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WIRELESS COMPETITION IN CANADA: AN ASSESSMENT

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SUMMARY

If there's one thing Canadians agree on, it's that Canada's wireless industry can and should be more competitive. The federal government is on side with the policy objective of having four carriers in every region and has responded with policies that provide commercial advantages to entrants. But, the rub is that there has not been a study that actually assesses the state of competition in wireless services in Canada, until now. Those in favour of policies that will promote and sustain entry point to Canada's high average revenue per user and low wireless penetration rate (mobile connections per capita) as evidence that there is insufficient competition. The difficulty is that the facts are not consistent with this simplistic analysis. Measurements of wireless penetration are skewed toward countries that maintain the Calling Party Pays Protocol and favour pay-as-you-go plans, both of which encourage inflated user counts. Canada's participation per capita on monthly plans and minutes of voice per capita are not outliers. Moreover, in terms of smartphone adoption and smartphone data usage, Canada is a global leader, contributing to high average revenue per user. Consistent with being world leaders in the rollout of high speed wireless networks, Canada lead its peer group in capital expenditures per subscriber in 2012: the competition of importance to Canadians is not just over price, but also over the quality of wireless networks.

In any event, none of the measures typically used in international comparisons are relevant to assessing the competitiveness of Canadian wireless services. The appropriate competitive analysis recognizes two relevant features of the technology of wireless services: (i) high fixed and sunk capital costs; and (ii) economies of scale and scope. The implications of these are that profitability requires mark ups over short run measures of cost — high gross margins — and that there will be a natural, upper limit on the number of wireless carriers. The key issue in terms of competition is whether prices track long run average costs, namely, whether wireless providers make monopoly profits. An examination of the leading firm's cash flow over the life cycle of the wireless industry suggests internal rates of return well below the likely *ex ante*, pre-tax, cost of capital that reflects the risk of its investments. This is not consistent with either the inefficient exercise of market power or monopoly profits. Moreover, international comparisons of structural indicators of competition indicate that, if anything, wireless services in Canada are more competitive than in many of its peers. There is no evidence that there is a competition problem in wireless services in Canada.

Efforts to create competition in the short run, that increase the number of carriers, will simply squeeze margins in the short run and likely will not be sustained in the long run, as carriers exit and consolidate to reduce competition and restore margins consistent with profitability and the natural limit. And, while consumers might gain in the short run from lower prices, everyone is likely made worse off in the long run from the misallocation of spectrum, reduction in scale of carriers, and reduction in incentives to invest from such intervention. The AWS set asides allocated spectrum to carriers whose focus was on talk and text, not carriers whose focus is on data, resulting in an inefficient mix of networks and a suboptimal allocation of spectrum.

† This report documents and updates the results of a long standing research program in telecommunications markets and regulation in Canada. That research program, our thinking on the nature of competition in wireless markets, and the assessment of that competition have benefited from comments and discussions with numerous individuals, including Martha Hall Findlay, Aidan Hollis, Len Waverman, Leslie Marx, and Ken Hendricks. A special note of acknowledgement is extended to Kalyan Dasgupta for his contributions to our thinking in this area over the years and an anonymous referee for their comments.

INTRODUCTION

Everybody knows that Canada has a competitive problem in wireless and that the federal government must do something, anything, to lower the consequent high prices for wireless services. It is not hard to find harsh assessments. Critics have accused the industry of being "woefully uncompetitive"[1] and "dysfunctional and in desperate need of an overhaul."[2] Government policy designed to enhance competition has been assessed as a failure,[3] the competition it sought to create "teetering towards collapse,"[4] with calls for the government to "admit its efforts to broaden competition in the wireless phone industry have largely been a bust."[5] And the government agrees that it is responsible for, and must take measures to enhance, competition and reduce the prices of mobile wireless services.

But what everybody knows is wrong.

This paper establishes that there is not a competition problem in mobile wireless services in Canada.[6] The government need not, and should not, intervene to promote competition on the basis that increased competition will lower prices; efforts to do so will likely be unsuccessful and inefficient. Unsuccessful means that the entrants are not likely to be viable without continued subsidization by the government; inefficient in that the benefits to consumers are less than the resource costs of incremental competitors and any direct or indirect costs of subsidization. In the long run, the effects are likely to be even worse: reduced investment, misallocated spectrum, lower quality, and perhaps even higher prices.

The government has responded aggressively, introducing policies intended to sustain and nurture the competition it created and takes credit for — in particular, the wireless entrants that entered in 2008.[7] Entry in the AWS auction was facilitated by spectrum set-asides.[8] Spectrum was set aside by the government for entrants — only entrants, including some provincial providers, could bid on it, not the three national incumbents (Rogers, Bell, and Telus). Five entrants (WIND, Mobilicity, Public Mobile, Eastlink, and Videotron) acquired spectrum and initiated service.[9]

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1 M. Geist, "Canadian Wireless Reality Check: Why Our Wireless Market is Still Woefully Uncompetitive," 10 March 2013, online at http://www.michaelgeist.ca/content/view/6803/125/.

2 C. Hart, S. Anderson, L. Pinto and R. Yeo, "Time for an Upgrade: Demanding choice in Canada's cell phone market," *OpenMedia*, April 2013, p. 4, online at https://openmedia.ca/sites/openmedia.ca/files/TimeForAnUpgrade_OpenMedia_130419.pdf.

3 S. Cousineau, "Quebec a model for wireless competition," *Globe and Mail*, 17 April 2013, B2.

4 R. Trichur, S. Silicoff, and B. Erman, "How Ottawa's plan to foster wireless competition sank," Globe and Mail, 18 May 2013, online at http://www.theglobeandmail.com/report-on-business/how-ottawas-plan-to-foster-wireless-competition-sank/article12005826.

5 S. Silcoff, "With wireless upstarts throwing in the towel, Ottawa needs to overhaul rules," *Globe and Mail*, 12 April 2013, online at http://www.theglobeandmail.com/report-on-business/rob-commentary/rob-insight/with-wireless-upstarts-throwing-in-the-towel-ottawa-needs-to-overhaul-rules/article11169262/.

6 The services considered in this paper are mobile wireless, not fixed wireless. All references to wireless services are references to mobile wireless and not fixed wireless services.

7 Any firm with revenues of less than 10 per cent of the total Canadian telecommunications market was defined by Industry Canada as an entrant. The only three firms not defined, therefore, as entrants, were Bell, Rogers, and Telus. As a result, MTS and SaskTel, each with more than 50 per cent market share in their respective provinces, were defined as entrants for the purpose of the 2008 AWS auction, and only Bell, Rogers, and Telus are defined to be incumbents.

8 Wireless services, as discussed here, use licensed spectrum. Access to use licensed spectrum is controlled by the federal government, with a license providing the right to use for approved purposes. These approved purposes include not just wireless services. Spectrum has other potential uses including radio and television broadcasting.

9 Public Mobile's spectrum is not set-aside spectrum.

The government has committed to "use any and every tool" available to "support greater competition in the market,"[10] and sustain at least some of the entrants who acquired AWS spectrum in 2008 (perhaps as another entity after being acquired by a foreign operator). The goal of the government is explicit: "We will continually review the regulations and policies that apply to the wireless telecommunications sector to promote at least four wireless providers in every region of the country so that Canadian consumers benefit from competition."[11] And the policy responses have been fast and furious, including:

- Explicitly preventing the acquisition by one of the incumbents of an entrant on the edge of bankruptcy,[12] as well as introducing a new transfer policy for spectrum that appears to put at risk option arrangements for the transfer of AWS set-aside spectrum from entrants to the incumbents after the five-year moratorium on transfers expires. [13]
- Instituting auction caps on the amount of 700 MHz spectrum the incumbents can acquire that are less than that of other bidders, including entrants and foreign firms.[14]
- Adopting new regulations intended to enhance roaming and tower sharing for entrants.[15] Roaming allows subscribers to the entrants' services to use the facilities of the incumbents in areas where the entrants do not have their own network coverage.
- Eliminating foreign ownership restrictions on firms with revenues that are less than 10 per cent of the roughly $43 billion national Canadian telecommunications market (the entrants therefore and not the incumbents). The effects of this policy shift are to lower the capital costs of entrants and enable network integration with large foreign carriers by the entrants.[16]

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[10] Industry Canada News Release, "Harper Government Protecting Consumers and Increasing Competition in Canadian Wireless Sector," 4 June 2013, online at http://news.gc.ca/web/article-eng.do?nid=746949.

[11] Industry Canada News Release, "Harper Government Protecting Consumers and Increasing Competition in Canadian Wireless Sector," 4 June 2013, online at http://news.gc.ca/web/article-eng.do?nid=746949.

[12] C. Dobby, "After Ottawa squashes Telus deal, Mobilicity now faces insolvency, Wind Mobile or oblivion," *Financial Post*, 13 June 2013, online at http://business.financialpost.com/2013/06/04/after-ottawa-squashes-telus-deal-mobilicity-now-faces-insolvency-wind-mobile-or-oblivion/.

[13] Industry Canada News Release, "Harper Government Releases Spectrum License Transfer Framework," 28 June 2013, online at http://news.gc.ca/web/article-eng.do?nid=754019 and C. Dobby, "Ottawa publishes rules on cellular spectrum transfers as industry prepares for shakeup," *Financial Post,* 13 June 2013, online at http://business.financialpost.com/2013/06/28/ottawa-publishes-rules-on-cellular-spectrum-transfers-as-industry-prepares-for-shakeup/.

The new transfer policy creates a miniature competition policy framework applicable to spectrum transfers; that is in addition to the existing merger and asset provisions contained in the *Competition Act* and enforced by the Competition Bureau. The provisions in the *Competition Act* are intended to prohibit transactions that result in a substantial lessening or prevention of competition. Presumably this is the same objective as the new licensing regime. The advantage, or disadvantage, of the new licensing and transfer regime is that it is controlled by the government and hence is much more susceptible to political influence. It is more likely that transfers will be stopped if they have either no effect on competition or have a positive effect. The rules of the AWS auction in 2008 imposed a ban on entrants selling their spectrum to incumbents for a period of five years. The moratorium commences with the date of the issue of a license and runs for five years. For most AWS spectrum this means the moratorium expires in 2014. Prior to the expiration of the five-year moratorium, some entrants reached option agreements with incumbents to sell their spectrum after the five year moratorium expires.

[14] Industry Canada News Release, "Harper Government Takes Action to Support Canadian Families," 14 March 2012, online at http://www.ic.gc.ca/eic/site/064.nsf/eng/07089.html.

[15] Industry Canada News Release, "Harper Government Puts Consumers First in Telecommunications Plan," 7 March 2013, online at http://news.gc.ca/web/article-eng.do?nid=724349.

[16] Industry Canada News Release, "Harper Government Takes Action to Support Canadian Families," 14 March 2012, online at http://www.ic.gc.ca/eic/site/064.nsf/eng/07089.html.

The Canadian Radio-television and Telecommunications Commission (CRTC) has also piled on. It mandated a code of conduct involving regulatory oversight of the terms and conditions of wireless service contracts, including restricting their length to two years instead of the common practice of three years.[17] Adoption of a wireless code of conduct was a result of an earlier decision in 2012 *confirming* that competition in wireless was sufficient with respect to prices, but was insufficient "to ensure that consumers have the information they need to participate effectively in the competitive mobile wireless market."[18]

These policy interventions are not costless. For instance, not allowing equal access to spectrum in an auction may prevent it from being used by the firm that can provide services of the greatest value to consumers. Second, if the market is competitive,[19] as will be established, efforts to create more entry are particularly pernicious because of their effect on incentives for investment if they result in prices below costs and put long-run profitability in jeopardy. A particular concern of the three incumbent carriers is the potential for spectrum caps, foreign ownership, acquisition by non-incumbents of entrants' AWS spectrum, and roaming regulations to result in subsidized entry of a much larger foreign wireless provider, such as Verizon, with consequent adverse effects on not only their profitability, but the market as a whole.[20] The adverse effects need not be confined just to the loss of expected returns on the incumbents, but as discussed, include negative consequences for consumers and the market in the long run.

The foundation of the government's wireless policy is clearly the assessment that competition is insufficient: their holy grail is establishing at least four carriers in every region. The issue we address in this paper is the validity of this underlying presumption: that competition between the three incumbent carriers — Bell, Rogers, and Telus — is insufficient. What is the basis for the assessment that wireless markets in Canada are insufficiently competitive and therefore require the policy interventions identified above?

This paper systematically assesses the evidence on the state of competition in Canadian wireless markets. In doing so, it considers the validity of the performance metrics often used to establish that there is a "competition problem" in Canadian wireless markets. Proponents of more intervention in wireless markets typically point to a number of key metrics where Canada has relatively poor performance. These generally include international comparisons of penetration rates (subscribers per capita), prices, and average revenue per user (ARPU). Each

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[17] Canadian Radio-television and Telecommunications Commission News Release, "Canadians can cancel their wireless contracts after two years under new CRTC wireless code," 3 June 2013, online at http://www.crtc.gc.ca/eng/com100/2013/r130603.htm. The key feature of the wireless code is the ability for consumers to cancel their wireless contracts after two years without penalty (which effectively limits the term of contracts to two years). In addition, the wireless code requires providers to cap extra data charges, unlock handsets after 90 days, and provide "easy to read and understand" contracts.

[18] Canadian Radio-television and Telecommunications Commission, Telecom Decision 2012-556, 11 October 2012 at 21 and 26, online at http://www.crtc.gc.ca/eng/archive/2012/2012-556.htm. It is difficult to understand how competition can be sufficient with respect to price, but not contract length or contract clarity. The problem with a code of conduct is that by standardizing contracts across carriers, it eliminates competition on contract length and contract clarity. It is well known that standardization on products contributes to the sustainability of coordinated pricing. See J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Chapter 10.

[19] Competitive does not mean perfectly competitive, but rather that there is not an inefficient exercise of market power or a significant and durable exercise of market power. See discussion below on page 21.

[20] See R. Trichur, "Wireless carriers press Ottawa for policy revamp," *Globe and Mail* 25 July 2013 at B1 and, especially the two page advertisement taken out by Bell on pages B4 and B5.

of these metrics will be evaluated in context and shown to be unpersuasive as evidence of insufficient competition in Canadian wireless services. First, upon close examination, it is not at all clear that the performance of the wireless sector in Canada sufficiently lags in international comparisons to justify government intervention. Indeed, on a number of measures involving wireless data usage, Canada is among the world leaders. Second, even if it was true that Canada's performance was relatively inferior on these measures, they are not relevant to assessing whether Canada has a competition problem in wireless services.

Instead, in this paper, we consider the application of indicators that are related to the exercise of market power and potentially indicative of the extent of competition. The traditional indices, measures of seller concentration (the number and size distribution of wireless carriers) and price cost margins, are assessed in terms of their relevance to wireless markets in Canada. In industries where the technology of production involves (i) relatively large sunk capital expenditures and (ii) economies of scale (or network size more generally) like wireless services,[21] measures that focus on the ability to profitably raise prices above short-run costs cannot distinguish between the inefficient and efficient exercise of market power.[22]

As explained later in more detail, in these circumstances, some exercise of market power may be necessary for firms to break even in the long run and hence that exercise is not inefficient. As a result, in these circumstances, a better indicator of whether competition is sufficient, or market power excessive, is to focus instead on the relationship between revenues and costs over the investment cycle. Excessive or inefficient market power would be consistent with evidence of monopoly profits: revenues in excess of the opportunity costs of production, including a competitive return on capital.[23]

The analysis indicates that the nominal internal rate of return — based on cash flows — for the dominant firm in Canada, Rogers, from 1986 to 2008, corresponding to the introduction of wireless services in Canada to the AWS spectrum auction with set-asides for the entrants, was 5.92 per cent. From 1986 to 2012, Rogers' nominal internal rate of return was 12.22 per cent. These *ex post* and pre-tax rates of return are not likely consistent with an *ex ante* competitive rate of return — given the risk involved — let alone excessive returns attributable to market power. This appropriate measure of market power in Canadian wireless services is not consistent with there being a competition problem. This conclusion is reinforced by the similarity in Canada of seller concentration and levels of gross margins with comparable countries. These two similarities are not consistent with the inefficient exercise of market power in Canada. If anything, the structure of the industry in Canada indicates greater competition than in most other comparable countries.

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[21] Investments in assets are sunk to the extent their opportunity cost (resale value) is less than their acquisition cost less accumulated depreciation. Hence selling them results in a capital loss, i.e., unrecovered capital investment. The short run implies that the utilization of at least one input, typically capital, is fixed. Output can be increased by using more of those inputs whose utilization can and must be varied to increase output.

[22] When used to diagnose changes in market power, as in an antitrust analysis of a particular conduct, this limitation is usually not an issue. When used to diagnose the overall competitiveness of a market, it can be a very important limitation.

[23] We recognize that the use of profits to measure market power is controversial and fraught with difficulty. For a summary of the difficulties see J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Chapter 12. Most of the criticism is based on the tendency for false positives, i.e., using profits to infer the existence of market power. The critiques are much less applicable when profit data is used to conclude that market power is not being exercised.

There is no "competition problem" that needs to be addressed by costly and intrusive policy measures. The outcome that is ultimately important for Canadians, both for consumers and for economy-wide productivity, is the availability of accessible and affordable world-class wireless data networks. Rather than continue to misdiagnose a problem — insufficient competition — the government would do better to focus on policy measures that promote inter-network competition and reverse course on its policies that reduce or restrict incentives for investment by the three incumbent carriers and their access to spectrum. The focus should be on such measures as:

- Maintaining and fostering incentives for non-price competition, in particular competition in investment and network characteristics — for instance speed, reliability, and capacity; and
- Efficiently allocating spectrum — making sure that it is allocated to those operators who can use it to provide the services, and quality of service, that Canadians expect and demand.

It is true that lower prices have, and would, benefit Canadian subscribers — at least in the short term. But without an analysis of the relationship between prices and costs, including the high capital costs of establishing networks, the danger is that revenues will not be sufficient to support the investment levels required to maintain and advance the quality of wireless networks. Reducing profitability below the level necessary to induce investment amounts to holding up and expropriating the capital of existing firms. In the case of wireless services in Canada, profitability does not seem even sufficient to support a competitive rate of return. The inefficiency of further entry also arises from the misallocation of spectrum and loss of scale to incumbents: the effects of these are higher prices and lower quality services. The benefits to consumers from the 2008 AWS entrants are limited by their narrow focus on voice and text in a mature market. Instead of allocating AWS spectrum to the incumbents who would use it to increase their speed and capacity for data, it has instead been allocated to entrants who have focused on voice and text. Canadians ended up with an incorrect mix of networks and an inefficient allocation of spectrum.

The next section of this paper considers the validity and interpretation of international comparisons. The paper then assesses the extent of competition directly. A subsequent section of this paper considers the viability of entry and the welfare effects of the government's efforts to promote competition by increasing the number of service providers.

INTERNATIONAL PERFORMANCE COMPARISONS

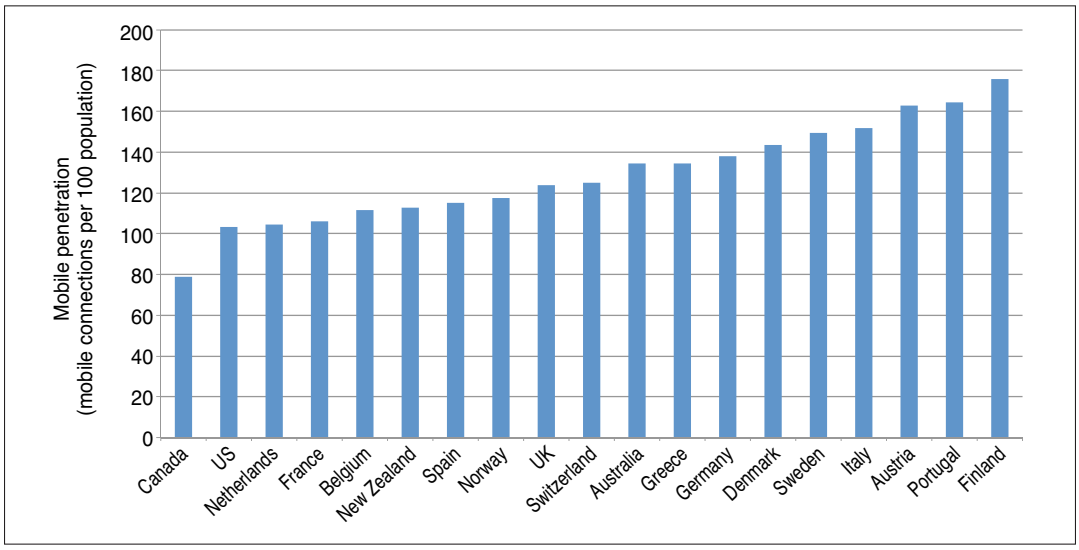
The Conventional Wisdom: Canada's performance indicates a laggard

The usual evidence that is used to argue that Canadian wireless services are insufficiently competitive is based on international comparisons. The two most familiar metrics used are shown in Figure 1 and Figure 2. Figure 1 shows mobile penetration as measured by mobile connections per 100 population, with Canada languishing relative to its OECD peers.[24]

[24] Because of the substantial differences in, among other things, government policies and population density, the set of OECD peers used in the comparisons typically excludes Asian countries, including Japan and South Korea.

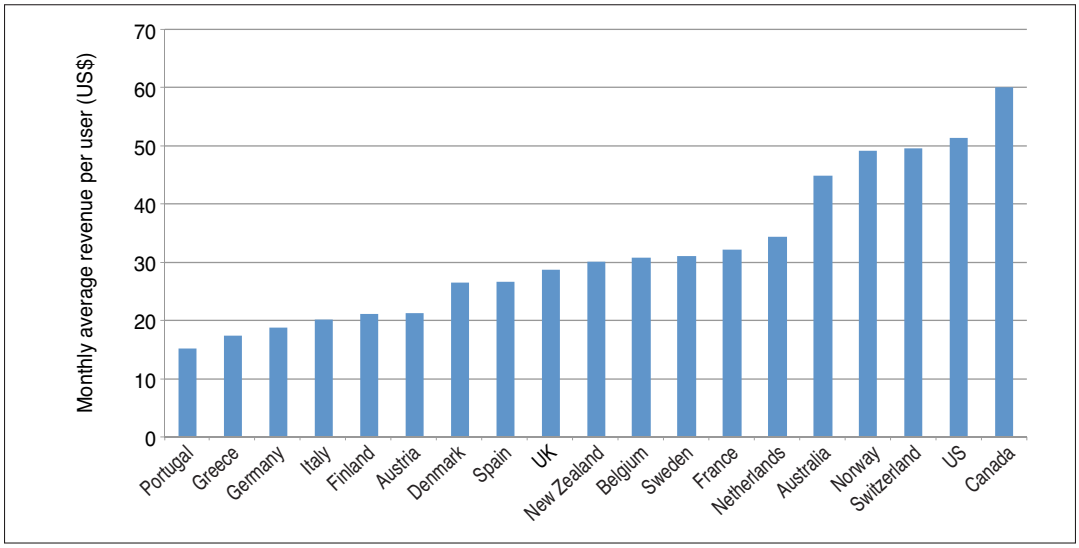
Figure 2 shows Average Revenue per User (or ARPU), widely used as a metric for price, and here Canada is at the top. Figure 3 provides a scatter plot that shows a negative correlation between the measure of price (ARPU) and the measure of output (penetration), suggesting that Canada's low penetration is explained by its high prices.[25]

FIGURE 1: MOBILE PENETRATION (4Q2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013.*

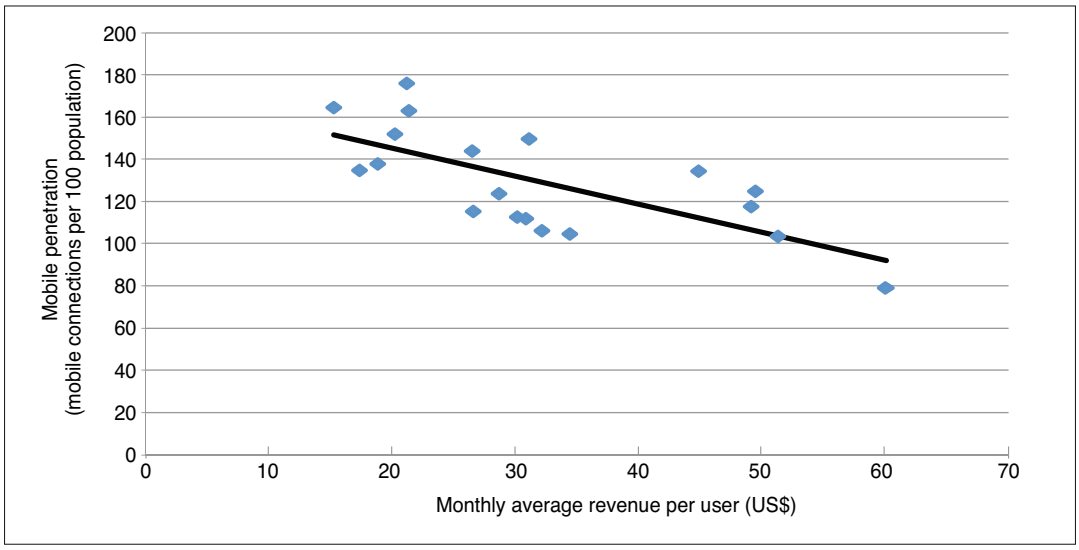
FIGURE 2: AVERAGE REVENUE PER USER (US$, 4Q2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013.*

[25] A recent report in support of spectrum set-asides and other measures to increase competition in wireless services in Canada used Canada's relatively poor ranking on price comparisons and penetration rates as evidence of insufficient competition. See I. Grant, A. Kaminer, T. Marshall, M. MacDonald, and L. Shaddy. "Long-Term Evolutionary Challenge: Limiting Wireless Carriers Gluttony," *SeaBoard Group*, February 2012, p. 30, online at http://www.seaboardgroup. com/main/images/stories/Reports/wirelessdietf11.pdf.

FIGURE 3: PENETRATION VS. AVERAGE REVENUE PER USER (4Q2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

Understanding Wireless Provision

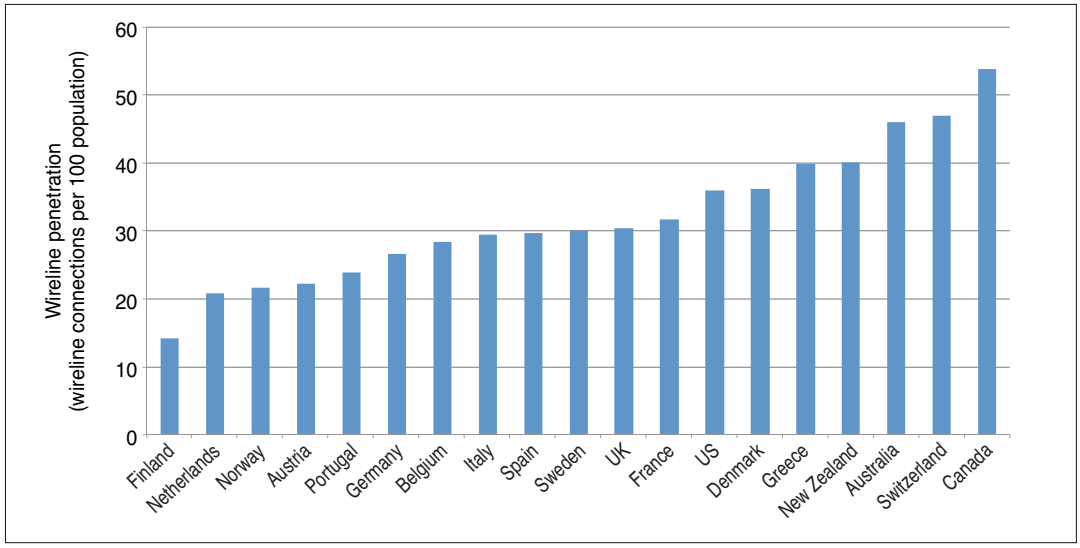
In order to understand what the metrics in Figures 1 and 2 actually measure, and whether they measure what is intended, it is important to understand an important institutional distinction in the marketing of wireless services. In European countries, the Calling Party Pays Protocol (CPPP) has been the common billing practice. Under CPPP, the calling party is billed for a call, not the receiving party; outgoing calls are paid for by the caller, incoming calls are free. Under CPPP, the calling party's wireless provider pays termination charges to the receiving party's provider for terminating calls on its networks. This system creates a substantial incentive for firms to charge high termination rates (they control a bottleneck on access to their subscribers), therefore causing calls made from one network to another network to be relatively expensive. These practices create, therefore, a substantial wedge — a difference in the costs of calling to a user — between "on-net" and "off-net" calls, and this in turn leads some customers who have contacts on multiple networks to seek out multiple subscriptions in order to minimize calling costs. The practice in Canada and the United States is very different. Both callers and receivers pay for usage, or have the minutes deducted from their purchased allowance, when a call is made.

Typically in CPPP countries, and related to the adoption of the GSM standard, unlocked handsets were purchased by subscribers. Unlocked means that subscriber identification module cards (SIM cards) could be swapped in and out to access different carriers' networks with the same handset. In North America, on the other hand, unlocked handsets were typically not purchased by subscribers. Instead, locked handsets were offered at a reduced upfront cost, with the "subsidy" recovered through prices in long-term contracts for service.

In addition there are also two other features that appear to distinguish Canadian wireless markets from other countries. These are:

- Quality and Affordability of Wireline Services. Figure 4 shows that wireline penetration in Canada is the highest among western developed countries (Canada's peer group), on the order of 20 per cent higher than the United States and almost 40 per cent higher than the country with the lowest wireline penetration, Finland. It has been observed for some time that Canada's quality and affordable wireline service has likely negatively affected wireless adoption.[26]
- Importance of Pre-paid Plans. Pre-paid plans are pay-as-you-go and involve prepaying for minutes. Figure 5 shows the share of mobile subscribers on pre-paid plans in Canada in the last quarter of 2012. Canada has the second lowest pre-paid share (19 per cent) after Finland, which is substantially lower than many in its peer group whose pre-paid share is over 40 per cent. Figure 6 shows the penetration rate for post-paid subscribers, i.e., those on a monthly plan. Unlike the total penetration rate in Figure 1, the number of Canadians on a monthly plan per capita is not an outlier.[27]

FIGURE 4: WIRELINE PENETRATION (2012)

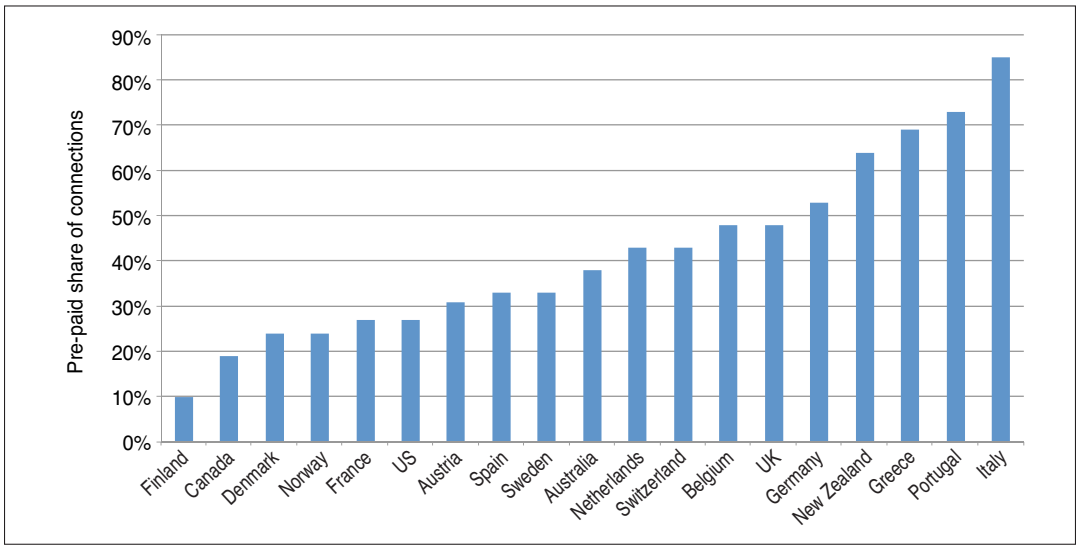


Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

[26] Quigley, N. and M. Sanderson, "Going Mobile – Slowly," *C.D Howe Institute*, Commentary No. 222, December 2005, online at http://www.cdhowe.org/pdf/commentary_222.pdf investigate the relationship between wireless penetration and fixed-line service. See also J. Church, "Spectrum Policy as Competition Policy: A Good Choice for Canada?" 28 February 2013, online at http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-018-10-jeffreychurch-rogers.pdf/$FILE/smse-018-10-jeffreychurch-rogers.pdf which includes regression analysis of fixed-line penetration against per-capita GDP. The analysis there shows that Canada's fixed-line penetration was 13 per cent higher over the period 1991-2004 than predicted by per-capita GDP, which suggests that fixed-line service was unusually affordable in Canada.

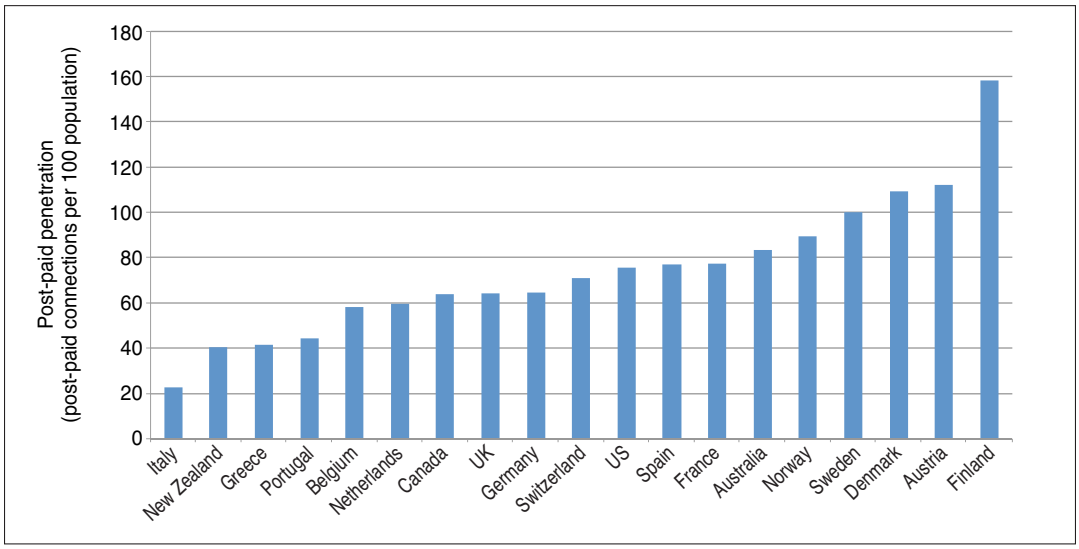
[27] The puzzle, if there is one, is in explaining the relatively low adoption rates of pay-as-you-go plans. As discussed below, it is very difficult to attribute this to insufficient competition.

FIGURE 5: PRE-PAID (PAY-AS-YOU-GO) SHARE OF CONNECTIONS (4Q2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013.*

FIGURE 6: POST-PAID PENETRATION (4Q2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013.*

There is typically a significant difference in the nature of the tariff between pay-as-you-go plans and a monthly plan. With a monthly plan, the access, or flat, portion of a subscriber's bill is relatively high, but the per-minute usage charge is relatively small — especially if usage is below the monthly allowance for minutes. On the other hand, for pay-as-you-go plans, the monthly fee is relatively low, indeed often zero, but the usage charge per minute is relatively high.[28]

[28] For instance, a typical Rogers monthly plan with 2 GB of data per month costs CDN$75, but would include unlimited nationwide calling and texting (the usage charge for calling and texting is zero), see http://www.rogers.com/web/Rogers.portal?_nfpb=true&_pageLabel=WLRS_Plans. In contrast a pay-as-you-go plan in the UK from T-Mobile with 1 GB of data costs £10 per month, but involves a 35p/min charge for calling over 100 minutes and a 14p/text charge for over 400 texts, see http://www.t-mobile.co.uk/shop/pay-as-you-go/plans/. Both sites accessed August 27, 2013.

Measures of Output: Penetration, Minutes of Use and Data

These considerations mean that the data on total penetration rates in Figure 1 are misleading. With respect to European countries, the preponderance of pre-paid contracts and CPPP means that the count of subscribers greatly exceeds the count of unique users. Specifically, there is (i) a counting problem with inactive pre-paid subscribers being retained in the subscriber counts of operators from whom they have churned away; and (ii) CPPP creates incentives for customers who have contacts on multiple networks to seek out and use multiple pre-paid subscriptions to minimise calling costs, which unlocked phones make possible.[29] The effect of both of these is to inflate the subscriber count in European countries, leading to penetration rates that are too high, *if* the objective of a penetration rate is to assess how many individuals have mobile service. And, as shown in Figure 6, the participation by Canadians on a monthly plan is similar to that in other countries. Hence overall penetration rates are not very informative regarding Canada's relative performance.

Penetration rates assume that the relevant measure of output is access. An alternative measure of output and hence industry performance is usage. Access, in and of itself, is often of relatively little value unless it is actually used, i.e., the value of access is derived from the value of calls.[30] Therefore, an alternative measure of industry performance is minutes of use per capita, which is minutes of use per subscriber multiplied by subscribers per capita.[31] Figures 7A and 7B present a comparison of minutes of use per capita and they indicate that the performance on this metric in Canada is comparable to most of its peers.

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[29] Subscribers might also have multiple SIM cards with the same carrier and for several different countries for inter-Europe travel.

[30] There is of course an option value of having access even if it is not used. But having access only in the event of an emergency is available at much less expense through a pay-as-you-go option instead of a monthly plan.

[31] See the discussion, for example, in Ofcom, *Wholesale mobile voice call termination review*, 29 July 2009, online at http://stakeholders.ofcom.org.uk/consultations/mobilecallterm/. Note that minutes of use per capita avoids the multiple subscriber biases associated with its two components: minutes of use per subscriber is too low and number of subscribers per capita is too high.

FIGURES 7A AND 7B: MONTHLY MINUTES OF USE PER CAPITA (4Q2012)

Figure 7A: Unadjusted Values

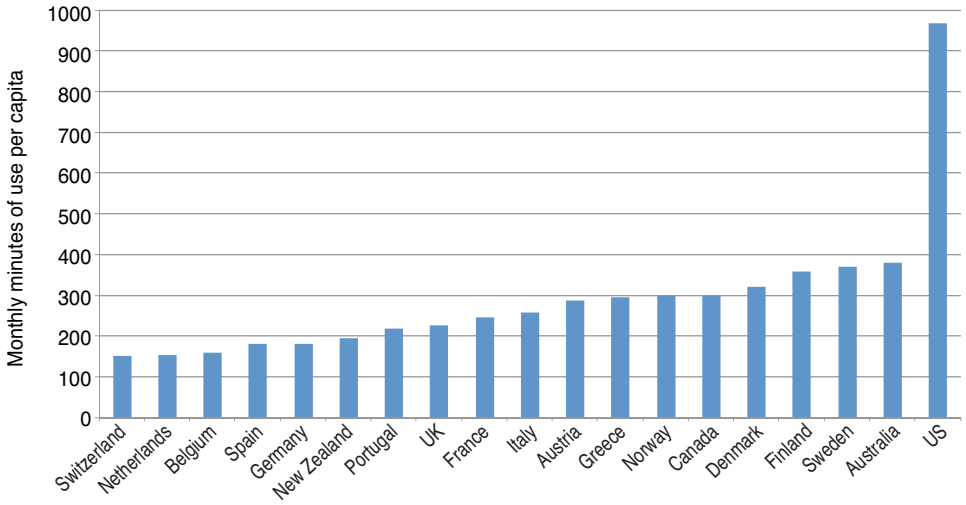
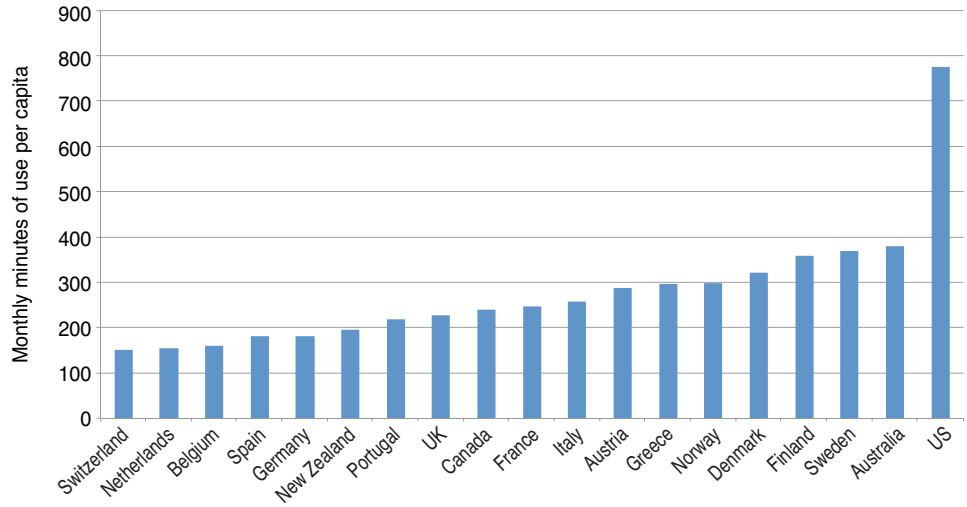


Figure 7B: With Conservative BoA Non-CPP Adjustment

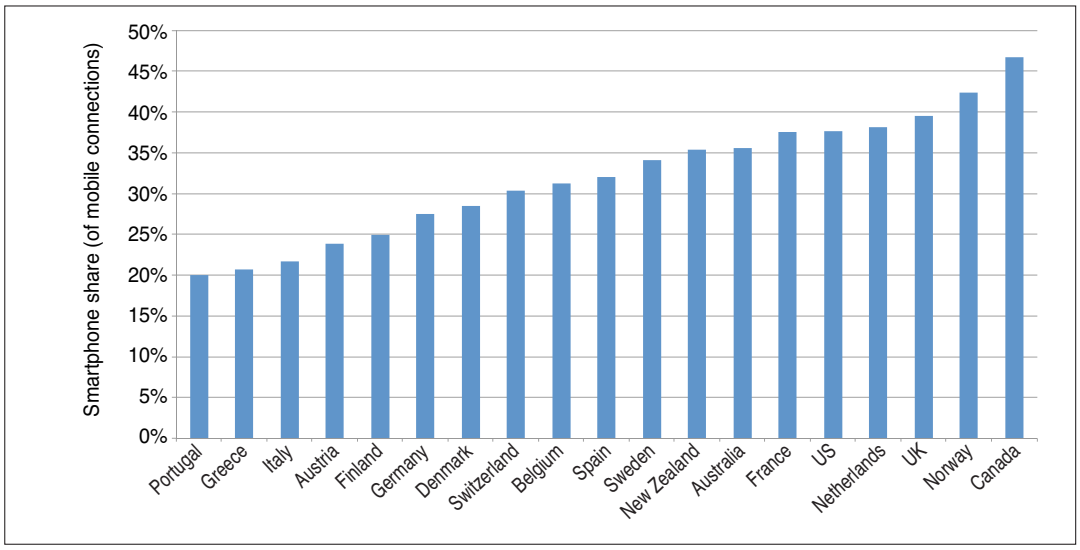


Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

Note that the values in Figure 7A are unadjusted for a potential measurement issue arising in countries where the calling-party-pays protocol is not used (Canada and the US). In these countries, a one-minute call between mobile subscribers using the same provider (an on-net call) is reported as two minutes, whereas in countries that use the calling-party-pays protocol, that same call would be counted as only one minute. As a result, the number of minutes reported for Canada and the US may be somewhat overstated relative to the other countries. BoA Merrill Lynch suggests that a conservative (high side) correction would be to reduce the Canada and US values by 20 per cent, which is presented in Figure 7B.

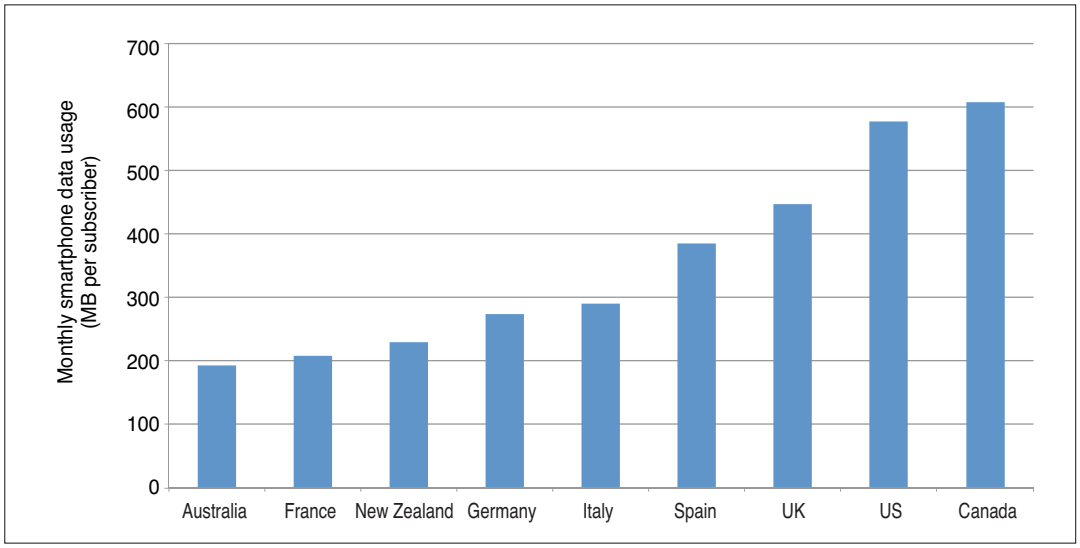
In addition to voice usage, another important indicator of output in wireless markets is smartphone adoption and usage. Figure 8 presents the ratio of smartphone penetration to wireless adoption, with Canada ranking first relative to its peer group. Average monthly smartphone data usage per smartphone subscriber is displayed in Figure 9; Canadian smartphone users are number one in the world for usage. Figure 10 shows smartphone data usage per capita; Canada ranks second only to the United States. On the whole, these metrics show that for smartphone adoption and usage, Canada actually compares very favourably to its international peers.

FIGURE 8: SMARTPHONE PENETRATION AS A SHARE OF MOBILE PENETRATION (4Q2012)



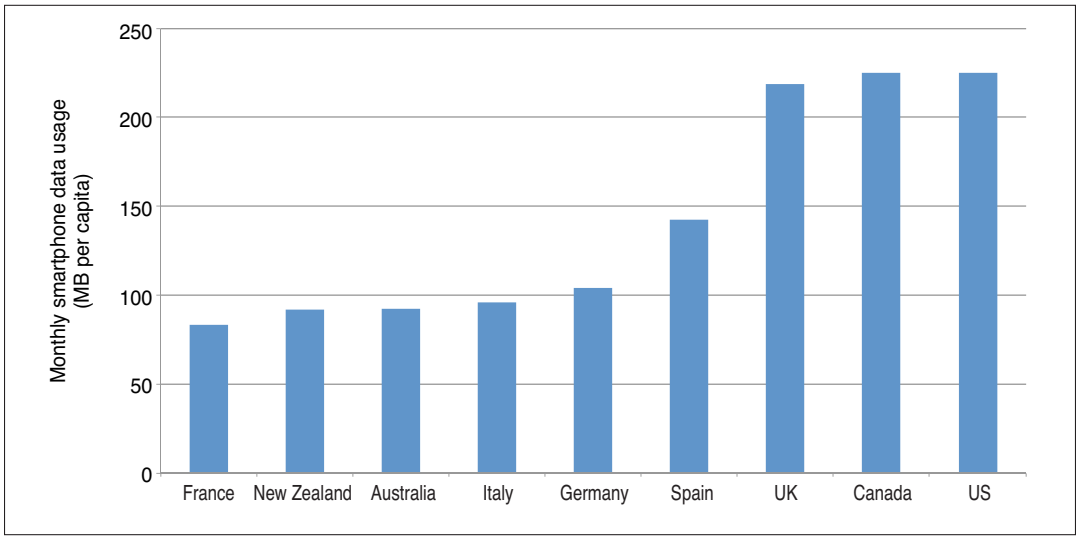
Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013.*

FIGURE 9: MONTHLY SMARTPHONE DATA USAGE PER SUBSCRIBER (2012)



Source: Cisco, VNI Mobile Forecast Highlights 2012-2017, online at http://www.cisco.com/web/solutions/sp/vni/vni_mobile_forecast_highlight/index.html#~Country

FIGURE 10: MONTHLY SMARTPHONE DATA USAGE PER CAPITA (2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013 and Cisco, VNI Mobile Forecast Highlights 2012-2017, online at http://www.cisco.com/web/solutions/sp/vni/vni_mobile_forecast_highlight/index.html#~Country*

Price Comparisons

Those who allege that Canadian wireless prices are among the highest in the world have often cited data published by the Organisation for Economic Co-operation and Development (OECD) in its biennial *OECD Communications Outlook*. The OECD undertakes international price comparisons on mobile wireless services by defining baskets of services with varying quantities of data, minutes, and text messages. The minimum cost to achieve the service level specified for each basket is then determined for each OECD member country. Much of the perception that Canada is a high-cost jurisdiction arises from the 2009 issue that reports on prices in August 2008.[32] In the 2009 issue, the OECD compares the prices for three baskets that correspond to what it considers as low (360 calls per year), medium (780 calls per year) and high usage (1680 calls per year).[33] Of the 30 countries surveyed, Canada's basket price is 19th for the high- and low-usage basket, and 28th out of 30th for the medium-usage basket.[34]

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[32] See for example, C. Hart, S. Anderson, L. Pinto and R. Yeo, "Time for an Upgrade: Demanding choice in Canada's cell phone market," *OpenMedia*, April 2013, p. 29, online at https://openmedia.ca/sites/openmedia.ca/files/TimeForAnUpgrade_OpenMedia_130419.pdf; K. Mewhart and S. Anderson, "Spectrum Policy in Canada: Leveling the playing field for affordable rates and breadth of choice," *OpenMedia and CIPPIC*, March 2013, p. 1, online at https://openmedia.ca/sites/openmedia.ca/files/STS_SpectrumReport_OpenMedia_120315.pdf; and the CBC News, "The price of staying connected," http://www.cbc.ca/news/interactives/map-cellphonecosts/.

[33] Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2009*, 17 August 2009, p. 269, online at http://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2009.htm

[34] Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2009*, 17 August 2009, at pp. 274-277, online at http://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2009.htm.

There are a number of issues with the OECD methodology, including differences in service offerings (couples and family plans, unlimited offerings, etc., are not addressed) and approaches to bundling, but a key limitation is that the methodology used does not account for variations in usage patterns across countries. This is explicitly highlighted by the OECD, which notes that "in certain countries the prices may appear more competitive in one basket than in another. This is commonly the result of offers tailored to specific national calling patterns that may mimic the composition of a certain basket more closely than others."[35] For example, the 2009 OECD price basket for a high user (the most expensive basket used in the 2009 study) includes 246 minutes of usage per month,[36] whereas in 2008 (the period studied), the *average* number of minutes of use per subscriber per month in Canada was substantially higher at 405.[37] That is, on average, Canadian subscribers had roughly 65 per cent more minutes of use per month than what the OECD defined for a high-volume user.[38] This strongly suggests that these baskets may not have been appropriate for identifying prices of service levels relevant to subscribers in Canada.

The 2011 edition of the *OECD Communication Outlook* had markedly different results for the price-basket analysis. Canada faired much better than in the 2009 report, placing 4th and 10th out of 34 countries for the two largest of the expanded mobile baskets (for 900 and 300 calls per month, respectively).[39] The results for the smallest baskets were less impressive, with Canada placing 23rd and 33rd out of 34 countries for the 100 and 30 calls per month baskets, respectively, and 27th for 40 pre-paid calls. After the 2011 edition of the *OECD Communication Outlook*, allegations that Canada had tremendously high prices became harder to sustain, at least with respect to the updated data and monthly plans.[40]

In the latest edition of the OECD report, released in July 2013,[41] the OECD introduced data plans and expanded the number of voice and text baskets. Canada's performance was in the middle of the pack. Table 1 shows Canada's rank for the voice and text baskets with and without the data options. For the plans with 2 GB of data, Canada placed 21st (for 900 calls per month) and 22nd (for 100 calls per month) out of 34 countries. Canada's ranking for the

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35 Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2009*, 17 August 2009, pp. 268-269, online at http://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2009.htm.

36 Organization for Economic Co-operation and Development, *OECD telecommunications price baskets 2009*, online at http://web.archive.org/web/20101218191647/http://www.oecd.org/document/5/0,3746,en_2649_34225_43877509_1_1_1_1,00.html. The total annual minutes included in the high basket is 2,952 or, dividing by 12, 246 minutes a month.

37 See Table 100 of G. Campbell, "Global Wireless Matrix 1Q2013," *Bank of America Merrill Lynch*, 15 April 2013.

38 If the number of minutes as reported by the Bank of America Merrill Lynch database is adjusted to reflect double counting, by reducing Canada's estimate by a conservative 20 per cent (see the notes to Figures 7A and 7B), the number of minutes of use in Canada on average is still almost a third higher than assumed by the OECD.

39 Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2011*, 22 June 2011, pp. 258-262, online at http://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2011.htm

40 Some critics continued to focus on the price-basket results from the 2009 report, while still referring to portions of the more recent 2011 edition elsewhere in the same analysis. See C. Hart, S. Anderson, L. Pinto and R. Yeo, "Time for an Upgrade: Demanding choice in Canada's cell phone market," *OpenMedia*, April 2013, p. 29, online at https://openmedia.ca/sites/openmedia.ca/files/TimeForAnUpgrade_OpenMedia_130419.pdf.

41 Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2013*, 11 July 2013, pp. 219-224, online at http://www.oecd.org/sti/broadband/communications-outlook.htm.

lower data usage plans was similar: 24th for both the 1 GB of data and 300 calls and the 500 MB and 100 calls per month baskets, as well as 25th for the 100 MB and 30 calls per month basket. While these results are not as impressive as some of those from the 2011 issue, it is interesting to note that Canada still outperformed the US in three of the five mobile baskets with data. The important point is that Canada is clearly not an outlier among the OECD countries in the 2013 report.

TABLE 1: CANADIAN RANKING IN 2013 OECD PRICE BASKET ANALYSIS

	Rank without Data	Rank with 100 MB	Rank with 500 MB	Rank with 1 GB	Rank with 2 GB
30 Calls – 100 SMS	30	25*	-	-	-
100 Calls – 140 SMS	26	-	24*	-	22*
300 Calls – 225 SMS	24*	-	-	24	-
900 Calls – 350 SMS	18	-	-	-	21
(Prepaid)	23	-	-	-	-

Source: Organization for Economic Co-Operation and Development, OECD Communications Outlook 2013, 11 July 2013, Tables 7.11 – 7.15; 7.31 – 7.35, online at http://www.oecd.org/sti/broadband/communications-outlook.htm

Analysis includes 34 OECD countries ranked from lowest to highest based on the total cost of each basket in USD at Purchasing Power Parity (PPP).

** Canadian total basket cost is lower than for the US.*

The OECD baskets do not control for quality, in particular speed and reliability. Low prices may not be very attractive if the effective speed of the network and handsets make the data option unattractive due to the high cost of a user's time. Or low prices might not be attractive if network access is an issue or calls are dropped frequently.[42] In this respect, competition over the quality of the network might be much more important to users than low prices, especially when the service is demanded over a wide area with a varying topography.[43]

The recent OECD pricing results are consistent with the CRTC's monitoring of international prices. Table 2 summarizes the 2013 comparison. Of the six countries considered, Canada is in the middle for average and high users, and — consistent with the OECD numbers — among the highest for low-volume users. The high price for low-volume users likely is reflective of the influence of demand patterns on competition, which in Canada is the relative lack of interest in pay-as-you-go. As the OECD observes:[44] "By way of contrast, for those countries that make less or little use of pre-paid cards, as opposed to post-paid services, prices are typically higher for the baskets with lower usage levels."

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[42] Concerns over the effect of low prices on incentives to invest have been documented in a recent publication released by the GSM Association, which compares the performance of US and European wireless markets. See E. Bohlin, K. Caves and J. Eisenach, "Mobile Wireless Performance in the EU & the US," *GSMA*, May 2013, at p.12, online at http://www.gsmamobilewirelessperformance.com/GSMA_Mobile_Wireless_Performance_May2013.pdf. This report makes the case for allowing consolidation in European wireless markets: "Efficient consolidation would provide incentives for investment, facilitate a more integrated mobile wireless ecosystem and improve consumer welfare." (at p. 2).

[43] In such instances, the price elasticity of demand for a carrier might be very inelastic, but quality of service very elastic. If this is the case, then demand will not be very responsive to changes in prices, but very responsive to service quality. High prices will not reduce demand, but poor coverage and reliability will. Hence competing firms will find it profitable to focus competition on quality of service. To the extent that service quality is costly, then in the long run prices will be higher.

[44] Organization for Economic Co-Operation and Development, *OECD Communications Outlook 2011*, 22 June 2011, p. 259, online at http://www.oecd.org/sti/broadband/oecdcommunicationsoutlook2011.htm

TABLE 2: INTERNATIONAL WIRELESS PRICING COMPARISONS PREPARED FOR THE CRTC (2013)

	Canada	U.S.	U.K	France	Australia	Japan
Level 1 (low-volume use)	30.71	33.08	21.97	20.24	21.82	28.09
Level 2 (average user)	44.86	76.14	38.85	44.08	35.04	44.36
Level 3 (high-volume user)	93.59	145.79	63.52	58.90	49.54	125.24

Source: Wall Communications Inc. Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2013 Update, Table A3.2. Prepared for the Canadian Radio-television and Telecommunications Commission and Industry Canada. Available online at http://www.crtc.gc.ca/eng/publications/reports/rp130422.pdf.

Average monthly prices in purchasing power parity adjusted Canadian dollars.

Average Revenue Per User

Many who allege that Canada is one of the highest price jurisdictions for wireless services do not, therefore, compare actual prices. For their argument to resonate, and be compelling as a basis for policy intervention, requires not that Canada's performance be average, but that Canada's prices be outliers, i.e., much higher than the rest of the world. This point can be made by highlighting that average revenue per user (ARPU) in Canada is the highest in the world.[45] ARPU is not a price, but a measure of consumer expenditure that depends on both price and quantity of both *voice and data services*. ARPU is aggregate service revenue, which is the sum across all services provided, divided by the total number of subscribers. Two things about mobile usage in Canada stand out as being important drivers of its high ARPU.

First, Canada is a world leader in smartphone adoption and usage. Among the western developed economies, Canada has the highest smartphone share of mobile users and is second, after the United States, in terms of monthly data usage.[46] To see why data usage and smartphone adoption matters for understanding ARPU, consider the assertion that "Quebec boasts the lowest wireless prices in the country, with an average bill that is 13 per cent cheaper than in Ontario and 49 per cent cheaper than Alberta."[47]

It is true that Quebecers spend less on average for mobile services than do Albertans. The 2011 value, the most recent available from the CRTC, for ARPU in Quebec was $50.36 a month; that in Alberta was $74.96 a month.[48] But this difference should not be attributed to differences in competition or regulation. The large difference in ARPU is not due to any difference in prices or the market share of entrants, but instead the difference reflects a different mix of wireless services being consumed.[49] Demand for smartphones and, presumably data consumption, in Alberta is substantially higher. The smartphone penetration rate in Alberta is 47 per cent, but it is only 27 per cent in Quebec.[50]

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[45] See Figure 2.

[46] See Figure 8 for smartphone penetration as a share of mobile penetration, Figure 9 for smartphone data usage per subscriber, and Figure 10 for smartphone data usage per capita.

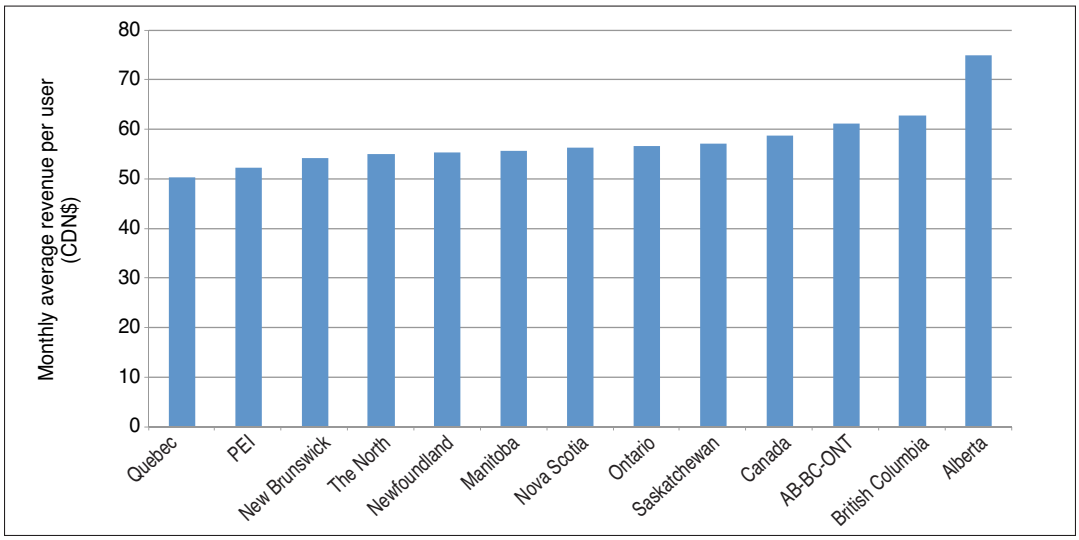
[47] S. Cousineau, "Quebec a model for wireless competition," *Globe and Mail*, 17 April 2013, B2. The lower prices are then asserted to be attributable to provincial regulation (in particular a wireless code of conduct) and competition from Videotron.

[48] See Figure 11.

[49] See Table 3. Prices for the three national incumbents are typically the same in Quebec and Alberta.

[50] See Figure 12.

FIGURE 11: PROVINCIAL AVERAGE REVENUE PER USER (2011)



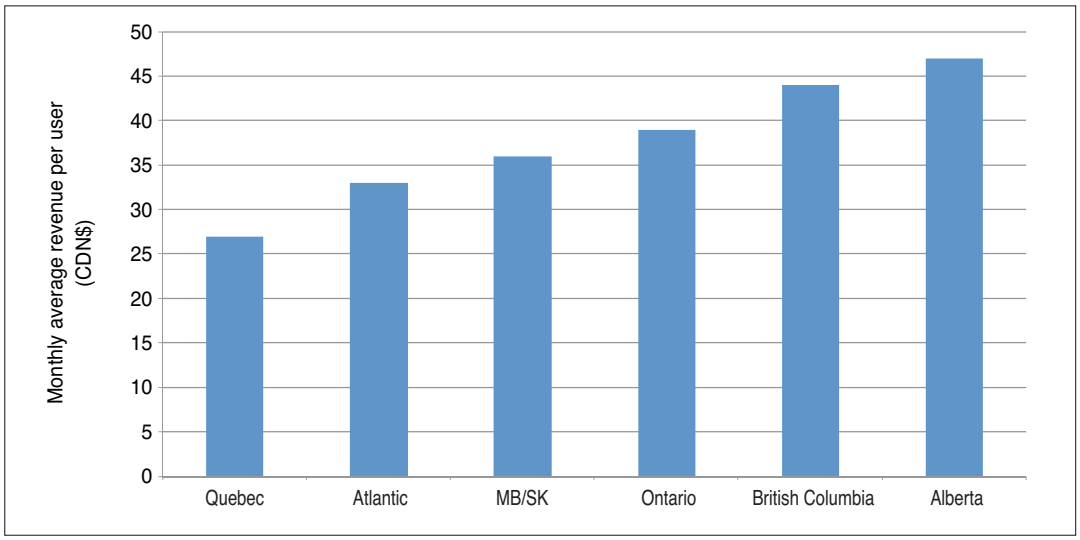
Source: Canadian Radio-television and Telecommunications Commission, Communications Monitoring Report 2012, September 2012, Table 5.5.6, online at http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2012/cmr2012.pdf.

TABLE 3: COMPARISON OF ALBERTA AND QUEBEC

	Alberta	Quebec
Market share of entrant service providers (of subscribers, 2011)	2%	7%
Smartphone penetration (smartphone subscribers per capita, 2011)	47%	27%
Total cellular phone penetration (total subscribers per capita, 2011)	97%	65%

Source: Canadian Radio-television and Telecommunications Commission, Communications Monitoring Report 2012, September 2012, Figure 4.5.22 and Tables 5.5.5 and 5.5.11, online at http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2012/cmr2012.pdf.

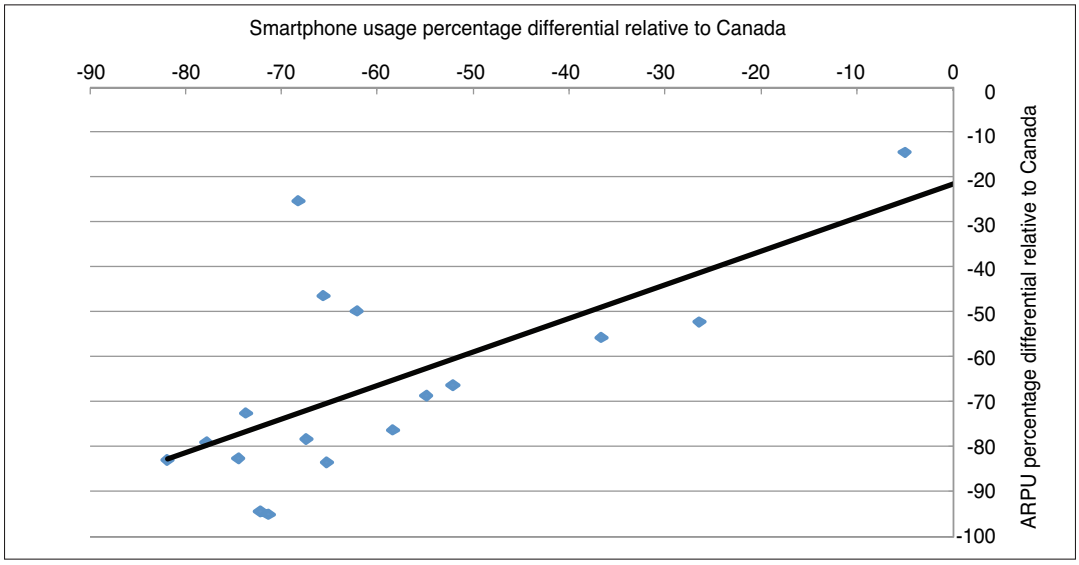
FIGURE 12: PROVINCIAL SMARTPHONE PENETRATION (2011)



Source: Canadian Radio-television and Telecommunications Commission, Communications Monitoring Report 2012, September 2012, Figure 4.5.22, online at http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2012/cmr2012.pdf.

The same dynamic underlies international comparisons of ARPU values. On the vertical axis in Figure 13 are countries' ARPU percentage differential relative to Canada. On the horizontal axis is the percentage usage differential (average smartphone usage for that country less average smartphone usage in Canada as a percentage of use in Canada). There is an obvious positive relationship: the smaller the smartphone data percentage usage differential, the smaller the ARPU percentage differential. The fitted regression line in Figure 13 indicates that a one per cent narrowing of the usage percentage differential results in almost a three-quarter of a per cent narrowing in the ARPU percentage differential.

FIGURE 13: ARPU DIFFERENTIAL VS. SMARTPHONE USAGE DIFFERENTIAL



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, *15 April 2013 and Cisco,* VNI Mobile Forecast Highlights *2012-2017, online at http://www.cisco.com/web/solutions/sp/vni/vni_mobile_forecast_highlight/index.html#~Country*

Regression Results:

$\Delta ARPU_i = -21.46 + 0.75\ \Delta Smartphone_i$

Standard errors: -13.75 and 0.22

*t - stats: -1.56 and 3.41**

** statistically significantly different from zero at the 99 per cent confidence level.*

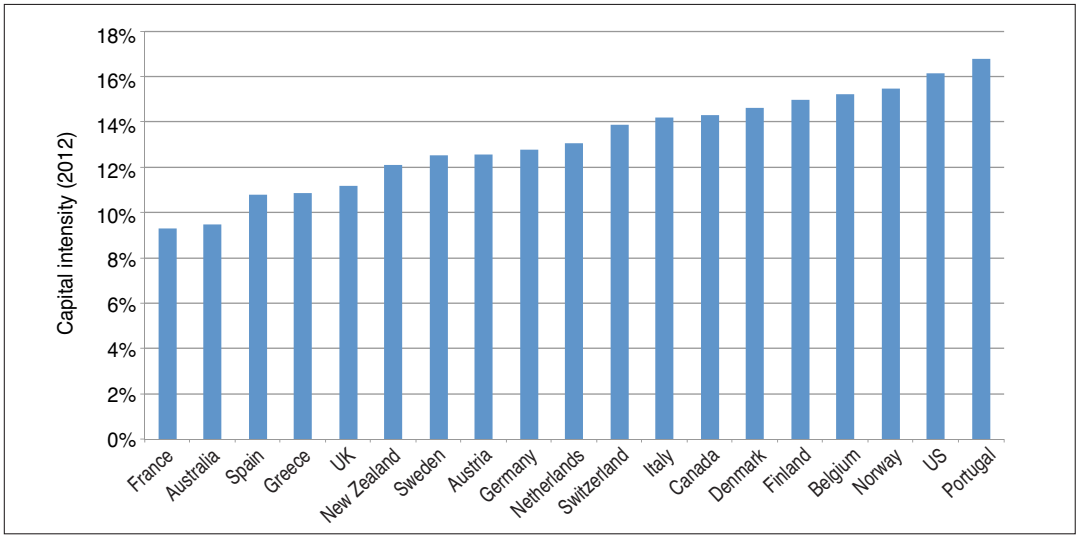
It is not only the price of service that matters, but its quality as well. To build world-class wireless networks, and thereby be assured of access to the latest and greatest devices, requires considerable investment. Canada's wireless industry compares very well internationally in terms of capital intensity (the ratio of capital expenditure to industry revenues), with higher values than countries such as France, Germany, Sweden, and the UK.[51] In terms of capital expenditures per subscriber, Canada lead its peers in 2012.[52] In terms of the introduction of wireless technology, Canada was the first country in North America to offer an HSPA+ network, was the first country in the world to have three national wireless carriers offering

[51] See Figure 14.

[52] See Figure 15.

HSPA+ service, and has been in the vanguard in rolling out LTE networks. Canadians' love of smartphones and high rates of data usage are a direct result of the rollout of high-speed networks and access to leading smartphones. Those who single out high ARPU as an indicator that something is wrong with prices — and therefore competition — are fundamentally misinformed about the meaning of ARPU and why it is high in Canada.[53]

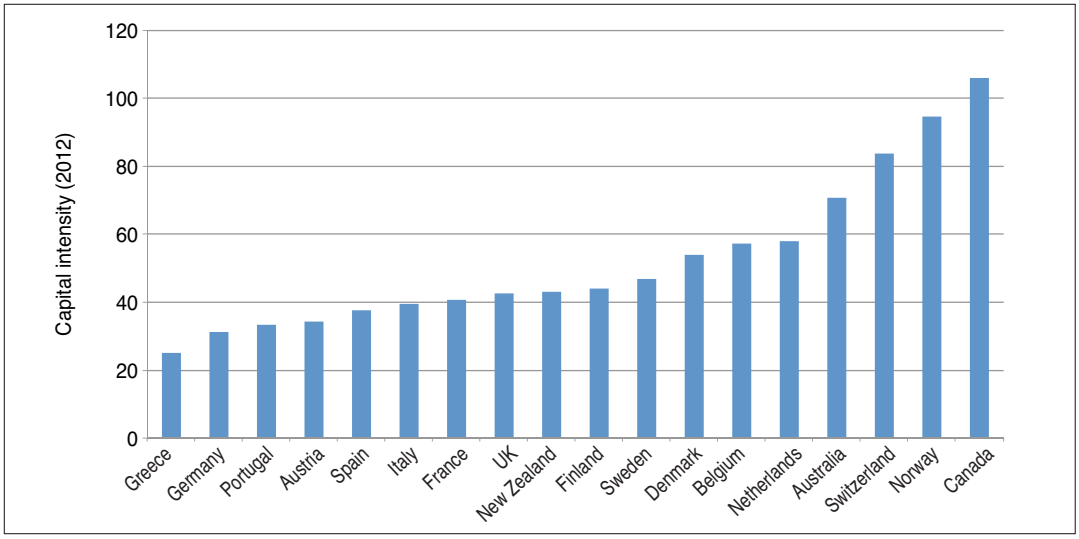
FIGURE 14: CAPITAL INTENSITY (2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

Capital intensity is calculated as the ratio of capital expenditures to industry service revenues, for the top one to three wireless operators in each country (depending on data availability).

FIGURE 15: CAPITAL EXPENDITURES PER SUBSCRIBER (US=100, 2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

This is calculated as the capital expenditures divided by the number of subscribers for the top one to three wireless operators in each country (depending on data availability). Note that this measure is relative to the capital expenditure per subscriber in the United States (which is denoted 100).

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[53] See for instance M. Wente, "I've got those wireless/cable/telecom blues," *Globe and Mail*, 3 August 2013, online at http://www.theglobeandmail.com/commentary/ive-got-those-wirelesscabletelecom-blues/article13581949/ pointing to Canada's ARPU ranking, highest in the world, and citing Peter Nowak.

The second interesting characteristic regarding the market for wireless services in Canada, which distinguishes it from many other countries, is the lack of interest in pre-paid plans. The hallmark of pre-paid plans is a relatively low total commitment for voice service. Figure 5 above showed the low percentage of subscribers in Canada on a pay-as-you-go or pre-paid plan. This lack of interest in relatively low-priced pre-paid plans (inside Canada) will also contribute to Canada having a relatively (across countries) high ARPU, just as it means that Canada will fare poorly in international comparisons of prices for low usage levels.[54]

MARKET POWER AND MEASURES OF COMPETITION

Relevance of International Performance Measures

The international performance metrics may be of interest for other reasons, but they are actually not relevant for the purposes for which they are often used — inferring the state of competition in Canadian wireless markets. The problem with the international comparisons in the proceeding section as a means to diagnose market power is that they assume an apples-to-apples comparison. This means that they assume that all the factors that affect demand and costs are the same across countries. For instance, to have an apples-to-apples comparison, the product, the cost of production, consumer preferences, and any other factor that influences prices, costs, and the relationship between prices and costs, except the difference in competition, must be the same across countries. If this is true, then an inference from poor performance to competition can be made.

But it is clearly not true. The quality of network service, industry pricing practices, consumer preferences, availability and terms of handset provision, alternatives to wireless services, costs of provision, and the institutional/regulatory/legal environment all differ across countries, and typically little effort is made to try and account for these differences in assessing why prices or penetration differ across jurisdictions. It should be obvious that demand, regulatory, and cost differences will mean that prices, penetration, minutes of use, and data consumption will differ even if competition (however measured) is the same.

If the policy interest is in assessing whether there is a market-power problem in wireless service provision in Canada, then the appropriate tools to assess market power and competition should be used. The appropriate tools recognize that competition and market power are assessed by considering the relationship between prices and costs of provision. The value of competitive markets is that prices track the opportunity cost of provision; the harm from market power is that prices are higher than the opportunity cost of provision. This means that consumers reduce their consumption of the product supplied by a firm exercising market power in response to its increase in price and instead consume their second choice. The total harm to society is the loss to consumers from selecting their second choice instead of their first choice, and the lost profits of the firms from supplying the second choice instead of their first choice.[55]

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[54] The tendency for multiple subscriptions to result in an overestimate of the number of unique subscribers in CPPP countries also means that the ARPU in these countries will be underestimated.

[55] In principle this loss can be measured in dollars. It is commonly called the deadweight loss from the quantity distortion (the reduction in the quantity demanded) induced by the increase in price when market power is exercised. Consumer surplus is the dollar value of the loss to consumers of buying their second-best choice instead of their best choice. If paid this amount, consumers would be indifferent to the payment and consuming their second-best choice when prices reflect market power *or* consuming their best choice when prices are competitive without receiving the payment.

An understanding of wireless markets and an assessment of competition must begin with an understanding of the nature of the technology. The technology of wireless services provision has a number of important characteristics that have implications for assessing competition.

Technology of Wireless Services

Provision of wireless telecommunications service uses a physical distribution network. This network is comprised of a number of different elements. One is access to bands of spectrum over which the radio waves are transmitted wirelessly. A second are the antennas and signal processing equipment (base stations) at towers which are connected wirelessly to subscribers' handsets. A third is the backhaul connection from base stations, typically a wired connection, to the provider's switch where calls are routed.

The wireless network of a provider is capital-intensive, its construction and capital costs are sunk, and it is characterized by both economies of scale and scope. Economies of scale arise from long-run fixed costs associated with construction and indivisibilities associated with the components of the network (the average cost of capacity of network components declines as capacity increases). Economies of scope arise because the network can be used to provide multiple services. For example, a single network that provides both data and voice services will be able to provide both services at lower cost than dedicated networks that provide data and voice services separately. Moreover, because the backhaul connection is often wired, there are important economies of scope, leading to lower costs for wireless and wired services if they are provided jointly using an integrated network. The capital costs of much of the network are sunk: the capital costs of network equipment and construction costs have a resale value less than their acquisition cost less accumulated depreciation.

Market Power, Competitive Prices, and Costs

Market power is often defined as the ability of a firm to profitably raise prices above competitive levels.[56] Firms with market power may exercise it by being able to profitably alter characteristics of their products or other aspects of their behaviour away from competitive levels. For instance a firm with market power may find it profitable to not only raise prices above competitive levels, but to reduce the quality of its products, its product variety, its level of customer service, or expenditure on research and development below competitive levels.[57] The substitution alternatives available to the customers of a firm determine its market power. The greater the extent to which consumers can, and will, switch to other products in response to a price rise (or other manifestation of market power) or alternative suppliers in a different geographic location, the less the market power of a firm.

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[56] See the Competition Bureau, *Merger Enforcement Guidelines* March 2011 at 2.3 or more generally G. Niels, H. Jenkins, and J. Kavanagh, (2011), *Economics for Competition Lawyers*, Oxford: Oxford University Press at p. 116 or D. Carlton and J. Perloff, (2005), *Modern Industrial Organization*, 4th edition, Boston: Pearson at p. 783.

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

It is very important to understand what defines the competitive level. Economists typically define market power as the ability to profitably raise price above marginal cost, the price that would prevail in perfectly competitive markets. Hence, there is a tendency to equate the competitive level for defining market power with marginal cost, especially short-run marginal cost (the price that would prevail in textbook perfectly competitive markets). However, defining market power as the ability to profitably raise prices above perfectly competitive levels is often not very useful for policy analysis. It does not reflect that most firms' demand will not be perfectly elastic, i.e., that if they raise their prices above competitive levels sales will *not* fall to zero. Instead, the extent to which their customers will substitute will be significant; increases in price above market levels will result in a large decrease in sales volume, but it will not fall to zero. Consequently, while not perfectly competitive, many firms will have a limited ability to raise prices above marginal cost. The absence of significant entry barriers means that their market power will be limited and they will not be able to profitably raise price above average cost levels, i.e., earn greater than a competitive return. This exercise of market power will not warrant public policy intervention. Its cost is small and the costs of policy intervention are not warranted.

More importantly however, it should be recognized that if a firm's unit cost declines as it expands output, the firm will have to be able to profitably raise price above marginal cost in order to break even. That is, some minimum level of market power, based on the definition of economists, is required for economic activity to persist in the long run. Hence, what should be meant by competitive levels is long-run average cost and market power reflects, at a minimum, the ability to profitably raise prices above long-run average cost. This definition of a competitive level recognizes the requirement for firms to break even and is a useful definition of a competitive market even when firms are not perfectly competitive. An alternative, and equivalent, specification is to adopt the economic definition of market power and distinguish between the inefficient and efficient exercise of market power. Only the exercise of market power that raises the price above long-run average cost levels is inefficient and raises concerns about insufficient competition.

The exercise of market power should be durable if it is to be the basis for policy intervention or a demand for intervention. Durability means that a firm can exercise market power without attracting entry, and hence, its exercise can persist in the long run. To summarize, policy intervention, with its attendant costs and unintended consequences, requires that the exercise of market power be significant, with prices above long-run average costs, and durable. Both of these mean that the firm is able to earn and sustain monopoly profits from the exercise of its market power — its return on capital exceeds its opportunity cost.

Natural Limits: the Implications of Significant Network Economies

The substantial fixed and sunk costs associated with network deployment mean that short-run avoidable cost will be less than long-run average cost. Economies of scale mean that short-run marginal cost will be less than long-run average cost. Both mean that providers must earn sufficient gross margins in order to be profitable. That is, there must be positive markups over short-run marginal cost. The difference between revenues and avoidable costs in the short run is known as quasi-rents. If the firm is to break even in the long run, its quasi-rents must cover

its sunk costs.[58] There is a minimum gross margin required for the marginal wireless service provider to be just profitable. The number of wireless service providers will adjust in the long run to ensure this margin is realized. If there are too many networks in the short run, price competition will be excessive and some firms will not break even. They will stay in the market if their quasi-rents are positive, but will refrain from making further investments. In the long run, consolidation and exit will occur until firms are at least able to raise prices and earn gross margins sufficient to break even.

Traditional Competition Policy Measures

There are two typical, or traditional, competition policy measures used to infer the existence and exercise of market power. These are price-cost margins and measures of supplier or seller concentration. Price-cost margins, or gross margins, are the difference between price and average variable cost as a percentage of price. Hence, they are an approximation of the Lerner Index, the difference between price and short-run marginal cost as a percentage of price.

The second traditional measure of market power is based on a presumption between the number and size distribution of suppliers and the exercise of market power. The more concentrated the market — the fewer and larger the number of suppliers — the fewer the alternatives available to customers and therefore, it would seem, the greater the potential for the exercise of market power. The measure of seller concentration that is thought to be most informative — because it captures both the number and relative sizes of sellers — is the Hirschman-Herfindahl Index (HHI).[59]

The use of seller concentration measures to identify market power involves a presumption or inference. The usual approach is to define the market and infer the exercise of market power from relatively high market shares and concentration.[60] This is not appropriate when there are significant economies of scale and scope and sunk costs. High margins and a concentrated market might indicate market power is a concern, but this could easily be a false positive. For firms to price in excess of marginal cost and be viable, concentration and gross margins might both have to be relatively high.

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[58] In perfectly competitive markets, the short-run marginal cost of providing output is increasing and firms are price-takers. This means that they earn quasi-rents without exercising market power, since the marginal cost of the marginal unit equals price and this exceeds the marginal cost of all other units. If short-run marginal cost is constant or declining, then price-takers will not earn quasi-rents. For more on quasi-rents see J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill at p. 23.

[59] The HHI is the sum of squared market shares. See J. Church and R. Ware, *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Chapter 8 for discussion or the U.S. Department of Justice/Federal Trade Commission *Horizontal Merger Guidelines*, Section 5.3, 19 August 2010, online at http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf. The HHI is related to the exercise of market power in the Cournot model of oligopolistic competition.

[60] For measures of seller concentration to be potentially meaningful indicators of market power requires markets to be defined appropriately. Market definition involves assessing the set of products and their suppliers which will be used to calculate the HHI. Antitrust market definition involves determining the set of products that are reasonable substitutes to try and facilitate the inference of concentration and high market shares to market power. See the discussion of market definition in J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Chapter 19.

The traditional measures of assessing market power cannot recognize when concentration and high gross margins are consistent with competition, rather than the exercise of significant, or inefficient, market power. However, there are two alternative approaches that do distinguish between competition and the exercise of market power when the industry is characterized by significant economies of scale and sunk costs. These approaches are calculating the internal rate of return on investment and undertaking international comparisons of market structure.

The Internal Rate of Return and Monopoly Profits

The existence of significant sunk and fixed costs, as well as economies of scale, implies that the appropriate measure of market power involves considering the net present value (NPV) of total cash flow generated over the lifecycle of a wireless service provider's investment. In the start-up phase, cash flows will be small or negative — both because the market is new and because of the requirements for investment. If the business survives, its cash flow will turn positive as investment requirements are reduced and demand materializes. If the investment is successful, high margins in later years will compensate the firm for its capital costs and losses in early years. A necessary, but not sufficient, condition for monopoly profit levels and market power is returns that are substantially above the opportunity cost of capital over the lifecycle of an investment project.[61] Market power is consistent with returns in excess of the cost of capital.

Rogers is the largest wireless incumbent in Canada and has been the market leader for some time. In the early 2000s, Rogers Wireless was considered a highly risky financial investment, with Moody's credit-rating service expressing concern about its ability to quickly generate cash flows that would compensate investors for the cash that the company had consumed to get its networks established.[62] To assess the significance of market power for its financial performance from 1986-2012, we estimate Rogers' internal rate of return on investments made in its wireless operations. It is possible to do this for Rogers because information on its cash flows from operations and its investments are available from financial statements.[63]

Table 4 shows an estimate of Rogers' cash flow from its wireless operations in the first column. Cash flow from operations is estimated by its earnings before interest, taxes, depreciation, and amortization (EBITDA). The second column shows an estimate of Rogers' capital expenditures (CAPEX) in its wireless business, while the third column shows other significant investments made by Rogers in the indicated year. The most significant of these are the $1.5 billion to acquire Microcell in 2004 and $1 billion for spectrum in the 2008 AWS

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[61] Even if it appears that profits exceed the opportunity cost of capital, care must be exercised to determine if the excess returns are attributable to market power or are Ricardian rents. Ricardian rents are really returns to superior factors of production that provide a firm with an apparent cost advantage. They are not a result of the firm exercising market power. See F. Fisher and J. McGowan, (1983), "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," American Economic Review 73: 82-97 and J. Church and R. Ware (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Chapter 12 for discussion. As noted above, most of the criticism against using profit data to infer market power is based on the tendency for false positives, i.e., using excessive profits to diagnose market power. The critiques are much less applicable when profit data are used to conclude that market power is not being exercised.

[62] See Moody's Investors Service, "Rating Action: Moody's Lowers Rogers Wireless Inc.'s SR Secured Ratings to Ba3 and SR Sub. Ratings to B2; Continues Review for Possible Downgrade," 12 July 2002, online at http://www.moodys.com/research/MOODYS-LOWERS-ROGERS-WIRELESS-INCs-SR-SECURED-RATINGS-TO-Ba3--PR_57805.

[63] See Table A1 for estimate sources and explanatory notes.

auction. The fourth column is our estimate of Rogers' free cash flow: EBITDA less the sum of CAPEX and other investments. We convert free cash flow to 1986 dollars in the second last column, while the last column is cumulative real cash flows from 1986 to 2012.

TABLE 4: ROGERS WIRELESS IRR 1986-2012

Year	EBITDA	Capex	Other cash investments	Free cash flow	Deflator (1986 = 100)	Real cash flow (1986 $)	Cumulative cash flow (1986 $)
1986	-$12,804	$62,814		-$75,618	1.025	-$73,785	-$73,785
1987	-$1,771	$52,651		-$54,422	1.071	-$50,794	-$124,579
1988	$17,797	$91,646		-$73,849	1.113	-$66,330	-$190,909
1989	$30,026	$261,328		-$231,302	1.172	-$197,296	-$388,205
1990	$76,156	$456,847	$38,721	-$419,412	1.241	-$338,049	-$726,254
1991	$99,605	$152,632	$9,824	-$62,851	1.287	-$48,825	-$775,079
1992	$129,452	$237,613	$3,118	-$111,279	1.315	-$84,609	-$859,688
1993	$198,600	$181,400		$17,200	1.337	$12,865	-$846,823
1994	$289,900	$149,100	$33,303	$107,497	1.340	$80,218	-$766,605
1995	$315,600	$185,600		$130,000	1.363	$95,353	-$671,252
1996	$351,100	$553,800		-$202,700	1.393	-$145,528	-$816,780
1997	$395,700	$604,700		-$209,000	1.404	-$148,889	-$965,670
1998	$395,100	$301,300		$93,800	1.418	$66,163	-$899,506
1999	$422,300	$401,000	$19,250	$2,050	1.455	$1,409	-$898,097
2000	$410,900	$526,000		-$115,100	1.502	-$76,654	-$974,751
2001	$411,900	$654,500	$396,800	-$639,400	1.512	-$422,766	-$1,397,517
2002	$527,700	$564,600		-$36,900	1.570	-$23,505	-$1,421,022
2003	$727,600	$411,900		$315,700	1.602	$197,007	-$1,224,015
2004	$950,400	$439,200	$1,507,700	-$996,500	1.637	-$608,867	-$1,832,882
2005	$1,337,000	$585,000		$752,000	1.671	$450,082	-$1,382,801
2006	$1,987,000	$684,000		$1,303,000	1.699	$767,031	-$615,770
2007	$2,589,000	$822,000		$1,767,000	1.739	$1,016,025	$400,255
2008	$2,806,000	$929,000	$1,008,000	$869,000	1.759	$493,942	$894,197
2009	$3,042,000	$865,000	$40,000	$2,137,000	1.783	$1,198,805	$2,093,002
2010	$3,173,000	$937,000	$73,000	$2,163,000	1.825	$1,185,508	$3,278,510
2011	$3,036,000	$1,192,000		$1,844,000	1.866	$987,967	$4,266,477
2012	$3,063,000	$1,123,000		$1,940,000	1.882	$1,030,825	$5,297,302
Real IRR		1986 - 2008					3.68%
		1986 - 2012					9.89%
Nominal IRR		1986 - 2008					5.92%
		1986 - 2012					12.22%

Source: Rogers/Cantel/Rogers AT&T Wireless Annual Reports for financials, and Statistics Canada. Table 326-0020 – Consumer Price Index (CPI), 2011 basket, annual (2002=100 unless otherwise noted). Capital expenditures correspond to "additions to property plant and equipment" for Rogers Wireless in recent annual reports. See Table A1 for detailed citations. Note that the 1990 financial year is from August 1989 to December 1990, and that previous financial years (1989 and prior) were August to August.

Over the period 1986-2012, the internal rate of return in nominal terms was 12.22 per cent; the real return (after inflation) 9.89 per cent.[64] The year 2008 is very significant since that was the year that Industry Canada instituted affirmative measures to boost competition in the wireless industry by setting aside significant amounts of AWS spectrum for entrants. It was also the year that the iPhone launched on Rogers' network and data traffic became the future source of demand growth. Up until that inflection point in the development of the market, Rogers Wireless' nominal IRR over the period from 1986-2008 was only 5.9 per cent and its real IRR only 3.68 per cent. Whether the time period is 1986-2008 or 1986-2012, the internal rate of return is likely below any reasonable estimate of the ex ante pre-tax cost of capital for Rogers Wireless.

To put the estimated Rogers Wireless' IRR value in context, the IRR across all industries in the US from 1977-2005 has been estimated at 12 per cent.[65] Furthermore, the (nominal) realized return on common equity for a selection of pipelines regulated by the National Energy Board (NEB) averaged 11 per cent after tax from 2004-2008.[66] The estimates for Rogers Wireless are not consistent with these values: the Rogers value are pre tax and the ex post realized return does not reflect the significant risk of Rogers' investment. The ex ante or expected return is likely much larger for Rogers. Rogers' realized return clearly does not reflect the significant risk that Rogers would fail. While the profitability of providing wireless services seems obvious today, it was not in 2002. In its credit downgrade in 2002, Moody's observed that:[67]

> The ratings of Rogers Wireless Inc. ("RWI") were lowered to reflect Moody's concerns that the company may lack of [sic] meaningful positive free cash flow for the foreseeable future, especially in relation to its increasing debt level within an industry environment characterized by decelerating subscriber growth.

Rogers' acquisition of additional spectrum in 2001, investment and upgrade to the GSM standard in 2002, and acquisition of Microcell in 2004 were questioned at the time by commentators and financial analysts.[68] Given Rogers Wireless' large negative cash flows before 2005, it is not hard to see why.

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[64] The calculation of IRR assumes no further cash flows after 2012. It is measuring the profitability of Rogers' investment over the period 1986-2012. To test the sensitivity of the real IRR to this assumption, assume instead that over the period 2013-2030 Rogers' real cash flow per year is $1 billion, similar to its 2010-2012 annual values. Under this assumption the real IRR rises to 13.18 per cent.

[65] See Inklaar, Robert, "The Sensitivity of Capital Services Measurement: Measure All Assets and the Cost of Capital," EU KLEMS Working Paper No.26, May 2008. The 12 per cent appears to be nominal and after tax.

[66] Calculation based on achieved, nominal values for Alliance, Foothills, M&NP, and TransCanada Mainline transmission systems as presented in Table 4.2 of National Energy Board, "Canadian Pipeline Transportation System Transportation Assessment," July 2009, online at http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/trnsprttn/trnsprttnssssmnt2009/trnsprttnssssmnt2009-eng.pdf.

[67] See Moody's Investors Service, "Rating Action: Moody's Lowers Rogers Wireless Inc.'s SR Secured Ratings to Ba3 and SR Sub. Ratings to B2; Continues Review for Possible Downgrade," 12 July 2002, online at http://www.moodys.com/research/MOODYS-LOWERS-ROGERS-WIRELESS-INCs-SR-SECURED-RATINGS-TO-Ba3--PR_57805.

[68] See, for example, J. Partridge, "Rogers Wireless mulls options," *Globe and Mail*, 22 November 2000 at p. B4 (wireless spectrum and GSM); S. Tuck, "Will 3G be DOA?," *Globe and Mail*, 12 July 2001 at p. B26 (GSM); and E. Reguly, "Damn the debt, Ted Rogers goes full speed ahead to build empire," *Globe and Mail*, 21 September 2004 at p. B2 (Microcell).

Indeed Rogers suffered nearly two decades of low or negative cash flow returns, and was not rewarded until the mid- and late-2000s, when it reaped the benefits both of its acquisition of scale and spectrum with the Microcell purchase, its adoption of the technology that became the global standard (GSM), and its exclusive rights to the iPhone. Rogers Wireless' EBITDA increased from less than $1 billion in 2004 to $3 billion 2009. Cumulative cash flow finally turned positive for Rogers Wireless, after commencing service in 1986, in 2007.

The experience in Canadian wireless markets is a good illustration of the difference between genuine scarcity rents (or Ricardian rents) and quasi-rents. Quasi-rents reflect the return on, and of, investments. For a firm to break even they must be at least as large as sunk fixed costs. Absent the ability to earn quasi-rents after an investment is sunk, firms would curtail or cease making investments. Understanding that quasi-rents are absolutely essential to the functioning of a market economy, and not artificially imperiling their existence, is important to reducing the risk of, and hence providing incentives for, investment. A government should not change its policies to undermine quasi-rents based on an incomplete and incorrect market-power analysis, itself based on the magnitude of those quasi-rents or the high gross margins from which they stem. To promote investment, and ensure prosperity, responsible governments try very hard to avoid expropriating the returns from sunk investments and thereby minimize policy and regulatory risk of investment.

By contrast, Ricardian rents are earned by controlling a factor that is in scarce supply, for instance spectrum. The evidence on Rogers' IRR suggests not only the absence of monopoly rents created by the inefficient exercise of market power, but also the absence of Ricardian rents accruing to Rogers. Instead, the Ricardian rents have been extracted, as expected, by using auctions to allocate spectrum.

The evidence on Rogers' IRR is not consist with the exercise of significant market power or the inefficient exercise of market power over the investment cycle — in this case, the evolution of the wireless market in Canada. To the contrary, the evidence is much more consistent with returns less than a competitive return, a return that would reflect the opportunity cost of capital with an appropriate risk adjustment.

The finding of the dubious profitability of wireless services in Canada is consistent with the financial difficulties of not just three of the AWS entrants (Mobilicity, Public Mobile, and Wind), but also Canada's earlier experiment with entry (Microcell and Clearnet). It also points out the ineffectiveness of policies that try to promote entry, such as subsidized access to spectrum.

The analysis does not indicate the existence of monopoly profits in the wireless sector that are waiting to be competed away. This seems to be confirmed by the difficulties that most entrants — even ones financed by powerful foreign parents — have had in developed wireless markets in the past decade. Globally, consolidation, rather than fragmentation, appears to be a strong trend in wireless services and in telecommunications more generally. The next section documents and draws out the implications of the striking similarity in seller concentration across countries for assessing market power.

Natural Limits on the Extent of Competition

An important implication of extensive economies of scale and scope is that there will be an upper bound on the number of wireless service carriers that can be supported. This upper bound is determined by the extent to which the wireless service providers must be able to price above short-run marginal cost sufficiently to break even. An implication is that inefficient market power would be indicated if the number of competitors was below this natural limit.

In general, the more extensive economies of scale and scope, the fewer the number of firms that can be supported. But whether or not market size makes much of a difference to concentration in a given industry may depend on the relative magnitude of start-up costs associated with entry. When start-up costs are relatively large in relation to demand, concentration will tend to be similar across markets of different size.[69]

Table 5 is a cross-country comparison of market structures across the world. It shows the Herfindahl-Hirschman Index (HHI), the market share of the leading supplier, the market share of the top two firms, the market share of the top three suppliers, and the number of national competitors by country.[70] None of the countries have more than four national competitors, and in many cases, two or three firms dominate the market. In those that have four nationwide competitors, two or three competitors have overwhelming market shares, suggesting that the fourth competitor is typically marginal.[71] The only two exceptions are the US and Germany. The striking feature of the data in Table 5 is how similar the market structure is across the different markets. The data in Table 5 suggests that the scope for entry is exhausted relatively quickly. Consistent with the large start-up costs involved in constructing wireless networks, the number of competitors appears to be limited.

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[69] The definitive framework for analyzing the relationship between technology, market size and equilibrium market structure can be found in J. Sutton, (1991), *Sunk Costs and Market Structure: Price Competition, Advertising and the Evolution of Concentration*, Cambridge, MA: MIT Press.

[70] The market share of the top N firms is known as the N firm concentration ratio.

[71] This is consistent with a recent analysis by the investment bank Credit Suisse. In its review of the possibility of Verizon entering the Canadian market it made the following observations: (a) there are very few markets in the OECD where there are four carriers and where there are four, the population density is usually higher than in Canada; (b) the fourth entrant is typically small, with low margins and market share; the most recent entrants, and those likely to be the most successful, are wireline incumbents; (c) the fourth entrant puts downward pressure on prices, quasi-rents and profitability. Indeed the theme of the report is the downside risk to investors of potential government intransigency and commitment to four carriers if that number proves unsustainable: "While the Canadian Government may allow a fourth to enter, it is uncertain whether they would ever allow a fourth to exit, at least unless financials became sufficiently weak. This presents a long-term structural risk." See C. Moore and R. Peters, "Three's a Crowd; Four's a Feud; Global Lessons from Four Carrier Wireless Markets," *Credit Suisse*, 7 August 2013, online at https://doc.research-and-analytics.csfb.com/docView?sourceid=em&document_id=x523794&serialid=2u%2bptq%2fGdnrURwf1PIGbUGO9gxbNY1FPpSTohxUt05g%3d.

TABLE 5: CONCENTRATION AND MARKET STRUCTURE (4Q2012)

	HHI	Largest Firm's Share	Top 2 Share	Top 3 Share	Competitors
Australia	3670	47%	78%	100%	3
Austria	2930	39%	69%	88%	4
Belgium	3500	41%	76%	100%	3
Canada	2780	34%	62%	90%	*
Denmark	2980	41%	69%	88%	4
Finland	3450	41%	75%	100%	3
France	3260	44%	76%	92%	4
Germany	2660	32%	62%	83%	4
Greece	3850	51%	80%	100%	3
Italy	2870	35%	67%	90%	4
Netherlands	3480	43%	73%	100%	3
New Zealand	3670	46%	80%	100%	3
Norway	3970	53%	81%	100%	**
Portugal	3610	44%	80%	100%	3
Spain	3020	39%	67%	93%	4
Sweden	3220	46%	72%	89%	4
Switzerland	4590	62%	84%	100%	3
UK	2790	34%	64%	89%	4
US	2420	33%	63%	80%	*

Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

* *In Canada and the US, there are a number of regional carriers. In Canada there are three national carriers (five including entrants) and in the US there are four national carriers.*

** *While Bank of America Merrill Lynch reports two competitors, it appears that Norway has three competitors (reflected in its 100 per cent Top 3 Share).*

For the UK, concentration values were calculated reflecting the combined market share of Orange/T-Mobile (Everything Everywhere).

The exercise of market power might be suggested if the market structure in Canada was more concentrated than elsewhere, but this is not the case.[72] To the contrary, the evidence in Table 5 is not consistent with the exercise of significant market power or the inefficient exercise of market power by Canadian providers of wireless services:

- The HHI in Canada is similar to other countries, indeed only in the US is it lower and only marginally so.
- The two-firm concentration ratio in Canada and Germany is smaller than all other countries.
- The three-firm concentration ratio in most other countries is the same or greater than in Canada. Only in the US and Germany is the three-firm concentration ratio more than marginally lower than in Canada.

[72] Consistent with our discussion above, it is not the absolute level of the HHI which is informative when the technology is characterized by economies of size (scale and scope). Instead it is the change in HHI from a merger which is informative or comparisons across jurisdictions. In this respect, any analysis based on the level of the HHI (or for that matter gross margins) to infer whether competition is reasonable is inadequate. For examples of this (for HHI) see D. Winseck, "Can a wireless 'code of conduct' cure the CRTC's poor record of competition?," *Globe and Mail*, 9 April 2012, online at http://www.theglobeandmail.com/technology/digital-culture/can-a-wireless-code-of-conduct-cure-crtcs-poor-record-on-competition/article4099050/ and (for margins) M. Wente, "I've got those wireless/cable/telecom blues," *Globe and Mail,* 3 August 2013, online at http://www.theglobeandmail.com/commentary/ive-got-those-wirelesscabletelecom-blues/article13581949/.

- The share of the leading firm in Canada is close to the smallest and significantly less than some countries, where it is 50 per cent or higher.

A complementary perspective is to look at gross margins across countries. In Canada, earnings margins before interest, taxes, depreciation, and amortization (EBIDTA) is towards the high end in the OECD, as shown in Table 6.[73] Indeed, several reports emphasize the higher EBITDA values of Canadian wireless firms relative to US firms.[74] However, EBITDA is a short-run measure of quasi-rents, not profitability as indicated above.

TABLE 6: AVERAGE CAPITAL INTENSITY, CASH MARGINS AND EBITDA MARGINS (2004-2012)

	Capital Intensity	EBITDA Margin	Cash-Flow Margin
Australia	10%	41%	30%
Austria	12%	35%	23%
Belgium	13%	44%	30%
Canada	14%	44%	30%
Denmark	14%	29%	14%
Finland	12%	31%	21%
France	12%	38%	26%
Germany	11%	46%	35%
Greece	12%	39%	27%
Italy	12%	52%	40%
Netherlands	11%	34%	24%
New Zealand	14%	41%	26%
Norway	11%	45%	34%
Portugal	15%	44%	28%
Spain	10%	42%	32%
Sweden	11%	38%	27%
Switzerland	12%	46%	36%
UK	11%	27%	16%
US	16%	37%	21%

Source: G. Campbell, "Global Wireless Matrix 1Q2011," Bank of America Merrill Lynch*, 28 April 2011 and G. Campbell, "Global Wireless Matrix 1Q2013,"* Bank of America Merrill Lynch*, 15 April 2013.*

Capital intensity is calculated as the ratio of capital expenditures to industry service revenues. EBITDA margin is calculated as the ratio of earnings before interest, taxes, depreciation and amortization to industry service revenues, and cash-flow margin is calculated as the ratio of EBITDA less capital expenditures to industry service revenues. Each of these values are for the top one to three wireless operators in each country (depending on data availability).

Telecommunications is a capital-intensive business, and the costs of investing and replacing the capital assets to sustain network service and expand service are very substantial. Further, these costs are likely significantly larger in Canada than in much of Europe, given Canada's geography and population density. The Federal Communications Commission (FCC) now calculates profitability of the wireless industry using EBIDTA less capital expenditure as a

[73] Note that these margin comparisons are comparisons for the weighted average profitability of the top one to three operators in each market, depending on data availability.

[74] For example, see I. Grant, A. Kaminer, T. Marshall, M. MacDonald and L. Shaddy, "Long-Term Evolutionary Challenge: Limiting Wireless Carriers Gluttony," *SeaBoard Group*, February 2012, p. 37, online at http://www.seaboardgroup.com/main/images/stories/Reports/wirelessdietf11.pdf.

share of revenue (a measure of capital intensity), a measure labeled the cash-flow margin.[75] Table 6 also shows the average cash-flow margin earned by Canadian wireless operators and the largest operators in other OECD countries during the period 2004-2012, as well as average capital intensity. While Canada's EBITDA margins are very high, so too is average capital intensity, so the corresponding cash-flow margin in Canada is similar to many other countries. Competition over this period between Rogers, Telus, and Bell over the quality of their networks is reflected in Canada's above average capital intensity.[76]

Conclusion on Market Power and the State of Competition in the Canadian Wireless Sector

The examination of the returns to the leading provider over the lifecycle of its investment and the similarity in seller concentration, as well as gross margins, across countries are not consistent with the significant, or inefficient, exercise of market power. There is no reliable evidence that competition in the provision of wireless services in Canada is insufficient or weak.

ASSESSING POLICY EFFORTS TO INCREASE COMPETITION IN WIRELESS SERVICES

Viability of Entrants

Wireless markets will be characterized by a limit on the number of viable market participants (that is, those who can compete and survive without policy interventions designed to advantage or subsidize them). As discussed above, this natural limit is determined by the interaction between the magnitude of set-up costs, economies of scale, and market size. The number of providers will adjust through time, such that the minimum gross margin required for the marginal network to be just profitable is attained.

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[75] As the FCC notes in its 14th CMRS report:

> Measures of profitability are useful indicators of absolute and relative provider performance, entry and exit conditions, growth conditions, and the intensity of rivalry. Because measuring the profitability of firms in a capital-intensive industry such as the mobile wireless industry is not as straightforward as in other industries, industry analysts often employ more than one measure. Analysts sometimes use Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) as an indicator of profitability, but this metric does not include the substantial cost of capital investment in tangible assets such as networks or in intangible assets such as spectrum licenses.

See Federal Communication Commission, *FCC 14th CMRS Report*, May 20, 2010 at p. 12, online at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-81A1.pdf.

[76] In this respect the assertion by the Public Interest Advocacy Centre (PIAC) that, "It's hard to see how the three wireless companies in Canada could possibly spend less on their networks," based on second quarter figures for 2013 is misleading. See also Figures 14 and 15. See PIAC News Release, *Canadian Wireless Policy will Spur Investment, Lower Wireless Prices*, 22 August 2013, online at http://www.piac.ca/telecom/canadian_wireless_policy_will_spur_investment_lower_wireless_prices.

There is thus a fundamental question, given that Canada is not out of line with other countries, about the viability of a fourth national competitor and/or the entry subsidized in 2008. Subsidizing or promoting entry beyond the natural limit will lead to a short-run reduction in price, but that will put pressure on gross margins and may, therefore, not be sustainable. Instead, in the long run, the natural limit will be restored as firms exit, or there is consolidation and rationalization until gross margins are sufficient to at least recover sunk costs. That is, in fact, the experience in Canada, Europe, Australia, and the United States. Indeed, the financial difficulties of three of the 2008 AWS entrants suggest a replay in Canada.

THE CANADIAN EXPERIENCE

The importance of scale and the pressure for consolidation are illustrated in the evolution of wireless markets in Canada. First, both Clearnet and Microcell were given spectrum and launched service in 1996. Clearnet was acquired by Telus in 2000. Microcell was acquired by Rogers in 2004 after emerging from bankruptcy. In its analysis of the competitive effects of the Microcell-Rogers transaction, the Competition Bureau highlighted its inability to finance the "next generation of product and service offerings" as well as the capital required to expand its network.[77] Four or five national providers proved unsustainable.[78]

Second, there are parallels to the most current round of entry in Canadian wireless markets. The entrants have never been in the data-intensive part of the market, which as discussed below was the source of growth post-entry. The Canadian entrants have mostly focused on deep discounting of voice and text, not on deploying the latest networks and smartphones.[79] The entrants are already almost two years behind the incumbent firms in deploying LTE networks.[80] Thus while they have been able to attain some market share and have some impact

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[77] See Competition Bureau, "Acquisition of Microcell Telecommunications Inc. by Rogers Wireless Inc.: Technical Backgrounder," 12 April 2005, online at http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/00257.html.

[78] The lesson is not that this was a high-water market for competition that somehow was frittered away by poor policy decisions. For an example of this misinterpretation see I. Grant, A. Kaminer, T. Marshall, M. MacDonald, and L. Shaddy. "Long Term Evolutionary Challenge: Limiting Wireless Carriers Gluttony," *SeaBoard Group*, February 2012, p. 12, online at http://www.seaboardgroup. com/main/images/stories/Reports/wirelessdietf11.pdf.

[79] See P. Nowak, "Public Mobile Lowers Price for Launch," *CBC News*, 25 May 2010, online at http://www.cbc.ca/news/technology/story/2010/05/25/public-mobile-launch-wireless-plans.html, that mentions Public Mobile's launch plans and their focus on voice. The Globe and Mail recently noted that "[A]fter three years, the entrants have captured less than six per cent of the market, having spent their early days focused on the low-budget pre-paid customer." R. Trichur, S. Silicoff, and B. Erman, "How Ottawa's plan to foster wireless competition sank," *Globe and Mail*, 18 May 2013, online at http://www.theglobeandmail.com/report-on-business/how-ottawas-plan-to-foster-wireless-competition-sank/article12005826. The article notes that in 2012, the entrants began to attempt to shift their strategies, but this is against the backdrop of imminent exit or takeover by larger firms. The same article also notes that the entrants were sideswiped by the shift in the nature of the wireless business model that was induced by smartphones, most particularly the iPhone. The CEO of Public Mobile was quoted in the same article as saying that the "talk and text" model that his firm hoped to market was outdated much more quickly than Public Mobile had anticipated.

[80] See CBC News, "Rogers details LTE network debut for Toronto," 30 August 2011, online at http://www.cbc.ca/news/technology/story/2011/08/30/technology-rogers-lte.html and J. Sturgeon, "Super-smart phones, faster networks tighten squeeze on new wireless carriers," *Financial Post*, 26 September 2012, online at http://business.financialpost.com/2012/09/26/super-smart-phones-faster-networks-tighten-squeeze-on-new-wireless-carriers/.

on prices for voice and text service, the three pure-play entrants, WIND, Public Mobile, and Mobilicity have not been financially successful.[81]

Third, in Canada there is a strong tradition of network-sharing and joint network agreements. Bell and Telus first entered into a reciprocal access agreement in 2001, as well as agreeing to jointly build an HSPA+ (GSM) network in 2008. In Saskatchewan, SaskTel, Bell, and Telus have a network-sharing agreement; in Manitoba, MTS and Rogers share an HSPA+ network and are jointly developing an LTE network; Rogers and Videotron are jointly developing an LTE network in Ottawa and parts of Quebec.

Finally, and perhaps most importantly, two of the entrants who acquired AWS spectrum in 2008 on favourable terms have not used at least some of that spectrum to provide service in some geographic areas. Videotron, which has entered in Quebec, has not entered in the Greater Toronto Area and has optioned its AWS spectrum there to Rogers.[82]

The most telling example is that of Shaw. Shaw has optioned its AWS spectrum to Rogers. It has AWS spectrum in major metropolitan areas (Vancouver, Calgary, and Edmonton) where it is an incumbent broadcast distribution undertaking and telecommunications provider with a cable network. Despite acquiring spectrum on favourable terms, owning a wireline network (giving it the ability to bundle and provide backhaul for its wireless option), a well-known brand name, *and* spectrum holdings in the two provinces with the highest ARPU (Alberta and British Columbia), Shaw decided that the risk of entering and providing wireless services was not prudent given the initial investment required of $1 billion.[83]

So it is perhaps not surprising that Verizon, one of the two dominant firms in the US wireless market, recently decided against entering the Canadian market. In spite of the new entrant status benefits that it would have enjoyed, Verizon decided that there were "much better returns for our shareholders than going into Canada."[84]

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[81] All three of the pure-play entrants face deeply uncertain futures. All are, or were, for sale. Public Mobile has been acquired by private investors. Telus had a deal to acquire Mobilicity that was denied by Industry Canada. It is difficult to see how there will not be further consolidation that eliminates some of the entrants. See CBC News, "Telus Agrees to Take Over Mobilicity for $380m," 16 May 2013, online at http://www.cbc.ca/news/business/story/2013/05/16/business-telus-mobilicity.html. See also Telegeography.com, "Public Mobile, Mobilicity Put Up for Sale Besides Wind, Report Says," 15 April 2013, online at http://www.telegeography.com/products/commsupdate/articles/2013/04/15/mobilicity-public-mobile-up-for-sale-alongside-wind-report-says/ and "Private equity firms scoop up Public Mobile, aim for more deals," *Wire Report*, June 6, 2013.

[82] C. Dobby, "Rogers, Videotron strike long-term network sharing deal, spectrum agreement," *Financial Post*, 13 May 2013, online at http://business.financialpost.com/2013/05/29/rogers-videotron-strike-long-term-network-sharing-deal-spectrum-agreement/.

[83] Instead of offering wireless services using licensed spectrum, Shaw Communications has started offering wireless connections to the internet using unlicensed spectrum over a Wi-Fi network. See Shaw Communications News Release, "Shaw to Build Broadband Wireless Network," 1 September 2012, online at http://www.shaw.ca/uploadedFiles/Corporate/Media/Press_Releases/Shaw_To_Build_Broadband_Wireless_Network_September%201_2011.pdf.

[84] R. Trichur, "Verizon 'never seriously considered' Canada: CEO", *Globe and Mail*, 3 September 2013, online at http://www.theglobeandmail.com/report-on-business/verizon-never-seriously-considered-canada-ceo/article14079195/.

CONSOLIDATION IN OTHER COUNTRIES

The experience in other countries is nicely summarized by a recent report by Credit Suisse.[85] This report considers 15 OECD countries that have or had four or more carriers. In those 15 markets, nine are characterized by consolidation or a potential acquisition. In only four have there been new entrants. Their conclusion is that the presence of a fourth strong player is a "level of competition [that] does not appear to be a natural state for most wireless markets, where scale is becoming increasingly important."[86]

The evidence of the pressure for consolidation and the effect of entry in the longer term on the size and number of wireless firms is illustrated nicely by Hutchison Whampoa. Hutchison has been one of the most prolific multinational entrants. It launched services under its "3" brand in Australia, Austria, Denmark/Sweden, Ireland, Italy, and the UK over the past decade, but because of its lack of scale its profitability has been problematic.[87] Its experience is relevant and informative:[88]

- In Austria, Hutchison entered as the fourth supplier in 2003. Its market share reached 12 per cent at the end of 2012. In 2013, Hutchison merged with Orange (the number three carrier), restoring the number of carriers to three.
- In Australia, Hutchison entered as the fourth supplier in 2003. Its market share reached nine per cent in 2009, at which time it merged with Vodafone, restoring the number of carriers to three. In its clearance, the Australian Competition and Consumer Commission considered that Hutchison was severely constrained in its ability to expand its network and make the investments required for it to *remain* an effective competitor in both the mobile broadband and mobile voice markets; it concluded that Vodafone was also constrained in its ability to compete. Thus, it approved the merger on the basis that such a consolidation would allow the firms to expand network capacity and make needed investments.[89]
- In Ireland, Hutchison entered as the fourth supplier in 2005. In 2013, Hutchison entered into an agreement to purchase O2 Ireland, the number two carrier, restoring the number of carriers to three, after a failed attempt in 2012 to acquire the number three carrier.[90]

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[85] C. Moore and R. Peters, "Three's a Crowd; Four's a Feud; Global Lessons from Four Carrier Wireless Markets," Credit Suisse, 7 August 2013, online at https://doc.research-and-analytics.csfb.com/docView?sourceid=em&document_id=x523794&serialid=2u%2bptq%2fGdnrURwf1PIGbUGO9gxbNY1FPpSTohxUt05g%3d.

[86] C. Moore and R. Peters, "Three's a Crowd; Four's a Feud; Global Lessons from Four Carrier Wireless Markets," *Credit Suisse*, 7 August 2013 at p. 6.

[87] See C. Humphries and C. Kane, "Telefonica sells O2 Ireland to Hutchison's 3 for $1 billion," 24 June 2013, online at http://uk.reuters.com/article/2013/06/24/uk-telfonica-ireland-idUKBRE95N05N20130624.

[88] Information from C. Moore and R. Peters, "Three's a Crowd; Four's a Feud; Global Lessons from Four Carrier Wireless Markets," *Credit Suisse*, 7 August 2013 and *Global Wireless Matrix* 1Q2013, Bank of America Merrill Lynch, 15 April 2013 unless otherwise indicated.

[89] Australian Competition & Consumer Commission. 2009. *Public Competition Assessment. Vodafone Group plc and Hutchison 3G Australia Pty Limited – proposed merger of Australian mobile operations.*

[90] See C. Humphries and C. Kane, "Telefonica sells O2 Ireland to Hutchison's 3 for $1 billion," 24 June 2013, online at http://uk.reuters.com/article/2013/06/24/uk-telfonica-ireland-idUKBRE95N05N2013062.

- In Italy, Hutchison entered as the fourth supplier in 2003. It has been in discussions regarding a merger in 2013 with Telecom Italia.[91]
- In the UK, Hutchison entered as the fifth supplier in 2003. Its market share reached 11 per cent in 2012. However, the UK arms of T-Mobile and Orange (the third- and fourth-largest carriers) merged in 2010 to form Everything Everywhere, to restore the number of carriers to four. The UK now has three networks with over 92 per cent market share, and a fourth small and precariously placed network, whereas prior to Hutchison's entry it had four roughly balanced networks. Moreover, in October 2012 a tower-sharing agreement between Vodafone and O2 (the number one and two carriers) was approved, following on a tower-sharing agreement between Everything Everywhere and Hutchison.[92]

Welfare effects of entry

Besides the feasibility of entry, there is also a basic question about what the efficiency effects of additional entry would be in a market that is close to the natural limit of the number of competitors. Even if the subsidized entry proves viable or durable, there are basic questions as to whether such entry is actually socially beneficial. Socially beneficial entry is efficient: are the resources used by the entrant more valued in their next best alternative use?

When there is imperfect competition, economies of scale, and positive margins, the welfare effects of further entry are not necessarily beneficial.[93] In such cases, the private incentive for entry can exceed the social benefits of entry. The social benefit of entry is the value of the expansion in output: usage and penetration/adoption, while the private benefit of entry is the profits of the entering firm. The private benefit can be greater than the social benefit because of the business-stealing effect. The profits of an entrant include the profits earned on incremental industry output and the units that it competes away from incumbents. The transfer of revenues and profit from the diversion of existing sales from incumbent networks is a private benefit to the entrant, but not a social benefit. This is because those calls would have been made, and those consumers would have subscribed, even without entry. These transfers may make an entrant's network privately profitable, even though the net *social* benefits do not justify the costs, and as a result, the entry is inefficient.

Inefficient entry is more likely:

- The more similar the products and services of the entrant are to those of the incumbent. That is, the less entrants differentiate their offerings by offering new products or services to consumers.
- The more important subsidization (by set-asides etc.) for entry.[94] Set-asides and subsidization are required to induce entry of another network when the entrant would *not have entered* in their absence.

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[91] A. Morris, "Hutchison wants control in Telecom Italia merger plan, according to reports," *Fierce Wireless Europe*, 12 April 2013, online at http://www.fiercewireless.com/europe/story/hutchison-wants-control-telecom-italia-merger-plan-according-reports/2013-04-12.

[92] B. Ray, "O2, Vodafone allowed to hop onto each other's towers," *The Register*, 1 October 2012, online at http://www.theregister.co.uk/2012/10/01/o2_voda/.

[93] This analysis draws upon N. Mankiw and M. Whinston (1986), "Free Entry and Social Inefficiency," *RAND Journal of Economics*, 17, pp. 48-58.

[94] Note that set-asides are only one form of subsidization. Any type of policy that improves market conditions for entrants (or worsens them for incumbents) may subsidize entry. For example, these policies may pertain to roaming or foreign ownership restrictions.

The difficulty is that the circumstances under which subsidization is required to promote entry are also the circumstances under which entry is particularly prone to being inefficient. This implies that the costs of the entrant are higher, or their products relatively similar, to that of the incumbents.

In the short run, even an inefficient entry is likely to lead to a temporary reduction of at least some prices, benefiting at least some consumers.[95] However, in the long run, there are four reasons why such entry might not benefit consumers.

- First, if the reduction in scale of the incumbents raises their marginal cost, entry might *raise prices*.
- Second, if the temporary reduction in prices results in insufficient gross margins, in the long run prices will rise as some firms exit and/or there is consolidation.
- Third, it is also likely that consumers will be harmed because incumbents are denied spectrum, raising their costs (as they substitute capital for spectrum inefficiently), reducing the quality and coverage of their networks, and perhaps product variety, relative to what they might have been if the incumbents had more spectrum. In this regard, consider the 2008 AWS auction set aside, under which 40 MHz of AWS spectrum out of a total of 90 MHz was not available to the incumbents. Because Bell and Telus failed to separately win 20 MHz in key provinces, the extent of cooperation between the two in rolling out their LTE networks may have been enhanced. Telus and Bell may well have had a network-sharing agreement to roll out their LTE networks even without the set-asides, but the presence of the set-asides restricted their options. A significant cost of the 2008 set-aside may have been that it resulted in Bell and/or Telus being substantially constrained in their ability to make choices regarding their future network evolution. Instead of allocating AWS spectrum to the incumbents who would use it to increase their speed and capacity for data, it has instead been allocated to entrants who have focused on voice and text. Canadians ended up with an incorrect mix of networks and an inefficient allocation of spectrum.
- Fourth, if the intervention involves unexpected changes in the policy regime that expropriates quasi-rents of existing service providers, there will be negative ramifications on investment, both in wireless services and other sectors of the economy.

Hence it is entirely possible that increasing the number of providers by subsidization and especially preferential access to spectrum — from set asides or preventing its acquisition — could harm consumers relative to the allocation of spectrum that would result without activist government policy because it (perversely by reducing scale) weakens competition and reduces quality. The benefits of the set-asides in 2008 are considered in the next section. The analysis indicates it is unlikely that there were any social benefits, let alone that the benefits exceeded the costs.

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[95] Hence the OECD and PIAC's focus on the price benefits of a fourth carrier. Their welfare analysis, however, may be dominated too much by the short run. See PIAC News Release, Canadian Wireless Policy will Spur Investment, Lower Wireless Prices, 22 August 2013, online at http://www.piac.ca/telecom/canadian_wireless_policy_will_spur_investment_lower_wireless_prices and its accompanying backgrounder *The State of the Wireless Market in Canada: The Case for a Fourth National Carrier*; "OECD analyst says fourth competitor would lower mobile pricing," *The Wire Report*, 12 July 2013, online at http://www.thewirereport.ca/news/2013/07/12/government-making-the-right-move-with-its-fourth-carrier-policy-oecd-analyst-says/27031.

Costs and Benefits of Entry from the Set-Asides in 2008

Canada's low penetration rate and high ARPU were, and are, tantalizing for an entrant.[96] The business plans of the entrants in 2008 were based on the perception that these were the result of Canadian consumers not being well served by the product offerings of the incumbents. The problem for the entrants was that there was not, in fact, pent-up demand for cheaper voice plans. The effect of entry was not to substantially increase the size of the market, but instead to put some downward price pressure on voice and text plans. But the commoditization of voice, the market saturation of voice services, competition between the three incumbents well before entry, and the small market shares of the entrants make it difficult to determine how much of the downward pressure on voice prices is attributable to the 2008 entrants.

EFFECT ON OUTPUT: PENETRATION AND USAGE

Table 7 shows for the time period 2005 to 2012 or 2008 to 2012 (depending on data availability) in Canada:

- The stock, percentage, and absolute increase in all subscribers, all subscribers of the incumbents (Rogers, Bell, and Telus) and all subscribers for others (regional carriers and the entrants, the latter 2010 and onwards, except WIND in 2009).
- The stock, percentage, and absolute increase in all monthly plan subscribers, monthly plan subscribers of the incumbents (Rogers, Bell, and Telus) and monthly plan subscribers of all others (regional carriers and the entrants, the latter 2010 and onwards, except WIND in 2009).
- The stock, percentage, and absolute increase in all pay-as-you-go subscribers, pay-as-you-go subscribers of the incumbents (Rogers, Bell, and Telus) and pay-as-you-go subscribers of all others (regional carriers and the entrants, the latter 2010 and onwards, except WIND in 2009).

The following are suggested by Table 7:

- The percentage growth in wireless market subscribers is highest in 2006, it declines thereafter until 2010, when there is a noticeable but small increase from the AWS entrants. The increase in market expansion in 2010 is not sustained, with noticeably lower growth in 2012. The growth rate and total increase in subscribers for the incumbents are not affected noticeably by entry in 2010. Instead, it is in 2011 and 2012 when their growth falls to approximately half of its levels in 2008-2010.
- Incumbent growth since 2008 has consisted almost entirely of monthly plans. Indeed in 2011 and 2012, the incumbents shed pay-as-you-go contracts and added more monthly plans than they did total subscribers. In 2012, monthly plan additions were 167 per cent of total additions for the incumbents.
- Post-2009, the other category mostly reflects the experience of the AWS entrants. In 2010 more than 62 per cent of their additions were pay-as-you-go subscribers. Their reliance on pay-as-you-go abated somewhat in 2011, but in 2012 their net additions were entirely pay-as-you-go, with an absolute loss in monthly plans.

[96] Recall Figure 3.

The patterns identified in Table 7 suggest a mature market with very little expansion attributable to commencement of operations by the AWS entrants. There is a bump to total market growth with their entry, and much of that is pay-as-you-go subscribers, but both are small. Relative to growth in 2009, growth in 2010 was higher by less than 500,000 subscribers, which out of almost 23,000,000 subscribers is a one-time increase in market size of roughly two per cent.

TABLE 7: CANADIAN POST-PAID, PRE-PAID AND TOTAL SUBSCRIBERS (2005-2012)

	2005	2006	2007	2008	2009	2010	2011	2012
ALL SUBSCRIBERS								
All Carriers								
Subscribers (000s)	16,799	18,577	20,045	21,610	22,976	24,811	26,324	27,451
Percentage Change		10.6%	7.9%	7.8%	6.3%	8.0%	6.1%	4.3%
Absolute Change (000s)		1778	1468	1565	1366	1835	1513	1127
Incumbents								
Subscribers (000s)	16,130	17,785	19,122	20,569	21,851	23,190	24,102	24,784
Percentage Change		10.3%	7.5%	7.6%	6.2%	6.1%	3.9%	2.8%
Absolute Change (000s)		1655	1337	1447	1282	1339	912	682
Others								
Subscribers (000s)	669	792	923	1,041	1,125	1,621	2,222	2,667
Percentage Change		18.4%	16.5%	12.8%	8.1%	44.1%	37.1%	20.0%
Absolute Change (000s)		123	131	118	84	496	601	445
POST-PAID SUBSCRIBERS								
All Carriers								
Subscribers (000s)			15,615	17,029	18,381	19,849	21,322	22,235
Percentage Change				9.1%	7.9%	8.0%	7.4%	4.3%
Absolute Change (000s)				1,414	1,352	1,468	1,474	913
Percentage of All Carriers				90.3%	99.0%	80.0%	97.4%	81.0%
Incumbents								
Subscribers (000s)	12,457	13,704	14,830	16,073	17,325	18,606	19,714	20,856
Percentage Change		10.0%	8.2%	8.4%	7.8%	7.4%	6.0%	5.8%
Absolute Change (000s)		1,247	1,126	1,243	1,252	1,281	1,108	1,142
Percentage of Incumbents				85.9%	97.7%	95.7%	121.5%	167.4%
Others								
Subscribers (000s)			785	956	1,055	1,242	1,608	1,379
Percentage Change				21.7%	10.4%	17.7%	29.4%	-14.2%
Absolute Change (000s)				171	100	187	366	-229
Percentage of Others				144.6%	118.7%	37.7%	60.8%	-51.5%

TABLE 7: CANADIAN POST-PAID, PRE-PAID AND TOTAL SUBSCRIBERS (2005-2012) (cont'd)

	2005	2006	2007	2008	2009	2010	2011	2012
PRE-PAID SUBSCRIBERS								
All Carriers								
Subscribers (000s)			4,430	4,581	4,595	4,962	5,002	5,216
Percentage Change				3.4%	0.3%	8.0%	0.8%	4.3%
Absolute Change (000s)				151	14	367	39	214
Percentage of All Carriers				9.7%	1.0%	20.0%	2.6%	19.0%
Incumbents								
Subscribers (000s)	3,673	4,084	4,292	4,496	4,526	4,584	4,388	3,932
Percentage Change		11.2%	5.1%	4.8%	0.7%	1.3%	-4.3%	-10.4%
Absolute Change (000s)		411	208	204	30	58	-196	-456
Percentage of Incumbents				14.1%	2.3%	4.3%	-21.5%	-66.9%
Others								
Subscribers (000s)			138	85	70	379	614	1,284
Percentage Change				-38.2%	-18.4%	443.7%	62.2%	109.2%
Absolute Change (000s)				-53	-16	309	235	670
Percentage of Others				-44.7%	-18.7%	62.3%	39.2%	150.6%

Source: G. Campbell, "Global Wireless Matrix 1Q2011," Bank of America Merrill Lynch, 28 April 2011 and G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, 15 April 2013. Bell, Rogers and Telus Annual Reports from 2006-2012.

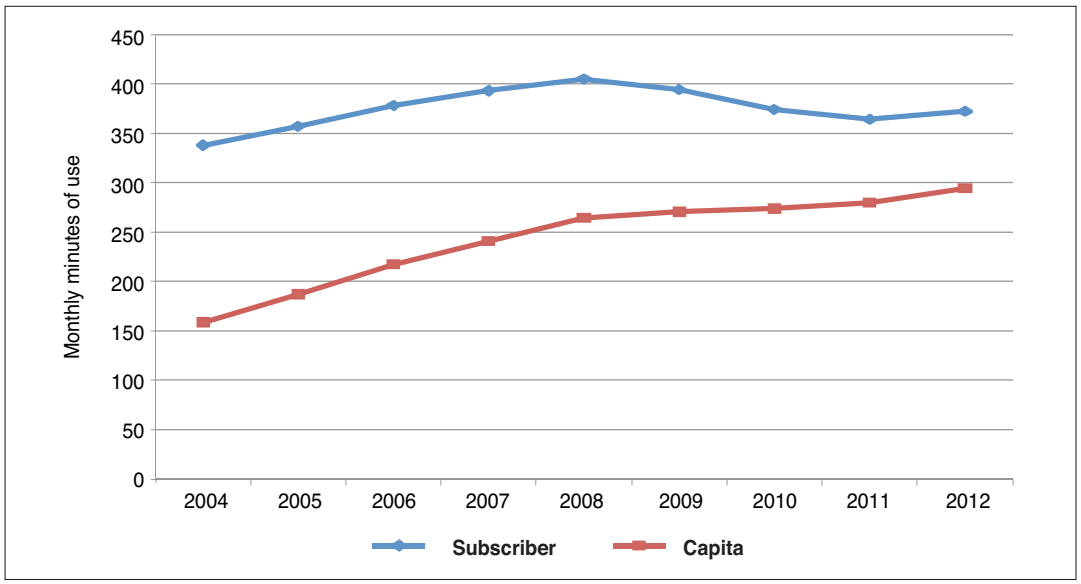
Note: The BoA subscriber values do not align precisely with Bell Annual Report values over this period (but do match Rogers and Telus values). As such, the Bell Annual Report values replace the BoA Bell values in the incumbent and aggregate values in this analysis.

Figure 16 shows minutes of use per subscriber and minutes of use per capita in Canada from 2004 to 2012. Minutes of use per subscriber peak in 2008 and in the same year growth in minutes of use per capita growth levels off substantially. Both are consistent with a maturing market for voice and both occur *prior* to the entrants becoming operational in late 2009 and early 2010.[97] Figure 17 shows total minutes in Canada. There is a noticeable deceleration in growth after 2008 prior to entry. It averages over 13 per cent from 2005 to 2008, but from 2009 to 2011 its average is only three per cent.[98]

[97] Both minutes per capita and minutes per subscriber reverse course in 2012. Minutes of use per subscriber rises slightly, while the growth in minutes per capita accelerates. It will be interesting to see if these reversals persist. The growth in minutes per capita from 2011 to 2012 is 5.3 per cent, well below its average annual growth rate of 13.6 per cent from 2004 to 2008.

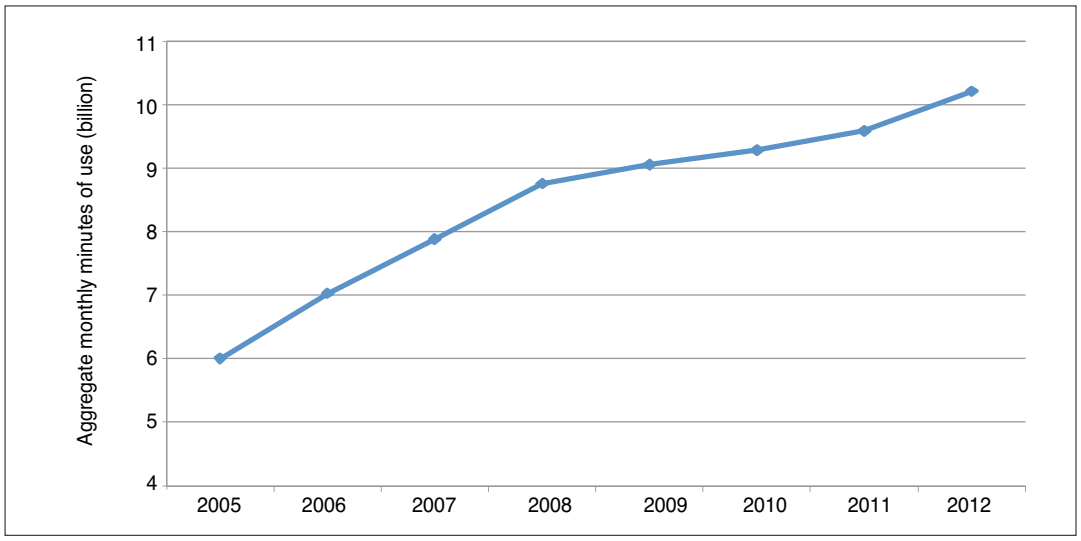
[98] As with minutes of use, in 2012 there is a reversal, growth accelerates to 6.6 per cent, still half of its level prior to 2009.

FIGURE 16: CANADIAN MINUTES OF USE PER SUBSCRIBER AND PER CAPITA (2004-2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2011," Bank of America Merrill Lynch*, 28 April 2011 and G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, 15 April 2013.*

FIGURE 17: CANADIAN AGGREGATE MINUTES OF USE (2005-2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2011," Bank of America Merrill Lynch*, 28 April 2011 and G. Campbell, "Global Wireless Matrix 1Q2013,"*Bank of America Merrill Lynch*, 15 April 2013.*

The story told in Table 7 and Figures 16 and 17 is not one of market expansion attributable to the 2008 AWS entrants. Instead, it suggests a market becoming saturated, with slowing growth prior to their entry, whether the measure is subscribers or minutes of use. The growth of incumbent subscribers in 2009 and thereafter is almost entirely attributable to new monthly plans. Similarly market growth since 2010 is disproportionately in subscribers on monthly plans. This provides evidence of the shift in usage from voice and text to data discussed below.

EFFECT ON PRICES

The policy reason for subsidizing entry is to lower prices. The CRTC has commissioned the Wall Report as part of its efforts to monitor pricing in telecommunications in Canada. The Wall Report methodology is similar to that of the OECD — it tracks the price of baskets of service through time. The three baskets correspond to low (150 minutes per month), average (450 minutes and 200 to 300 texts per month depending on the year), and high (1,200 minutes per month, 200 to 300 text messages and 1 Gigabyte (GB) data usage per month) usage. The data are collected during the first half of the indicated year. Table 8 shows, for the period 2008-2013, the Wall Report price level for the three mobile baskets tracked and the year-to-year change in prices.

The Wall Report data in Table 8 shows the following:

- The price for the low-usage basket is virtually unchanged from 2008 to 2012. In the first half of 2013 it falls by 11 per cent relative to the first half of 2012. Entry had virtually no effect on pay-as-you-go plan pricing.
- Prices for the medium usage basket fall from the first half of 2008 to the first half of 2009 by five per cent, well before the first entrant starts offering service (WIND in December 2009, the rest in 2010, except Eastlink in 2013). This price decrease was not dissimilar from that in the following two years. Prices actually rise from 2011 to 2012 for this basket, before a large decrease in 2013.
- Prices for the large usage basket fall from the first half of 2008 to the first half of 2009 by eight per cent, well before the first entrant starts offering service (WIND in December 2009, the rest in 2010, except Eastlink in 2013). Prices rise from 2009 to 2010, fall again from 2010 to 2011, are virtually unchanged in 2012, before falling at a reduce rate from 2012 to 2013.

TABLE 8: CANADIAN PRICE BASKET ANALYSIS (2008-2013)

	2008	2009	2010	2011	2012	2013
Level 1 (CDN$)	32.73	33.03	34.03	33.73	34.32	30.71
Percentage Change		0.9%	2.9%	-0.9%	1.7%	-11.8%
Level 2 (CDN$)	60.81	57.78	53.49	50.51	51.31	44.86
Percentage Change		-5.0%	-7.4%	-5.6%	1.6%	-12.6%
Level 3 (CDN$)	112.34	103.24	109.59	99.69	98.37	93.59
Percentage Change		-8.1%	6.2%	-9.0%	-1.3%	-4.9%

Source: Wall Communications Inc. Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2013 Update, Table A2.2. Prepared for the Canadian Radio-television and Telecommunications Commission and Industry Canada. Available online at http://www.crtc.gc.ca/eng/publications/reports/rp130422.pdf.

Level 1: Low-volume use – 150 minutes per month

Level 2: Average use, 450 minutes and 300 texts per month

Level 3: High-volume use, 1200 minutes, 300 texts and 1 GB of data per month

Population-weighted average monthly prices for five Canadian cities.

A broader measure of overall price levels for voice is revenue per minute. This is Voice ARPU divided by Minutes of Use per Subscriber. Table 9 shows revenue per minute in Canada over the period 2006-2012 and the year-to-year change in revenue per minute. This measure shows prices falling over the period 2006 to 2009 prior to entry, moderating during the first full year of entry, then the decrease accelerating to eight per cent in 2011 and 10 per cent in 2012.

TABLE 9: CANADIAN VOICE REVENUE PER MINUTE (2006-2012)

	2006	2007	2008	2009	2010	2011	2012
Voice Revenue Per Minute (US$/min)	0.136	0.131	0.126	0.118	0.116	0.106	0.095
Percentage Change		-3.4%	-3.7%	-6.3%	-2.1%	-8.3%	-10.1%

Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

It is true that the entrants have offered much lower prices than the incumbents. The Wall report indicates that in 2011, the entrants' services were an average of 22 per cent less expensive for the low-usage basket, eight per cent less expensive for the average-usage basket, and 32 per cent less than the incumbents for the high-usage basket.[99] In 2013, the average price differentials were 19 per cent for the low-usage basket, 14 per cent for the average-usage basket and 39 per cent for the high-usage basket.[100]

However, despite these large price differentials, the market share of the entrants is relatively small at four per cent of subscribers in 2011 (most recent CRTC estimate)[101] and 5.6 per cent at the end of 2012.[102] Entry does not seem to have been associated with a large increase in the number of subscribers to wireless services or diversion of demand from the incumbents. Consistent with the data on the maturation of the voice market prior to entry, price competition between the incumbents was putting downward pressure on prices prior to entry. Given the small market shares of the entrants, it is likely that much of the price decreases, especially in 2013, are attributable to competition between the incumbents, especially given the financial difficulties of the three national entrants.[103] A key dynamic in wireless is the commoditization of voice and the increased importance of data.

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[99] Wall Communications Inc., *Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2011 Update*, June 2011, Table 3. Prepared for the Canadian Radio-television and Telecommunications Commission and Industry Canada, online at http://www.crtc.gc.ca/eng/publications/reports/rp1106.htm. The 2010 Wall Report considers only Wind's prices in Toronto: "In terms of relative pricing, we found that WIND offered a far cheaper price plan for the Level 1 basket (i.e., just over $20 per month versus the $33 national average), a slightly cheaper price plan for the Level 2 basket (roughly $49 per month versus the national average of $52) and, again, a far cheaper price plan for the Level 3 basket (i.e., roughly $83 per month versus the national average of $110). On balance, WIND's mobile wireless pricing is relatively aggressive compared to the incumbents." Online at http://www.crtc.gc.ca/public/partvii/2009/8663/c12_200907321/1398110.DOC.

[100] Wall Communications Inc., *Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2013 Update*, July 2013, Table 3. Prepared for the Canadian Radio-television and Telecommunications Commission and Industry Canada, online at http://www.crtc.gc.ca/eng/publications/reports/rp130422.pdf.

[101] Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report 2012*, September 2012, Figure 5.5.4, online at http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2012/cmr2012.pdf

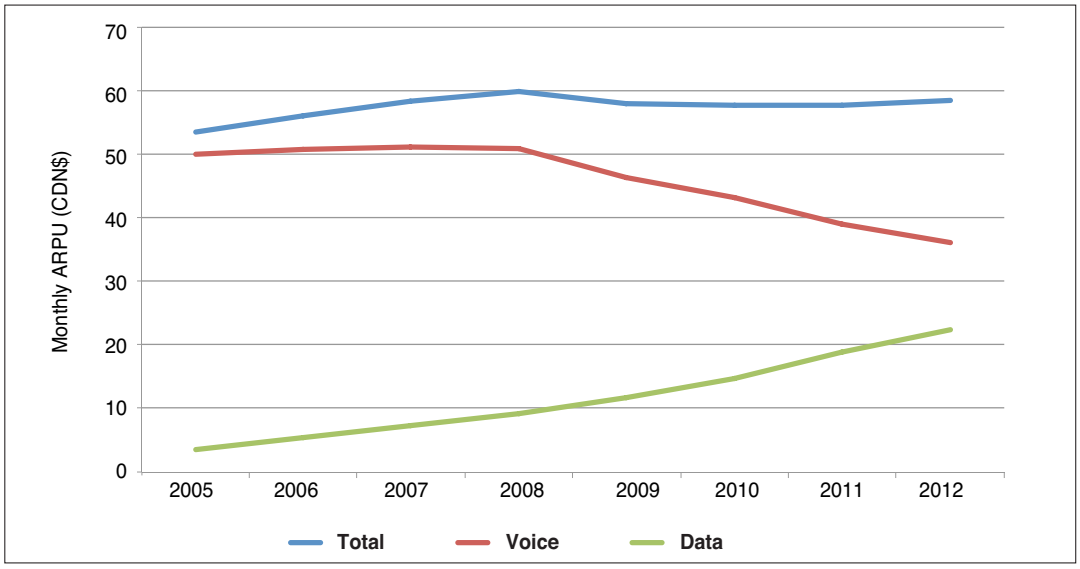
[102] This is based on the Bank of America/Merrill Lynch estimate of 1.540 million subscribers for entrants and the estimate for total subscribers of 27.451 million in Table 8. CWTA reports Videotron's subscriber base as approximately 400,000 at the end of 2012 and 590,000 for WIND. See http://cwta.ca/wordpress/wp-content/uploads/2011/08/SubscribersStats_en_2012_Q4.pdf. Based on the Bank of America/Merrill Lynch estimate of 1.540 million subscribers for entrants, this implies the three national entrants have a national market share of 4.2 per cent. An upper bound on Videotron's market share in Quebec is 7.7 per cent. This is based on their 2013 subscriber estimate of 400,000 and the most recent data on total Quebec subscribers for 2011 of 5,185,000.

[103] The Conservative Party's website (http://www.consumersfirst.ca/) highlights a 20 per cent fall in wireless prices since 2008 and implies that this is attributable to its policies to create competition. This seems to ignore the reality of increased competition in voice between incumbents, consistent with a maturing market, prior to entry in December 2009 and 2010 and the limited diversion to entrants post entry. The price fall might also be attributable, in part, to technological change decreasing costs. Competition between the incumbents or technological change are both explanations for falling prices that are independent of entry.

THE RISING IMPORTANCE OF DATA

The rising importance of data is reflected in the change in the composition of ARPU for the incumbents in Canada. Figure 18 shows the change in voice and data ARPU for incumbents from 2005 to 2012, and it highlights that the reduction in voice and text ARPU for the incumbents is essentially offset by a substantial increase in data ARPU. Moreover, consistent with the analysis of prices, the sharp drop in voice ARPU begins in 2009, prior to entry.

FIGURE 18: VOICE, DATA AND TOTAL AVERAGE REVENUE PER USER ROGERS, BELL, AND TELUS (2005-2012)



Source: G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch*, 15 April 2013.*

Note that the values for data percentage of revenues for Bell were unavailable in the BoA data from 2005-2007. The values for the incumbent data percentage of revenues for these years are the subscriber-weighted average of Rogers and Telus.

The implementation of the government's policy to increase competition in wireless markets (set-asides in the 2008 AWS auction) occurs almost exactly when the wireless market is fundamentally transformed in Canada by the introduction of Apple's iPhone, which effectively made mobile internet access possible. What seems obvious today was transformative at the time. The iPhone popularized the mobile internet and initiated an exponential growth in the demand for data, and hence, capacity and spectrum on wireless networks.[104]

Virtually as soon as they entered, the business plans of the entrants were rendered economically obsolete with their focus on talk and text, and not on data.[105] This is reflected in their relatively low average revenue per user (on the order of half of the incumbents) and relatively small share of post-paid subscribers relative to the three incumbents. For instance, in

[104] For recent projections, see Cisco Systems, *Cisco Virtual Networking Index: Global Mobile Data Traffic Forecast, 2012-17*, online at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf.

[105] See R. Trichur, S. Silicoff, and B. Erman, "How Ottawa's plan to foster wireless competition sank," *Globe and Mail*, 18 May 2013, online at http://www.theglobeandmail.com/report-on-business/how-ottawas-plan-to-foster-wireless-competition-sank/article12005826, which states "the entrants were partly to blame for their own misfortunes…they underestimated the impact of the Smartphone revolution….the business model quickly shifted from talk and text on flip phones to data consumption…on devices like the iPhone."

the first quarter of 2013 the per cent of subscribers for the incumbents that are on monthly plans (postpaid) was approximately 85 per cent, the share of data revenue was 40-43 per cent, and ARPU varied between $56 and $60.[106] In contrast, Wind Mobile's monthly average revenue per user in the first quarter of 2013 was $27.60[107] and in large part because of its initial focus on the pre-paid market, post-paid subscribers accounted for only 40 per cent of its subscriber base as of early 2012.[108] Moreover, as noted above, the entrants are two years behind in their rollout of LTE networks and have faced difficulties providing a complete array of smartphones. For instance, until recently, none of them offered an iPhone.[108] There is a virtuous circle at work here; increases in the power and capabilities of devices increase demand for faster networks, while faster networks increase demand for more capable devices. Demand for data service will be less if networks are slow or devices are not very powerful in terms of their capabilities or processing speed.

CONCLUSION ON THE WELFARE EFFECTS OF THE ENTRANTS

The extent of the benefits from entry by the 2008 AWS entrants appears to be limited by the small output response, in terms of minutes, penetration, and data usage. Entry by the 2008 AWS entrants appears more likely to be an example, therefore, of business-stealing and inefficient entry, given the costs of entry discussed above.[110]

CONCLUSION AND IMPLICATIONS OF THE ANALYSIS

The commitment by the present government to enhance competition by committing to four competitors in every region is ill-advised. It is based on unsophisticated and misinformed textbook economics — that more competitors are better — which is simply inappropriate for services where there are important economies of network size, including economies of scale and scope. This paper uses appropriate measures to assess competition in Canadian wireless services and finds that there is not evidence of inefficient or significant market power — and therefore there is not evidence of insufficient competition in wireless services in Canada.

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[106] See BCE News Release, "BCE reports first quarter 2013 results," 9 May 2013, online at http://www.bce.ca/news-and-media/releases/show/bce-reports-first-quarter-2013-results?page=1&perpage=10&year=&month=&keyword= and Wire Report, "Bell, Telus chipping away at Rogers' lead in postpaid wireless," 9 May 2013.

[107] See *Orascom Telecom Holding First Quarter 2013*, 15 May 2013, p. 12, online at http://www.rns-pdf.londonstockexchange.com/rns/7479E_-2013-5-15.pdf.

[108] See Telecom Review, "Expanding a NEW Mobile Network," November-December 2012, online at http://www.telecomreviewna.com/index.php?option=com_content&view=article&id=274:expanding-a-new-mobile-network&catid=44:novembre-decembre-2012&Itemid=88.

[109] While none of the entrants (in summer of 2013) provided iPhones, unlocked iPhones could be purchased from the Apple Store and a supporting SIM card purchased for some of them.

[110] A cost to taxpayers, not discussed above, of the set-asides are forgone revenues from reducing competition for spectrum when there are set-asides. The lost revenues from set-asides at the 2008 AWS auction have been estimated to be on the order of $400-500 million. See K. Hyndman and C. Parmeter, *Efficiency or Competition? A Structural Econometric Analysis of Canada's AWS Auction and the Set-Aside Provision*, 20 February 2013, online at http://www.hyndman-honhon.com/hyndman/HP-AWS-Auction.pdf.

The commitment to enhance competition is based on the notion that increases in the number of competitors will lead to lower prices. Prime Minister Stephen Harper has succinctly summarized the government's position:[111]

> "Our government has pursued extremely consistently and extremely clearly a policy of fostering greater competition in this industry for the benefit of consumers."
>
> "We have every intention of continuing that policy in the interests of Canadian consumers and the broad Canadian public, including proceeding with the auction as we have laid out for some time."
>
> and
>
> "At the same time, the government has a responsibility toward a wider public interest, and Canadians are very clear about what that wider public interest is to us: They want to see enhanced competition, lower prices, better services in this area."

It is true that lower prices have, and would, benefit Canadian subscribers — at least in the short term. But without an analysis of the relationship between prices and costs, including the high capital costs of establishing networks, the danger is that revenues will not be sufficient to support the investment levels required to maintain and advance the quality of wireless networks. As explained above, reducing quasi-rents below the level necessary to induce investment amounts to holding up and expropriating the capital of existing firms. In the case of wireless services in Canada, those quasi-rents are not even sufficient to support a competitive rate of return. The inefficiency of entry also arises from the misallocation of spectrum and loss of scale to incumbents. The benefits from the 2008 AWS entrants are limited by their narrow focus on voice and text in a mature market. Instead of allocating AWS spectrum to the incumbents, who would use it to increase their speed and capacity for data, it has instead been allocated to entrants who have focused on voice and text. Canadians ended up with an incorrect mix of networks and an inefficient allocation of spectrum.

It is important to be careful about what you wish for, the consequences may be very different than what is intended: low prices, but networks that do not adequately support, if at all, future generations of mobile devices and services. Governments should worry about prices when they do not reflect the cost of service, not because they think they can win votes by redistributing wealth from shareholders to consumers by adopting policy measures that arbitrarily lower prices.[112]

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[111] All three quotes from S. Ladurantaye, "Harper refuses to change telecom rules despite corporate lobbying," *Globe and Mail*, 9 August 2013, online at http://www.theglobeandmail.com/report-on-business/harper-says-ottawa-wont-change-telecom-rules/article13695693/.

[112] The Conservative Party's identification of the policy objective of lower wireless prices and their aggressive promotion to voters of their commitment includes a website (http://www.consumersfirst.ca/) and an online petition (http://www.conservative.ca/?page_id=3165). For a wry comment on the online petition see T. Corcoran, "Why is Harper organizing petition to himself in support of his own government's intervention in telecom market?" Financial Post 4 July 2013, online at http://opinion.financialpost.com/2013/07/04/why-is-harper-organizing-petition-to-himself-in-support-of-his-governments-intervention-in-telecom-market/. In response to the aggressive campaign by the big three to change the auction rules, the government has counterattacked with its own public relations effort. See S. Chase, "Ottawa launches defence of plan to lure foreign telecom firms," *Globe and Mail*, 16 August 2013, online at http://www.theglobeandmail.com/news/politics/ottawa-launches-defence-of-plan-to-lure-foreign-telecom-firms/article13808611/.

APPENDIX A

TABLE A1: NOTES FOR ROGERS WIRELESS CALCULATIONS

Year	EBITDA	Capex	Other Cash Investment
1986	RCI-AR 1987 (p. 23)	Value of total assets for year-ended August 1986 (Rogers Cantel Prospectus August 8, 1991 p. 8), which is consistent with estimates of pre-1987 CAPEX. Services were first offered in 1986.	
1987	RCI-AR 1988 (p. 27)	RCI-AR 1988 (p. 27)	-
1988	RCI-AR 1989 (p. 29)	RCI-AR 1989 (p. 29)	-
1989	RCI-AR 1990 (p. 18)	RCI-AR 1990 (p. 18)	-
1990	RCI-AR 1990 (p. 18)	RCI-AR 1990 (p. 18)	Acquisition of CSCs – RCI-AR 1990 (p. 32)
1991	RCI-AR 1992 (p. 11)	RCI-AR 1992 (p. 11)	Acquisition of CSCs – RCI-AR 1991 (p. 37)
1992	RCI-AR 1993 (p. 16)	RCI-AR 1993 (p. 16)	Acquisition of CSC – RCI-AR 1992 (p. 29)
1993	RCI-AR 1994 (s.B.2)	RCI-AR 1994 (s.B.2)	-
1994	RCI-AR 1995 (p. 31)	RCI-AR 1995 (p. 31)	Acquisition of Maclean-Hunter Paging – Rogers Cantel Annual Report 1995 (p. 42)
1995	RCI-AR 1996 (p. 25)	RCI-AR 1996 (p. 25)	-
1996	RCI-AR 1997 (p. 27)	RCI-AR 1997 (p. 27)	-
1997	RCI-AR 1998 (p. 39)	RCI-AR 1998 (p. 39)	-
1998	RCI-AR 1999 (p. 13)	RCI-AR 1999 (p. 13)	-
1999	RCI-AR 2000 (p. 13)	RCI-AR 2000 (p. 13)	Acquisition of Shaw Paging – RCI-AR 1999 (p. 44)
2000	RCI-AR 2001 (p. 27)	RCI-AR 2001 (p. 27)	-
2001	RCI-AR 2002 (p. 22)	RCI-AR 2002 (p. 22)	Acquisition of 1900 MHz spectrum – RCI-AR 2001 (p. 31)
2002	RCI-AR 2003 (p. 45)	RCI-AR 2003 (p. 45)	-
2003	RCI-AR 2004 (p. 26)	RCI-AR 2004 (p. 26)	-
2004	RCI-AR 2005 (p. 25)	RCI-AR 2005 (p. 25)	Acquisition of Microcell, Total Transaction Value $1.5018 billion RCI-AR 2004 (p. 47). Acquisition of fixed-wireless spectrum for $5.9 million RCI-AR 2003 (p. 44)
2005	RCI-AR 2006 (p. 28)	RCI-AR 2006 (p. 28)	-
2006	RCI-AR 2007 (p. 30)	RCI-AR 2007 (p. 30)	-
2007	RCI-AR 2008 (p. 34)	RCI-AR 2008 (p. 34)	-
2008	RCI-AR 2009 (p. 27)	RCI-AR 2009 (p. 27)	Acquisition of AWS spectrum – RCI-AR 2008 (p. 103)
2009	RCI-AR 2010 (p. 26)	RCI-AR 2010 (p. 26)	Inukshuk acquisition of BRS spectrum from Look Communications for $80 million, totaling $40 million for Rogers' 50% share – RCI-AR 2009 (p. 25)
2010	RCI-AR 2011 (p. 28)	RCI-AR 2011 (p. 28)	Acquisition of Cityfone Wireless for $26 million – RCI-AR 2010 (p. 30). Inukshuk acquisition of BRS spectrum from Craig Wireless for $80 million and from YourLink Inc. for $14 million, total $47 million for Rogers' 50% share – RCI-AR 2010 (p. 24)
2011	RCI-AR 2012 (p. 35)	RCI-AR 2012 (p. 47)	-
2012	RCI-AR 2012 (p. 35)	RCI-AR 2012 (p. 47)	-

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