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WIRELESS COMPETITION IN CANADA: DAMN THE TORPEDOES! THE TRIUMPH OF POLITICS OVER ECONOMICS[†]

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SUMMARY

Last year featured a high stakes battle between two mighty protagonists. On one side, allegedly representing the interests of all Canadians, the federal government. On the other side, Bell, Rogers, and Telus. The issue at stake: What institutions should govern the allocation of resources in the provision of wireless services? Should the outcomes — prices, quality, availability, and other terms of service — be determined by the market? Or should the government intervene? The answer to these questions should depend on the extent of competition and the ability of wireless providers to exercise inefficient market power — raise prices above their long run average cost of providing services. Do Bell, Rogers, and Telus exercise substantial inefficient market power?

The accumulated wisdom of market economies is that state intervention inevitably is very costly, given asymmetries of information, uncertainty, and political pressure. At the very least the onus on those demanding and proposing government action is to provide robust evidence of the substantial exercise of inefficient market power. This paper is a contribution to the ongoing debate regarding the existence and extent of market power in the provision of wireless services in Canada.

The conventional wisdom that competition in wireless services was insufficient was challenged by our earlier School of Public Policy paper.^{††} In that study we demonstrated that the Canadian wireless sector was sufficiently competitive. The evidentiary record we developed was not consistent with a robust finding of a substantial exercise of inefficient market power; policy efforts to create and sustain more competition were unlikely to be successful without ongoing subsidization; and to the extent those efforts were successful, they would likely to lead to an inefficient allocation of scarce resources, with the benefits of additional competition less than its costs.

The federal government's standard bearer in this debate has been the Competition Bureau. The Competition Bureau has made submissions and commissioned expert evidence in regulatory proceedings that conclude that there is market power in the provision of wireless services in Canada and there are substantial benefits to enhancing competition.

This follow-up paper is a critical assessment of the Competition Bureau's submissions and the expert evidence on which it is based. We remain unconvinced that market power is a problem in wireless services or that additional competition in wireless services is efficient. As explained at length in this paper, the expert evidence prepared for the Competition Bureau on both points is simply insufficient to warrant regulation and subsidization of competition. The evidence with respect to market power is inconsistent with substantiality and it is not robust. The expert evidence does not address whether entry is efficient. Instead it provides only an estimate of the competitive benefits of a fourth national entrant — not its costs — and it does not assess the financial viability of a fourth national competitor. The assessment of the competitive benefits of entry are unreliable, attributable to both the methodologies used by the expert and the assumptions required to implement its simulation methodology. The lack of fit between outcomes derived from the model and calibrated parameters with observed values indicate that the concerns over the specification and assumptions in implementing the model are well-founded. Its inaccuracies pre-entry cast considerable doubt on its use to accurately forecast the effect of a fourth national entrant.

Given the absence of compelling evidence demonstrating the substantial exercise of inefficient market power, the evidence that more than three carriers likely raises concerns regarding financial viability without ongoing subsidization, and the evidence that additional entry is inefficient, one wonders how long the federal government and its agencies will continue the failed policy of attempting to "enhance competition" in wireless markets. What will be the final cost to Canadians of an economically vacuous commitment to the proposition that competition is measured by the number of competitors?

[†] We are grateful to an anonymous referee for comments and suggestions.

^{††} J. Church and A. Wilkins, *Wireless Competition in Canada: An Assessment*, University of Calgary, The School of Public Policy, *SPP Research Series*, 6(27), September 2013.

INTRODUCTION

In September 2013, The School of Public Policy at the University of Calgary published *Wireless Competition in Canada: An Assessment* by Jeffrey Church and Andrew Wilkins.¹ This study considered three issues: (i) the invalidity of some commonly used international comparisons, and the superiority of output measures in assessing the relative international performance of Canada's wireless services; (ii) in any event, why these international comparisons could not, and should not, be a basis for assessing competition in Canada's wireless services, while developing and applying more suitable measures for assessing the state of competition in wireless services; and (iii) the sustainability and welfare implications of a fourth wireless carrier in Canada. The relevant measures that reflect the technological characteristics of wireless did not, and do not, suggest that competition in wireless services in Canada was, or is, insufficient. The evidence does not suggest that there is an exercise of inefficient market power in the provision of wireless services that would justify regulatory and policy initiatives to further competition. Efforts to enhance competition, even without considering the burden of subsidization, are unlikely to be efficient and to improve the welfare of Canadians. The costs of such efforts will likely be greater than the benefits, with the result being that the value of goods and services produced by Canada's scarce resources will likely be reduced.

Moreover, the analysis indicated that it was very unlikely that a fourth carrier would be profitable without ongoing subsidization. Indeed the analysis suggested a very different equilibrium in Canada and the United States relative to much of the rest of the world: rather than a low-price, low-quality, low-investment, low-usage outcome, the equilibrium in Canada is characterized by higher revenues, higher quality, higher investment, and higher usage. Measures to enhance price competition run the risk of ending this distinction in a way that is unlikely to be in the interests of most Canadians.

The federal government has not backed off its commitment from the summer of 2013 to enhance wireless competition, with the oft-repeated objective of realizing "more choice, better service and lower prices."² Its policy initiatives have granted preferential access to new spectrum for entrants and capped roaming rates under which the entrants could use the facilities of the incumbents to provide service.³

¹ J. Church and A. Wilkins, *Wireless Competition in Canada: An Assessment*, University of Calgary, The School of Public Policy, *SPP Research Series*, 6(27), September 2013. Available online at <http://policyschool.ucalgary.ca/?q=content/wireless-competition-canada-assessment>. This research paper extends and develops at length our independently authored response to the comments of the Competition Bureau, which was submitted as an appendix to a submission by Bell Canada at the Canadian Radio-television and Telecommunications Commission (CRTC). See: J. Church and A. Wilkins, "Wireless Competition in Canada: Response to the Competition Bureau," submitted as Appendix 2 of "Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile roaming in Canada — Unjust discrimination/undue preference — Reply Comments of The Companies," 10 February 2014. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2073564>. The Digital Economy Program at The School of Public Policy is funded by telecommunication service providers in Canada. The funders of the program do not have rights of approval with respect to its research activities and all research published by The School of Public Policy, including our original paper and this current paper, are subject to independent, blind, peer review.

² See for example: Industry Canada Press Release, "More Choice for Canadians Wireless Consumers," 19 February 2014. Available online at <http://news.gc.ca/web/article-en.do?nid=816849>.

³ Details of the policy initiatives can be found in Section 2 *infra*.

Fundamental to each and every one of these policy initiatives, and indeed the set aside in 2008 of AWS spectrum that subsidized the entry of Wind and Mobilicity nationally, as well as Videotron in Quebec and Eastlink in Atlantic Canada, is the assessment that competition in wireless is insufficient. However, if wireless services at retail are competitive, then there is no justification for regulating roaming rates, mandating access to wholesale services, or restricting access to spectrum by the incumbents. If wireless services are competitive, then attempts to foster more competition are inefficient — the value created is less than the cost of subsidization and the value of goods and services produced from Canadian's scarce resources is reduced.⁴

The purpose of diagnosing market power is to assess whether there is a market failure that warrants policy intervention. In assessing whether a policy intervention is optimal, two types of errors are relevant, as are their relative probabilities and costs. The two errors are diagnosing inefficient market power when in fact it is not present (a false positive) and a finding that there is not inefficient market power when in fact there is (a false negative).

The costs of these two errors are very different. The costs of an incorrect diagnosis of inefficient market power include not only the institutional costs of the regulatory process, but more fundamentally the losses in economic surplus (value of production) that result from a less efficient allocation of resources that arises from the incentives created by regulation. A bias to market outcomes is warranted given that regulatory interventions are particularly prone to negative outcomes when the regulator is imperfectly informed, there is uncertainty, and the regulator is influenced by political considerations (e.g., lobbying and rent seeking, which themselves use real resources and often create inefficiencies). The costs of not intervening when there is inefficient market power can be large as well, but markets have a tendency to be self-correcting: the lure of monopoly profits provides incentives for entry.⁵

Based on the relative expected costs of imperfect markets and imperfect regulation, the threshold for regulatory intervention should be set high. The decision to intervene must be rigorously justified with a clear demonstration that the expected benefits of state and regulatory intervention exceed expected costs. These considerations should be obvious to a government whose policy instinct is to favour markets over regulation.⁶

It is not enough that there may be some evidence of inefficient market power. The evidence must be compelling: to be compelling, the evidence must not only indicate a substantial and durable inefficient exercise of market power, but that evidence must also be robust. An indicator is robust if it is not fragile to changes in assumptions or data. The substantiality of the evidence and its level of robustness are clearly related to the probability of an error: again given the relative costs it is better to favour false negatives than false positives. The evidence must indicate a substantial exercise of inefficient market power and substantiality must not disappear with alternative assumptions.

⁴ If wireless services are sufficiently competitive, differences in roaming agreements might harm individual carriers, but they are unlikely to harm Canadians that use wireless services. Indeed Canadians likely benefit if lower roaming rates for Americans traveling in Canada result in lower rates for Canadians traveling in the U.S.

⁵ For a seminal overview of the tradeoffs associated with regulatory intervention in the face of uncertainty, see: F. Easterbrook, (1984), "The Limits of Antitrust," *Texas Law Review*, 63: 1-40.

⁶ The explanation for the government's policy choice would appear to be rooted in the economics of public choice. The government's policies may be better explained by the hypothesis that it believes that it is creating and transferring economic benefits to its core base of voters, rather than an understanding that it is making Canadians better off in aggregate by addressing a market failure based on the exercise of market power.

Our study has been introduced as evidence in the CRTC's undue discrimination proceeding and in its wholesale wireless proceeding.⁷ The Competition Bureau has responded in both proceedings, taking issue with our conclusion and methodology.⁸ In its submissions, the Competition Bureau asserts that the provision of wireless services in Canada is characterized by the exercise of market power and monopoly profits. Its initial dissension in the undue discrimination proceeding was short and unsupported by expert economic evidence. Its submission in the wholesale wireless proceeding is more fulsome and supported by an expert report by the Brattle Group.^{9,10} Unfortunately, the Competition Bureau has fundamentally mischaracterized and misunderstood both our methodology and our findings.

In this report, we explain why our conclusions are robust to the Competition Bureau's submissions and the analysis of the Brattle Group:

- Wireless services in Canada are not insufficiently competitive. They do not exhibit levels of market power that suggest market failure.
- A fourth national entrant is unlikely to be viable without subsidization.
- Entry by a fourth national entry is not likely efficient.

⁷ "Bell Response to CRTC File No. 8620-C12-201312082 — Request for Information — Wireless Roaming — Responses," 27 September 2013, available online at <http://crtc.gc.ca/otf/eng/2013/8620/c12-201312082.htm>, and "Telecom Notice of Consultation CRTC 2014-76, Review of wholesale mobile wireless services — Intervention of Bell Mobility," 15 May 2014, available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2132065>.

⁸ "Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Submission by the Commissioner of Competition," 29 January 2014. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2067254>. "Telecom Notice of Consultation CRTC 2014-76, Review of wholesale mobile wireless services — Submission by the Commissioner of Competition," 15 May 2014. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2131726>.

⁹ Commissioner of Competition, CRTC 2014-76 Submission. The Brattle Report filed with the Bureau's submission is: K. Hearle, G. McHenry, J. Reitzes, J. Verlinda, and C. Bazelon, *Canadian Wireless Market Performance and the Potential Effect of an Additional Nationwide Carrier*, The Brattle Group, 12 May 2014. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2131727>.

¹⁰ Several other interveners have highlighted the Competition Bureau's criticisms of our study in the undue discrimination and the wholesale wireless proceedings. For undue discrimination, see: "Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Reply Comments of the Public Interest Advocacy Centre (PIAC), Consumers' Association of Canada (CAC), National Pensioners Federation (NPF), & Council of Seniors [sic] Citizens [sic] Organizations of British Columbia (COSCO)," 10 February 2014, at para. 23, available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2073876>, and "Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Reply Comments of Globalive Wireless Management Corp. (WIND Mobile)," 10 February 2014, at para. 24, available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2073501>. For wholesale wireless, see: "Telecom Notice of Consultation CRTC 2014-76, Review of Wholesale Mobile Wireless Services — Intervention of Canadian Network Operators Consortium Inc.," 15 May 2014, at para. 40. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2132198>.

In this report we address *only* the Competition Bureau’s analysis and conclusions with respect to competition and market power in wireless services.¹¹

The Brattle Report evidence does not support the Competition Bureau’s policy conclusion because either (i) its results are not fundamentally different from ours; (ii) where its conclusions do differ, its methodology is not sufficiently accurate or robust; or (iii) it fails to address the key question, whether a fourth carrier is sustainable.

One of our indicators of inefficient market power is evidence of pricing above average cost. Pricing above average cost implies economic profits: the rate of return exceeds the cost of capital. We found that the pre-tax realized rate of return for Rogers’ investment in wireless was sufficiently low that it was unlikely to substantially exceed its cost of capital. We found it much more likely that it was less than Rogers’ cost of capital.

¹¹ We do not address the theory of raising rivals’ costs, which the Competition Bureau invokes to justify a finding of undue discrimination and undue preference. For the Competition Bureau’s characterization of the differentials in roaming rates — that higher rates for entrants are intended to raise their costs and reduce competition — to be coherent, a prerequisite is market power in wireless services. If there is not market power, then the rationale for the higher rates for entrants cannot be anti-competitive, but instead is likely consistent with efficiencies, such as lower roaming rates for Canadians in the United States. Even if the different roaming rates are an example of price discrimination, price discrimination is not necessarily an indicator of the inefficient exercise of market power. Price discrimination is consistent with competition between multi-product firms with fixed or sunk common costs. Indeed Baumol and Swanson argue that competition forces firms to price discriminate in order to break even and recover their fixed or sunk common costs. They show that it does not identify inefficient market power, but instead competition will result in prices above short-run marginal cost sufficient for the firm to break even. This corresponds to the distinction we make between inefficient and efficient exercise of market power. See discussion *infra*. W. Baumol and D. Swanson, (2003), “The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power,” *Antitrust Law Journal*, 70: 661-685.

We also do not address the Competition Bureau’s suggested framework for evaluating market power in wholesale services. If there is not market power at retail, then there is no economic justification for considering the incentives and ability for the exercise of market power in the supply of inputs to its retail competitors. We note, however, that the Competition Bureau seems not to recognize that its approach in the wholesale wireless proceeding differs from the analysis it has traditionally applied to determining whether access should be mandated at wholesale to wired telecommunication facilities. There is a notable absence in the Competition Bureau’s wireless submission of preserving incentives for investment, the effect on competition of mandating access, and the value of investment competition that are key considerations in its analysis of wired telecommunications markets. See: “Telecom Public Notice CRTC 2006-14, Review of Regulatory Framework for Wholesale Services and Definition of Essential Service — Evidence of the Commissioner of Competition,” 15 March 2007, available online at http://www.crtc.gc.ca/public/partvii/2006/8663/c12_200614439/737543.zip, “Telecom Public Notice CRTC 2006-14, Review of Regulatory Framework for Wholesale Services and Definition of Essential Service — Supplemental Material of the Commissioner of Competition,” 5 July 2007, available online at http://www.crtc.gc.ca/public/partvii/2006/8663/c12_200614439/784002.zip, and “Telecom Notice of Consultation CRTC 2013-551, Review of wholesale services and associated policies — Second Submission by the Commissioner of Competition,” 27 June 2014, available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2157481>.

In its recent submission to the CRTC’s review of wholesale wireline services, the Competition Bureau notes the existence of “vigorous” competition between two facilities-based providers and recommends the CRTC withdraw mandated wholesale access to unbundled local loops for residential wireline services. See: Commissioner of Competition, CRTC 2013-551 Second Submission, at para. 3 and para. 26. The rationale for why two facilities-based competitors may produce vigorous competition in the provision of wireline services, while three facilities-based competitors are suggestive of the exercise of market power in wireless services, is not explicitly addressed in the Competition Bureau’s submissions. The answer would appear to be related to two differences: capacity constraints in wireless and an assessment that co-ordinated conduct in wireless is more likely. In Section 5 below we observe that co-ordinated conduct is not an issue in wireless and we note below that capacity constraints in wireless for the incumbents are in part a function of the government’s spectrum policy that restricts spectrum availability for Bell, Rogers, and Telus. Other industry observers have also noted the contrast in the Competition Bureau’s approach to assessing competition in wireless versus wireline markets. See: M. Goldberg, “Opposing resale competition?” *Telecom Trends*, 22 July 2014. Available online at <http://mhgoldberg.com/blog/?p=7362>.

The Brattle Group adopts and extends our analysis of the examination of excess profitability as an indicator of market power by: (i) extending the analysis to include Telus; (ii) looking at Rogers' returns post-tax; and (iii) comparing estimated rates of return to estimated costs of capital to assess excessive profitability. The Brattle Group analysis confirms our findings: excessive profit margins — the difference between the rate of return and the cost of capital — are small, especially for relevant cases. Moreover, the small margins are not very robust:

- The small excessive profit margins depend upon projections of future cash flows: the excess profit margins to date are typically negative.
- The excess profit margins are based on realized returns and not expected returns. Realized returns might well exceed the cost of capital if there is a significant probability of them being small or negative. Prior to investment what is relevant is expected returns, not realized returns. Realized returns can be very deceptive and must be interpreted very carefully before they support a conclusion of excessive profitability. Expropriating or eliminating realized returns may well reduce the incentive for investment even if returns are competitive *ex ante*.¹²
- The cost of capital measures are based on estimates for the consolidated operations of Rogers and Telus, not their wireless operations. These costs of capital are likely not reflective of the appropriate cost of capital for initial wireless investments: they will be too low, not reflecting the risk of investment in wireless prior to the mid-2000's.
- Similarly, the Brattle Group assumes the average risk premium over the period 2000-2012 is appropriate for investments in wireless prior to 2000. It is very unlikely that the risk premiums based on consolidated operations from 2000 to 2012 are sufficiently high to reflect the risk of wireless investment prior to 2000.
- The costs of capital derived by the Brattle Group are particularly sensitive to the forecasts for interest rates in the future. Assuming that the low interest period from 2010-2012 will persist until, for instance, 2030, likely results in an understatement of the cost of capital.

The Competition Bureau's submissions emphasize the high levels of concentration in wireless services as indicative of market power. However, the Competition Bureau does not appear to recognize that wireless markets will inevitably be "concentrated," because of their technological characteristics. The question is not whether or not the market is concentrated, but whether or not it is excessively concentrated. Concentration and some exercise of market power should be expected, the issue is whether wireless markets are excessively concentrated and support the exercise of inefficient market power. This requires an examination of other indicators of inefficient market power. The evidence of the Brattle Group does not provide robust evidence of substantial inefficient market power. Moreover, as our first study demonstrates, concentration in Canadian wireless services is typically less than in Canada's international peers, consistent with concentration not being excessive in Canada.

¹² The danger is that if realized returns above the cost of capital justify a policy response, but firms are not subsidized if the cost of capital is greater than realized returns, then the fear of a policy response that penalizes successful investment deters firms from investing. If the top of the return distribution is cut off by fear of a policy response, then expected returns will be less and incentives for investment will be reduced.

The Competition Bureau has also suggested that the co-ordinated exercise of market power should be a concern. The co-ordinated exercise of market power occurs when firms collectively determine prices that exceed those when firms act non-cooperatively and set prices to unilaterally maximize their individual profits. There are a number of characteristics that more convincingly suggest that co-ordination in wireless services is difficult. These include product differentiation, non-price competition, the presence of regional firms, asymmetrical capabilities to bundle, and market-share asymmetries. Non-price rivalry between the three incumbent firms underscores the extent of competition and the absence of co-ordinated conduct. Extensive non-price rivalry in capital expenditures, customer service, network quality, and advertising are consistent with competition, not the co-ordinated exercise of market power. The extent of active rivalry between the three national incumbent wireless providers and the absence of co-ordinated conduct is consistent with (i) the substantial variability in the annual share of net additions for each of the three major carriers and (ii) the instability of their market shares.

In our study we used an analysis of the benefits and costs of the 2008 AWS entrants to argue that a fourth national carrier was likely inefficient. The benefits from entry — the increase in wireless consumption from lower prices — was unlikely to be greater than the costs of that entry — from reduced spectrum available to the incumbents and the capital costs of the entrants. We also concluded, based on available evidence, that a fourth national entrant was unlikely to be financially viable. The Competition Bureau's assessment is considerably different. Based on the evidence of the Brattle Group, the Competition Bureau's conclusion is that entry by a fourth national carrier may be efficient and will provide significant benefits to consumers.¹³

The Brattle Group does not show that entry is efficient. To do so would require showing that the social benefits of entry exceed the social costs of entry. Instead the Brattle Group provides an estimate only of the competitive benefits of a fourth national entrant — not its costs. The Brattle Report does not provide evidence to support the claim by the Competition Bureau that entry might be efficient. Moreover, the Brattle Group does not assess the viability of a fourth national competitor.

The methodology used by Brattle involves determining the competitive impact of entry by using the results of an event study. The effect on the profits of the incumbents — Bell, Rogers, and Telus — from entry of a fourth competitor is estimated based on the change in their valuation in the stock market in response to news that Verizon was not going to enter. This estimate is combined with a simulation model of the wireless sector to determine the effects on prices, wireless adoption, and consumer benefit of entry by a fourth national carrier. The consumer benefits of entry found by Brattle arise from two sources: (i) consumer adoption of a product that they prefer over that offered by an existing provider; and (ii) lower prices from increased competition. Of the \$1 billion in consumer benefits, approximately eighty percent is attributable to the increase in the choice set of consumers and switching to the entrant's product, and only approximately twenty percent is attributable to lower prices and increased output from increased competition.

¹³ Commissioner of Competition, CRTC 2014-76 Submission, at para. 51.”

The benefits of entry determined by the Brattle Group are not reliable and, if anything, likely overestimate the effect of entry. First, the results hinge on the validity of the event study and the ability of stock markets to accurately forecast the effect of entry. It is well known that while the response of share prices is usually — but not always — in the same direction as the change in profits, the response is typically very imprecise. Hence using an event study to pin down the effect of another entrant on competition is not a suitable basis on which to construct a simulation model and expect that the results of the model will be accurate.

Second, the specification of consumer preferences in the simulation model imposes very restrictive substitution patterns on consumers that likely make it inappropriate for assessing the effects of entry in wireless services. The specification imposes restrictions on cross-price elasticities of demand and patterns of substitution that mean it is not useful when product differentiation and patterns of substitution are likely to be asymmetrical, in particular when some products are better substitutes than others. This shows up in two ways: (i) it will indicate substitution from some products to others even though they are not very good substitutes and (ii) it will underestimate substitution between products that are very close substitutes. Thus this model is not likely to provide much insight on the price effects of additional entry.

The approach of the Brattle Group also has a tendency to overestimate the benefits to consumers from entry when their choice set expands. It will predict substitution to the new entrant's variety and therefore find increased consumer value from consuming a more preferred variety — even if such substitution would not happen because the existing variety and the new entrant's variety are not good substitutes. It will also assume a substantial increase in consumer value from consuming a more preferred variety even if the new entrant's variety is very similar to an incumbent's offering. This specification of preferences is therefore, a priori, not likely suitable for assessing the benefits from additional choices to customers, especially when the additional choice assumed is based on Verizon, since Verizon's product offerings would likely be very similar to those of Rogers, Bell, and Telus.

The specification is also problematic since it assumes discrete choice (consumers select a service provider) and in its implementation the Brattle Group assumes that the price paid by each consumer is average revenue per user (ARPU). In reality consumers choose a service provider and a plan from that service provider. The details of the plan selected by a subscriber includes the price for usage (price per minute or megabyte) and subscribers choose their usage: voice, text, and data consumption. ARPU is not a price, the choice made by consumers is not discrete.

A key determinant of the outcome of the simulation is the elasticity of demand for wireless services. The Brattle Group *assumes* provincial values. They also assume that provincial elasticities of demand are based inversely on provincial average revenues per user. Their justification is that differences in ARPU are based on differences in preferences. We think it more likely that differences in ARPU across provinces arise from differences in income and economic activity, not because Albertans have different preferences than residents of Quebec for wireless internet access. The assumed values for the elasticity of demand are an important determinant of the benefits from increased competition. The greater the elasticity of demand, the greater the expected decrease in price and increase in penetration from a fourth national entrant.

The suitability of preference specifications and input assumptions used in simulation models are typically assessed by comparing observed values with values derived from the model and its calibrated parameters. This basic check is not done by the Brattle Group. The significant differences between the derived and observed values for marginal cost and variable profits imply that the Brattle model is not a very good representation of consumer preferences and competition in wireless services in Canada. The Brattle Group's analysis implies a total market size for wireless subscribers in most provinces that exceeds its population. In addition there is quite a wide variation across provinces in the extent to which the total market size exceeds the population of a province. The larger the total market size, the greater the welfare gains estimated and the larger the share of non-subscribers, leading to higher elasticities of demand and, as a result, likely a bias to greater output and lower prices from further entry.

The modeling of competitive interaction adopted by the Brattle Group assumes that the source of market power is only product differentiation. The evidence also suggests the importance of understanding the impact of capacity constraints and network congestion on pricing dynamics. The relaxation of capacity constraints by increasing spectrum available to Rogers, Bell, and Telus is more likely to have a significant effect on prices than will entry. Hence the cost of misallocation of spectrum includes not only the increased capital costs of the incumbents, but also the potential for reduced price competition between existing firms.

Based on our analysis of the Competition Bureau's submissions and the Brattle Report, our assessment remains unchanged. The Canadian wireless sector is sufficiently competitive and additional government or regulatory intervention to increase competition is not warranted. The evidentiary record to date is not consistent with a robust finding of a substantial exercise of inefficient market power; viability of a fourth entrant has not been established; and such entry would likely lead to an inefficient allocation of scarce resources, with the social costs exceeding the social benefits.

The next section provides a brief summary of the policies adopted by the government to subsidize competitors and competition in wireless services in Canada. This is followed by a summary of "Wireless Competition in Canada: An Assessment." A subsequent section considers the Competition Bureau Submissions and the Brattle Report's assessment of unilateral market power and the efficiency of entry. The final section assesses the potential for the co-ordinated exercise of market power.

A SAMPLING OF RECENT POLICIES TO PROMOTE COMPETITION

The government has attempted to maintain and enhance competition through a number of measures. In this section, the major initiatives are highlighted, providing evidence of the extent of the government's preoccupation with being active on this file, and complementing its advertising blitz.¹⁴

¹⁴ L. Payton, "Cellphone industry targeted in Ottawa's \$9M ad campaign," CBC News, 2 December 2013. Available online at <http://www.cbc.ca/news/politics/cellphone-industry-targeted-in-ottawa-s-9m-ad-campaign-1.2447812>.

- Providing entrants with preferential access to spectrum.
 - In the recently completed 700 MHz spectrum auction, the government restricted the amount of spectrum the three national incumbents could acquire. To promote competition, the 700 MHz auction rules prevented Rogers, Bell and Telus from acquiring more than one prime block each. Since there were four prime blocks, there was little competition for the fourth block, which was acquired primarily by Videotron, Eastlink or, in Manitoba and Saskatchewan, by the respective regional carrier, MTS and SaskTel. The result was that Videotron, Eastlink, MTS, and SaskTel (as fourth players) paid fire-sale prices for one of the prime blocks. The price was so low that, in the words of Videotron: “Given the way the auction unfolded, Quebecor Media could not pass up the opportunity to invest in licences of such great intrinsic value in the rest of Canada.”¹⁵ The price per MHz-pop (the product of bandwidth and population of the area covered by the licence) of spectrum acquired was \$0.65 for Eastlink, \$0.73 for SaskTel and MTS, \$0.83 for Videotron, \$1.05 for Bell, \$1.78 for Telus, and \$4.32 for Rogers.¹⁶
 - The upcoming 2500 MHz spectrum auction, scheduled to begin in April 2015, will include spectrum-aggregation limits for bidders.¹⁷ A considerable quantity of spectrum will be included in this auction: between 60 MHz (30+30 MHz paired) and 125 MHz (50+50 MHz paired, 25 MHz unpaired) spectrum across Canada. However, prospective bidders will be limited to holding a maximum of 40 MHz total spectrum in the 2500 MHz band in a licence area. For wireless providers who previously acquired licences in this band (notably Bell, Rogers and SaskTel), this policy means that their ability to acquire spectrum will be limited in some licence areas. The constraint on these bidders will likely lead to lower auction prices for the remaining participants.
 - Industry Canada has also signaled its intention to restrict access to spectrum in a recently announced auction for AWS-3 spectrum (planned for March 2015, prior to the 2500 MHz auction).¹⁸ As in the original AWS auction held in 2008, Industry Canada plans to set

¹⁵ See: Quebecor News Release, “Industry Canada 700 MHz Spectrum Auction: Quebecor Media Acquires Seven Operating Licences in Four Provinces at an Advantageous Price,” 19 February 2014. Available online at <http://www.quebecor.com/en/comm/industry-canada-700-mhz-spectrum-auction-quebecor-media-acquires-seven-operating-licences-four->.

¹⁶ See: Industry Canada, “700 MHz — Spectrum Auctions,” 19 February 2014. Available online at http://agora.ic.gc.ca/ccaWinners_eng.cfm?p_auction_id=8.0. The premium paid by Rogers (over four times the price per MHz-pop paid by Bell) is a result of its desire to obtain two contiguous blocks of paired spectrum across almost all of Canada. The other bidders won different licences in different service areas, making offering service and entering into sharing arrangements potentially more challenging. By winning both block B (a prime block) and block A (a non-prime block that may suffer from some technical interference issues), Rogers hopes to realize the speed and capacity benefits associated with having a larger contiguous block of spectrum. The spectrum cap meant that Rogers could not acquire two prime blocks, let alone two contiguous prime blocks. Rogers instead opted for the next best alternative, blocks A and B. Following its recent NHL hockey exclusivity agreement, Rogers plans to use this spectrum to bolster its mobile NHL video service. See: Rogers News Release, “NHL fans to benefit from 700 MHz spectrum auction,” 3 April 2014. Available online at http://about.rogers.com/About/Media_Relations/News/14-04-03/NHL_fans_to_benefit_from_700MHz_spectrum_auction.aspx.

¹⁷ Industry Canada, “Licensing Framework for Broadband Radio Service (BRS) — 2500 MHz Band,” January 2013. Available online at [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/2500-decisionBRS-2013.pdf/\\$file/2500-decisionBRS-2013.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/2500-decisionBRS-2013.pdf/$file/2500-decisionBRS-2013.pdf).

¹⁸ Industry Canada, “Consultation on the Technical, Policy and Licensing Framework for Advanced Wireless Services in the Bands 1755-1780 MHz and 2155-2180 MHz (AWS-3),” July 2014. Available online at [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-004-14-AWS-3-EN.pdf/\\$file/SLPB-004-14-AWS-3-EN.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-004-14-AWS-3-EN.pdf/$file/SLPB-004-14-AWS-3-EN.pdf).

aside spectrum such that only certain auction participants are permitted to bid. While in the 2008 auction Industry Canada set aside 44 per cent of the original AWS spectrum (20+20 MHz of a total 45+45 MHz of paired spectrum) for “new entrants,” the AWS-3 consultation calls for 60 per cent of the spectrum (15+15 MHz of a total 25+25 MHz of paired spectrum) to be reserved only for “operating new entrants.” To be eligible to bid on the AWS-3 set-aside spectrum, these operating new entrants must currently provide mobile services to the general public, have less than 20 per cent provincial wireless subscriber market share, and cover a specified minimum per centage of the population in the relevant service area,¹⁹ as well as having less than 10 per cent national wireless subscriber market share.²⁰ These restrictions effectively limit possible bidders to WIND, Mobilicity, Videotron and Eastlink in their respective operating territories. As a result, there will likely be minimal bidding competition for the set-aside spectrum, potentially resulting in spectrum being licenced at reservation prices and, at the very least and most obviously, there will be a transfer from Canadian taxpayers — as owners of the spectrum — to shareholders of these firms.²¹

¹⁹ Industry Canada proposes to auction the AWS-3 at the “Tier 2” level, which largely corresponds to provincial boundaries. To be eligible to bid on the set-aside spectrum, a new entrant must meet minimum population coverage levels in the relevant area, ranging from 10 per cent for the Yukon and Northwest Territories service area, to 25 per cent for service areas such as Alberta, British Columbia, Southern Ontario and Eastern Quebec.

²⁰ Note that for the 2008 AWS Auction, Industry Canada defined a new entrant as an entity holding less than 10 per cent of the national wireless market based on revenue. This had the effect of allowing SaskTel and MTS, each with more than 50 per cent wireless subscriber market share in their respective provinces, to bid on the set-aside spectrum. Industry Canada, “Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range,” November 2007. Available online at [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/\\$FILE/awspolicy-e.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/$FILE/awspolicy-e.pdf).

²¹ By setting aside spectrum especially for *operating* new entrants in the upcoming AWS-3 spectrum auction, Industry Canada has unilaterally boosted the value of these firms as potential conduits for acquiring large quantities of inexpensive spectrum, likely a considerable amount relative to their value as wireless service providers. Indeed it is not clear that Mobilicity and WIND have a future as wireless operators.

Mobilicity is in bankruptcy without an obvious suitor, as the government has effectively browbeaten Telus into dropping its third attempt to acquire the struggling entrant. Indeed, it was widely reported that if Telus persisted in its attempts to acquire Mobilicity, Industry Canada would change the rules for the upcoming 2500 MHz auction to exclude it (and other incumbents) from bidding. See: S. Chase, “Ottawa threatens to cut Telus out of wireless auction,” *The Globe and Mail*, 25 April 2014. Available online at <http://www.theglobeandmail.com/report-on-business/ottawa-threatens-to-cut-telus-out-of-wireless-auction/article18202648/>.

WIND is only now (nearly five years after launching services) close to breaking even on a cash-flow basis. A. Sharp, “Canada’s Wind Mobile nears break-even, sees 2015 profit,” Reuters, 17 June 2014. Available online at <http://ca.reuters.com/article/businessNews/idCAKBN0ES2OE20140617>. Furthermore, Wind’s multinational parent, VimpelCom, has written down its stake to \$0, refused to make any further expenditures, and reiterated its desire to divest its Canadian division. See: C. Dobby, “Wind Mobile’s subscribers top 700,000, but VimpelCom still looking for an exit,” *Financial Post*, 14 May 2014. Available online at <http://business.financialpost.com/2014/05/14/wind-mobiles-subscribers-top-700000-but-vimpelcom-still-looking-for-an-exit/>. Indeed, VimpelCom has reportedly placed a \$300 million price tag on WIND, and Quebecor, as well as private equity firms, have been mulling making an investment. See: C. Dobby, “Quebecor among potential buyers circling Wind,” *The Globe and Mail*, 31 July 2014. Available online at

<http://www.theglobeandmail.com/report-on-business/potential-buyers-circle-wind-mobile/article19881154/>. However, at least one potential buyer appears to have withdrawn because of concerns over the viability of WIND and it seems that VimpelCom is reluctant to continue to cover WIND’s losses. See: B. Erman, “For potential Wind suitors, obstacles look to be too much to overcome,” *The Globe and Mail*, 12 August 2014. Available online at <http://www.theglobeandmail.com/report-on-business/streetwise/caveat-emptor-wind-purchase-obstacles-may-prove-too-much-to-overcome/article19995255>.

- Maintaining preferential access by restricting transfers of spectrum.

Industry Canada has made important changes to its policy regarding spectrum-licence transfers since the 2008 auction. Initially, Industry Canada’s framework for the auction had provisions that restricted new entrants from selling their licences to incumbents for five years, but the implication was that — subject to the approval of the Minister — transfers could occur after the five year period.²² After deciding not to launch service in Western Canada using its AWS spectrum, Shaw entered into an option agreement to sell Rogers this spectrum once Industry Canada’s moratorium ended in 2014.²³ Rogers also reached an option agreement with Quebecor, now heralded as a possible fourth national wireless provider, to purchase the Quebec-based company’s set-aside AWS spectrum in the Greater Toronto Area.²⁴ Later, Industry Canada expressed misgivings about the Rogers-Shaw deal.²⁵ When Telus reached an agreement to acquire Mobilicity in May 2013, Industry Canada demonstrated its willingness to block spectrum transfers, even from financially constrained firms that pose little existing competitive constraint, as a means of promoting competition. In particular, then minister of industry Christian Paradis proclaimed that the government “... will not approve this, or any other, transfer of set-aside spectrum to an incumbent ahead of the five-year limit... I will not hesitate to use any and every tool at my disposal to support greater competition in the market.”²⁶

After quashing the first attempt by Telus to acquire Mobilicity, Industry Canada released a new framework outlining how it would approach spectrum transfers in the future.²⁷ Under this framework, a broad array of factors will be considered in making Industry Canada’s “determination” about whether or not to approve a spectrum transfer. These include changes in spectrum-concentration levels, the utility and substitutability of the spectrum, and impacts on existing and future competitors. Rather than providing clarity, arguably this framework simply provides flexibility for whatever policy the government wants to pursue at a given time.²⁸

²² “While all licence transfers must be approved by the Minister, licences obtained through the set-aside may not be transferred to companies that do not meet the criteria of a new entrant for a period of 5 years from the date of issuance.” Industry Canada, Framework Relating to Transfers, Divisions and Subordinate Licensing of Spectrum Licences for Commercial Mobile Spectrum, p. 6.

²³ J. Sturgeon, “Rogers strikes \$700M deal to buy Shaw’s wireless spectrum, Mountain Cablevision,” *Financial Post*, 14 January 2013. Available online at <http://business.financialpost.com/2013/01/14/rogers-strikes-700m-deal-with-shaw-to-buy-wirless-spectrum-mountain-cablevision/>.

²⁴ At the same time, Rogers and Quebecor entered into an LTE network-sharing agreement in Quebec. E. Rocha and A. Sharp, “Rogers, Videotron extend reach with network-sharing deal,” *Reuters*, 30 May 2013. Available online at <http://www.reuters.com/article/2013/05/30/us-quebecor-rogers-idUSBRE94T0IP20130530>.

²⁵ D. Ljunggren, “Paradis signals unease with Shaw’s planned sale of wireless spectrum to Rogers,” *Financial Post*, 15 April 2013. Available online at <http://business.financialpost.com/2013/04/15/paradis-signals-unease-with-shaws-planned-sale-of-wireless-spectrum-to-rogers/>.

²⁶ Industry Canada, “Harper Government Protecting Consumers and Increasing Competition in Canadian Wireless Sector,” 4 June 2013. Available online at <http://news.gc.ca/web/article-en.do?nid=746949>.

²⁷ Industry Canada, “Framework Relating to Transfers, Divisions and Subordinate Licensing of Spectrum Licences for Commercial Mobile Spectrum,” June 2013. Available online at [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/dgso-003-13-transfer.pdf/\\$file/dgso-003-13-transfer.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/dgso-003-13-transfer.pdf/$file/dgso-003-13-transfer.pdf).

²⁸ Indeed, Industry Canada candidly states that “[t]his framework complements other measures taken by the Government of Canada to increase competition in the provision of wireless telecommunications services.” Industry Canada, Framework Relating to Transfers, Divisions and Subordinate Licensing of Spectrum Licences for Commercial Mobile Spectrum, p. 2.

- Wholesale roaming initiatives.

Wholesale mobile wireless roaming arrangements are the contractual arrangements between two wireless carriers that ensure a carrier without network facilities in a particular geographic area can still provide service to its retail customers in that area by using the network of another carrier. Wholesale roaming is particularly important for new entrants since it allows them to provide service in areas where they have not yet — and may never — invest in their own facilities. Wholesale roaming is mandated and governed by Industry Canada.²⁹

- Mandatory roaming and tower-sharing provisions. These provisions were introduced by Industry Canada in November 2008 in the conditions of licence for all licenced spectrum deployed by wireless providers.³⁰ Mandatory roaming obliges wireless providers to allow rival providers to offer service over (or to “roam” on) their networks, whereas mandatory tower sharing requires providers to allow rivals to gain access to existing towers and sites. For both mandatory roaming and tower sharing, agreements must include negotiated, commercially reasonable rates (where technically feasible), with a mandatory arbitration process to resolve any disputes.

Mandatory roaming was originally designed to allow new entrants to offer service in areas where they had not yet built their own network infrastructure.³¹ As such, mandatory roaming was initially implemented as a temporary measure, lasting for five years within a new entrant’s service area.³² Outside of their respective operating territories, both new entrants and incumbents were eligible to request mandatory roaming, initially for a period of 10 years. Later, in March 2013, the conditions of licence were revised such that mandatory roaming was extended for the duration of the licence (effectively indefinitely) for roaming both inside and outside of a provider’s service area.³³ This has the effect of repurposing a policy designed to provide coverage “while the licensee builds out its network”³⁴ into a possible permanent mode of offering service that does not require building network facilities. Under the current conditions of licence, all wireless providers are entitled to mandatory roaming and tower sharing, however the policy is clearly designed to enhance the service offerings of new entrants, who have much less extensive network coverage than the incumbents.

- Not one, but three regulatory initiatives by the Canadian Radio-television and Telecommunications Commission (CRTC) on wholesale roaming. Despite wholesale

²⁹ Industry Canada, “Revised Frameworks for Mandatory Roaming and Antenna Tower and Site Sharing,” March 2013. Available online at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10546.html>.

³⁰ Industry Canada, “Conditions of Licence for Mandatory Roaming and Antenna Tower and Site Sharing and to Prohibit Exclusive Site Arrangements,” Issue 2, March 2013. Available online at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09081.html>.

³¹ Industry Canada, Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range, pp. 7-9.

³² Industry Canada, Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range, p. 8. If a new entrant had won licences covering all of Canada in the 2008 auction, it would have been considered a “national new entrant” and would have been eligible for a possible five-year “in territory” roaming extension, subject to meeting Industry Canada rollout requirements.

³³ See: Industry Canada, Revised Frameworks for Mandatory Roaming and Antenna Tower and Site Sharing, pp. 5-7.

³⁴ Industry Canada, Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range, p. 8.

roaming being mandated and governed by Industry Canada, the CRTC decided to launch its own investigation into its provision.³⁵ Its initial findings were that there were large differences between the roaming rates and terms of service provided by the three Canadian incumbents (Bell, Rogers, and Telus) to U.S. carriers and those provided to other Canadian carriers.³⁶ This set up a second regulatory proceeding where the CRTC considered whether or not these differences are undue discrimination or unjust preference and whether the CRTC should institute remedial measures.³⁷ The third hearing is to address whether wholesale mobile wireless services are sufficiently competitive and if they are found by the CRTC not to be sufficiently competitive, what regulatory measures are required.³⁸ The wholesale wireless services to be considered include not just roaming, but also:

- > tower and site sharing, under which wireless carriers gain access to rivals' towers and/or sites to install their network equipment, even though this is subject to regulatory oversight by Industry Canada.³⁹
- > any other network elements or services of existing networks, not currently regulated by Industry Canada, that competing retail providers of wireless services would like to have mandated accessed to at regulated rates. For instance a branded reseller provides service by "reselling" the services of an existing network. If resale is mandated, then a reseller could purchase — at a regulated price — the wireless services offered by an existing retail provider, which it would then rebrand and sell as its own, providing only marketing, billing, and distribution.
- The federal government was not, however, willing to wait for the CRTC's regulatory processes. The government of Canada's 2014 budget introduced additional policy measures, notably limiting the amount a carrier can charge for domestic roaming services compared to the average price it charges its own retail subscribers, as well as monetary penalties for violating the terms of the Wireless Code.⁴⁰

³⁵ CRTC, "Request for information — Wireless Roaming, Staff Letter, File No. 8620-C12-201312082," 30 August 2013. Available online at <http://www.crtc.gc.ca/otf/eng/2013/8620/c12-201312082.htm>.

³⁶ The other Canadian carriers include the 2008 entrants.

³⁷ CRTC, "Telecom Notice of Consultation, CRTC 2013-685 — Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference," 12 December 2013. Available online at <http://crtc.gc.ca/eng/archive/2013/2013-685.htm>. The CRTC decision in this proceeding was recently released. See CRTC, "Telecom Decision CRTC 2014-398, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference," 31 July 2014. Available online at <http://www.crtc.gc.ca/eng/archive/2014/2014-398.htm>. The CRTC determined that there were "clear instances of unjust discrimination and undue preference" in the wholesale mobile wireless agreements that Rogers had negotiated with certain new entrants. In particular, the exclusivity provisions contained in these agreements were found to be inappropriate and are now prohibited in all wholesale agreements between Canadian carriers for service in Canada. There is neither an analysis of competition in the retail market nor the effect exclusivity agreements have on competition in the CRTC's decision.

³⁸ See: CRTC, "Telecom Notice of Consultation, CRTC 2014-76 — Review of wholesale mobile wireless services," 20 February 2014. Available online at <http://crtc.gc.ca/eng/archive/2014/2014-76.htm>.

³⁹ Industry Canada, Revised Frameworks for Mandatory Roaming and Antenna Tower and Site Sharing.

⁴⁰ "Budget 2014 — The Road to Balance: Creating Jobs and Opportunity," Government of Canada, pp. 177-178. Available online at <http://www.budget.gc.ca/2014/docs/plan/pdf/budget2014-eng.pdf>. Bill C-31, "An Act to implement certain provisions of the budget tabled in Parliament on February 11, 2014," 19 June 2014 (Assented To), at para 240. Available online at <http://www.parl.gc.ca/HousePublications/Publication.aspx?DocId=6684616&Language=E&Mode=1&File=4>.

SUMMARY OF COMPETITIVE ASSESSMENT OF WIRELESS SERVICES IN CANADA

Our earlier study considered the following three issues: (i) the use and validity of international comparisons in assessing competition in Canadian wireless services; (ii) the application of relevant measures for assessing competition in Canadian wireless services; and (iii) the sustainability and welfare effects of additional entry.

International Comparisons

Our study noted that perceptions of a competition problem in wireless services in Canada typically arise from incorrectly making a causal link from Canada's high ARPU to its low wireless penetration rate (mobile connections per capita).⁴¹ We demonstrate that Canada is not an international outlier when it comes to price and penetration,⁴² and more importantly when it comes to usage — consumption of wireless services — Canadians are avid consumers of data services. In terms of smartphone data usage and smartphone adoption, Canada is a world leader.⁴³ With respect to wireless voice, Canada's participation per capita on monthly plans and minutes of voice per capita are similar to most of its peers.⁴⁴

We found that Canada's high ARPU is explained by Canadians' high usage of wireless telecommunication services, particularly of data.⁴⁵ High data usage is attributable to world-class wireless networks and advanced handset adoption, while the quality of Canadian networks is attributable to high investment levels.⁴⁶ In Canada (and the U.S.) it is important to recognize that the evolution of wireless services is different than it is in much of the world. Competition between networks has focused not just on price, but also on the quality of the network — coverage, capacity, and speed — as well as handsets. The emphasis on quality results in greater investment, higher demand, and higher usage. The greater demand and usage results in higher revenues that support network investment and the cost of providing higher quality.

In any event, international comparisons of price and output are not reflective of competition or market power. In assessing competition, what matters is how closely prices track costs in a country. That, in turn, involves a comparison of prices and costs in a country, not a comparison of prices between countries.⁴⁷

⁴¹ Church and Wilkins, *Wireless Competition*, pp. 5-7. Indeed, some commentators continue to highlight measures of revenues and penetration in their analysis. See: "Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Comments of the Public Interest Advocacy Centre (PIAC), Consumers' Association of Canada (CAC), National Pensioners Federation (NPF), & Council of Seniors [sic] Citizens [sic] Organizations of British Columbia (COSCO)," 29 January 2014, para 15. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2067213>.

⁴² Church and Wilkins, *Wireless Competition*, p. 8 and p. 15.

⁴³ Church and Wilkins, *Wireless Competition*, pp. 11-12.

⁴⁴ Church and Wilkins, *Wireless Competition*, pp. 10-11.

⁴⁵ Church and Wilkins, *Wireless Competition*, p. 18.

⁴⁶ Church and Wilkins, *Wireless Competition*, pp. 18-19.

⁴⁷ Unless network quality, costs, and demand — among other things — are the same across countries (i.e., an apples-to-apples comparison), prices should not be expected to be the same. See Church and Wilkins, *Wireless Competition*, at p. 20.

Measures of Competition

RELEVANT MEASURES OF COMPETITION FOLLOW FROM THE TECHNOLOGY OF PRODUCTION

The typical measures used by competition authorities as an indication of competition and market power are (i) concentration (the number and size distribution of firms; in this case, wireless service providers) and (ii) high margins.⁴⁸ But in wireless services, as in other similar network industries, these structural measures will not be very informative and will be prone to errors of interpretation. It should be expected that both concentration and margins will be high in the provision of wireless service. The issue is not whether they are high or whether service providers will have market power, but whether they are “too high” and service providers will be able to exercise inefficient market power.

The reason concentration will be high in the provision of wireless services follows from 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 markups over short-run measures of cost — high gross margins — in order for firms to cover their fixed and sunk network costs. The difference between revenues and avoidable costs in the short run are known as quasi-rents, and for a firm to break even its quasi-rents must cover its sunk fixed costs. If they do not, then the firm will exit in the long run. If there are too many competitors, then the consequent downward pressure on prices will squeeze margins and quasi-rents and, as a result, some or all competitors will not recover their fixed network costs. The result will be firm exit and consolidation until margins are restored. The implication is that there will be a natural upper limit on the number of wireless carriers.

Economists typically define market power as the ability to profitably raise and maintain price above marginal cost, the price that would prevail in perfectly competitive markets. However, the definition used by economists is less useful for policy analysis, since many firms will be able to exercise market power based on this definition but they will not be able to raise price above average cost levels (i.e., earn greater than a competitive return). Indeed, if a firm’s average cost declines as it expands output — so that marginal cost is less than average cost — the firm must be able to profitably raise price above marginal cost in order to break even. If there are economies of scale and scope that make marginal cost pricing unprofitable and perfect competition impossible, then average cost pricing is a more useful definition of a competitive outcome. It is difficult to argue that market power that enables prices to be raised above marginal cost and thereby allows firms to break even is a market failure, justifying policy intervention, since without it there would be no service or production provided. An alternative, and equivalent approach, 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 gives rise to monopoly profits.

⁴⁸ The margin here is the gross margin, the difference in theory between price and short-run marginal cost, which in practice is usually the difference between price and short-run average variable costs.

The existence of a natural limit on the number of firms gives rise to several important implications. First, if the natural limit is small, significant margins may be required and there will only be relatively few effective suppliers. Second, entry above the natural limit will not be sustainable. Third, the relevant measures of competition should reflect the natural limit, and regulatory interventions to increase the number of competitors above the natural limit may be inefficient — that is, they result in an allocation of resources that does not maximize their value to society.

USEFUL MEASURES FOR ASSESSING COMPETITION IN WIRELESS SERVICES

There are two measures for assessing competition in industries characterized by extensive economies of scale, scope, and size. The first is based on the key competition issue of whether prices track long-run average costs — i.e., whether wireless providers make monopoly profits. The second is whether the market is more concentrated than the natural limit or, equivalently, margins are higher than necessary to avoid exit or consolidation. In this regard, international comparisons of market structure and margins can be useful, in particular whether concentration and margins in Canada are *higher* than in other countries. If margins or concentration in Canada are noticeably higher than in other countries, then further investigation as to why and what it means for the exercise of market power is warranted.

Internal Rate of Return

The technology characteristics of wireless services mean 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. 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 that lifecycle.

An examination of the leading firm's cash flow over the lifecycle of the wireless industry suggests internal rates of return (IRR) well below the likely *ex ante*, pre-tax, cost of capital that reflects the risk of its investments.⁴⁹ Over the period 1986-2012, Rogers Wireless' real, pre-tax, realized internal rate of return was just under 10 per cent.⁵⁰ This is not likely consistent with the inefficient exercise of market power and monopoly profits. Indeed it is interesting to observe now the concerns expressed by the financial community and informed observers over the risk and low returns of Rogers' investment in wireless 10 years ago.⁵¹ Those concerns are substantiated by Rogers' internal rate of return from 1986-2008: the real pre-tax realized rate was 3.7 per cent.⁵² The data revolution launched by the iPhone in 2008 not only transformed

⁴⁹ Church and Wilkins, *Wireless Competition*, pp. 24-27.

⁵⁰ Church and Wilkins, *Wireless Competition*, p. 25.

⁵¹ Church and Wilkins, *Wireless Competition*, p. 26.

⁵² Church and Wilkins, *Wireless Competition*, p. 25. Consistent with the numbers in the text, margins over the period 2009-2012 are much higher than pre-2009. However, these higher margins do not reflect inefficient market power, but quasi-rents required to compensate Rogers for its capital expenditures and losses in prior years. See Church and Wilkins, *Wireless Competition*, p. 24.

the market, but also gave a glimmer of hope for competitive returns. Whether competitive or monopoly returns will be realized clearly depends upon the future trajectory of cash flows. We noted that if real cash flows were assumed to be \$1 billion annually — their average over the period 2010-2012 — then the realized pre-tax real IRR for Rogers would be 13.18 per cent.⁵³ Our conclusion was that the realized rates of return, when adjusted to reflect their *ex post* nature, were likely less than reasonable estimates of Rogers's cost of capital, consistent with a finding of competition and not consistent with a robust finding of market power justifying intervention. For Rogers' investment to pay off, its real cash flows after 2012 likely need to be substantially larger than the average from 2010-2012.

Concentration and Margins

A second measure of the competitiveness of Canadian wireless markets is to compare concentration and margins internationally with comparable peer countries. Our comparison shows the following:⁵⁴

- The Herfindahl-Hirschman Index (HHI) in Canada is similar to other countries; indeed, only in the U.S. and Germany is it lower, and then only marginally so.⁵⁵
- The two-firm concentration ratio in Canada and Germany is smaller than all other peer countries.⁵⁶
- The three-firm concentration ratio in most other countries is the same or greater than it is in Canada. Only in the U.S. and Germany is the three-firm concentration ratio noticeably lower than it is in Canada.
- The share of the leading firm in Canada is close to the smallest compared to that of leading firms in peer countries, and is significantly less than it is in some countries, where the leading firm's share is 50 per cent or higher.
- Cash-flow margins in Canada — the difference between earnings margins before interest, taxes, depreciation and amortization (EBIDTA) and capital expenditure as a share of revenue (a measure of capital intensity) — are similar to those in many other countries.⁵⁷

⁵³ Church and Wilkins, *Wireless Competition*, footnote 64, p. 26.

⁵⁴ Note that the shares and concentration metrics are based on Bank of America Merrill Lynch *Global Wireless Matrix* subscriber values reported in the country-specific tables from the fourth quarter of 2012. To facilitate cross-country comparisons, MVNO subscribers (where disaggregated counts are reported) are included in the corresponding facilities-based provider's subscriber counts. See: Church and Wilkins, *Wireless Competition*, pp. 29-30.

⁵⁵ The HHI is the sum of squared market shares. See: J. Church and R. Ware, (2000), *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 — as measured by the difference between price and marginal cost — in the Cournot model of oligopolistic competition.

⁵⁶ The *N* firm concentration ratio is the sum of the market shares of the *N* largest suppliers.

⁵⁷ Based on average cash-flow margins from 2004-2012. See Church and Wilkins, *Wireless Competition*, p. 30.

The striking feature of the international data is how similar the market structure is across the different markets.⁵⁸ The exercise of market power in Canada might be suggested if the market structure in Canada was more concentrated than it is elsewhere or margins were higher. This is not the case. If anything, wireless services in Canada are more competitive than in many of its peers based on these structural measures.

Sustainability and Efficiency of Another Competitor

The natural-limit analysis in our study suggests that viability of a fourth national competitor is an issue. The push for consolidation back to the natural limit — which in most countries appears to be three — is documented in our report.⁵⁹ The experience in Canada and elsewhere suggests the reality that three effective competitors is the long-run equilibrium. This implies

⁵⁸ The relationship between concentration and market size (e.g., available demand) depends on the relationship between market size and “set-up” costs. When set-up costs are relatively large in relation to total demand, concentration will tend to be similar even across markets of different size. The similarity in market structures across countries suggests that the scope for entry is exhausted relatively quickly. Consistent with the large set-up costs involved in constructing wireless networks, the number of competitors appears to be limited. The definitive framework for analyzing the relationship between technology, market size and equilibrium market structure can be found in John Sutton, (1991), *Sunk Costs and Market Structure: Price Competition, Advertising and the Evolution of Concentration*, Cambridge, MA: MIT Press.

⁵⁹ The presence of a fourth player typically results in unsustainably low prices and profit margins which ultimately lead to consolidation. See: Church and Wilkins, *Wireless Competition*, pp. 31-35. Additional examples of potential consolidation from four to three include the U.S., France, Germany, Spain, and Italy. After AT&T’s failed attempt to acquire T-Mobile in the U.S., the push for consolidation to three national carriers remains with Sprint making, and then abandoning, an offer for T-Mobile. However, the forces in favour of consolidation remain given the financial difficulties and loss in subscribers of Sprint in the U.S. See: S. Kim, M. Lopes, and Y. Shida, “Sprint drops bid to buy T-Mobile, changes CEO,” *Reuters*, 6 August 2014. Available online at <http://www.reuters.com/article/2014/08/06/sprint-corp-tmobile-idUSL2N0QB2WU20140806>.

In France, there has been considerable upheaval in wireless markets. After entering as a fourth player in 2012, Free Mobile/Illiad (whose parent also offers residential broadband, VOIP telephony, and IPTV services) offered “cutthroat tariffs, forcing rivals to slash prices.” However, while some viewed this increase in competition as an achievement to be emulated, it does not appear to be durable. The second-largest carrier, SFR, was sold recently to Numericable, a French cable company, and there is speculation that consolidation between Free Mobile and Bouygues (the third-largest carrier) is inevitable. See: “Vivendi’s SFR Call Widens Rift,” *The Wall Street Journal*, 6 April 2014 online at <http://online.wsj.com/news/articles/SB10001424052702303456104579485722491794180>; and “Numericable gains SFR. What now for Bouygues?” *The Economist*, 6 April 2014 online at <http://www.economist.com/blogs/schumpeter/2014/04/french-telecoms>.

In Germany, a merger between Telefonica and E-Plus reduced the number of carriers from four to three, with some commentators viewing it as a template for consolidation in the fragmented European market that currently “leads to price wars and poorer-quality service for consumers.” See: R. Bartunek and H. Ten Wolde, “EU clears Telefonica Deutschland’s takeover of E-Plus,” *Reuters*, 2 July 2014. Indeed, there is also speculation about four-to-three mergers in both Italy and Spain. The transaction in Italy is different from the four-to-three merger that was under discussion and reported in our previous paper. See: G. Campbell, “Global Wireless Matrix 2Q14 — Consolidation: The art of the possible,” Bank of America Merrill Lynch, 21 July 2014. The consolidation from four to three in Germany may mean on a going forward basis that Germany’s HHI and three-firm concentration ratio are no longer less than Canada’s.

Consistent with Canada’s experience with Microcell and Clearnet, Telus acquired Public Mobile in the fall of 2013. Both Industry Canada and the Competition Bureau approved the transaction. Part of the reason was that Public Mobile was going to discontinue a low price plan because of “financial sustainability issues”. The Bureau concluded that the elimination of Public Mobile would not result in a substantial lessening or prevention of competition because of effective remaining competition. The Bureau believed that the remaining 2008 AWS entrants (WIND and Mobilicity in Ontario, Videotron in Quebec) would “continue to provide effective competition post-transaction.” See: “Competition Bureau Statement Regarding the Proposed Acquisition by TELUS of Public Mobile,” 29 November 2013. Available online at <http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/03633.html>.

that sustaining more than three national competitors will require subsidization.⁶⁰ A recent report by Informa Telecoms & Media (a consultancy in the United Kingdom) notes that “A consensus is emerging in the mobile communications industry that three is the optimum number of mobile operators for any given market.”⁶¹

Entry by the 2008 AWS entrants appears to be an example of inefficient entry. The extent of the benefits from entry by the 2008 AWS entrants appears to have been very limited, given the small increase in output in terms of minutes, penetration, and data usage.⁶² Moreover, entry seems to have had very little effect on prices actually paid by Canadians.⁶³ The fall in prices for voice appears to be due to the commoditization of voice and competition between the incumbents.⁶⁴

The benefits from the 2008 AWS entrants were limited by the entrants’ narrow focus on voice and text in a mature market. Given that their business plans focused on what they thought was the market niche not well served by the incumbents — the low-price, prepaid segment — the entrants were not constrained by spectrum.⁶⁵ As discussed in our report, they were constrained

⁶⁰ The acquisition by Quebecor of 700 MHz spectrum outside of Quebec is indicative of subsidization. See the discussion above regarding the fire-sale price paid by Quebecor for this spectrum. Quebecor’s lack of commitment with respect to actually entering and providing service, especially given its optioning of its AWS spectrum to Rogers in Toronto, its lack of wireline infrastructure outside of Quebec, and the low spectrum acquisition price, means that Quebecor’s acquisition may be in part a bet that government policy will change in the future and it will be able to profitably sell its 700 MHz spectrum outside of Quebec. To build a national network, Quebecor would have to make very large capital expenditures and would likely require partners to help share the financial burden. Dvai Ghose, an analyst with Canaccord Genuity, neatly summarizes Quebecor’s challenges: “Given the amount of capital that we assume is required, we fear that Videotron would be diluted to a very small ownership in a hypothetical (joint venture) if it just contributed its spectrum. Then again this may be better than investing and destroying capital. We are left wondering why a partner would only partner outside Quebec, where Videotron has no obvious competitive advantages.” See: G. O’Brien, “Much still to be done to remove risk, attract investment, if Quebecor is to go national with wireless, say execs,” *CARTT*, 31 July 2014. Available online at <https://cartt.ca/article/much-still-be-done-remove-risk-attract-investment-if-quebecor-go-national-wireless-say-exec>. Another analyst noted that “Quebecor is also likely seeking regulations that would ensure domestic wholesale roaming rates for data less than one cent per megabyte, better rules to ensure access to towers, successfully negotiating a combined entity involving Wind Mobile and Mobilicity, access to unused spectrum held by Shaw Communications Inc., and an immediate cash investment of about \$1.3 billion from Quebecor and investment partners. See “Government ‘determined to get that fourth national carrier’,” *The Wire Report*, 7 July 2014. Available online at <http://www.thewirereport.ca/news/2014/07/07/aws-3-spectrum-coming-available-next-year/28504>.

⁶¹ M. Newman, “Informa Telecoms & Media’s Top Predictions for 2014,” Press Release, 20 January 2014. Available online at <http://blogs.informatandm.com/19202/press-release-informa-telecoms-medias-top-predictions-for-2014/>.

⁶² Church and Wilkins, *Wireless Competition*, pp. 37-40. The comparatively low HHI value for Canada, even relative to other countries with four players, suggests that the “fourth player” in those countries typically has a marginal effect on competition.

⁶³ Church and Wilkins, *Wireless Competition*, pp. 41-42.

⁶⁴ Church and Wilkins, *Wireless Competition*, pp. 43-44.

⁶⁵ See, for example: Lemay-Yates Associates, *The Impact of 700 MHz Spectrum on LTE Deployment and Broadband in Canada*, 28 February 2011. Available online at [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-018-10-lemay-submission.pdf/\\$FILE/smse-018-10-lemay-submission.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/smse-018-10-lemay-submission.pdf/$FILE/smse-018-10-lemay-submission.pdf).

Indeed, as noted in Commissioner of Competition, CRTC 2013-685, footnote 6, incumbents providers control 85 per cent of spectrum, however they provide service to 90 per cent of subscribers (as of 2012). See CRTC, *Communications Monitoring Report September 2013*, Figure 5.5.4. Available online at <http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2013/cmr2013.pdf>. On the business plans and focus of the entrants, see: Church and Wilkins, *Wireless Competition*, p. 43.

by the fact that Canadians had very little interest in low-priced, prepaid plans.⁶⁶ Instead of allocating AWS spectrum to the incumbents, who would use it to increase the speed and capacity of their data networks, it has instead been allocated to entrants who have focused on voice and text. As a result, Canadians ended up with an incorrect mix of networks (e.g., at least three additional networks with a focus on voice and text) and an inefficient allocation of spectrum (too little to the three incumbents to meet rising demand for data transmission).

The costs to Canadians from this misallocation are twofold. First, the incumbents have higher costs, as they are forced to substitute capital investment in the form of more cells (requiring more towers) for spectrum. Second, it is likely that the market power of the incumbents is a function of congestion on their networks. As their capacity constraints are relaxed, their ability and incentive to exercise market power is reduced. Firms that are not capacity constrained typically have incentives to price more aggressively than if they have capacity constraints. The incentive of a capacity constrained firm to lower its prices are reduced since an effective capacity constraint means they cannot capture all of the increase in sales.⁶⁷

In our view, the relaxation in capacity constraints associated with voice calls is a likely explanation for the reduction in the price of voice documented in our study.⁶⁸ The increased spectrum available to the incumbents, capital investment, and adoption of LTE have also increased the capacity of the incumbents' data networks. Table 1 reflects the findings of the 2014 Wall Report and it indicates that prices rose 16.2 per cent for the low-usage basket, one per cent for the average-usage basket, but fell by almost 15 per cent for the high-usage basket over the period 2013-2014.⁶⁹ The decline in the high-usage basket reflects a similar decline in the average-usage basket over the period 2012-2013. Our observation on the price decreases observed over the period 2012-2013 — that they reflect competition between the incumbents — is likely even more relevant to the price decrease in the high-usage basket — with its data component — over the period 2013-2014.

⁶⁶ See: Church and Wilkins, *Wireless Competition*, p. 8 and pp. 37-40. Note that this suggests that the “higher prices at the retail level” that the Competition Bureau alleges are the result of excessive wholesale roaming rates, even if true, may not have changed the fate of the entrants, given their business model. Commissioner of Competition, CRTC 2013-685 Submission, para. 7.

⁶⁷ S. Loertscher and L. Marx (2014), “An Oligopoly Model for Analyzing and Evaluating (Re)-Assignments of Spectrum Licenses,” *Review of Industrial Organization*, forthcoming. Available online at <http://dx.doi.org/10.1007/s11151-014-9427-y>.

⁶⁸ Church and Wilkins, *Wireless Competition*, pp. 41-42.

⁶⁹ See: Church and Wilkins, *Wireless Competition*, pp. 41-42, for our analysis of the Walls Report price data for the period 2008-2013. Table 1 updates Table 8 in Church and Wilkins, *Wireless Competition*. See: Wall Communications Inc., *Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2014 Update*, prepared for the Canadian Radio-television and Telecommunications Commission and Industry Canada, at Table A2.2. Available online at <http://www.crtc.gc.ca/eng/publications/reports/rp140714.pdf>.

TABLE 1: CANADIAN PRICE BASKET ANALYSIS (2008-2014)

	2008	2009	2010	2011	2012	2013	2014
Level 1 (CDN\$)	32.73	33.03	34.03	33.73	34.32	30.71	35.70
YoY Percentage Change		0.9%	3.0%	-0.9%	1.7%	-10.5%	16.2%
Level 2 (CDN\$)	60.81	57.78	53.49	50.51	51.31	44.86	45.26
YoY Percentage Change		-5.0%	-7.4%	-5.6%	1.6%	-12.6%	0.9%
Level 3 (CDN\$)	112.34	103.24	109.59	99.69	98.37	93.59	79.69
YoY Percentage Change		-8.1%	6.2%	-9.0%	-1.3%	-4.9%	-14.9%

Source: Wall Communications, *Price Comparisons 2014 Update*, Table A2.2

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.

In this regard, the government likes to trumpet that government policies are responsible for a price decline of 22 per cent from 2008 to 2014.⁷⁰ What should be clear from an examination of the data is that this price decline is despite its efforts to create competition. The price impact of the entrants should be reflected primarily in the low-usage basket, rather than the high-usage basket.⁷¹ The Wall Report data make clear that this is not the case. The interesting question is how much lower prices would be if the 2008 AWS spectrum had not been preferentially allocated to the entrants.

Given that demand and adoption rates for the three different baskets are not the same, a weighted average based on actual usage is a much better indicator of the change in price. For instance, it seems reasonable to assume that users of the high-usage basket (that includes data) have a smartphone and that subscribers of low-usage baskets are on prepaid plans. Using the earliest available figures from Bank of America, smartphone adoption is 47 per cent at the end of 2012 and the share of prepaid plans is 18 per cent. Assume that smartphone users subscribe to the high-usage basket, prepaid subscribers to the low-usage basket, and the balance is comprised of average users. Then the weighted average price in 2008 is \$80.20 and in 2014 it is \$59.87, a decline of more than 25 per cent, a figure that reflects the relative importance of the high-usage basket and its greater fall in price. The fall in price of the high-usage, data-centric plans, underlines that the fall in prices likely has nothing to do with the 2008 AWS entrants.

The conclusion of the inefficiency of entry beyond the natural limit applies generally to additional entry, not just the specifics of the 2008 AWS entrants. The experience of the 2008 AWS entrants does however clearly illustrate the potential for inefficient entry.

⁷⁰ Industry Canada News Release, “Wireless Policies Working to Lower Prices for Canadian Families,” 14 July 2014. Available online at <http://news.gc.ca/web/article-en.do?nid=867679>. Industry Canada calculates the change in prices in a curious way. It calculates the price decrease by considering the change in the *simple average* of the price of the three baskets. This is not very informative since it does not reflect the relative importance of the different baskets.

⁷¹ See: Church and Wilkins, *Wireless Competition*, pp. 41-44 for discussion of the new entrants’ initial focus on low-usage, prepaid voice and text services, and *supra*.

COMPETITION BUREAU CHALLENGE

The Competition Bureau submission challenges our earlier study on three grounds: (i) the profitability analysis of Rogers Wireless; (ii) our use and interpretation of international comparisons; and (iii) the inefficiency of entry.⁷² In support of its rebuttal, the Competition Bureau commissioned a report by the Brattle Group.⁷³ We address each of these challenges in turn.

Monopoly or Competitive Returns?

Our analysis collected publicly available financial information for Rogers Wireless to create an estimate of its annual free cash flow from 1986 to 2012. From this, we calculated estimates of the internal rate of return for Rogers' wireless operations.

The Competition Bureau claims that our analysis is limited in that it:⁷⁴

- (1) examines only one service provider;
- (2) does not actually measure that service provider's cost of capital; and
- (3) when properly interpreted, does not support our conclusions that market power is not an issue in wireless services in Canada.

The Competition Bureau's assessment of our report is informed by the Brattle Group Report which contains an assessment of the profitability of wireless services in Canada. Fundamentally, its logic is the same as ours, but it differs in three significant ways and is presented as reaching a different conclusion. First, it calculates a pre-tax nominal IRR for Telus' wireless services.⁷⁵ Second, it calculates a post-tax nominal IRR for Rogers. Third it compares the IRR for the two companies' wireless services to an estimate of the weighted average cost of capital (WACC) for Telus and Rogers (the companies as a whole, not their wireless investments). The Brattle Group concludes that Telus and Rogers' wireless business "are generally earning above-normal returns on their investments, consistent with the exercise of market power."⁷⁶

⁷² Commissioner of Competition, CRTC 2013-685 Submission, para. 11. Commissioner of Competition, CRTC 2014-76 Submission, para. 16-17.

⁷³ Brattle Group, *Canadian Wireless*.

⁷⁴ Commissioner of Competition, CRTC 2013-685 Submission, para. 11.

⁷⁵ We did not calculate an IRR for Telus. To do so requires a large number of assumptions. Those made by Brattle to do so include: (i) using net book value in 1990 to value AGT's investment before 1990 plus an additional \$16.1 million of other possible Capex; (ii) ignoring AGT's EBIDTA from 1986 to 1990; (iii) assuming 25 per cent of the acquisition costs of EdTel and QuebecTel are for wireless assets; (iv) estimating from net book value in 1988 investment by BC Telecom prior to 1988 and ignoring EBIDTA prior to 1988; (v) estimating EBIDTA for BC Telecom from 1988 to 1997; (vi) estimating wireless investment for BC Telecom from 1988 to 1990. See: The Brattle Group, *Canadian Wireless* p. 21, and pp. 57-61 and "Telecom Notice of Consultation CRTC 2014-76 — Responses of the Commissioner of Competition to Interrogatories," 7 July 2014, Table Bell-Q21, available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?Key=74312&Type=Notice>. The validity of the analysis depends on the accuracy of the assumptions, both individually and in aggregate.

⁷⁶ Brattle Group, *Canadian Wireless*, p. 1.

THE ANALYSIS OF THE BRATTLE GROUP

Tables 2 and 3 show, for three time periods, our estimates of the pre-tax IRR for Rogers, the Brattle estimate of the post-tax IRR for Rogers, the pre-tax IRR for Telus (lower- and upper-bound estimates), Brattle's estimates of the WACC for Telus (pre-tax) and Rogers (post-tax), and our pre-tax estimate of Rogers' WACC.⁷⁷ The lower and upper bound for Telus' IRR depend on the difference in treatment of its acquisition of Clearnet in 2001.

TABLE 2: ROGERS IRR AND WACC VALUES

	Rogers pre-tax IRR	Rogers pre-tax WACC	Rogers post-tax IRR	Rogers post-tax WACC
1986-2008	5.9%	15.8%	-0.2%	9.4%
1986-2012	12.2%	14.6%	8.1%	9.0%
1986-2030	15.6%	12.2%	12.7%	8.1%

Sources: Rogers pre-tax IRR values calculated using pre-tax cash flows from Brattle Group, Canadian Wireless, Table A-5. Rogers pre-tax WACC values calculated using after-tax WACC values from Brattle Group, Canadian Wireless, Table A-7, and, following the Brattle Group's approach for Telus (Brattle Group, Canadian Wireless, p.63), "grossing up" these values by multiplying by one less the statutory income tax rate values from Brattle Group, Canadian Wireless, Table A-5. Rogers post-tax IRR values calculated using post-tax free cash flows from Brattle Group, Canadian Wireless, Table A-5. Rogers post-tax WACC values from Brattle Group, Canadian Wireless, Table A-7.

TABLE 3: TELUS IRR AND WACC VALUES

	Telus Lower pre-tax IRR	Telus Upper pre-tax IRR	Telus pre-tax WACC
1988-2008	-3.7%	8.0%	13.3%
1988-2012	6.8%	14.0%	12.8%
1988-2030	13.8%	17.9%	11.5%

Source: Telus pre-tax Lower IRR values calculated using pre-tax free cash flow from Brattle Group, Canadian Wireless, Table A-1. Telus pre-tax Upper IRR values calculated using pre-tax free cash flows from Brattle Group, Canadian Wireless, Table A-2. Telus pre-tax WACC values from Table A-4.

Whether there are greater-than-competitive returns depends on whether the estimated IRR is greater or less than the estimated WACC. In Tables 2 and 3 this comparison can be done for four cases, for each of the three time periods, 1986 to 2008, 1986 to 2012, and 1986 to 2030 (the periods start in 1988 for Telus). Each time period provides a different perspective that informs an assessment on whether inefficient market power is substantial and durable:

- The IRR to 2008 indicates low rates of return for services based only on voice and indicates that to 2008 the evidence is inconsistent with market power and monopoly. The IRR is less than the WACC for all four cases.
- The IRR to 2012 indicates the importance of the data revolution and its impact on the return on capital in the wireless sector. The high demand realization for wireless services was not evident in 1986, 1996, or even 2002. The explosion in data usage was a fortunate outcome that was likely not even knowable, let alone predictable when network investments were originally taking place. The IRR to 2012 indicates that recent margins and free cash flows are more consistent with competitive returns on network investments, than they are with substantial and durable market power and monopoly profits. The IRR is less than the

⁷⁷ On an annual basis, this is the Brattle pre-tax estimate divided by one less the estimated tax rate. Following Brattle, we calculate a weighted average WACC for the entire period using share of real investment as the annual weight.

WACC in three of the four cases; only in the upper-bound case for Telus is the IRR greater than the WACC, and then only by 1.2 per cent.

- The IRR to 2030 indicates the importance of future returns for a finding of inefficient market power. But what is astonishing is how small the extent of the excess returns are in the three cases that are likely relevant: 3.4 per cent (Rogers pre-tax), 4.6 per cent (Rogers post-tax), and 2.3 per cent (Telus lower bound).

The upper-bound estimate for Telus arises from treating Clearnet as if it was part of Telus.⁷⁸ The lower-bound estimate arises from deducting from Telus' cash flow in 2001 the \$6.6 billion paid for Clearnet.⁷⁹ The Brattle Group's concern is that, in the acquisition of Clearnet, excessive returns were capitalized. Brattle argues that of the \$6.6 billion, most reflects capitalized monopoly profits and the value of the 30 MHz PCS licence was relatively small.⁸⁰ But this seems to ignore that Clearnet's national 30 MHz PCS licence did have scarcity value and that Clearnet had 735,000 subscribers.⁸¹ Telus, pre-acquisition, had 35 MHz of spectrum in its operating areas and approximately 1.2 million subscribers. Acquiring Clearnet was one, and maybe the only, opportunity for Telus to become a national carrier.⁸² In any event, if approximately 65 per cent of the \$6.6 billion is the competitive value of Clearnet, then the IRR from 1988 to 2012 equals the Brattle Group's estimate of the WACC and is close to Rogers' IRR.

It seems dubious that Telus' IRR should exceed that of Rogers.⁸³ As discussed in our analysis, "Rogers is the largest wireless incumbent in Canada and has been the market leader for some time."⁸⁴ The average market share of Rogers over the period 2002-2012 was 36.4 per cent; Bell's was 31.1 per cent; and Telus' 27.1 per cent.⁸⁵ The monthly ARPU for Rogers has averaged \$60.72 since its acquisition of Microcell in 2005, approximately the same as Telus' (\$60.18) and above that of Bell's (\$52.84).⁸⁶ This leadership is attributable to its acquisition of scale and spectrum with the Microcell purchase, its adoption of the technology that became the global standard (GSM), it being the first provider to roll out an HSPA network and, initially, its exclusive rights to the iPhone in Canada.⁸⁷ Indeed, we document that Rogers Wireless' EBITDA increased from less than \$1 billion in 2004 to \$3 billion in 2009.⁸⁸

⁷⁸ See Brattle Group, *Canadian Wireless*, p. 62.

⁷⁹ This is the treatment of the acquisition by Rogers of Microcell by *both* Brattle and Church and Wilkins in determining Rogers' IRR.

⁸⁰ Brattle Group, *Canadian Wireless*, p. 62.

⁸¹ For spectrum holdings, see: Industry Canada, "A Brief History of Cellular and PCS Licensing," October 2004. Available online at <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08251.html>. For subscriber values, see: Clearnet 3Q2000 Report to Shareholders, 27 October 2000; and L. Nguyen, "New titan enters battle of cellphones," *The Globe and Mail*, 22 August 2000, p. A1.

⁸² L. Nguyen, "New titan enters battle of cellphones," *The Globe and Mail*, 22 August 2000, p. A1.

⁸³ As is clear from Tables 2 and 3, as well as what follows, our focus on Rogers was representative and did not understate the returns in the industry, as alleged by the Competition Bureau.

⁸⁴ Church and Wilkins, *Wireless Competition*, p. 24.

⁸⁵ G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, 15 April 2013; and G. Campbell, "Global Wireless Matrix 4Q07," Merrill Lynch, 21 April 2008.

⁸⁶ G. Campbell, "Global Wireless Matrix 1Q2013," Bank of America Merrill Lynch, 15 April 2013.

⁸⁷ Church and Wilkins, *Wireless Competition*, p. 27.

⁸⁸ Church and Wilkins, *Wireless Competition*, p. 27.

A comparison of the financial performance of Rogers and Telus from 1999 to 2012 is very instructive, both with respect to (i) the relative returns of Rogers and Telus and (ii) the importance of the Clearnet transaction for Telus. In 1999 and 2000, prior to the Clearnet transaction, Telus' EBIDTA was less than half that of Rogers. In 2001, the year of the Clearnet transaction, Telus' EBIDTA is about three-quarters that of Rogers. From 2002 to 2005, Telus' EBIDTA is larger than Rogers, but then there is a remarkable change as Rogers rides the data revolution. Over the period 2006-2012, Rogers' EBIDTA exceeds that of Telus every year, and over this period, Telus' EBIDTA is only approximately 72 per cent of Rogers'.⁸⁹ Furthermore, Rogers' investment in GSM technology and its initial iPhone exclusivity in the mid-2000s allowed it to offer attractive new services to consumers while Bell and Telus scrambled to catch up.⁹⁰

The Brattle Group's assessment that Telus and Rogers' wireless operations "*are generally* earning above-normal returns on their investments, consistent with the exercise of market power" (emphasis added) is not supported by its analysis. The results in Tables 2 and 3 indicate that any assessment that there is inefficient market power and above-normal returns clearly depends on the accuracy of the forecasts for the future evolution of the industry. As we discuss next, the estimates of profitability do not appear to be a very firm foundation for a compelling case of market failure that warrants the costs of policy intervention. They are small and not likely robust to the assumptions made by the Brattle Group.

ROBUSTNESS OF THE BRATTLE GROUP ANALYSIS

In this section we consider the robustness of the excess profit margins found by the Brattle Group — based on the future profitability of the wireless sector. The small excess returns found may not be robust to changes in assumptions. The margin can disappear either because the IRR is overestimated or the WACC is underestimated. In what follows, we identify issues with both the IRR and WACC estimates that suggest the estimated margins in the Brattle Report are too large.

IRR

We begin by noting that, as with our IRR, all of the IRR estimated are based on realized revenues and costs. It is important to remember that the appropriate comparison is *ex ante*, that is, between the expected IRR and the cost of capital before the investment is made. An *ex post* analysis of profitability, involving comparisons between the realized IRR and the cost of capital can be very deceptive. Significant returns are required *ex post*, if the investment is successful, in order to compensate for the risk of failure at the time of the investment. A realization of *ex post* profitability must therefore be interpreted very carefully.

⁸⁹ The analysis here provides additional support for why we do not think the Brattle upper bound on Telus' IRR is relevant. During the important years for profitability, 2006 to 2012, Rogers' financials are better than those of Telus, casting doubt on whether Telus' IRR can exceed that of Rogers, which it does under the assumptions of the upper-bound estimate.

⁹⁰ See, for example: C. McLean, "Rogers' wireless hunch paying off," *The Globe and Mail*, 2 November 2007, p. B5.

For instance, suppose that there are two possible outcomes to an investment project that are equally likely. If the project is a success, the IRR is 30 per cent. If the project is a failure the IRR is zero per cent. The expected IRR is 15 per cent. If the cost of capital is also 15 per cent, returns would be competitive. But an *ex post* comparison would indicate excess profits if the project was successful, since it would involve comparing a realized IRR of 30 per cent to a cost of capital equal to 15 per cent.⁹¹ The analysis of the IRR to 2030 demonstrates that for the expected return to substantially exceed the cost of capital for Rogers, its free cash flow from 2013 to 2030 likely must be well above current levels.

The Brattle Group argues that its assumption of constant real cash flows likely results in IRR estimates that are too low.⁹² The rationale is that investments in 2012, and indeed 2013, were likely above what is required to maintain its operations and should be expected to lead to growth. For corroborating evidence it shows that Rogers Wireless' free cash flow was 12.2 per cent higher in the first three quarters of 2013 relative to 2012.⁹³ However, increasing competition over not just price, but price and quality also, may well mean that investment is required to preserve sales volume. Rogers' free cash flow from wireless for the first six months of 2014 is only 3.6 per cent higher than for the same time in 2013, with operating profit less than three per cent higher. This is close to having constant real cash flows.⁹⁴

Given the magnitude and unpredictability of technological change in telecommunications, an assumption of stable real cash flows actually seems optimistic. In this regard, the maturation and commoditization of voice is relevant. As demonstrated in our study, increased competition between the three incumbents led to a drop in voice revenues per minute by more than 30 per cent over the period 2006 to 2012.⁹⁵ As the three incumbents invest in their networks and reduce capacity constraints on data transmission, prices for data plans — as discussed above — have also started to fall. As well as concerns over prices, subscriber growth is likely to be an issue. Rogers' net wireless postpaid additions were only 40,000 in the first half of 2014, down from 130,000 in the first half of 2013.⁹⁶

WACC

There are two fundamental difficulties with the estimates Brattle uses to derive the WACC. The WACC values are from Bloomberg, but apparently (i) available only for the period 2000 to 2012 and (ii) available only for the consolidated operations of Telus and Rogers, not their wireless operations. As a result, the Brattle Group argues that the WACC for the consolidated operations of Telus and Rogers is applicable to their wireless operations, and it has to estimate the WACC for the years prior to 2000 and after 2012.

⁹¹ This example is from G. Niels, H. Jenkins, and J. Kavanagh (2011) *Economics for Competition Lawyers*, Oxford University Press, pp. 163-164.

⁹² Brattle Group, *Canadian Wireless*, p. 67.

⁹³ Brattle Group, *Canadian Wireless*, p. 67.

⁹⁴ Rogers News Release, "Rogers communications Reports Second Quarter 2014 Results," 24 July 2014. Available online at http://www.rogers.com/cms/investors/pdf/quarterly-results/2014-Q2_Results-Release.pdf.

⁹⁵ Church and Wilkins, *Wireless Competition*, pp. 41-42.

⁹⁶ Rogers News Release, Rogers communications Reports Second Quarter 2014 Results.

The WACC values for years prior to 2000 are estimated by adding the average risk premium above the 10-year Canadian bond rate from 2000-2012 to the long bond rate from 1986 (or 1988 in the case of Telus). The WACC value for the years 2013 to 2030 are assumed to equal the real rate average from 2010-2012 plus a two per cent adjustment for inflation. The WACC compared to the IRR is the weighted average annual WACC, where the annual weights are the share of real investment.

This methodology likely underestimates the WACC applicable for investment in wireless operations:

- The risk premium over the consolidated WACC from 2000 to 2012 is *extremely unlikely* to be representative of the risk premiums associated with investments in wireless by Telus and Rogers in the 1980s and 1990s. It may be true that wireless operations in the 2000s, especially in the later years of that decade, account for the majority of Telus and Rogers' earnings, but that is certainly not the case when the initial investments in wireless were made. As discussed in our study, the financial community thought Rogers' investments in wireless, even in the early part of the 2000s, were risky.⁹⁷
- The low interest rate environment from 2010-2012 is unlikely to persist for the next 18 years. Given the weighting put on the WACC for the period 2013-2030 (44 per cent for Telus and 51 per cent for Rogers), the effect is to bias the WACC downwards.

Adjustments for these two factors can have a significant effect on the WACC. For instance, increasing the risk premium to 5.4 per cent from 2.7 per cent for Telus, increases its pre-tax WACC from 1988 to 2030 by one per cent.⁹⁸ The effect of assuming that the WACC average over the period 2013 to 2030 is the same as over the period 1988 to 2012 is to raise the WACC during the forecasted period from 7.2 per cent to 8.7 per cent, and increases Telus' pre-tax WACC from 1988 to 2030 by one per cent. Making both adjustments raises Telus' pre-tax WACC from 1988 to 2030 by 2.6 per cent. This is more than sufficient to eliminate the excess-return margin of 2.3 per cent calculated by Brattle for Telus.

Conclusion on Brattle's Profitability Analysis

Given the potential costs of imperfect regulation, the threshold for regulatory intervention should be set high. It is not enough that there is some evidence of inefficient market power. The evidence must be compelling: the indicated magnitude substantial and the evidence robust. An indicator is robust if it is not fragile to changes in assumptions or data. In this regard, it is hard to interpret the Brattle Group's analysis as providing robust evidence of substantial market power that warrants regulatory intervention.

The Bureau challenged our conclusions on the basis that we failed to measure Rogers' cost of capital and the implication that this measure was necessary to reach a conclusion. We think that the comparison between the IRR and the cost of capital is what was meant by the Competition Bureau with its vague suggestion (at the time) that our interpretation of the results is somehow incorrect. Indeed, Rogers' cost of capital was not explicitly measured in our analysis. However, the results of the analysis suggest that Rogers' IRR (even assuming large future free cash

⁹⁷ Church and Wilkins, *Wireless Competition*, p. 24.

⁹⁸ While this is a doubling of the risk premium, it still results in a WACC during the initial years of wireless service deployment that is less than the 15 per cent discount rate used in two financial analysis to value Microcell's EBITDA. See: Commissioner of Competition, CRTC 2014-76 Responses to Interrogatories, Table Bell-Q25-iii.

flows) was low.⁹⁹ The returns were put into context by comparing them with returns from other sectors that were much higher and less risky.¹⁰⁰ The obvious conclusion was that Rogers' returns are not indicative of substantial excessive profitability and did not suggest a substantial inefficient exercise of market power by Rogers. The Brattle Group does consider one measure of the WACC for Telus and Rogers: explicit introduction of the WACC does not change our conclusion. The analysis of the Brattle Group's excessive profitability margins establishes that they are not substantial or robust and therefore cannot be a basis sufficient to justify the costs of regulatory intervention.¹⁰¹

INTERNATIONAL COMPARISONS

The Competition Bureau, supported in part by the analysis of the Brattle Group, suggest that our international comparisons are inadequate and therefore presumably do not support a conclusion that the inefficient exercise of market power in Canadian wireless services is not an issue.¹⁰² Both focus on the United States and argue that *if* it is a relevant competitive benchmark, then lower penetration levels, lower minutes of use, and higher voice revenue per minute of use in Canada indicate that wireless services in Canada are less competitive than in the U.S.¹⁰³ However our point, also echoed by the Brattle Group, is that international comparisons of *outcomes* are not informative of market power and the extent of competition.¹⁰⁴ The U.S. is not a relevant competitive benchmark based on performance. Indeed, we go to great lengths to explain why the observed penetration rate in Canada is not attributable to insufficient competition, but instead to differences in demand.¹⁰⁵ It is astonishing — especially after the experience with the 2008 AWS entrants — that the Brattle Group would trot out the argument that Canada's penetration rate would be similar to the rest of the world if we had entrants that focused on the prepaid market and offered lower-priced voice and text options.¹⁰⁶

⁹⁹ Church and Wilkins, *Wireless Competition*, pp. 25-26.

¹⁰⁰ Church and Wilkins, *Wireless Competition*, p. 26.

¹⁰¹ Two other points of concern regarding our profitability analysis were raised by a referee. Both are based on the premise that the low rate of return for Rogers reflects cost inefficiencies. One source of possible cost inefficiency is X-inefficiency. X-inefficiency captures the hypothesis that for firms where there is separation of ownership from control, market power and the absence of competition results in higher costs. However, it seems unlikely that Rogers' low internal rates of return are a result of X-inefficiency, given the extent of price and non-price competition from two similar rivals, Telus' similar rates of return, and the role of the Rogers family as owners and managers, suggesting limited separation of ownership from control. The second source of cost inefficiency is that the high-investment/high-quality outcome in Canada reflects *over-investment* by the three incumbents. Under this hypothesis, the three incumbents engage in strategic over-investment to prevent entry and expansion by rivals. A corollary is that Canadians would be better off with lower quality and lower-price networks. This also seems improbable because: (i) the low rates of return are not consistent with preserving monopoly power; (ii) co-ordination by the three firms on investment to deter entry is even less probable than co-ordination over prices, which, as demonstrated below, is not consistent with the evidence; (iii) the adoption of new technologies and faster speeds was distinctively asymmetrical, with Rogers being the leader, and hence not consistent with co-ordination; and (iv) the AWS entrants did provide a lower-quality/lower-price option that was not adopted by Canadians (see: Church and Wilkins, *Wireless Competition*, pp. 43-44). See: J. Church and R. Ware, (2000), *Industrial Organization: A Strategic Approach*, San Francisco: McGraw-Hill, Sections 3.4.2 and 4.4.1, for a discussion of X-inefficiency. See discussion *infra* in Section 4 and the discussion of price competition in Church and Wilkins, *Wireless Competition*, pp. 41-42.

¹⁰² Commissioner of Competition, CRTC 2013-685 Submission, para. 12. Commissioner of Competition, CRTC 2014-76 Submission, para. 17 and para. 25. Brattle Group, *Canadian Wireless*, p. 14.

¹⁰³ Brattle Group, *Canadian Wireless*, p. 14.

¹⁰⁴ Brattle Group, *Canadian Wireless*, p. 17. Church and Wilkins, *Wireless Competition*, p. 20.

¹⁰⁵ Church and Wilkins, *Wireless Competition*, pp. 7-9.

¹⁰⁶ Brattle Group, *Canadian Wireless*, p. 13.

But international comparisons of market structure — the number of firms and their market shares — are easy to make and are potentially informative. The empirical regularities documented in our study are informative regarding the potential for an additional entrant to be viable and the exercise of market power. As discussed above, if Canadian markets were more concentrated than international markets, there might be an indication of inefficient market power. But that is simply not the case.

UNILATERAL MARKET POWER AND CONCENTRATION

The submissions from the Competition Bureau in *Undue Discrimination* and *Wholesale Wireless* fail to appreciate the difference between the efficient and inefficient exercise of market power and the role of concentration. As the Competition Bureau notes, “mobile wireless markets are characterized by high concentration and very high barriers to entry and expansion.”¹⁰⁷ With large economies of scale and scope, as well as large fixed and sunk investments, the wireless market will inevitably be “concentrated,” in the sense of having fewer major participants than some other industries. The question is not whether or not the market is concentrated, but whether or not it is excessively concentrated.

This fundamental point continues to elude other commentators as well. For example, Globalive’s reply comments in *Undue Discrimination* cite the conclusion of a report by the Canadian Media Research Concentration Project: “wireless markets in Canada, whether measured by revenue, spectrum held, spectrum in use or subscribers, or at level [sic] of the country as a whole, specific provinces and Canada’s nine biggest cities ... are remarkably concentrated.”¹⁰⁸ High concentration and high margins should not be surprising given the technology of production, nor does this contradict any of our findings. Without further consideration, the presence of high concentration levels is not indicative of a competition problem. Our analysis, on the other hand, points to the level of concentration and margins being consistent with competition.

The Competition Bureau, in *Wholesale*, points to the evidence of the Brattle Group for support of the proposition that the concentration in Canadian wireless markets is consistent with the inefficient exercise of market power.¹⁰⁹ As indicated above, the Brattle Group’s evidence on the profitability of wireless services and international comparisons does not support a robust finding of the substantial exercise of inefficient market power, consistent with justifying remedial regulatory measures.

¹⁰⁷ Commissioner of Competition, CRTC 2013-685 Submission, para. 9. Commissioner of Competition, CRTC 2014-76 Submission, para. 11 and para. 26.

¹⁰⁸ “Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Reply Comments of Globalive Wireless Management Corp. (WIND Mobile),” 10 February 2014, at footnote 11. Available online at <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2073501>.

¹⁰⁹ Commissioner of Competition, CRTC 2014-76 Submission, para. 25.

The Efficiency of Entry

The second challenge to our study by the Competition Bureau has nothing to do with whether wireless services are, or are not, competitive. Instead, the Competition Bureau originally suggested that our analysis was deficient with respect to the efficiency of further entry because it did not consider the relationship between spectrum availability and the costs of network build-out.¹¹⁰ The Competition Bureau then clarified in its *Wholesale* submission, based on the Brattle Report, its efficiency analysis and, by implication, its disagreement with our conclusion on the limited benefits of additional entry and its inefficiency.¹¹¹

The Brattle Group's analysis is not a complete efficiency analysis that considers the benefits of entry by a fourth national carrier. Instead, the Brattle Group provides estimates of the following three components of such an analysis:

- The Brattle Group estimates that the increase in consumer welfare from a fourth national entrant would be \$1 billion a year. Of this, \$220 million is from lower prices and increased consumption of wireless services; the balance is attributable to the extra benefit consumers would get from consuming the services of the entrant instead of those of one of the incumbents (“entrant brand value” according to the Brattle Report).¹¹²
- The Brattle Group estimates the variable profits of the fourth national carrier to be \$843 million, while variable profits of the existing carriers would decrease by \$855 million annually. The change in industry variable profits would be a loss of \$12 million annually.¹¹³
- The Brattle Group estimates a cost to the three incumbents of reducing spectrum availability to each by 10 MHz. This spectrum is presumably used to support the fourth national carrier instead. They estimate that it would result in increased capital costs for the three incumbents of approximately \$370 million.¹¹⁴ This is not an annual estimate, but the net present value of additional capital required by 2017.

For a full efficiency analysis, however, the \$1 billion increase in total surplus — the competitive benefits — must be compared to the costs of entry. The costs of entry are not just the extra \$370 million of extra capital costs for the three incumbents, but also include the capital costs of rolling out the fourth network, the costs of subsidization, and any lost benefits from a reduction in price and non-price competition because the market allocation of spectrum is prohibited by government policy. As discussed above, the relaxation of capacity constraints on the three incumbents might have a measureable effect on the terms of their services, including prices.

¹¹⁰ Commissioner of Competition, CRTC 2013-685 Submission, para. 11:

Second, the C-W Report appears to suggest that, because of the presence of significant scale and network economies in the provision of mobile wireless services, entry by an additional competitor in the market would lead to significant cost inefficiencies. Such a conclusion is premature; an in-depth analysis of the relationship between the limits on spectrum availability and the costs of network build-out is necessary to properly address any such effect.

¹¹¹ Commissioner of Competition, CRTC 2014-76 Submissions, paras. 50-54.

¹¹² Brattle Group, *Canadian Wireless*, p. 2, p. 20, and p. 44.

¹¹³ Brattle Group, *Canadian Wireless*, p. 38.

¹¹⁴ Brattle Group, *Canadian Wireless*, pp. 52-53.

The Competition Bureau and the Brattle Group have not shown that entry is efficient. Indeed before even addressing the question of efficiency, the natural starting point might have been to ask whether entry was profitable without subsidization. On this, the Competition Bureau appears to misinterpret the evidence of the Brattle Group by indicating that entry *may* be viable.¹¹⁵ The Brattle Group is explicit in that it does not consider whether such entry is viable.¹¹⁶ The evidence in Church and Wilkins on the viability of a fourth carrier is not addressed by the Competition Bureau or the Brattle Group.¹¹⁷

Our analysis, summarized above, focuses on the existence of a natural limit and its implications for sustainability and efficiency. In that context, the costs and benefits of the 2008 AWS entrants were discussed above. That the economic value created by the entrants is small arises because their entry was duplicative and their offerings unpopular. The cost inefficiencies we highlight are the potential loss of scale economies to the incumbents and, especially, the inefficient mix of technologies associated with reducing the amount of spectrum available to the incumbents. We observed the following:¹¹⁸

... 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 inefficient allocation of spectrum.

The potential for lost scale economies and the importance of adequate spectrum for efficient rollout of data-centric networks seems obvious given the explosion in demand for mobile data. But more importantly, our analysis focused on the overall inefficiency of entry, of which cost inefficiencies are only one aspect.

¹¹⁵ Commissioner of Competition, CRTC 2014-76 Submission, para 51: “The Brattle Report indicates that (i) the Canadian wireless sector may support efficient entry by an additional carrier...” See also Commissioner of Competition, 2014-76 Responses to Interrogatories, Bureau (Bell Mobility), 9 Jun 14-21.

¹¹⁶ Brattle Group, *Canadian Wireless*, p. 55:

Although we find evidence that Canadian wireless carriers may possess market power and that there could be substantial surplus gains to added competition, further analysis is necessary to determine whether the Canadian wireless industry could sustain an additional nationwide carrier. In order to be viable, the new carrier must expect to earn at least a normal return on the investment required to create an additional nationwide network. The analyses undertaken do not directly address whether the new or emerging nationwide carrier could expect to earn at least a normal return on its investment. Moreover, our analyses do not examine whether incumbents would continue to earn normal or above normal profits with additional entry into the Canadian wireless market.

¹¹⁷ See discussion *supra*.

¹¹⁸ Church and Wilkins, *Wireless Competition*, p. 36.

The analysis in our report establishes:¹¹⁹

- That further entry is likely inefficient. The benefits from entry — increased consumption of wireless services — are likely very much less than the costs of entry, where the costs of entry are the opportunity costs of the resources used by the entrants to provide service, including spectrum and the capital costs of their networks.
- That in the long run, consumers might not benefit from further entry because of cost inefficiencies arising from reduced scale and reduced access to scarce spectrum, eventual consolidation due to insufficient gross margins, and reduced incentives for future investment.

Indeed an additional cost of subsidization of a fourth carrier might arise if the commitment by the government to accommodate expansion of entrants by denying the incumbents access to spectrum reduces their investment and willingness to innovate.¹²⁰

The difference between our analysis and that of the Brattle Group is on the magnitude and the nature of the competitive benefits of entry. The Brattle Group suggests benefits of \$1 billion per year, while our analysis, based on the actual record of entry by the 2008 AWS entrants, suggests that the competitive benefits of entry are negligible. In the next section, we explain why the benefits of an entry by a fourth national carrier estimated by the Brattle Group are not likely indicative of the competitive benefits of entry. They are likely unreliable and overestimated.

THE BRATTLE GROUP'S ESTIMATE OF THE BENEFITS FROM COMPETITIVE ENTRY

The Brattle Group's analysis is based on: (i) an event study and (ii) a market simulation. The event study looks at the effect on the share prices of Bell, Rogers, and Telus of Verizon's announcement that it was not going to enter the Canadian market after there were indications that it might. The increase in their share value is used to calibrate what the wireless sector would look like if Verizon — or a Verizon-like entrant — entered the Canadian wireless sector and provided service. The net present value of the loss in variable profits implied by the loss in share prices is used as the foundation for the market simulation. The Brattle Report market simulation is based on a well-known merger simulation approach to determine what the post-entry equilibrium in the wireless sector — by province — would have to be for entry to result in the required loss in variable profits.

Unfortunately, event studies are not well known for their accuracy in predicting the effect of events on the exercise of market power and the particular modeling choice by the Brattle Group for modeling consumer preferences for wireless services — the logit model of differentiated products — is not well known for its suitability for modeling competitive interactions in an oligopoly where products are differentiated.

As discussed below, the logit specification imposes very restrictive substitution patterns on consumers that likely make it inappropriate for assessing the effects of entry in wireless services. The specification imposes restrictions on cross-price elasticities of demand and

¹¹⁹ Church and Wilkins, *Wireless Competition*, pp. 35-36 and p. 44.

¹²⁰ We thank a referee for this observation.

patterns of substitution that mean it is not useful when product differentiation and patterns of substitution are likely to be asymmetrical, in particular when some products are better substitutes than others. This shows up in two ways: (i) it will indicate substitution from some products to others even though they are not very good substitutes and (ii) it will underestimate substitution between products that are very close substitutes. Thus this model is not likely to provide much insight on the price effects of additional entry.

The logit specification also has a tendency to overestimate the benefits to consumers from entry when their choice set expands. It will predict substitution to the new entrant's variety and therefore find increased consumer value from consuming a more preferred variety — even if such substitution would not happen because the existing variety and the new entrant's variety are not good substitutes. It will also assume a substantial increase in consumer value from consuming a more preferred variety even if the new entrant's variety is very similar to an incumbent's offering.

Event-Study Analysis

The literature on the utility of event-study analysis for predicting the effects on profitability of a merger is informative since it involves similar considerations as those relevant here: the effect on a change in the number of competitors on profits and hence share valuation. The assessment in the literature is that the short-run responses of stock prices are often positively, but weakly, correlated with the actual effects on profitability of a merger, including an increase in profits from an increase in market power.¹²¹ That is, while the short-run reaction of the stock market to a merger generally predicts the direction of change correctly, the magnitude of the estimate is not very precise.

It is not hard to see why: it is unlikely that traders are able to accurately assess the profitability effects of a merger if the event window is small. In some sense, the assumption underlying the Brattle analysis is that, while it works backwards from the stock market effect to the predicted equilibrium, stock market participants are able to work forward — from their predictions of the effect of Verizon's entry on profits to stock market valuations — as accurately as the Brattle Group, and in the window from the announcement of Verizon's potential entry to its ultimate decision not to enter. Such an assumption has, in a very understated way, been characterized as questionable.¹²² Using an event study to pin down the effect of another entrant on competition

¹²¹ See: P. Pautler, (2003), "Evidence on Mergers and Acquisitions," *Antitrust Bulletin*, Spring 2003: 119- 221, at pp. 135-136 for a review of the literature. The study of 20 mergers in the edited collection by S. Kaplan, (2000), *Mergers and Productivity*, Chicago: University of Chicago Press, appears to have been particularly persuasive in establishing the assessment that "the stock market's initial reaction to a merger is often a poor forecast of the merger's ultimate profitability." See: M. Whinston, (2007), "Antitrust Policy toward Horizontal Mergers," in M. Armstrong and R. Porter eds., *Handbook of Industrial Organization*, Volume 3, North-Holland: 2369-2440, at p. 2424. A recent study that confirms the weak effect of estimated changes in profitability on the stock market reaction to merger announcements is T. Duso, K. Gugler, and B. Yurtoglu, (2010), "Is the event study methodology useful for merger analysis? A comparison of stock market and accounting data," *International Review of Law and Economics*, 30: 186-192. Two former chief economists for the Directorate General Competition of the European Commission suggest that event studies might no longer be used by the U.S. antitrust agencies. See: T. Duso, D. Neven, and L.-H. Roller, (2007), "The Political Economy of European Merger Control: Evidence using Stock Market Data," *Journal of Law & Economics*, 50: 455-489 at p. 465.

¹²² See: M. Whinston, "Antitrust Policy toward Horizontal Merger," at p. 2424. Whinston observes (footnote omitted):

Any suggestion that an antitrust authority should primarily rely on event-study analysis presumes that stock market participants are able to forecast the competitive effects of mergers more accurately (and faster) than is the agency, perhaps a questionable assumption.

is unlikely a suitable basis on which to construct a simulation model and expect that the results of the model will be accurate.

Simulation Based on the Logit Model of Product Differentiation

The simulation model used by the Brattle Group assumes that wireless service providers compete over price and have differentiated products. The nature of demand for their differentiated products is modeled using the logit model. The logit model assumes that consumers make a discrete choice from a set of options. They do not choose how much to consume, but what to consume. The assumption is that they select, from the set of choices, the option (product) that maximizes their net benefit. Included in their choice set is the option of not purchasing from the set of products and instead purchasing the so-called outside option: instead of purchasing wireless services from one of the providers, they opt not to have wireless services. The logit model assumes that consumers' value of a particular choice consists of two elements: (i) a common valuation of the consumption value or benefit and (ii) a component that is consumer specific. The consumer specific component is independently and identically distributed across all consumers.¹²³

The logit model is informationally parsimonious: it requires information only on total market size, market shares, and prices, plus estimates of two parameters. One of these is the elasticity of demand for wireless services, which captures the willingness of consumers to substitute away from wireless services to other products as the market price of wireless services increase. The other is a parameter that captures the willingness of consumers to substitute between wireless service providers as the price of one of those providers increases. The logit model therefore imposes by assumption that the willingness of consumers to substitute from provider *i* to provider *j* is the same as the willingness of consumers to substitute from provider *i* to *k*. The cross-price elasticity between wireless service providers is simply the product of three terms: the market share and price of the good whose price increases, as well as the parameter that governs substitution between wireless providers. This means that the ratio of cross-price elasticities for any two services with respect to the price increase of a third service is one.

The restriction on cross-price elasticities follows from the property of the irrelevance of independent alternatives (IIA) of the logit model. In the logit model, the ratio of choice probabilities between any two options is equal to the ratio of the shares of those two options. Thus, the choice between two products *i* and *j* is independent of the availability of any other good, the total number of choices/goods, or the price of any other good other than the prices of *i* and *j*. It means that if there are three options, with shares of 60, 30, and 10 per cent for products *A*, *B*, and *C*, that if the price of *C* were to rise, consumers of *C* would substitute to *A* and *B* in the ratio of 2 to 1, thereby maintaining their share and choice-probability ratio. Equal cross-price elasticities insure this outcome since they result in an equal per centage change in the quantity of *A* and *B* from a change in the price of *C*. For this reason, the logit model's

¹²³ For instance in the linear specification used by the Brattle Group, consumer *j*'s net benefit from option *i* is assumed to be $U_{ji} = \delta_i - \alpha p_i + \xi_{ji}$, where δ_i is the benefit (common to all consumers of option *i*), p_i the price of *i*, and ξ_{ji} the consumer-specific value of option *i*. Under the assumptions of the logit model, the distribution of ξ_{ji} is the extreme value distribution function. The parameter α governs the willingness to shift from option *i* to option *k* as the price of *i* increases. See: G. Werden and L. Froeb, (1994), "The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy," *Journal of Law, Economics, & Organization*, 10: 407-426.

ability to predict the outcomes from price changes is typically limited. The potential for error arises because: (i) it will indicate substitution from some products to others even though they are not very good substitutes and (ii) it will underestimate substitution between products that are very close substitutes.

The IIA property also gives rise to the “red bus/blue bus” problem that makes it problematic to consider the welfare effects of new product introduction.¹²⁴ Assume that there are two options for a commuter, taking the blue bus and driving their car. Suppose further that it is equally likely that a given commuter will find each optimal, i.e., their ratio of choice probabilities is one to one. In aggregate this means that the market shares of the blue bus and driving will be a half: half will prefer the blue bus, while half will prefer driving.

Now suppose a third option becomes available: the choice set of commuters is expanded by the addition of the option of taking a red bus. The red bus option is identical to the blue bus in every other way *except* for the colour of the bus. Assuming no effect on prices from entry and that consumers do not care about the colour of the bus, one might expect that shares post entry should remain half for cars and half for bus transportation, with the share of bus transportation split equally between the red and blue bus. One might also expect that the introduction of the red bus would not only disproportionately affect demand for the blue bus, but welfare gains to consumers would arise *only if prices fell from increased competition from entry by the red bus and the social gains of entry by the red bus arise from any switching from the outside option (staying at home) to commuting in response to the change in price. One would not expect welfare gains because the red bus provides an option to some commuters that is a better match to their preferences than the existing options.*

The logit model of consumer preferences for differentiated products does not result in this pattern of substitution or welfare gains. Instead, consumers would have a common and equal valuation of the shared- or common-component value of the red and blue bus and the shares (assuming unchanged prices) across all three transport options would be one-third each. Notice that the share ratio between cars and the blue bus would remain at 1:1, the expected consequence of the IIA property. The welfare gains would be indicated in the logit model not only from expansion of the market from lower prices, but also from consumers switching from cars and the blue bus option to the red bus option because it is more highly valued. Of course, contrary to the predictions of the logit model, those using cars are unlikely to switch to the red bus option and not much, if any, value is created from consuming a different bus option simply because it is a different colour. The logit model will substantially overestimate the value of increasing brand diversity in these circumstances.

¹²⁴ See: D. McFadden, (1974), “Conditional Logit Analysis of Qualitative Choice Behaviour,” in P. Zarembka ed. *Frontiers in Econometrics*, New York: Academic Press, 105-142. The “red bus/blue bus” problem is recognized as a limitation by the Brattle Group, and that it is not surprising that its approach results in large benefits from entry (Brattle Group, *Canadian Wireless*, p. 41). The source of the large gain related to the logit model is from consumers switching to a brand that they prefer — what the Brattle Report refers to as “Entrant Brand Value.” Our sources for the discussions of the limitations of the logit model in what follows are P. Davis and E. Garces, (2010), *Quantitative Techniques for Competition and Antitrust Analysis*, Princeton: Princeton University Press and D. Gore, et al, (2013), *The Economic Assessment of Mergers under European Competition Law*, Cambridge: Cambridge University Press.

Calibration of the Logit Model by the Brattle Group

The logit specification of preferences means that the equilibrium price and quantities when there are N service providers is determined by a number of equations.¹²⁵ The condition for each service provider to maximize its profits is:

$$m_j = \frac{(p_j - c_j)}{p_j} = \frac{1}{\eta_{jj}} = \frac{1}{\alpha p_j (1 - s_j)} \quad (1)$$

or

$$m_j = \frac{(p_j - c_j)}{p_j} = \frac{1}{\eta_{jj}} = \frac{\bar{p}}{[\alpha \bar{p} (1 - \hat{s}_j) + \varepsilon \hat{s}_j] p_j} \quad (2)$$

where p_j is the price of wireless provider j , c_j is the marginal cost of provider j , m_j the price cost margin of firm j , s_j the choice probability for provider j , η_{jj} is the own price elasticity of provider j , \bar{p} is the average wireless price, ε is the market elasticity for wireless services, α the parameter that determines substitution between wireless providers, and \hat{s}_j the market share of wireless services for provider j . Equation (2) is the usual condition that profit-maximization requires the firm to select is price such that its relative profit margin equals one over its elasticity of demand.

The other equations specify demand for each of the N inside good options and the outside option. The choice probability of inside option j is implicitly defined by

$$\ln(s_j) - \ln(s_o) = \delta_j - \alpha p_j \quad (3)$$

where δ_j is the common value of the consumption benefits of good j and s_o the probability that no wireless service is selected. The choice probability that no wireless service is selected is

$$s_o = \frac{\varepsilon}{\alpha \bar{p}} \quad (4)$$

The relationship between the probability of service j being selected and its share of all wireless services (its market share) is

$$s_j = (1 - s_o) \hat{s}_j \quad (5)$$

We find it easier not to express the profit-maximizing condition, as the Brattle Group does, based on choice probabilities (equation (1)), but instead based on shares of wireless services (equation (2)).

¹²⁵ Equations (1), (3) and (4) are from the Brattle Report.

The variables that are estimated externally to the model or assumed in the set of equations (2) through (4) are the following:

- the share of wireless services for each provider \hat{s}_j .¹²⁶
- the margin of firm j , m_j , estimated from financial information.¹²⁷
- the price of firm j , p_j , assumed to be wireless provider i 's ARPU.
- the average price \bar{p} is the share weighted average price of all providers.
- the market elasticity, ε , assumed.

The unknowns in equations (2) through (4) that the calibration exercise solves for are:

- the choice probability of the outside good — i.e., the no-wireless option, s_o .
- the common valuation or benefit parameter of each good j , δ_j .
- the parameter governing substitution between wireless service providers, α .

The unknowns in equations (2) through (4) can be solved as functions of the variables that are known or estimated.¹²⁸ The Brattle Group then goes back and uses (1) to resolve for the marginal cost of each provider c_j .

In calibrating the logit model — finding the unknowns as described above — the Brattle Report makes a number of assumptions. These include the following:

- The calibration is done by province. This requires an ARPU by province. But the only data available on ARPU by carrier are national, and the ARPU available by province is averaged across all carriers. As a result, the Brattle Group assume that the ratio of two carriers' ARPU by province is the same as the ratio nationally. This, when used with the definition that the ARPU in a province is the weighted average (by shares) of the carrier's provincial ARPUs, allows for the Brattle Group to solve for provincial ARPU by carrier/provider.¹²⁹
- Since the calibration is done by province, it requires an estimate of the demand elasticity for wireless services by province. The Brattle Group assumes a range of elasticities (from 0.5 to 1.0) and that the most inelastic demand is in Alberta, the province with the highest ARPU, while the province with the most elastic demand is Quebec, the province with the lowest ARPU. It uses these two points to estimate a line between observed ARPU and elasticity. This linear relationship is used, along with the ARPU for the other provinces, to estimate the elasticity for each of the other provinces.¹³⁰

¹²⁶ From the CRTC, *Monitoring Report 2013*, Table 5.5.5.

¹²⁷ Brattle Group, *Canadian Wireless*, p. 75, Table B-1.

¹²⁸ Only one of the profit-maximizing conditions is required. Since there are N of them, the results would be specific to which one was used. The Brattle Report therefore uses three of them by selecting the unknowns to minimize the sum of squared errors across the profit-maximizing conditions for the three incumbents (Bell, Rogers, and Telus). The calibration of the Brattle Group is not standard, in the sense that it is usual to assume values for both the market elasticity and the parameter, controlling substitution between wireless service providers, and then resolve for each providers' marginal cost. See: G. Werden and L. Froeb, (1996), "Simulation as an Alternative to Structural Merger Policy in Differentiated Products Industries," in M Coate and A. Kleit, eds. *The Economics of the Antitrust Process*, Kluwer: Boston, 65-88, at p. 79.

¹²⁹ Brattle Group, *Canadian Wireless*, p. 73.

¹³⁰ Brattle Group, *Canadian Wireless*, p. 76.

The end result of the calibration is that all of the parameters required to solve for equations (2) through (4) for prices and quantities are known. These parameters are the marginal costs (c_j), the elasticity of market demand (ϵ), the substitution parameter (α), and the common value parameters (δ_j).

Entry Simulation by the Brattle Group

The final step in the three-step process to determine the effects of a fourth national entrant is to combine the calibrated logit model with the results of the event study. The gain in market value from Verizon not entering is converted into an equivalent expected annual loss in variable profits for each of Bell, Rogers, and Telus. The logit model is expanded by adding another provider. To add another provider requires two parameters: the common value of its consumption benefits and its marginal cost. The Brattle Group assumes that the additional provider's marginal cost is the average of all existing providers in that province.¹³¹

The common value parameter for the entrant is determined from all other existing parameters and the reduction in the variable profits of the three incumbents predicted by the event study. The variable profits for each of the three incumbents — Bell, Rogers, and Telus — can be written as a function of all the parameters of the model — determined by the calibration — and the unknown value parameter of the entrant. The reduction of variable profits of approximately eight per cent for each incumbent is assumed to be constant across all of the provinces. In each province, the predicted value of the variable profits is set equal to the variable profit function and solved for the unknown value parameter for the entrant.¹³²

Armed with the common value parameter and the marginal cost of the entrant, the Brattle Group can then determine the underlying equilibrium provincial prices and quantities for every carrier in a province. By comparing this equilibrium from the logit model to the pre-entry equilibrium, the Brattle Group is able to make predictions regarding the effect of the fourth national carrier on provincial prices, quantities (penetration), variable profits, and consumer welfare (consumer surplus). The key results highlighted by the Brattle Group and the Competition Bureau are the increase in consumer welfare, in particular the large increase in consumer surplus from expanding the choice set of consumers (79 per cent of the gain), as well as the increase in consumer surplus from a reduction in price of 1.7 per cent and an expansion of output (penetration) of three per cent.¹³³

¹³¹ Brattle Group, *Canadian Wireless*, p. 79.

¹³² Since there are three incumbents, this would give rise to three different values for each province. The Brattle Group therefore chooses the value parameter to minimize the sum of squared errors across these three equations for each province. See: Brattle Group, *Canadian Wireless*, p. 79, footnote 146.

¹³³ Brattle Group, *Canadian Wireless*, pp. 40, 42, and 81.

AN ASSESSMENT OF THE BRATTLE GROUP ESTIMATES OF THE EFFECT OF A NATIONAL ENTRANT IN WIRELESS

In this section, we assess the Brattle Report's estimates of the benefits of entry. The validity of the analysis depends on the applicability of the logit specification and the assumptions required for its implementation. The Brattle Report's conclusions with respect to the competitive benefits of a fourth national carrier are likely inaccurate and likely overestimate the benefits of entry. The limited value of the Brattle Report's analysis follows because of (i) the inherent inapplicability and biases of the specification used to model consumer preferences; (ii) the lack of foundation for the assumptions necessary to implement the model; and (iii) the failure of the calibrated model to match outcomes pre-entry. The lack of fit between the outcomes derived from the model and calibrated parameters with observed values pre-entry indicate that the concerns over the specification and assumptions in implementing the model are well-founded.

Logit Specification is Unreliable for a Basis to Assess Competitive Effects of an Entrant

The simple logit model, despite the claims of the Brattle Report,¹³⁴ is not particularly well suited for antitrust analysis in differentiated markets and if it is used, it is used because there is not a better alternative. The assumptions that the logit specification imposes on cross-price elasticities and patterns of substitution mean that it is not useful when product differentiation and patterns of substitution are likely to be asymmetrical (some products are better substitutes than others). The American Bar Association notes that it is "ideal for quick, preliminary analyses of potential price effects of mergers based on very little information"¹³⁵ and that it is useful to provide a "screen" comparable to market shares and changes in market shares in relevant markets.¹³⁶ Others are not so sanguine regarding its usefulness. For instance:¹³⁷

Most strikingly, substitution patterns do not depend on how good substitutes j and k really are, for example, whether they have similar product characteristics. Because of the inflexible and unrealistic structure that the MNL [multinomial logit] model imposes on preferences, they probably should never be used in merger simulation exercises or in any other exercise where the pattern of substitution plays a central role in informing decision makers about appropriate policy.

Our discussion of the logit model above explained the nature of the inappropriate restrictions it imposes on patterns of substitution by consumers and its tendency to overestimate the benefits of increased choice.

¹³⁴ Brattle Group, *Canadian Wireless*, p. 3 and pp. 33-34.

¹³⁵ ABA Section of Antitrust Law, (2005), *Econometrics* Chicago: ABA, p. 277.

¹³⁶ ABA Section of Antitrust Law, *Econometrics*, p. 286.

¹³⁷ P. Davis and E. Garces, (2010), *Quantitative Techniques for Competition and Antitrust Analysis*, at p. 482. See also: D. Gore, et al, (2013), *The Economic Assessment of Mergers under European Competition Law*, at pp. 216 and 524.

The event study used by the Brattle Group is based on entry by Verizon, a firm with product offerings, services, and prices in the U.S. that would appear to be similar to that of Bell, Rogers, and Telus. It does not seem sensible to have a model that predicts large gains from product differentiation from the offerings of the fourth entrant if that entrant is Verizon or Verizon-similar, yet that is what is assumed by the Brattle Group.¹³⁸ To realize the gains from product differentiation, as the Brattle Group itself observes, requires a different kind of entrant:¹³⁹

Alternatively, relatively low overall penetration, few prepaid services, and high usage suggest that the Canadian wireless market may lack sufficient product differentiation in comparison to other developed countries. The combination of lower penetration overall (particularly for prepaid services), higher ARPU, and higher smartphone usage suggests that wireless services in Canada are focused on higher end customers.

Postpaid and smartphone service plans are generally more expensive than prepaid and mobile phone service plans, respectively. In this case, the entry of an additional nationwide carrier may spur existing carriers to compete for a relatively unserved segment of the market by offering both lower prices and more actively promoting other types of service. As discussed below in Section IV.B, an additional nationwide carrier may act as a “maverick” and use a different pricing and service strategy from its competitors.

But it is very unlikely that Verizon or a Verizon-similar entrant would be a maverick or would be anticipated by the stock market to be a maverick. Our analysis demonstrates that the usual critique of wireless services in Canada — low penetration rates for prepaid services — is not likely the result of a lack of competition, but instead a function of existing competition for postpaid services and of the preferences of Canadians.¹⁴⁰ If Verizon’s offerings are similar to those of the existing incumbents (Bell, Telus and Rogers), it would appear that the logit model will significantly overvalue the value created for consumers by the expansion of the choice set. That is, the “red bus/blue bus” problem is likely to be an important consideration in why the Brattle analysis overestimates, perhaps significantly, the benefits of entry.¹⁴¹

The Brattle Report downplays the “red bus/blue bus” issue.¹⁴² The authors seem to imply that any overestimate of brand diversity benefits due to service offerings being close substitutes would be made up by increased price competition. However, while increased price competition would offset the loss in product diversity benefits calculated based on the logit model, the question not answered by the Brattle Report is the extent of the offset. The issue is not the direction, but the magnitude. Given the signs of a maturing market and the relative inelasticity of demand for wireless services, it seems doubtful that the overestimate of the contributions to total surplus from brand diversity could be offset to any significant extent by expansion in the adoption of wireless services.

¹³⁸ See also Commissioner of Competition, 2014-76 Responses to Interrogatories, Bureau (Bell Mobility), 9 Jun 14-13, 9 Jun 14-14, and 9 Jun 14-18.

¹³⁹ Brattle Group, *Canadian Wireless*, p. 13.

¹⁴⁰ Church and Wilkins, *Wireless Competition*, pp. 7-9.

¹⁴¹ Of course, the efficiency benefits of a low-priced maverick would be similar to those of the 2008 AWS entrants, considered in Church and Wilkins, *Wireless Competition*.

¹⁴² Brattle Group, *Canadian Wireless*, p. 44.

The assumption that the entrant's marginal cost will be equal to the average of the incumbents is also not innocuous: the brand value/common assessment of consumption benefit of the entrant is a function of its marginal cost. The larger the marginal cost assumed, the greater the implied brand value of the entrant must be for the variable profits of the three incumbents to be reduced by eight per cent. This of course means that the estimate of the value created by offering consumers another option will be larger.

Finally, Verizon, unlike other potential national entrants, does have brand awareness in Canada. Hence the event study calculation is not likely representative of a new entrant, but would likely overestimate the effect of a new entrant.

Assumptions to Implement the Logit Simulation Model

Two key inputs for the logit model are the prices and the elasticity of demand for wireless services. The logit model is intended to capture a discrete choice by consumers: not how much they consume, but what they consume. The Brattle Group assumes that ARPU is a price. In reality consumers choose a service provider and a plan from that service provider. The details of the plan selected by a subscriber includes the price for usage (price per minute or megabyte) and subscribers choose their usage: voice, text, and data consumption. The choice made by consumers is not discrete. As we explain in our earlier study, ARPU is not a price, but average revenue per subscriber.¹⁴³ It is a function of both prices and the quantity of services consumed.

The Brattle Group assumes elasticities across provinces differ based on the assumption that ARPU differences reflect different elasticities of demand because of differences in preferences.¹⁴⁴ It assumes that high ARPU must mean inelastic demand. As we explored in our earlier study, differences in ARPU between Quebec and Alberta are based on differences in data consumption and smartphone penetration. The difference in ARPU, we suspect, is *primarily not* explained by differences in preferences between Canadians in different provinces (as assumed by Brattle), but instead by differences in income and economic activity. There is no empirical support for the assumed range of elasticities (0.5 to 1.0) by the Brattle Group. The assumed values for the elasticity of demand are an important determinant of the benefits from increased competition. The greater the elasticity of demand, the greater the expected decrease in price and increase in penetration from a fourth national entrant.

The assumption that differences in ARPU are a result of differences in preferences is used by the Brattle Group to justify calculation of provincial ARPU. If it is not appropriate, then even assuming ARPUs are a price (which they are not), the provincial prices will be in error, with consequences for the accuracy of the calibration and simulation.

¹⁴³ Church and Wilkins, *Wireless Competition*, pp. 16-18.

¹⁴⁴ Brattle Group, *Canadian Wireless*, at p. 73 and p. 76.

Assessing the “Fit” of the Simulation Model

It is standard practice to assess the suitability and accuracy of a simulation model and the assumptions required for its implementation by comparing its derived values with observed values. The derived values can be of two sorts. The first are the model’s predictions of outcomes, such as prices, quantities, or profits, for the industry pre-entry. The model should be able to replicate observed outcomes for things it is intended to predict. The second are the parameters of the model derived in the calibration, such as marginal cost. The greater the difference between derived model values and observed values, the less confidence there should be in its ability to accurately predict the effect of an exogenous change — here entry by a fourth national carrier. The observed values are for 2012 unless otherwise indicated.

The suitability of the Brattle simulation exercise can be assessed by comparing observed values to implied values for marginal cost, variable profits, and market size. Table 4 compares the values available for these variables with those implied by the calibrated logit model used by Brattle:

- **Market Size.** Rows 1 to 4 show the population of each province and for Canada, the total subscribers observed (as estimated by the Brattle Group) for each province and Canada (which is the sum of the values for the ten provinces); the model’s derived value for the total market size; and the percentage difference between the population of the province and Canada and the estimated market size. The estimated market size is the total number of potential buyers of wireless service. It is the total number of consumers assumed to be choosing between the outside option and wireless service. The share of the outside option is one of the variables solved for in the calibration of the model. The market size is the number of estimated subscribers (Row 2) divided by the share of the outside option. This is Row 3.

The market size is larger than the population of every province except Quebec. It ranges from 21 per cent larger in Alberta to just under one per cent for New Brunswick. The expectation *ex ante* is that the total number of individuals in a province that might be a subscriber would be less than the population, because some would not be making the choice between the outside option and wireless service, for instance children below a certain age. If individuals’ have multiple accounts, however, the total market size could be larger than the population. This might be the case if enough individuals have a work and a personal phone.¹⁴⁵ An interesting aspect of Row 4 is the variation across provinces and whether the extent to which the market size exceeds the population should vary across provinces as much as the model suggests.

If actual outside shares are lower than estimated, which would be the case if the market size was closer to the population of a province, then the market elasticity for that province would be smaller. For instance, an estimate of the market size closer to the population would indicate an outside share equal to one minus the penetration rate for that province.¹⁴⁶

¹⁴⁵ This was certainly more prevalent in the past than it is today, likely contributing to the change in the fortunes of Blackberry.

¹⁴⁶ The market size would equal the population if the total number of individuals in a province that were choosing both work and personal services equaled the total number not able to choose wireless service.

In the case of Saskatchewan and Ontario this would imply outside shares of 21 per cent and 20 per cent.¹⁴⁷ This would indicate market elasticities of 0.52 and 0.55 instead of Brattle's assumed values of 0.74 and 0.77.¹⁴⁸ The greater the elasticity of demand, the greater the expected decrease in price and increase in penetration from a fourth national entrant. If the market elasticity assumed is too large, then the model will likely overestimate the expansion in output, reduction in price, and increase in consumer benefit, estimates that were already relatively small.

- **Marginal Costs.** Rows 5 through 13 show model marginal cost for each of Bell, Rogers, and Telus by province, Brattle's estimate of observed variable cost for Canada, a subscriber weighted average for Canada for each of Bell, Rogers, and Telus and the per cent difference. The weighted average for Canada can be compared to the financial estimate derived by the Brattle Group — but not used in the simulations. This value is 11.5 per cent higher for Bell, almost four per cent higher for Rogers, and close to three per cent for Telus.

The wide variability in estimates for marginal cost across carriers in a province and between provinces is a striking feature of Table 4, that certainly provides additional evidence that concern regarding the fit of the logit model is warranted. The logit model estimates of marginal cost vary considerably across carriers within a province. This is an indication that the logit-model preference parameters are not capturing the preferences of consumers: the variation in marginal costs estimated from the logit model arise in part because of the market share variations in the provinces. Bell's marginal cost in the Atlantic provinces (of which the extreme version is Newfoundland and Labrador) is likely not as significantly less than that of Rogers and Telus as what is implied by the logit model. Bell's marginal cost is \$9.36, Telus' \$31.03, and Rogers' \$35.75. Instead, the logit model calibration has likely underestimated brand preference in some provinces, and for the model to match Bell's market share, Bell must have a substantially smaller marginal cost than Rogers and Telus.

- **Variable Profits.** Rows 14 through 18, for Canada, show the aggregate variable profits for Bell, Rogers, and Telus, based on the derived values for the logit model pre-entry, actual variable profits from financial statements, an alternative based on Brattle's estimated profit margin and number of subscribers, as well as the per centage difference between either actual estimate and the estimate of the logit model. The two estimates for actual variable profits in 2012 are similar, but differ substantially from the value derived from the calibrated logit model. The difference is on the order of \$2 billion and approximately 23 per cent. This difference is obviously large and provides compelling evidence that the fit of the Brattle model is not strong.

¹⁴⁷ See: CRTC, Communications Monitoring Report 2013, Table 5.5.10, for provincial penetration values.

¹⁴⁸ See equation (4) above. The comparison holds constant the inside parameter governing substitution between wireless services (α).

Unfortunately, we do not have access to all of the equilibrium values of the calibrated logit model pre-entry. In particular, the Brattle Group has not provided either the ARPU values by carrier by province or the subscriber numbers of every carrier by province. It is thus not possible to understand why the model's predictions for variable profits are so much larger than actual or to use them to test for fit. In particular, comparing actual subscriber numbers to the subscriber numbers by carrier from the calibrated logit model might be very informative.

What can be determined is that some combination of the price and subscriber counts for Bell, Rogers, and Telus is responsible for more than two-thirds of the difference between actual variable profits and model variable profits. About 30 per cent of the aggregate profit difference is attributable to the difference in marginal costs. The only other two possibilities are a difference in quantity (subscribers) or price.¹⁴⁹

Moreover, it is the value of variable profits derived from the logit model — not actual variable profits — that the Brattle Report applies the implied loss in annual variable profits from the event study to determine the common consumer valuation. The inaccuracy of the variable profits in the calibration stage feed into the predictions for estimating the effects of the entrant. Despite this difficulty, it may be the case that a reduction of eight per cent on actual variable profits would result in parameters for the entrant which are not sensible and simulation outcomes that are similarly not plausible.¹⁵⁰

The values and comparisons in Table 4 show considerable discrepancy between the actual values and the values implied by the logit model pre-entry, confirming that as expected, the logit model and its implementation is not a very good representation of consumer preferences and competition in wireless services in Canada. Its inaccuracies pre-entry cast considerable doubt on its ability to accurately forecast the effect of a fourth national entrant.

¹⁴⁹ For instance, access to the ARPU by carrier by province numbers and the number of subscribers might allow some assessment on the validity of the assumption made by the Brattle Group to derive provincial ARPU by carrier. Recall that the Brattle Group in deriving carrier ARPUs by province assumes that the ratio of two carriers' ARPU by province is the same as the ratio nationally. The comparison of the logit model with actuals suggests this might not be the case. If the number of subscribers in the logit model is less than actuals then the variable profit difference — approximately \$2 billion higher in the logit model — must be attributable to a higher margin. While marginal costs are less in the calibrated logit model, the variable profit difference might be sufficient to suggest that the prices assumed to calibrate the logit model provincially are incorrect.

¹⁵⁰ The Brattle Group has not provided information on the common brand value for any of the providers, including the fourth entrant.

TABLE 4: BRATTLE GROUP'S IMPLIED MODEL VALUES VS. OBSERVED VALUES

		Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan	Canada
Population	[1]	3,923,160	4,558,597	1,254,320	756,560	527,619	944,403	13,457,345	145,250	8,107,419	1,094,350	34,769,023
Total Subscribers (Observed)	[2]	3,844,697	3,678,332	914,525	533,299	390,649	707,830	10,784,716	104,333	5,377,651	856,329	27,192,361
Market Size (Model)	[3]	4,746,540	4,904,443	1,288,063	761,856	574,484	996,944	14,978,772	149,047	7,793,697	1,223,327	37,417,172
Market Size vs. Population (% Difference)	[4]	21.0%	7.6%	2.7%	0.7%	8.9%	5.6%	11.3%	2.6%	-3.9%	11.8%	7.6%
Bell Marginal Cost (Model, \$)	[5]	32.32	33.43	31.58	21.08	9.36	21.23	29.86	21.87	29.17	29.44	28.66
Bell Marginal Cost (Observed, \$)	[6]	-	-	-	-	-	-	-	-	-	-	32.39
Bell Marginal Cost (% Difference)	[7]	-	-	-	-	-	-	-	-	-	-	-11.5%
Rogers Marginal Cost (Model, \$)	[8]	36.49	31.50	29.31	34.26	35.75	35.42	28.77	34.64	33.21	33.45	30.92
Rogers Marginal Cost (Observed, \$)	[9]	-	-	-	-	-	-	-	-	-	-	32.19
Rogers Marginal Cost (% Difference)	[10]	-	-	-	-	-	-	-	-	-	-	-3.9%
Telus Marginal Cost (Model, \$)	[11]	23.36	31.10	34.39	33.48	31.03	32.53	35.65	32.61	33.33	33.18	31.02
Telus Marginal Cost (Observed, \$)	[12]	-	-	-	-	-	-	-	-	-	-	31.91
Telus Marginal Cost (% Difference)	[13]	-	-	-	-	-	-	-	-	-	-	-2.8%
Big Three Variable Profit (Model, \$millions)	[14]	2,033.16	1,389.24	144.48	184.92	208.08	272.64	3,893.52	33.00	1,263.24	88.20	9,510.48
Big Three Variable Profit (Observed, \$millions)	[15]	-	-	-	-	-	-	-	-	-	-	7,636
Big Three Variable Profit (% Difference, Model/Observed)	[16]	-	-	-	-	-	-	-	-	-	-	24.5%
Big Three Variable Profit (Alternate, \$millions)	[17]	-	-	-	-	-	-	-	-	-	-	7,742
Big Three Variable Profit (% Difference, Model/Alternate)	[18]	-	-	-	-	-	-	-	-	-	-	22.8%

Sources: Source notes for Table 4 in Appendix A.

CO-ORDINATED EXERCISE OF MARKET POWER

The Competition Bureau also asserts that there is a risk of co-ordinated pricing in wireless services in Canada. That is, the Competition Bureau suggests that conditions in wireless service markets are such that the three large carriers *may* not only recognize the advantages of co-ordinating price increases, but also may be able to do so. The Competition Bureau asserts that “Canadian mobile wireless markets are characterized by other factors that, when combined with high concentration and very high barriers to entry and expansion, create a risk of co-ordinated interaction in these markets.”¹⁵¹ The Competition Bureau explains that the relevant factors include the availability of “information regarding prices, rival firms, and market conditions” and “the existence of joint ventures and industry organizations that *could* facilitate the communication and dissemination of information” (emphasis added).¹⁵² While it is well known that public information about prices *often* facilitates co-ordination, that symmetrical information regarding rivals and market conditions *can* make co-ordination easier, and that joint ventures and trade associations *might* facilitate co-ordination, the Competition Bureau’s statements without an analysis that they *do lead* to co-ordination in wireless services in Canada amounts to mere possibility, and does not provide a foundation for policy intervention.

There are a number of other characteristics that more convincingly suggest that co-ordination in wireless services is difficult. These include product differentiation, non-price competition, the presence of regional firms, asymmetrical capabilities to bundle, and market-share asymmetries.^{153,154}

The actual conduct of the three large wireless firms provides compelling evidence that co-ordination is not an issue. The extent of active rivalry between the three national incumbent wireless providers — reflected in investment levels, product innovation, pricing, and advertising — is clearly inconsistent with co-ordinated conduct.¹⁵⁵ The extent of this rivalry is reflected in Figure 1. It shows the share of incumbent net additions by incumbent (which includes both new wireless subscribers, as well as subscribers switching from other providers). The share of net additions for each of the three major carriers varies substantially over time. This is consistent with rivalry and not with the relatively stable shares that would be consistent with co-ordination. Figure 2 confirms the lack of relatively stable market shares. It shows the share, by incumbent, of the total number of incumbent subscribers.

¹⁵¹ Commissioner of Competition, CRTC 2013-685 Submission, para. 9, footnote omitted. Commissioner of Competition, CRTC 2014-76 Submission, para. 28.

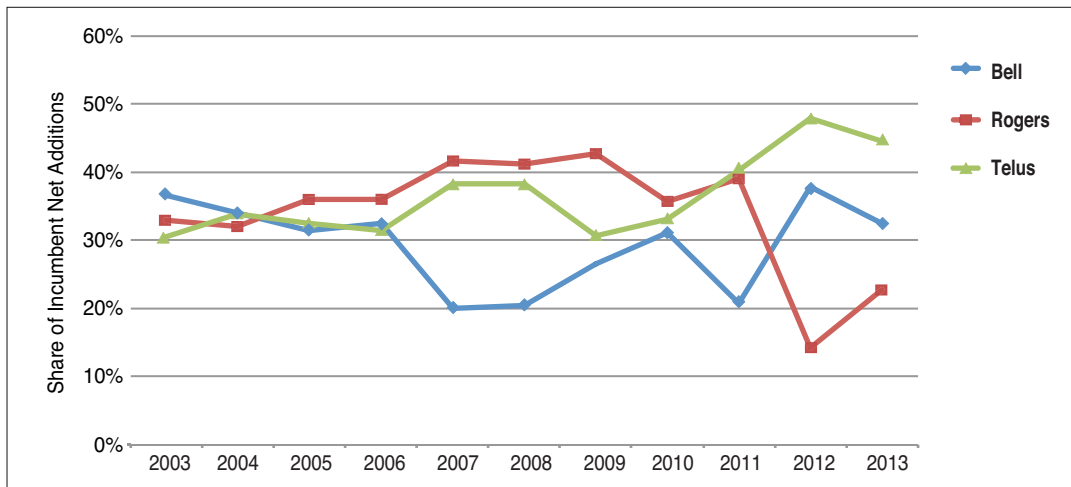
¹⁵² Commissioner of Competition, CRTC 2013-685 Submission, footnote 13. See also Commissioner of Competition, CRTC 2014-76 Submission, footnote 14.

¹⁵³ See: Church and Ware, *Industrial Organization*, Section 10.1.3 for factors that make agreement on co-ordination difficult, and Section 10.5 for factors that make sustaining co-ordination difficult.

¹⁵⁴ Wi-Fi connections may be a viable alternative to data consumption on networks using licenced spectrum. This is more likely the case for nomadic users, who need connectivity upon arriving at a variety of locations, rather than truly mobile users, who require connectivity while on the move. As pointed out by a referee, the presence of a strong substitute makes co-ordination difficult.

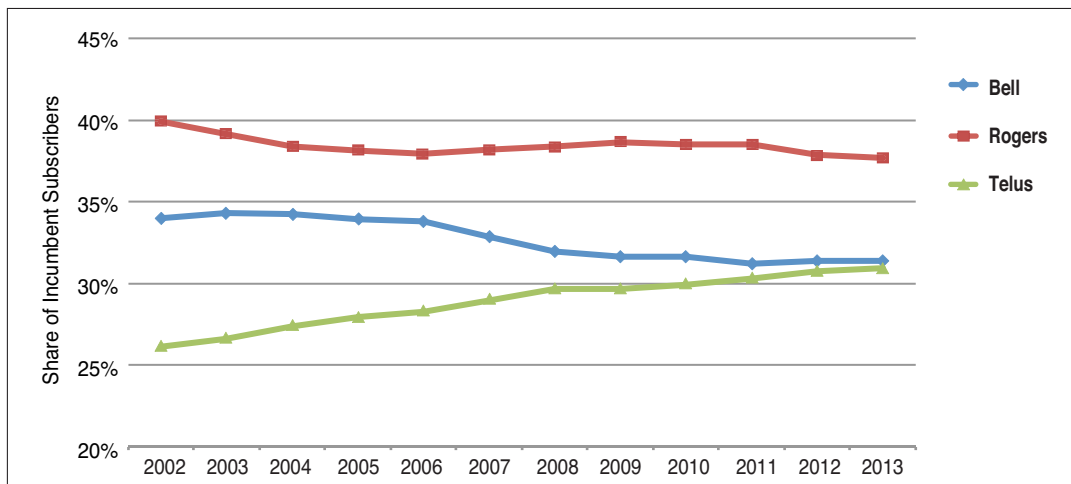
¹⁵⁵ Prices in competitive markets are typically the same and move together. The observation that firms have similar prices and that price changes are similar is consistent with competition, oligopoly, and co-ordination. To establish the co-ordinated exercise of market power — co-ordination — requires evidence on the level of prices. In particular it requires evidence that prices are higher than at the competitive level.

FIGURE 1: SHARE OF INCUMBENT NET SUBSCRIBER ADDITIONS BY INCUMBENT



Source: G. Campbell, "Global Wireless Matrix 2Q2014," Bank of America Merrill Lynch, 21 July 2014; and G. Campbell, "Global Wireless Matrix 4Q07," Merrill Lynch, 21 April 2008.

FIGURE 2: SHARE OF TOTAL INCUMBENT SUBSCRIBERS BY INCUMBENT



Source: G. Campbell, "Global Wireless Matrix 2Q2014," Bank of America Merrill Lynch, 21 July 2014 and G. Campbell, "Global Wireless Matrix 4Q07," Merrill Lynch, 21 April 2008.

Non-price rivalry between the three incumbent firms underscores the extent of competition and the absence of co-ordinated conduct. Canada has been a leader in HSPA+ and LTE rollouts and compares favourably to its international peers in terms of wireless investment, with a high level of capital intensity (the ratio of capital expenditures to revenues) and the highest level of capital expenditures per subscriber among its peers in 2012.¹⁵⁶ There is also considerable competition over customer service. In 2012-2013, Telus had a far smaller share of complaints to the Commissioner for Complaints for Telecommunications Services (CCTS) than did Bell or Rogers and, relative to 2011-2012, Telus' absolute number of complaints actually fell, whereas

¹⁵⁶ Church and Wilkins, *Wireless Competition*, pp. 18-19.

those for Bell and Rogers increased.¹⁵⁷ Canadian telecommunications companies also spend heavily on advertising: Rogers and Bell are two of the largest advertisers in the country.¹⁵⁸ Adjusting for operating revenues, Rogers and Bell's advertising expenditures appear to be relatively intensive compared to other sectors.¹⁵⁹ And, of course, the analysis of Rogers' profitability suggests the absence of both the unilateral and co-ordinated exercise of market power.

The evidence is consistent with the absence of substantial inefficient market power, whether unilateral or co-ordinated.

¹⁵⁷ Including sub-brands, Telus accounted for approximately eight per cent of total CCTS complaints, whereas Bell and Rogers accounted for 31 per cent and 35 per cent respectively over the period 2012-2013. The CCTS does not break out wireline versus wireless complaints by telecommunications service provider. However, for 2012-2013, approximately 60 per cent of all issues were related to wireless services. Assuming this ratio holds for complaints and is similar across the three incumbent carriers, the number of complaints per million wireless subscribers in 2012-2013 was 322.7 for Bell, 306.2 for Rogers, and only 83.8 for Telus. See: Commission for Complaints for Telecommunications Services, *CCTS Annual Report 2012-13*, p. 37 and pp. 44-50; and Commission for Complaints for Telecommunications Services, *CCTS Annual Report 2011-12*, pp. 40-45. Available online at <http://www.ctcs-cprst.ca/wp-content/uploads/pdfs/en/2012-2013/CCTS-Annual-Report-2012-2013.pdf> and <http://www.ctcs-cprst.ca/wp-content/uploads/pdfs/en/2011-2012/CCTS-Annual-Report-2011-2012.pdf>. For more on the strategic importance of customer service at Telus — and the scramble by Rogers and Bell to catch up — see: R. Trichur, "Why Canada's wireless industry may have finally shifted in the customer's favour" *The Globe and Mail* 5 February 2014, online at <http://www.theglobeandmail.com/report-on-business/why-canadas-wireless-industry-may-have-finally-shifted-in-the-customers-favour/article16721659/>.

¹⁵⁸ In 2012, Rogers Communications and Bell Canada were the second- and fourth-largest advertisers in Canada with advertising expenditures of \$145 million and \$90 million respectively. C. Powell, "GroupM Adjusts Expectations for Global, Canadian Ad Spending," *Marketing Magazine*, 14 August 2013. Available online at <http://www.marketingmag.ca/news/media-news/groupm-adjusts-expectations-for-global-canadian-ad-spending-85770>.

¹⁵⁹ For 2012, Bell and Rogers' advertising as a share of operating revenues is estimated at 0.79 per cent. See: Powell, "GroupM Adjusts" and BCE and Rogers' 2012 Company Annual Reports. The advertising sector represented 0.39 per cent of Canadian GDP. See: "Service bulletin: Advertising and Related Services 2012," Statistics Canada, online at <http://www.statcan.gc.ca/pub/63-257-x/63-257-x2014001-eng.htm>; and "Gross domestic product, expenditure-based," Statistics Canada, online at <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/econ04-eng.htm>. In 2012, three of the other top 10 advertisers in Canada were the Big Three domestic automobile manufacturers. The share of advertising in revenues for the automotive sector, based on GroupM's estimate of total automotive advertising of \$1.03 billion, and StatsCan's estimate of total retail sales for new motor vehicles of \$85.10 billion, is 1.21 per cent. See: Powell and Statistics Canada Retail Sales by Industry. Available online at <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/trad15a-eng.htm>.

CONCLUSION

The conclusions from our initial study continue to have broad applicability to prospective policy interventions that aim to create more competition by subsidizing entry. The key issue is whether the evidence supports a robust finding of a substantial inefficient market power. Without such a finding, there are no grounds for policy intervention. As an example, without evidence consistent with the exercise of inefficient market power in wireless services, the Competition Bureau's assertions that high roaming rates have raised the costs of entrants and resulted in a substantial lessening of competition are irrelevant. Similarly, the Competition Bureau's argument that new entrants would have been more successful but for the high roaming rates charged by incumbents, depends upon a finding of market power.¹⁶⁰

Moreover, using wholesale roaming rates as a mechanism to subsidize what would otherwise be unviable entry may have unintended consequences. If competition is artificially sustained, firms may find their margins squeezed such that they do not earn sufficient quasi-rents to recover their investments. As we argued in our analysis:¹⁶¹

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.

One wonders how long the federal government and its agencies will continue the failed policy of attempting to “enhance competition” in wireless markets beyond its natural limit and what the final cost to Canadians of an economically vacuous commitment to the proposition that competition is measured by the number of competitors.

¹⁶⁰ The Competition Bureau cites the Federal Court of Appeal ruling on *Canada (Commissioner of Competition) v. Canada Pipe Company Ltd.*, in support of its “but for” argument. See: “Telecom Notice of Consultation CRTC 2013-685, Wholesale mobile wireless roaming in Canada — Unjust discrimination/undue preference — Reply of the Commissioner of Competition,” February 10, 2014, Comments at footnote 22, <https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2073547>.

The Federal Court of Appeal found that a “but for” analysis was required to determine the effect of the alleged anti-competitive conduct on market power. But this is only sensible if the firm whose conduct is at issue has market power. In *Canada Pipe* the tribunal did find that *Canada Pipe* was dominant (i.e., had market power), a finding upheld on appeal by the Federal Court of Appeal. See: *Canada (Commissioner of Competition) v. Canada Pipe Company Ltd.*, 2006 FCA 233 at para. 59, <http://reports.fja.gc.ca/eng/2007/2006fca233.html>; and, more generally: *Canada (Commissioner of Competition) v. Canada Pipe Company Ltd.*, 2006 FCA 236, <http://decisions.fca-caf.gc.ca/fca-caf/decisions/en/item/32926/index.do>.

¹⁶¹ Church and Wilkins, *Wireless Competition*, p. 27.

APPENDIX A

Sources – Table 4:

[1]: Population values are from Brattle Group, Canadian Wireless, Table 12. Note that the Canada value is the sum of the values for the ten provinces.

[2]: Total observed subscriber values are from Brattle Group, Canadian Wireless, Table 13. Note that the Canada value is the sum of the ten provinces. It appears that the Brattle Group calculated these values by multiplying their population values by both the wireless penetration and wireless coverage rates from CRTC, Communications Monitoring Report 2013, Table 5.5.10. It is unclear why wireless coverage rates should be included in this calculation (as population multiplied simply by penetration rate yields the number of subscribers), however given the high wireless coverage rate in Canada, including this rate does not greatly impact the resulting subscriber value.

By multiplying these total observed subscriber values for each province with provincial firm share data (presented below) we calculate provincial observed subscriber values for Bell, Rogers and Telus. As above, the Canada total is the sum of the 10 provinces. The “Big Three” total is the sum of the Bell, Rogers and Telus values.

Provincial level subscriber shares for Bell, Rogers, and Telus (from Brattle Group, Canadian Wireless, Table 1):

	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
Bell Subscriber Share (%)	23	18	5	58	73	55	28	58	33	10
Rogers Subscriber Share (%)	24	39	33	19	2	16	44	15	29	9
Telus Subscriber Share (%)	50	40	9	23	25	29	20	27	28	10

Corresponding observed subscriber values for Bell, Rogers and Telus:

	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan	Canada
Bell Observed Subscribers	884,280	662,100	45,726	309,313	285,174	389,307	3,019,720	60,513	1,774,625	85,633	7,516,391
Rogers Observed Subscribers	922,727	1,434,549	301,793	101,327	7,813	113,253	4,745,275	15,650	1,559,519	77,070	9,278,976
Telus Observed Subscribers	1,922,349	1,471,333	82,307	122,659	97,662	205,271	2,156,943	28,170	1,505,742	85,633	7,678,069
Total “Big Three” Observed Subscribers	3,729,356	3,567,982	429,827	533,299	390,649	707,830	9,921,939	104,333	4,839,886	248,335	24,473,436

[3]: Model market size is calculated by dividing the observed number of subscribers in [2] by the inside market share, calculated below as 100 per cent less the outside market share, from Commissioner of Competition, CRTC 2014-76 Response to Interrogatories, Table Bell-Q28.

	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
Model Outside Share (%)	19	25	29	30	32	29	28	30	31	30
Model Inside Share (%)	81	75	71	70	68	71	72	70	69	70

The Canada value for model market size is calculated as the sum of the ten provinces.

[4]: $([3]-[1])\div[1]\times 100\%$

Model market size vs. population % difference is calculated by dividing the difference between the model market size and population by population.

[5], [8], and [11]: Provincial model marginal cost values for Bell, Rogers, and Telus from Commissioner of Competition, CRTC 2014-76 Response to Interrogatories, Table Bell-Q29. The Canada marginal cost values are calculated by weighting these provincial model marginal cost values using the respective firm subscriber values found in the source notes for [2].

[6], [9], and [12]: Observed marginal cost values (variable cost values) for Canada for Bell, Rogers, and Telus from Brattle Group, Canadian Wireless, Table B-1.

[7], [10], and [13]:

[7]: $([5]-[6])\div[6]\times 100\%$

[10]: $([8]-[9])\div[9]\times 100\%$

[13]: $([11]-[12])\div[12]\times 100\%$

Marginal cost % difference values for Bell, Rogers, and Telus are calculated by dividing the difference of the model marginal cost less the observed marginal cost for each firm by the observed marginal cost for each firm.

[14]: Big Three model variable profit values are from Brattle Group, Canadian Wireless, Table B-3.

[15]: $(\$2,115 \text{ million})+(\$3,063 \text{ million})+(\$2,458 \text{ million}) = \$7,636 \text{ million}$

Observed Big Three variable profit values are the sum of reported values (for 2012) from the Big Three annual reports. 2013 BCE Annual Report, p. 47 (wireless EBITDA=\$2,115 million). Available online at http://www.bce.ca/assets/investors/AR_2013/BCE_2013_Annual_Report.pdf. 2013 Rogers Annual Report, p. 39 (wireless adjusted operating profit=\$3,063 million). Available online at https://www.rogers.com/cms/investors/pdf/annual-reports/2013_Annual-Report.pdf. 2013 Telus Annual Report, p. 40 (wireless EBITDA=\$2,458 million). Available online at <http://about.telus.com/investors/annualreport2013/files/pdf/en/ar.pdf>.

[16]: $([14]-[15])/[15]\times 100\%$

Big Three variable profit (model/observed) % difference is calculated by dividing the difference of the model Big Three variable profit less the observed Big Three variable profit by the observed Big Three variable profit.

[17]: Alternative Big Three Variable Profits = $(\$23.66/\text{month}/\text{Bell subscriber})\times(12 \text{ months})\times(7,516,391 \text{ Bell subscribers})$
+ $(\$27.46/\text{month}/\text{Rogers subscriber})\times(12 \text{ months})\times(9,278,976 \text{ Rogers subscribers})$
+ $(\$27.68/\text{month}/\text{Telus subscriber})\times(12 \text{ months})\times(7,678,069 \text{ Telus subscribers})$
= \$7.742 million

Bell, Rogers and Telus variable profit values (in \$/month/subscriber) are from Brattle Group, Canadian Wireless, Table B-1.

Bell, Rogers and Telus subscriber values are the observed subscriber values calculated in the source notes for [2].

[18]: $([14]-[18])/[18]\times 100\%$

Big Three variable profit (model/alternate) % difference is calculated by dividing the difference of the model Big Three variable profit less the alternative Big Three variable profit by the alternative Big Three variable profit.

About the Authors

Jeffrey Church is a Professor in the Department of Economics and Director, Digital Economy Program, The School of Public Policy at the University of Calgary. The focus of his scholarship is on competition policy, regulation and network economics. He has acted as an expert on a wide range of regulatory and competition policy matters. Dr. Church has been extensively involved in the regulatory restructuring of telecommunications in Canada. He was a regular contributor to the Competition Bureau's submissions on unbundling and forbearance and has contributed to a number of recent telecom policy discussions in Canada, including foreign ownership, spectrum auction rules, usage based billing, and integration between channels and distribution. Besides the Competition Bureau, Dr. Church has been retained to provide expert evidence by Bell, Rogers, and Toronto Hydro on telecommunications and broadcasting matters. For more information see <http://econ.ucalgary.ca/profiles/jeffrey-church>.

Andrew Wilkins earned an MA in Economics from the University of Calgary in 2010, with a focus on competition issues. He has lectured on topics in industrial organization, and prior to joining The School of Public Policy, he worked as a Competition Law Officer at the Competition Bureau (Canada).

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