters a few hundred meters away. These technologies are now beginning to be deployed and are likely to constitute a major new source of home Internet access within a few years.[12]

[11] *Id.*
[12] *Id.* at p. 61. See the 2017 TELUS Annual Report, p. 84 and 94, for a discussion of TELUS' view of the potential benefits of 5G technology. Note that these benefits will depend crucially on the Government of Canada's decision to make spectrum available for 5G.

At this juncture, it is very difficult to predict how the new 5G technologies will affect the manner in which consumers connect to the internet. It is likely that the proliferation of access points – currently described as "hot spots" – will dramatically change consumer options and, consequently, the prices available to consumers. As 5G is deployed, the distinction between wireless and wireline services may begin to disappear.

The current evidence thus shows that a large number of Canadian consumers find wireless and wireline access to be substitutes. Given the improvement in satellite technology, consumers in many areas of Canada can choose between satellite, wireline, and wireless broadband Internet access. Equally important, subscribers with both a wireless subscription and a wireline – or a satellite – subscription can choose between these services to access the Internet for various purposes. For these reasons, the most appropriate relevant market for consumer access to the Internet includes wireless, wireline, and satellite broadband service.

B. Canadian Wireline Broadband Prices

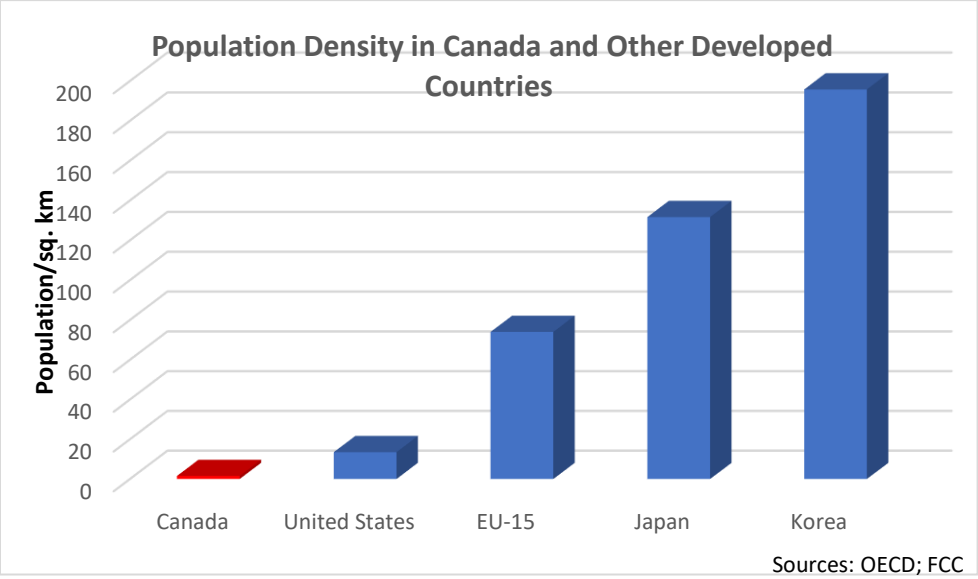
Any analysis of the Canadian wireline broadband sector should begin by acknowledging a fundamental difference between Canada and most other developed countries, namely, Canada's extremely low population density. Providing fixed-wire or wireless broadband services requires carriers to deploy expensive networks comprised of copper wires, coaxial cable, fiber-optic cables, or a combination of these transmission media, and wireless towers. These networks must be deployed over pole lines, through underground ducts, or by interconnected wireless transmission facilities. For these technologies, the cost of serving customers rises substantially as the population density of the covered area declines.

1. Canada's Low Population Density

As Figure 1 shows, Canada's average population density is far below that of the United States and even farther below the population densities found in Europe,[13] Japan, and Korea, countries whose broadband markets are routinely compared with Canada's. Furthermore, even in urban areas Canada is less densely populated than most other developed countries.

[13] For most of this report, data for Europe will include only the EU-15 countries, the more developed, Western European countries that comprised the European Union before its 2004 expansion into Eastern Europe, Cyprus, and Malta or for a subset of these 15 countries if data are unavailable for one or more of them. The Western European countries have higher incomes per capita and more developed communications systems.

Figure 1

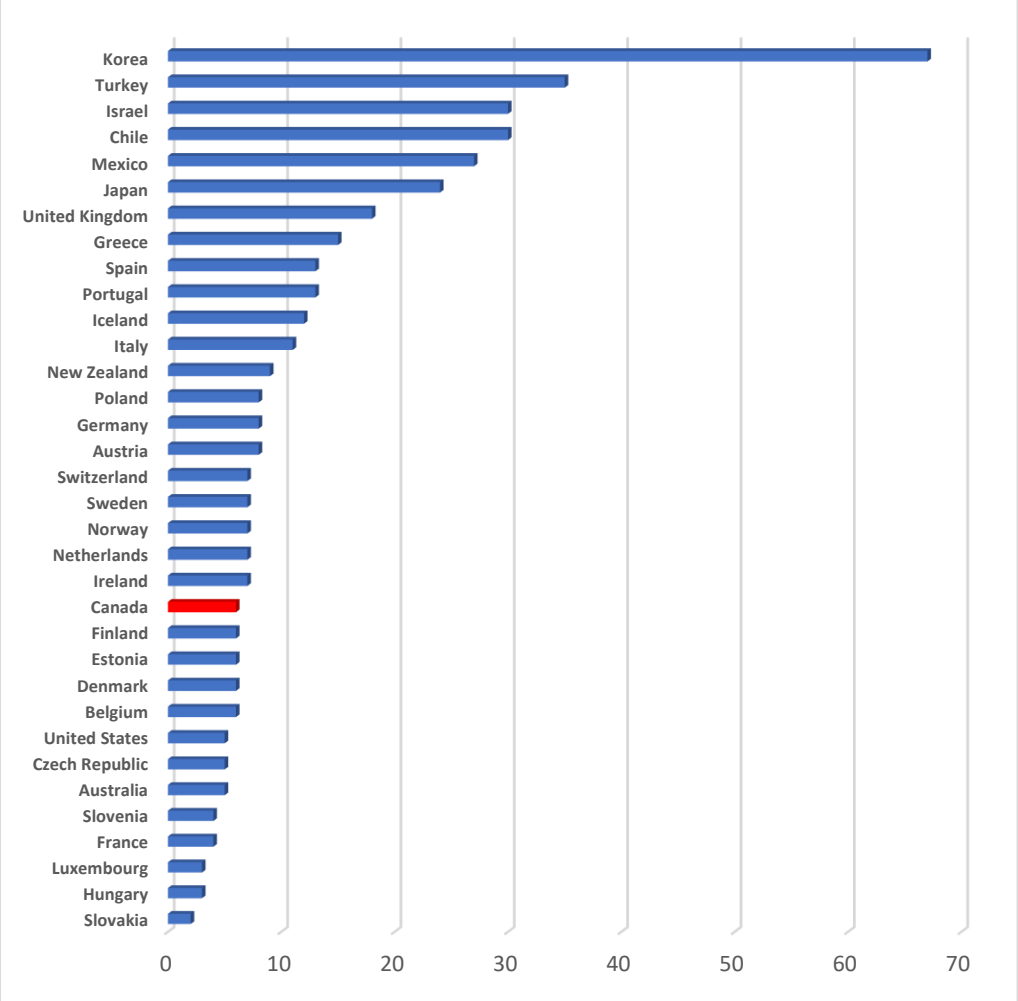


The Information Technology and Innovation Foundation has calculated an index of "urbanicity" that is equal to the share of population in urban areas multiplied by the population density in those urban areas.[14] (Figure 2) This index places Canada at 13th among 34 OECD countries; *i.e.,* Canada has lower urban population concentration than all but 12 of the 34 most developed countries in the world, and its concentration is far below the urban concentration in countries such as the United Kingdom, Japan, and Korea. The Canadian population is simply less concentrated in large urban areas than is the population of most other developed countries.

[14] Richard Bennet, Luke A. Stewart, and Robert D. Atkinson, *The Whole Picture: Where America's Broadband Networks Really Stand*, The Information Technology & Innovation Foundation, Washington, DC, 2013.

Figure 2

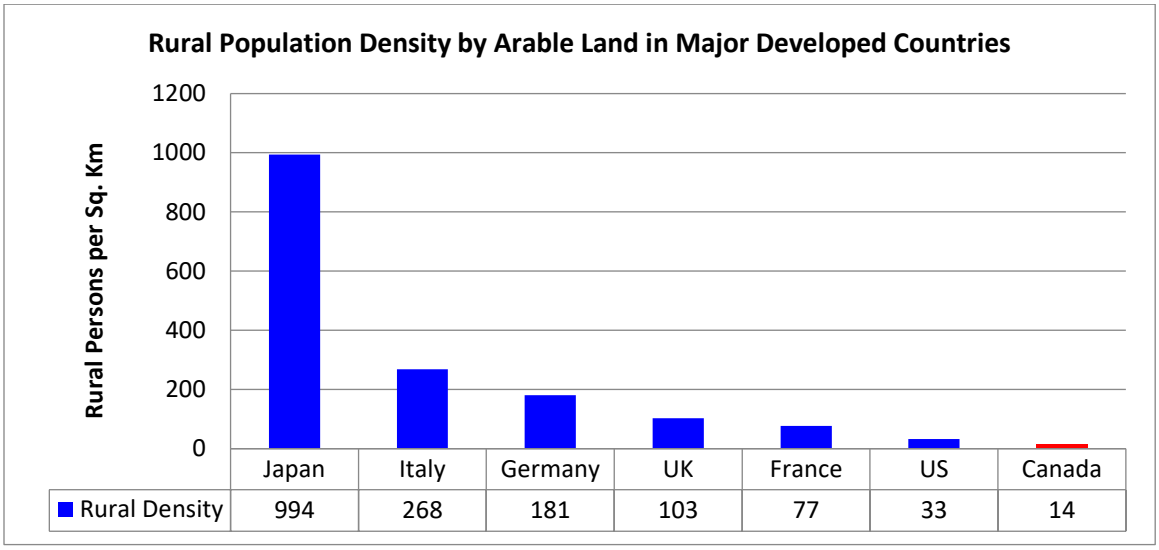
The "Urbanicity" of Developed (OECD) Countries



Source: The Information Technology & Innovation Foundation (2013)

In addition, Canada's rural areas have much lower population density than the rural areas in the United States and the larger European countries, as Figure 3 shows. Thus, even in rural areas, Canada has a cost disadvantage relative to other major developed countries. Given the economics of network deployment, this low population concentration means that it simply costs more to serve broadband subscribers in Canada than in most other developed countries.

Figure 3



Source: Richard Bennett, *G-7 Broadband Dynamics: How Policy Affects Broadband Quality in Powerhouse Nations.* American Enterprise Institute, 2014

2. Canadian Broadband Prices

International comparisons of high-speed broadband prices are often misleading for a number of reasons. First, fixed-wire broadband service is often purchased in a bundle with television, voice, and even mobile services. These other components of the bundle vary substantially across countries. For example, the bundle of television channels offered can include a few channels of local original content, channels that offer reruns of old television series or movies, public-affairs programming, and a variety of sports offerings.[15] Canadian and U.S. programming services typically include a substantial amount of sports programming, but the European television services generally offer far fewer major sports channels. Correcting for the

[15] It is impossible to know the number and quality of basic cable channels included in each country's bundled price plans that are included in the various analyses cited in the next three footnotes. However, in their study of broadband prices, Scott Wallsten and James Riso ("Residential and Business Broadband Prices, Part 1: An Empirical Analysis of Metering and Other Price Determinants," Technology Policy Institute, November 2010) show that the median number of video channels in U.S. and Canadian triple-play bundled service plans were 160 and 116, respectively, more than any other country in their 30-country sample. Most triple-play bundles offered by carriers in member countries in the European Union contained between 30 and 60 channels. (See Table 4 of their study.)

differences in the quality of these bundles across countries would be very difficult and, in fact, is not even attempted by most statistical sources.[16] For instance, the annual study on fixed broadband prices in Europe, published by the European Commission, makes no effort to adjust for differences in the quality of bundles used in their analysis.[17] Nor does the Wall/Nordicity Report prepared periodically for Canada's CRTC and Industry Canada.[18] Thus, these comparisons of bundled prices are generally meaningless.

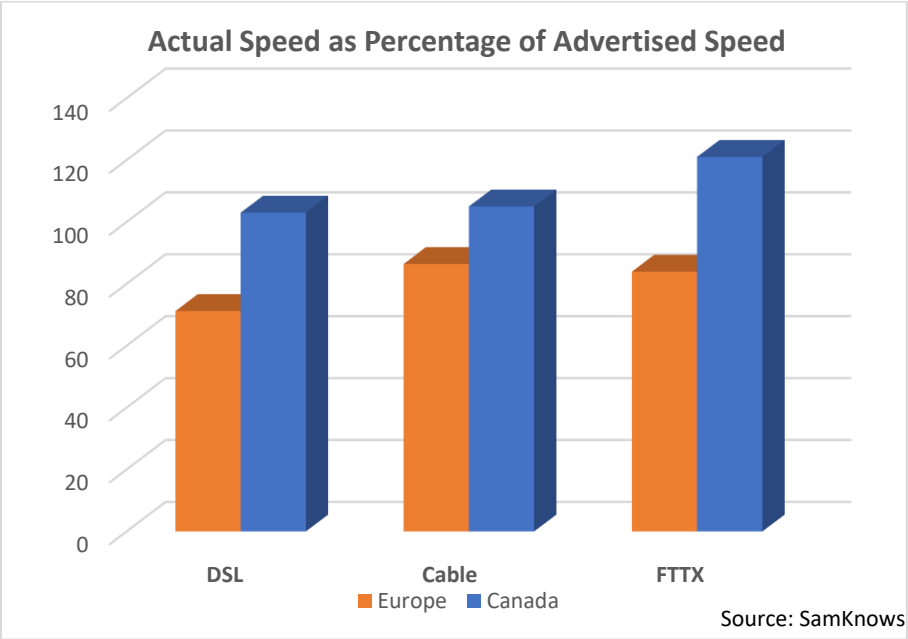
Second, given the competitive rivalry in communications markets – particularly, in Canada – standalone Internet service or bundled services are often offered at competitive discounts. Most statistical reports of broadband prices, such as the European Commission Report, the Wall/Nordicity Reports, or the U.S. Federal Communications Commission's annual International Broadband Reports,[19] generally rely on list prices and may therefore overstate actual prices paid by consumers.[20]

Third, broadband prices are generally reported for advertised download and upload speeds, but actual speeds often diverge substantially from these advertised speeds. Indeed, actual speeds throughout Europe are generally below, and often far below advertised speeds, while actual speeds in Canada are much closer to their advertised levels.[21] (See Figure 4) Thus, it is

[16] The Federal Communications Commission's *Sixth International Broadband Data Report*, 2018, offers an attempt to adjust prices through a "hedonic regression" approach that includes several service-quality variables. (Appendix C, §29-32) Unfortunately, it uses *advertised* prices and broadband speeds, not transaction prices and measured (actual) speeds in this analysis, rendering the results extremely unreliable.
[17] European Commission, *Fixed Broadband Prices in Europe, 2016* (and earlier reports).
[18] The latest of these reports is NGL Nordicity Group Ltd., *2017 Price Comparison Study of Telecommunications Services in Canada and Select Foreign Jurisdictions*, October 2017, prepared for Innovation, Science and Economic Development Canada.
[19] Federal Communications Commission, *International Broadband Data Report*, International Comparison Requirements Pursuant to the Broadband Data Improvement Act, annually.
[20] The 2017 Nordicity Report (fn. 18 above) states that "The price data collected for this Study were drawn from the surveyed service providers' websites . . . The price data reflect currently advertised prices that are available to new customers or customers changing service plans." (p. 23) The FCC's latest (sixth) *International Broadband Data Report* states at §12 that: " We examine *advertised* broadband prices for both fixed and mobile service plans in the United States and up to 28 comparison countries depending on data availability (for a total of up to 29 countries)." The European Commission's *Fixed Broadband Prices in Europe, 2016* explained its methodology as follows: *"*Where prices differ by payment method, the most easily and *publicly accessible* price is recorded, regardless of the payment or billing method specified. Discounts were recorded which applied to all customers, and applied on the first day of the Price Reference Period." (emphasis added)
[21] SamKnows, *Quality of Broadband Services in the EU,* October 2014; SamKnows, *Quality of Broadband Performance in Canada,* March and April, 2016. More recent data for the United Kingdom, showing that actual ADSL speeds are far below advertised speeds, may be found in Ofcom, *UK Home Broadband Performance*, 12 April 2017, available at

very misleading to make cross-country comparisons of the prices or other attributes of services that advertise a given advertised download speed of, say, 30 Mbps or 50 Mbps, since subscribers in various countries may in reality be receiving very different services for any advertised speed.

Figure 4



Finally, statistical reporting services routinely report the list prices offered by small and large carriers alike in each country and then construct average or median of prices from these list prices. But many small carriers offer service only in low-cost, high-density urban areas, and their prices surely reflect these lower costs. This is particularly true for cable and fiber-optic lines in Europe. For example, in France cable systems offering broadband services passed only 27.9 percent of households and fiber-optic based services – were only offered to 20.8 percent of homes in 2016.[22] In Italy, there are no cable systems offering broadband and just 18.8 percent of households had access to fiber-optic based services in 2016.[23] Canadian cable systems pass 85 percent of homes with broadband services with download speeds of at least 5 Mbps across the country, and fiber-based broadband is available to 28 percent of Canadian homes.[24] If cable were only deployed in Toronto, Montreal, and Vancouver, for example, they would still serve a larger share of the population than the French cable systems serve, and their costs and prices would

https://www.ofcom.org.uk/__data/assets/pdf_file/0015/100761/UK-home-broadband-performance,-November-2016-Technical-report.pdf

[22] European Commission, *Broadband Coverage in Europe 2016: Mapping progress towards the coverage objectives of the Digital Agenda*, 2017.

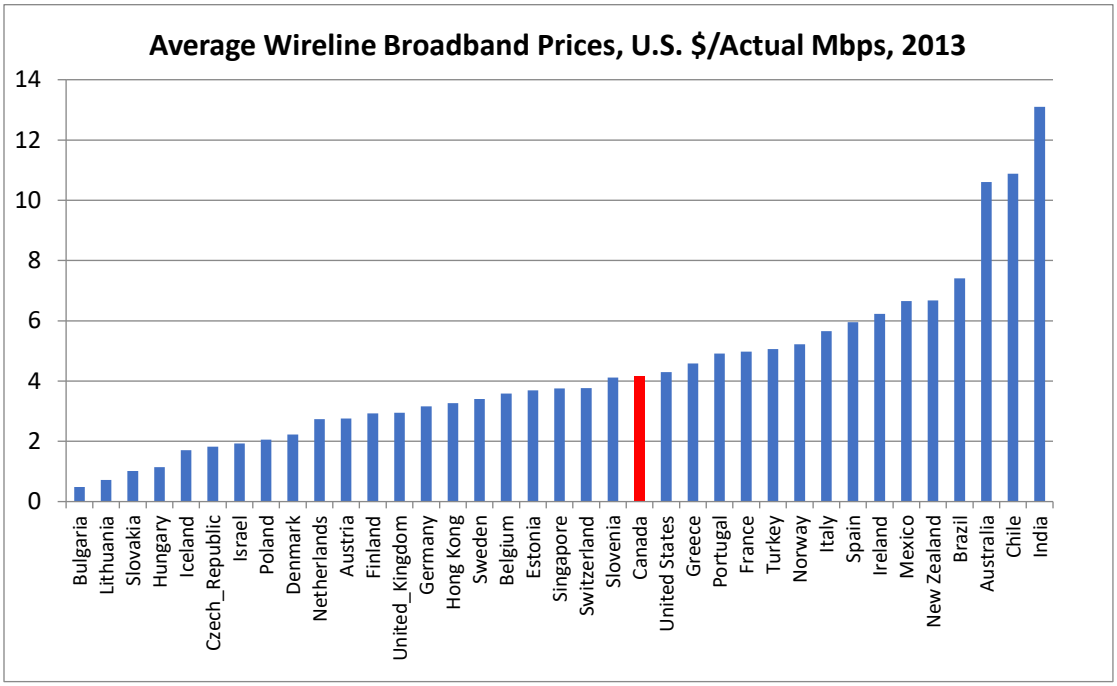
[23] *Id.*

[24] CRTC, *2017 Communications Monitoring Report*, Figure 5.3.15.

likely be much lower. Thus, comparing French and Canadian cable Internet rates is misleading at best.

One source of wireline broadband prices that uses *actual* speeds is provided by Ookla. In its 2015 *International Broadband Report*, the U.S. Federal Communications Commission (FCC) reported the median price per Mbps for 37 countries based on Ookla's speed tests and consumer surveys of prices paid for broadband service.[25] The results for all 37 countries are displayed in Figure 5.

Figure 5



Source: Federal Communications Commission, *Fourth International Broadband Report,* February 4, 2015.

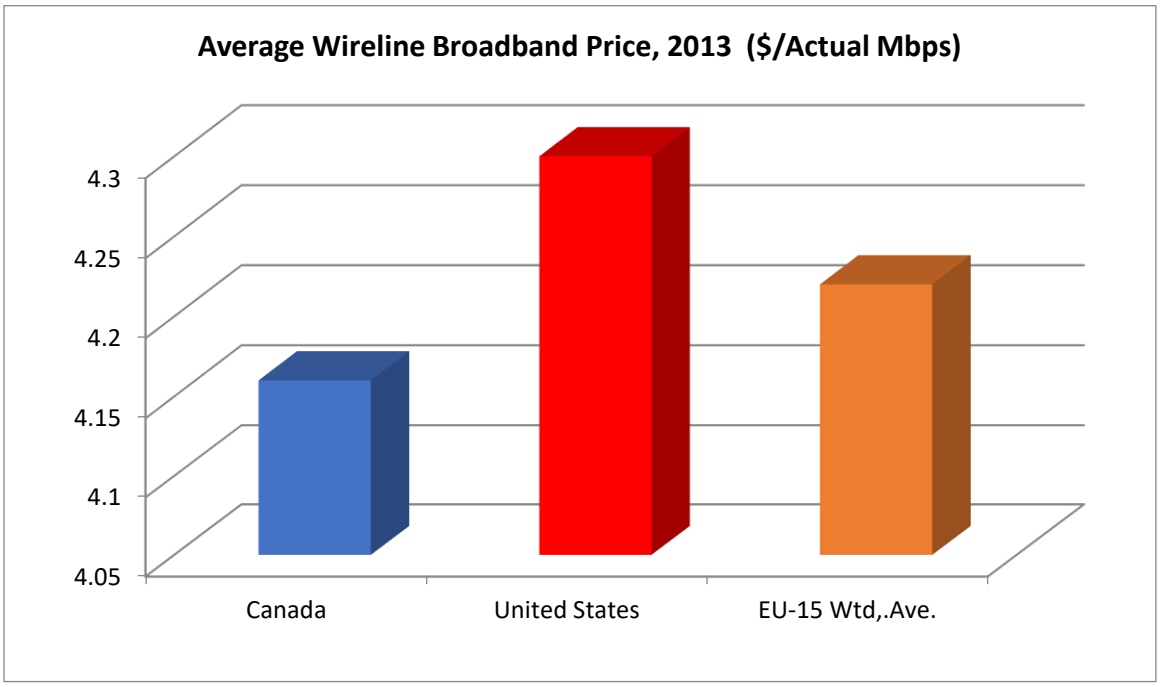
Canada's median price per actual Mbps delivered is near the middle of the distribution, but even this observation is misleading because the sample includes countries with demographics, network deployment, and population density that are very different from Canada's. Clearly, Hong Kong, Singapore, and Israel are countries with much greater population density and, therefore, much lower network costs. In addition, many of the countries with the lowest prices per Mbps are Eastern European countries that began to deploy advanced networks rather recently and therefore have more households passed by FTTx relative to DSL over traditional copper networks. Finally, it is inappropriate to compare Canadian prices with those in Brazil, Chile, India or Mexico, given their much lower level of economic development. These

[25] FCC, *Fourth International Broadband Report*, February 4, 2015, pp. 11-12 and Appendix C, Table 5. More recent *International Broadband Reports* do not include price comparisons based on actual measured broadband download speeds.

countries are unlikely to have rural high-speed services comparable to those in Canada.[26] Thus, the measure of $/Mbps in these countries is likely to come only from densely-populated urban areas while Canada's measure is more likely derived from a mix of rural and urban services.

A more valid comparison of prices would therefore focus on countries with demographics that are similar to those in Canada, namely those in Western Europe and North America. Such a comparison is displayed in Figure 6, which shows the average price per actual Mbps in Canada, the U.S., and a weighted average of EU-15 countries.[27]

Figure 6



Source: Federal Communications Commission, *Fourth International Broadband Report,* February 4, 2015, Table 5.

Canada had lower average wireline broadband prices per actual Mbps delivered in 2013 than the EU-15 and the United States. Given that these countries had similar average actual download speeds across broadband subscribers, this conclusion would not appear to be related to a disproportionate sampling of extremely high- or low-speed plans. Moreover, these countries have similar demographic conditions that drive broadband demand. Thus, the best data available allow one to conclude that Canadian consumers face wireline broadband prices that are slightly

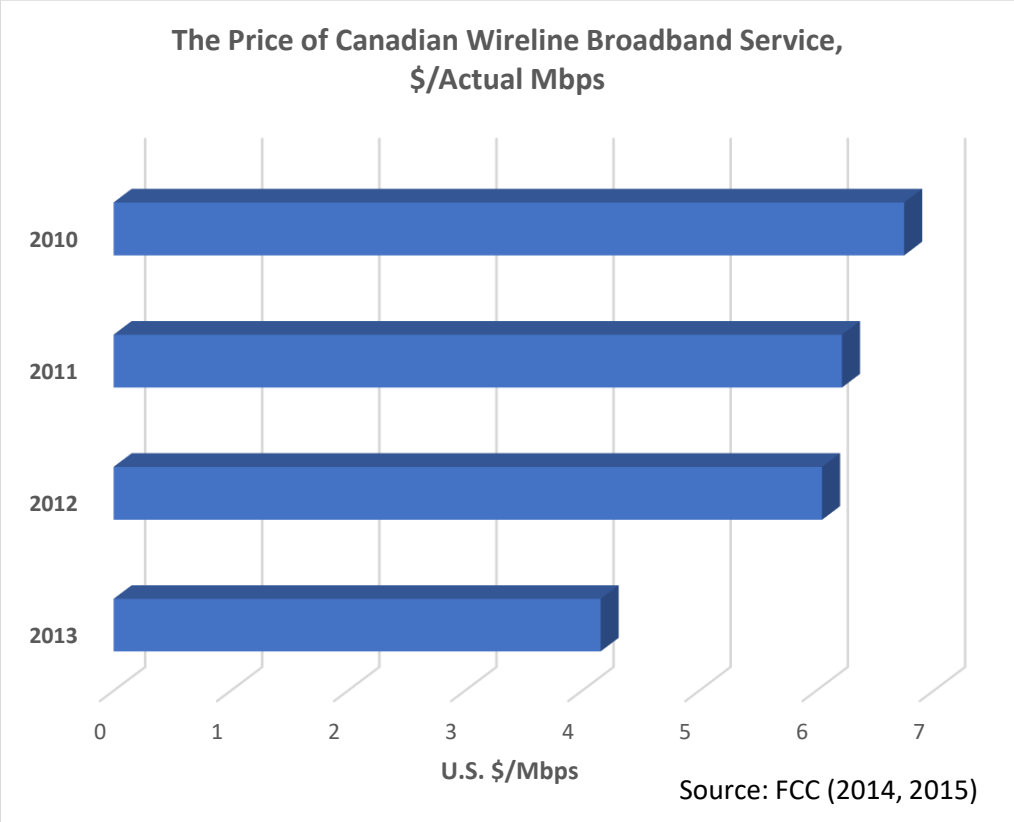
[26] For evidence that many of these less developed countries have much less broadband availability, see The Economist Intelligence Unit, *The Inclusive Internet Index: Bridging Internet Divides,* 2017.

[27] There is no observation for Luxembourg; therefore, the EU-15 average is actually for EU-14.

lower than those in similar countries throughout the world despite Canada's obvious topographical disadvantages.

Not only are Canadian wireline broadband prices modest when compared to prices in the U.S. and Western Europe, but they have also been declining. The U.S. Federal Communications Commission data on international prices per Mbps of download speed, from which Figures 5 and 6 are derived, show a substantial decline in Canadian prices between 2010 and 2013.[28] This decline is exhibited in Figure 7.

Figure 7



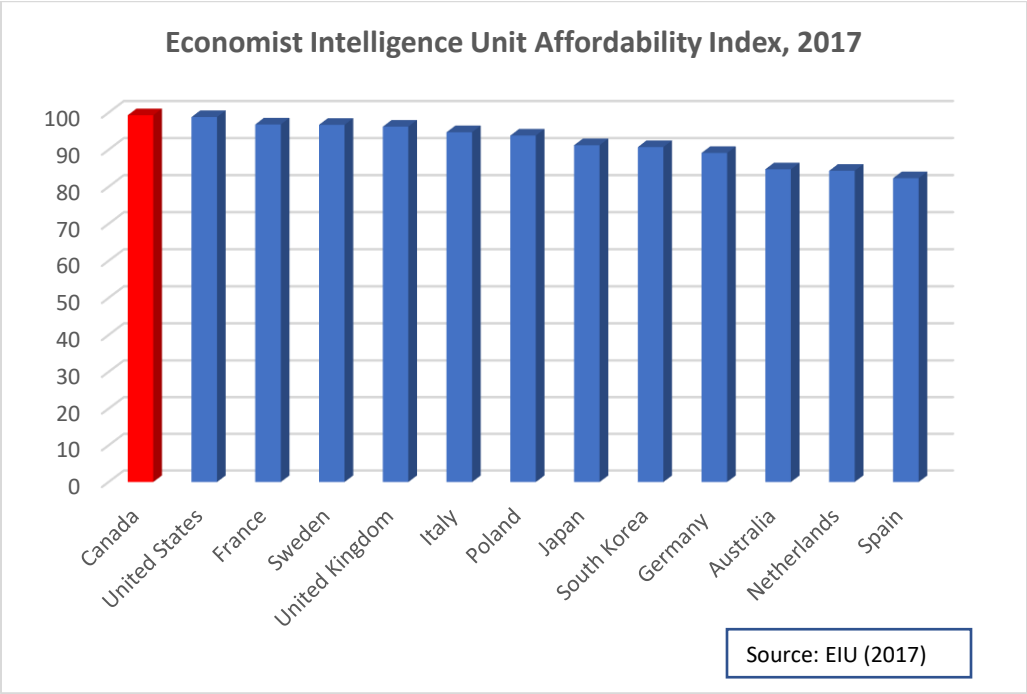
Source: FCC, *Fourth International Broadband Report,* February 4, 2015, Table 5.

Confirmation of the relative affordability of Canadian high-speed broadband services is also provided by the Economist Intelligence Unit's (EIU's) recent 2017 *Inclusive Internet Index* report.[29] Canada is ranked highest among the 75 countries it sampled in terms of affordability of broadband according to the EIU. Because of their greater per-capita incomes, the developed

[28] Earlier or later data are not available in these FCC *International Broadband Reports*.
[29] The Economist Intelligence Unit, *The Inclusive Internet Index: Bridging Internet Divides,* 2017.

countries in the EIU study have higher Affordability Indexes than the lower-income countries in their sample. In part, this is due to the greater competition present in developed countries' broadband markets, particularly in Canada. But Canada outranks all of the other (thirteen) developed OECD countries in their sample in terms of affordability, as Figure 8 shows.

Figure 8



Based on the available recent evidence, one must conclude that Canadians are able to subscribe to high-speed wireline Internet services at very reasonable prices. As shown below, these prices reflect a Canadian policy environment that has stressed platform competition and thereby encouraged network investment to overcome the difficulties posed by Canada's low population density.

I now turn to responses to the Bureau's questions, all of which are directed at wireline broadband services in Canada and not a definitive notion of the overall broadband services *market* in Canada.

III. The Market Study Notice's Questions

The Notice invites responses to four questions concerning the activities and effectiveness of resellers and policy issues surrounding resale. TELUS has asked me to provide responses for only the last two of these questions.

Question c.) How does regulation in this industry affect the economic behavior of broadband suppliers?

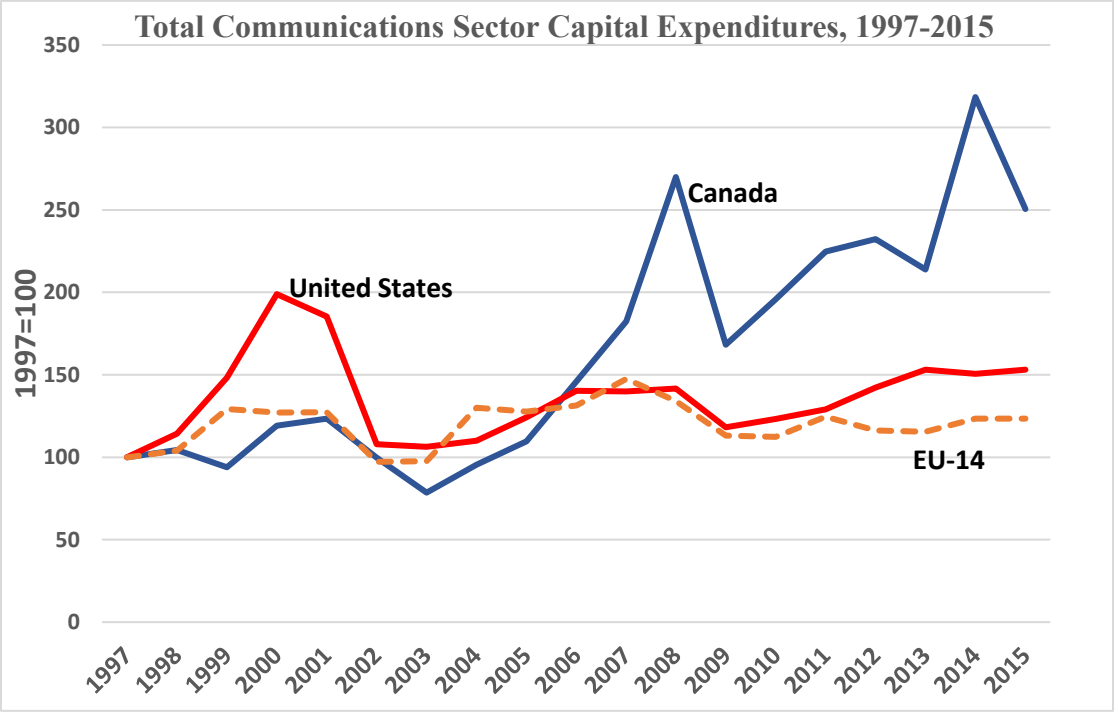
Answer.

In Canada, as in the United States, regulators have promoted *platform* competition among incumbent telecommunications companies, cable systems, satellite companies, and wireless carriers.[30] In contrast, the European Union and many other jurisdictions require their carriers to provide access to their facilities to competitors at very low monthly wholesale rates to encourage *service* competition.[31] These latter policies permit entrants to compete without making comparable investments in their own platforms, thereby discouraging investment by incumbents and entrants alike in new facilities to improve service quality and to extend broadband into underserved areas.[32] The investment disincentives created by a reliance on service competition lead to less rural access to broadband and far lower broadband speeds in these areas.

Canada's reliance on platform competition was strongly confirmed by the government's 2006 Telecommunications Policy Review.[33] The years following this policy review witnessed an acceleration in capital spending in the Canadian communications sector, as shown in Figure 9. The U.S. had a milder acceleration after 2005 when it chose to deregulate broadband offered by telecommunications carriers.[34] Since 2006, Canada's capital spending has continued to be very strong compared with both the United States and the EU-14[35]. Canada has relied principally on competition between telecommunications platforms, as has the United States. The EU, on the other hand, has relied on service competition. The result of these very different policies has been quite predictable – greater access to higher and higher speeds for Canadian consumers.

[30] The CRTC's decision, *Telecom Regulatory Policy CRTC 2015-326: Review of wholesale wireline services and associated policies* (22 July, 2015) is an exception to this general policy direction.
[31] The most recent data for the European Union show that nearly half of all DSL subscriber connections are provided by non-incumbent carriers using unbundled or bitstream access to incumbent facilities. See European Commission, *Connectivity: Broadband Market Developments in the EU* (Digital Economy and Society Index Report: Connectivity), 2018.
[32] See the discussion below of the differences in telecommunications capital spending between Canada and the European Union.
[33] Telecommunications Policy Review Panel, *Final* Report, 2006, available at https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/tprp-final-report-2006.pdf/$FILE/tprp-final-report-2006.pdf.
[34] Broadband services offered by U.S. cable television carriers were never subject to federal regulation.
[35] Data for Sweden are not available for the early years of this chart.

Figure 9

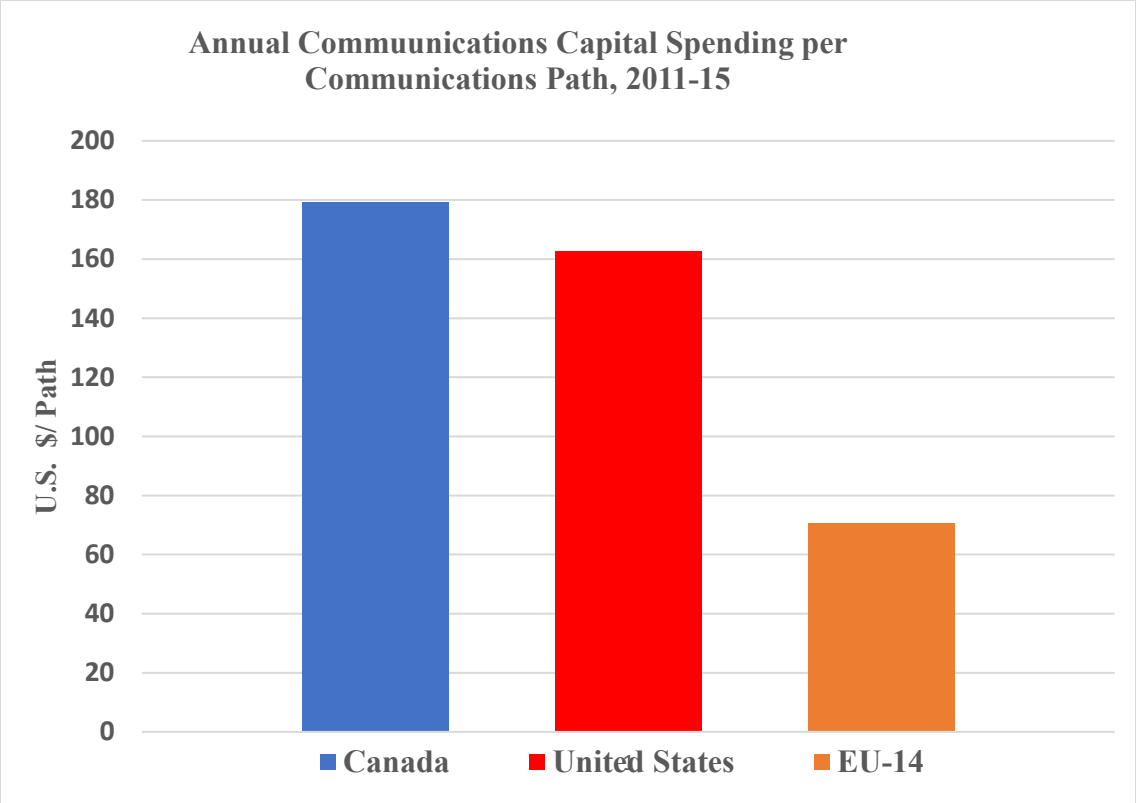


Source: OECD, *Digital Economy Outlook, 2017, online tables.*

Capital spending by Canadian and U.S. carriers has greatly exceeded capital spending in Europe over recent years., as Figure 10 shows. The data in Figure 10 are drawn from the OECD's most recent estimates of total communications sector capital spending in each country for 2011-15, divided by the total communications paths – telephone lines, cable television subscriptions, and wireless (cellular) connections – in each country.[36] It is quite clear that Canadian and U.S. carriers have been spending far more than their counterparts in Europe in recent years. Such spending has allowed North American carriers to provide much greater access to very high-speed services than is now available in Europe, a fact that is clearly recognized in Europe as the European Commission struggles to develop policies to induce greater network investment.[37]

[36] OECD, *Digital Economy Outlook, 2017, online tables,* available at http://www.oecd.org/internet/ieconomy/deo2017data/deo-tab.les-2017.htm
[37] See European Commission, *Commission Staff Document: A Digital Single Market Strategy for Europe - Analysis and Evidence*, June 5, 2015.

Figure 10



Source: OECD, *Digital Economy Outlook, 2017, online tables.*

Unlike Canada and the United States, whose regulators promote platform competition, the European Union is unable to stimulate sufficient private investment to obtain its goal of universal access to 30 Mbps across the continent by 2020. It now envisions filling the gap through government expenditures of 21 billion euros ($30 billion Cdn.) of the total 34 billion euros required through 2020.[38] This is clearly a concession that its regulatory policies of network sharing have failed to generate sufficient private investment in broadband platforms and, therefore, lagging deployment of higher speed broadband services, particularly in rural areas – a warning to anyone who would suggest that Canada adopt similar policies.

The empirical research on the effects of regulation on broadband investment and subscriber penetration is extensive and conclusive, corroborating the conclusions drawn above. Crandall, Eisenach and Ingraham (2013) provide a literature review and their own results on the effects of access regulation – *i.e.,* the regulation underlying service competition – on subscriber

[38] European Commission, *Commission Staff Document: A Digital Single Market Strategy for Europe - Analysis and Evidence*, June 5, 2015, p. 85.

penetration.[39] Using data from 28 countries for the decade 2001-2010, they find that network access regulation in the form of mandated unbundling at regulated wholesale prices reduces subscriber penetration.[40] These results are largely consistent with other recent studies.[41]

Given the importance of innovation and investment in modern networks, equally important research involves the effect of access regulation on network investment. An early literature review by Cambini and Jiang (2009) concludes that network unbundling generally discourages network investment by broadband incumbents and entrants.[42] More recent research strongly confirms this conclusion. A paper by Briglauer, Gugler and Haximusa (2016) finds that platform competition encourages network investment, but service competition (through resale or network unbundling) has negative effects on investment in the later stages of liberalization in the European Union.[43] A 2015 study commissioned by the United Kingdom's regulator, Ofcom, concludes that platform competition is the most important driver of investment in new super-fast broadband networks. This study concludes that countries with limited platform competition which are therefore induced into relying on service have lower investment in such networks.[44] These latter two studies confirm the results obtained by Wallsten and Hausladen that network unbundling reduces investment in advanced fiber networks.[45]

The empirical research thus supports the conclusions that can be drawn from the data presented above. Platform competition is superior to service competition in promoting investment in the deployment of broadband networks. Countries that have limited platform competition and have therefore relied upon service competition have lower investment in advanced broadband networks, less rural coverage, and lower broadband speeds.

[39] Robert W. Crandall, Jeffrey A. Eisenach, and Alan T. Ingraham, "The long-run effects of copper-loop unbundling and the implications for fiber," *Telecommunications Policy*, Vol. 37 (2013), pp. 262-81.
[40] *Id.*
[41] *Id.*, Table 1. The exceptions are two early studies whose results cannot be extended to the current broadband environment in advanced countries, one that uses data from a large number of developing countries, and one whose results have been refuted.
[42] Carlo Cambini and Yanyan Jiang, "Broadband regulation and investment: A literature review," *Telecommunications Policy*, Vol. 33 (2009), pp. 559–574.
[43] Wolfgang Briglauer, Klaus Gugler, and Adhurim Haxhimusa, " Facility- and Service-based Competition and Investment in Fixed Broadband Networks: Lessons from a Decade of Access Regulations in the European Union Member States," *Telecommunications Policy*, Vol. 40 (2016), pp. 729-42.
[44] Ilsa Godlovitch, Iris Henseler-Unger, and Ulrich Stumpf, *Competition sand Investment: An Analysis of the Drivers of Superfast Broadband.* WIK study prepared for Ofcom, July 2015.
[45] Scott Wallsten and Stephanie Hausladen, "Net Neutrality, Unbundling, and their Effects on International Investment in Next-Generation Networks," *Review of Network Economics*, Vol. 8, No. 1 (2009), pp. 90-112.

It is also important to note that platform competition is also more conducive to price competition than is service competition. With large investments in built-out platforms – both wireline and wireless – carriers have relatively low marginal costs of serving adding additional subscribers. Thus, they are more likely to compete aggressively for subscribers because the profitability of serving these incremental subscribers is substantial given that a large share of their costs is sunk –that is, they do not vary with the number of subscribers served.[46]

Question d.) How do other countries manage and regulate broadband competition?

Answer.

The differences in communications-sector investment between Canada (and the United States) and the European Union, shown above, are due to the very different regulatory policies pursued by the EU countries and Canada. The EU has chosen to rely heavily on providing entrants with low-cost regulated wholesale access to their incumbents' networks. Canada has relied principally on competition between telecommunications platforms. Similarly, after a series of court reversals of earlier Federal Communications Commission rulemakings, the United States has also relied more heavily on platform competition rather than resale since 2005.

In January 2016, 68 percent of EU wireline broadband subscriptions were to DSL services offered over traditional copper-wire telecom networks, either provided directly by incumbents or resellers.[47] The CRTC *Monitoring Report, 2017,* reports that in 2016 only 38 percent of Canadian residential subscriptions were to a DSL service, while 56 percent were to a cable-provided service.[48] Countries such as Greece and Italy have virtually no cable service. With so little cable, platform competition within the fixed-wire sector is simply not possible in many European countries outside of the major cities in which some fiber to the premises has been deployed. Regulators in Europe have therefore chosen to pursue an aggressive policy of promoting resale and network unbundling despite their attendant depressing effects on network investment. By contrast, Canada has relied principally on platform competition between cable,

[46] See Martin Peitz and Tommaso Valletti, "Reassessing Competition Concerns in Electronic Communications Markets," *Telecommunications Policy,* Vol. 39, (2015), pp. 896-912. They note that "Those who have invested in infrastructure have strong incentives to attract customers and fill existing capacity as additional business can be accommodated at little or no additional cost... [Regulators] may also have to be wary about capacity expansion that discourages investment by competing infrastructure providers, but at the same time acknowledge that in geographic areas or market segments where facilities-based competition exists, concerns about market power should be greatly reduced." (p. 910)

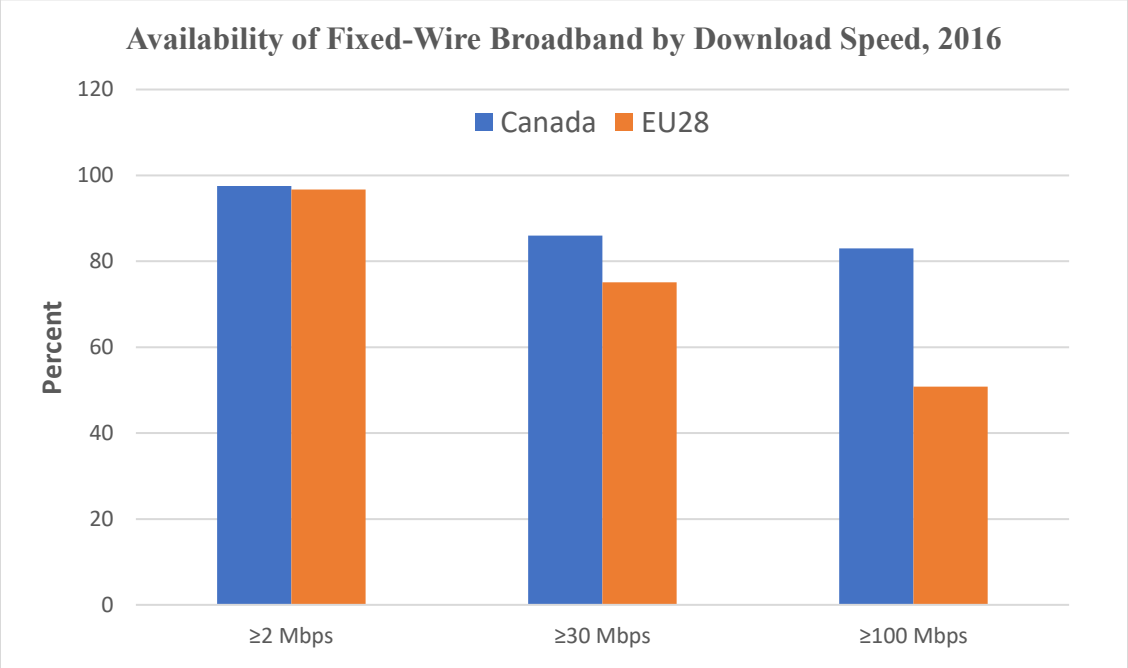
[47] European Commission, *Broadband Access in the EU, Data as of January 2016* (2017), available at https://ec.europa.eu/digital-single-market/en/news/broadband-access-eu-data-january-2016

[48] CRTC, *Communications Monitoring Report, 2017,* Figure 5.3.12.

wireline telecommunications, satellite, and wireless networks, thereby unleashing a torrent of network investment in high-speed networks. The results, discussed below, testify to its success.

The large amounts that Canadian carriers have invested in their platforms have allowed them to deploy high-speed broadband services throughout Canada, not just in large urban areas, despite the country's very low population density. As a result, as Figure 11 shows, Canadian households have far wider access to broadband services with download speeds of 30 Mbps or 100 Mbps than most European countries. For example, while 83 percent of Canadians have access to speeds of 100 Mbps or more, only 34 percent of French households, 19 percent of Italian households, and 24 percent of UK households have access to such speeds. Even Sweden, with its municipally-subsidized fiber networks, has extended 100 Mbps coverage to just 69 percent of its households.[49] Moreover, the CRTC recently concluded that the Canadian wireline broadband network infrastructure is now capable of supporting download and upload speeds of up to 1 Gbps without requiring significant additional investment. [50]

Figure 11



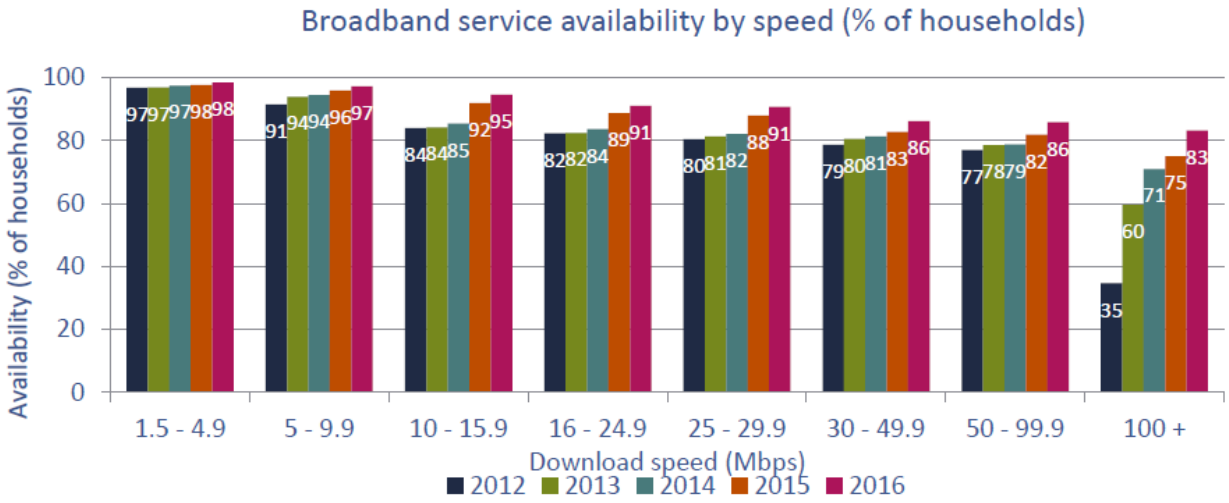
Sources: European Commission, *Broadband Coverage in Europe: Mapping progress towards the coverage objectives of the Digital Agenda*, 2017, Table 4.5.1; CRTC, *Communications Monitoring Report 2017,* Figure 5.3.16.

[49] European Commission (2017).
[50] CRTC, Telecom Regulatory Policy 2016-496*: Modern telecommunications services – The path forward for Canada's digital economy,*21 October, 2016, para.79. In August 20-18, Bell announced that it would begin to offer 1.5 Mbps speeds to customers with fiber connections to its network. See https://business.financialpost.com/telecom/bell-enters-the-fast-lane-as-back-to-school-internet-competition-heats-up.

Canadians generally are able to actually obtain these speeds while the actual speeds available to Europeans are generally substantially below these advertised speeds.[51] (see Figure 4, above) Thus, international comparisons of available *reported* download speeds understate Canada's superiority in actual download speed delivered. And this remarkable availability of actual super-fast broadband for Canadians exists despite the obvious geographic obstacles to broadband network deployment in Canada.

Further evidence of the continuing deployment of high-speed infrastructure by Canadian wireline carriers is the steady increase in the speed of service available to most Canadians. (Figure 12) The 2017 CRTC Monitoring Report finds that – in 2016 – fully 86 percent of households had access to a wireline broadband service with at least a 50 Mbps download speed and 83 percent had access to at least 100 Mbps. The availability of such speeds has been increasing steadily over the past few years. It is a safe bet that in 2018 even more Canadians will have access to super-fast broadband.

Figure 12



Source: CRTC, *Communications Monitoring Report 2017,* Figure 5.3.16

IV. Conclusions

My conclusions on the state of Canadian broadband may be summarized as follows:

- The Canadian broadband market is much broader than that suggested by the Bureau's Notice. Wireless broadband services are rapidly replacing fixed wireline services among Canadian consumers, reflecting their view that

[51] SamKnows, *Quality of Broadband Services in the EU,* October 2014; SamKnows, *Quality of Broadband Performance in Canada,* March and April, 2016

wireless and wireline broadband services are substitutes. The relevant market for consumer broadband services includes wireline, satellite, and wireless services.

- Despite Canada's very low population density, Canadian fixed-wire broadband prices are relatively low. Indeed, one recent major study places Canada first in terms of broadband "affordability" among 75 countries studied.

- **Question c.):** How does regulation in this industry affect the economic behavior of broadband suppliers?

  Answer: Canadian regulators' reliance on platform competition, rather than service competition, has spurred much greater broadband investment than that which results from service competition in other developed countries, particularly in the European Union. This greater investment has resulted in the deployment of very high-speed services throughout Canada, including rural areas, eclipsing the average speeds found in European countries that are more reliant on service competition in regulating broadband.

- **Question d.):** How do other countries manage and regulate broadband competition?

- **Answer:** Canada and the United States stand out as countries that rely heavily on platform competition. The European Union, by contrast, has relied on service competition as its approach to broadband regulation, which suppresses network investment to the detriment of European consumers.

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