


Vertical Foreclosure in Canadian Wholesale Services Markets

Supplemental Filing

PREPARED FOR

Competition Bureau

Government of Canada

PREPARED BY

Kevin C. Hearle

Giulia C. McHenry

James D. Reitzes

Jeremy Verlinda

Coleman Bazelon

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The Competition Bureau of the Government of Canada has engaged The Brattle Group to evaluate the competitiveness of the Canadian wireless market to provide evidence in relation to the Canadian Radio-television and Telecommunications Commission's (CRTC's) review of wholesale mobile wireless services in Telecom Notice of Consultation CRTC 2014-76.

We each acknowledge that it is our duty to provide evidence in relation to this proceeding as follows:

- to provide opinion evidence that is fair, objective and non-partisan;
- to provide opinion evidence that is related only to matters that are within our area of expertise; and,
- to provide such additional assistance as the Commission may reasonably require, to determine a matter in issue.

We each acknowledge that the duty referred to above prevails over any obligation which we may owe to any party by whom or on whose behalf we are engaged.

We acknowledge the valuable contributions of many individuals to this report and to the underlying analysis, including Sarah Germain, Carrie Hopkins, and Ann Murray.

Finally, all results and any errors are our responsibility and do not necessarily represent the opinion of The Brattle Group, Inc. or its clients.



Kevin C. Hearle



Giulia C. McHenry



James D. Reitzes



Jeremy Verlinda



Coleman Bazelon

Dated August 18, 2014



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I. Introduction

1. In our original filing in this proceeding (“the Brattle Report”),¹ we examined the market performance of the Canadian wireless services “market.”² We found evidence that large, incumbent wireless carriers are earning above-normal returns on their investments, consistent with the notion that these carriers may possess substantial market power. We also found that significant consumer surplus benefits would likely accrue from the entry of an additional network carrier and that the benefits of such entry would exceed the costs borne by incumbent carriers in lost profits and higher network investment costs.
2. Our analysis in the Brattle Report was focused on the downstream retail market for wireless services. For this supplemental filing, we have been asked by the Canadian Competition Bureau to examine wholesale wireless services in Canada. Specifically, we have been asked to assess the potential for vertical foreclosure³ by large, incumbent, vertically integrated wireless service providers in order to inhibit new or existing small carriers from reaching the size and scope necessary to achieve the benefits described in the Brattle Report.
3. The hypothetical entrant firm in the Brattle Report was envisioned to be a rival facilities-based carrier (or mobile network operator, hereinafter “MNO”) similar in

¹ See Kevin C. Hearle, Giulia C. McHenry, James D. Reitzes, Jeremy Verlinda, and Coleman Bazelon, “Canadian Wireless Market Performance and the Potential Effect of an Additional Nationwide Carrier,” prepared for the Competition Bureau, Government of Canada, May 12, 2014.

² For purposes of this Supplemental Filing and the Brattle Report, we did not perform a formal product or geographic market analysis of either retail or wholesale mobile telephony services. Our use of the term “market” is not intended to convey a formal definition of the telecommunications market(s) in Canada.

³ For the purposes of this Supplemental Filing, we define vertical foreclosure as the ability of a vertically integrated firm to shift demand away from its downstream rivals’ products, either partially or in entirety (*i.e.*, full foreclosure). The vertically integrated firm may implement this by charging supra-competitive prices in the wholesale market or by restricting access to wholesale inputs in ways that distort downstream rivals’ quantity and quality options. Partial foreclosure occurs when the integrated firm successfully shifts some portion of demand away from the downstream rival. Full foreclosure occurs when the downstream rival is either prevented from entering or is *de facto* forced to exit the market.

network scope to Rogers, Bell, or TELUS. An entrant MNO must overcome the hurdle that retail wireless customers prefer broad geographic and continuous wireless coverage. Yet, for an MNO to support such a broad network facility requires a sufficiently large retail customer base to reach minimum efficient scale. One path to overcoming this hurdle is for new or regional retail service providers to partner with established wholesale network providers as they build out their customer base.

4. Consequently, vertical foreclosure (partial or full) is a potential concern in the Canadian wireless services market because, as we explain in detail below, vertically integrated MNOs have conflicting incentives when selling wholesale wireless services to firms that directly compete with their downstream wireless service offerings. Providing competitively priced wholesale wireless services to rival retail wireless service providers may decrease profits for the vertically integrated carrier's downstream affiliate, even as the wholesale arm of the MNO benefits from the sale of services to the wholesale customer.

5. The CRTC has recognized this potential in its ruling in the antecedent wholesale wireless services proceeding.⁴ In that ruling, the CRTC found that

...the rates that [Rogers] charged certain new entrants were significantly higher than the rates it charged many large U.S.-based mobile wireless carriers and other Canadian mobile wireless carriers, particularly with respect to wholesale mobile wireless data roaming services.⁵

6. Intervener filings in the current proceeding also support the concern that vertical foreclosure may be a practical problem for existing small carriers (*e.g.*, the Advanced Wireless Services (AWS) entrants like Wind, Mobilicity, and Eastlink) and mobile virtual network operators (*e.g.*, PC Mobile, Primus, and Talk & Save, hereinafter "MVNOs").⁶ For example, Wind has claimed that they were only able to obtain a

⁴ Telecom Decision CRTC 2014-398 (hereinafter "CRTC 2014-398"), available at: <http://www.crtc.gc.ca/eng/archive/2014/2014-398.htm>.

⁵ *Id.* at ¶29.

⁶ The largest MVNOs in Canada are actually operator-owned: Fido Solutions is owned by Rogers, Koodo is owned by TELUS, and Virgin Mobile Canada is owned by Bell. See

roaming agreement from Rogers, and that as such the agreement was only offered on a “take it or leave it basis,” with no ability to negotiate.⁷ Additionally, Eastlink has claimed that the incumbent firms are “incentivized to maintain their dominant position in the retail market by imposing unjust wholesale rates and terms.”⁸

7. The Canadian legislature has recently amended the *Telecommunications Act* to impose wholesale price caps that limit roaming charges to no higher than the average usage rates charged to the MNO’s retail customers.⁹ This price cap may provide meaningful protection against large, incumbent MNOs’ existing incentives to foreclose their smaller downstream rivals.
8. Nevertheless, there may be additional scope for regulatory scrutiny of and/or intervention in the wholesale wireless services market.¹⁰ As discussed below, implementing price caps does not remove, and may even amplify, the incentive and potential to employ non-price foreclosure mechanisms. The CRTC may ultimately wish to consider remedies that would limit the ability of MNOs to engage in non-price strategies that reduce downstream rivals’ quantities or skew such rivals’ quality offerings in ways that protect the MNO’s own market positions.
9. In the remainder of this report, we discuss several models of foreclosure and discuss how the institutional details of the Canadian wireless industry suggest that it could be prone

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<http://www.mvndynamics.com/mvno-companies/north-american-mvno-companies/canadian-mvno-companies/>.

⁷ See WIND Intervention in 2014-76, May 15, 2014 at ¶ 64, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=215494&Lang=e>

Wind also states that the resulting terms and conditions “were a clear reflection of Rogers exercising its enormous market power.” *Id.* at ¶ 67.

⁸ See Eastlink Intervention in 2014-76, May 15, 2014 at ¶ 19, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=215491&Lang=e>

⁹ A description of the legislative act (hereinafter “Budget 2014”) is described in CRTC 2014-398.

¹⁰ The CRTC has also recently ruled that “...carriers are prohibited from applying exclusivity provisions in wholesale roaming agreements with other Canadian mobile wireless carriers.” See CRTC 2014-398 at ¶39.

to both price and non-price methods of foreclosure. We explore several mechanisms that large, vertically integrated incumbent wireless carriers could potentially use to foreclose (either partially or fully) their downstream rivals, even in the presence of multiple vertically integrated MNOs competing to provide wholesale input services. Finally, we conclude with a brief discussion of potential remedies that could be employed, in addition to the existing price cap regulation, to alleviate concerns of further potential acts of foreclosure.

II. Incentives for Vertical Foreclosure in the Canadian Wireless Industry

10. As discussed below, a vertically integrated firm may have a theoretical incentive to raise its downstream rivals' costs, or otherwise reduce the quality of its rivals' products, if it has the opportunity. We quantify this incentive in the Canadian wireless services market using the entry results from the logit modeling in the Brattle Report. We then discuss how recent Canadian regulatory restrictions that ostensibly limit the available mechanisms of vertical foreclosure nonetheless will not remove the vertically integrated firm's incentive to foreclose downstream rivals.

A. FORECLOSURE INCENTIVES OF LARGE CANADIAN MNOs

11. A vertically integrated supplier of an essential input may have an incentive to foreclose, either partially or fully, its rivals from the downstream market.¹¹ One mechanism for such foreclosure is to raise the wholesale (input) prices faced by downstream rivals. Alternatively, vertically integrated carriers may employ non-price mechanisms of foreclosure, including contractual quantity restrictions and limiting input access in ways that restrict the quality offerings of rivals' downstream products.¹²

¹¹ See Patrick Rey and Jean Tirole, "A Primer on Foreclosure," in Mark Armstrong and Robert Porter (eds.), *Handbook of Industrial Organization Volume 3* (2007), p 2148 (hereinafter "Rey and Tirole").

¹² Quality restrictions can be either low or high-quality restrictions that benefit the vertically integrated firm by preserving market power in its own segment niche. In the case of wireless services, throttling and queuing provisions are quantity restrictions on the downstream rival that may also reduce the quality of the rival's product.

12. Such foreclosure can be an effective strategy for preserving or increasing market power in the downstream market in order to maximize the total profits of the vertically integrated firm. This is especially true if a significant proportion of the lost sales to the downstream rival are captured by the vertically integrated supplier's downstream affiliate.
13. In this section, we first focus on price mechanisms to foreclose downstream rivals.¹³ Next, we consider non-price mechanisms of foreclosure that may already exist or arise in light of recently imposed regulatory restrictions on the pricing of wholesale wireless services in Canada.¹⁴

B. QUANTIFYING FORECLOSURE INCENTIVES WITH NO REGULATORY PRICE CAPS

14. In horizontal mergers where a larger brand acquires a smaller rival, in the absence of compensating marginal cost reductions, price increases would be expected for the acquired brand.¹⁵ This happens because the acquiring brand will tend to receive a large share of any sales lost by the acquired (smaller) brand when its price is raised.¹⁶ If the markup earned by the acquiring brand on these recaptured sales is significant, the lost profits for the smaller acquired brand that result from its price increase are more than made up for by the acquiring brand's recapture, and so the price increase is profitable.

¹³ Our focus on price mechanisms is partially due to the claims made by AWS entrants in the present proceeding regarding the high cost of roaming fees. It also simplifies the discussion of incentives to foreclose within the familiar frameworks of upwards pricing pressure and raising rivals costs.

¹⁴ This is not to imply that such mechanisms arise only when price restrictions are in place. For example, CRTC Ruling 2014-398 also prohibits exclusive contract provisions in roaming agreements, which are alleged to have contributed to entrant and MVNO foreclosure in retail wireless markets even as these carriers faced allegedly high roaming costs.

¹⁵ See Gregory J. Werden and Luke M Froeb, "Unilateral Competitive Effects of Horizontal Mergers," *Handbook of Antitrust Economics* (2008), p 51.

¹⁶ This assumes that the two brands are not perceived to be much closer substitutes than any third party brands. In general, mergers are considered to be a problem the closer substitutes are the merging brands. See, for example, Canadian Competition Bureau Merger Enforcement Guidelines, October 6, 2011, available at:

<http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/03420.html>.

15. A similar phenomenon exists when firms are vertically integrated. A dominant brand in the market will tend to receive a large share of any lost sales that occur when a smaller rival raises its price.¹⁷ If the dominant brand is also the wholesale provider of inputs used by the smaller brand and it enjoys significant margins on its own downstream sales, then it will have an incentive to raise wholesale prices to the downstream rival in order to raise the downstream rival's retail price.¹⁸
16. This raising rivals' costs upward pricing pressure ("RRC-UPP") is a measure of the incentive the dominant firm has to raise input prices on its downstream rivals. The RRC-UPP is equal to the rate of diversion¹⁹ from the downstream rival to the input provider, multiplied by the wholesale provider's markup²⁰ on downstream (retail) sales.²¹
17. In the Canadian wireless market, the RRC-UPP of a large incumbent MNO (*e.g.*, Rogers, Bell, or TELUS) is determined by its markup on retail wireless services and the extent to which it captures diverted sales from its downstream rivals. The diverted sales are determined by the quantity of retail wireless service customers that divert to the MNO's

¹⁷ This assumes that the larger brand is not a distant substitute to the small brand. If the small brand is serving primarily a niche segment, then it may be plausible that a large share of lost sales exit the market after a price increase by the small brand.

¹⁸ The desired increase in wholesale price is in addition to the markup that would be imposed by a wholesale input provider that is not vertically integrated into the downstream market. As in horizontal acquisitions, one would predict no wholesale price increase if a marginal cost reduction that lowered the cost of providing the wholesale input was sufficient to compensate for the upward pricing pressure resulting from vertical integration.

¹⁹ In general terms, the diversion ratio from Firm A (the downstream rival) to Firm B (the vertically integrated MNO) is equal to the proportion of the sales lost by Firm A, as a result of a small price increase, that are captured by Firm B. In this case, the diversion ratio is equal to the proportion of the sales lost after a price increase by the downstream rival that are captured by the integrated wholesale supplier.

²⁰ We define the term markup to mean the difference between price and marginal cost. This is distinct from a firm's margin, which is the markup divided by price.

²¹ The analysis here is a direct analogy of the concept of upward pricing pressure in horizontal mergers as described in Joseph Farrell and Carl Shapiro "Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition," *The B.E. Journal of Theoretical Economics* 10(1), 2010.

own retail wireless service following a retail price increase by the downstream rival that is also its wholesale wireless services customer.²²

18. In the Brattle Report, we presented a logit model to estimate the consumer welfare and lost profits to the incumbent wireless carriers from the introduction of a fourth large Canadian wireless carrier.²³ Diversion ratios can be calculated from this model to estimate the existing carriers' incentives to increase the retail prices of its downstream rivals through wholesale service prices.²⁴

19. To the extent, however, that there is ongoing foreclosure in the Canadian wireless industry, the observed market shares for the Canadian AWS entrants today would understate their potential market shares in the absence of foreclosure.²⁵ To resolve this potential problem, we rely on the predicted shares for the hypothetical new entrant and incumbent firm markups as described in the Brattle Report. Table 1 presents diversion ratios based on inputs from the Brattle Report's logit model.²⁶

²² In this context, the wholesale wireless services customer could be an MVNO or another MNO, such as a regional carrier or other facilities-based entrant seeking broader network coverage through the purchase of roaming services.

²³ See the Brattle Report, section IV.B.

²⁴ The diversion ratio in a logit model depends on shares for each firm. Supplemental Report Appendix A, Table 4 contains detailed shared information for this calculation.

²⁵ This is a classic example of the *cellophane fallacy*, where the decision by the U.S. Supreme Court in *du Pont* was widely criticized for concluding that a high elasticity for cellophane plastic wrap implied a broad market definition. The court failed to consider that the reason for the high elasticity was that du Pont was setting such a high price that consumers were considering alternative wrapping products, evidence that was indicative of du Pont's market power. Antitrust practitioners generally recognize that it is incorrect to use a world with the anticompetitive practice in place as a competitive benchmark. See *United States v. E.I. du Pont de Nemours & Co.*, 351 U.S. 377 (1956); Massimo Motta, *Competition Policy: Theory and Practice* (2004), p 105.

²⁶ Diversion in the logit model is proportional to share. The predicted share captured by brand A for a small price increase by brand B is equal to $s_A/(1 - s_B)$. See, for example, Robert Willig "Merger Analysis, Industrial Organization Theory, and Merger Guidelines," *Brookings Papers on Economic Activity: Microeconomics* pp 281 - 332 (1991). In the Brattle Report there is also an outside good, so some of the entrant's lost sales will exit the market in proportion to the size of the outside good share.

Table 1: Diversion from Entrant to Incumbent Carriers

Province	Rogers	Bell	TELUS	Regional
Alberta	19%	18%	40%	
British Columbia	29%	13%	29%	
Manitoba	22%	3%	6%	37%
New Brunswick	12%	39%	15%	
Newfoundland and Labrador	1%	48%	16%	
Nova Scotia	11%	38%	20%	
Ontario	31%	20%	14%	1%
Prince Edward Island	10%	39%	18%	
Quebec	19%	22%	19%	
Saskatchewan	6%	7%	7%	49%

Source: Calibrated Values from the Logit Model

20. All else equal, diversion from the entrant varies across the provinces depending on the relative market shares predicted in the Brattle Report’s post-entry results. In markets where a particular carrier has a dominant presence, such as TELUS in Alberta, Bell in Newfoundland and Labrador, or SaskTel in Saskatchewan, the results are significant. The predicted share of sales captured by the dominant carrier from a small price increase by the entrant equals or exceeds 40% of the entrant’s lost sales in each of these Provinces. For relatively small carriers in each province, the amount of lost sales captured by the incumbent carrier is correspondingly small.
21. In most instances, the firm with the greatest capture rate (*i.e.*, the wireless carrier that captures the most customers as a result of a price increase by a rival carrier) also has the largest wireless network in the Province. Meanwhile the firms with the smallest capture rates generally have minimal cellular sites installed in the region. Consequently, the best roaming partners from a technical perspective are also likely to be those with the highest diversion percentages.²⁷

²⁷ For example, in Newfoundland and Labrador, Bell is predicted to capture 48% of sales, and Bell owns 47 cell sites, as opposed to only 5 Rogers sites and no TELUS sites. See Table C-2 of the Brattle Report.

22. In fact, it is likely that the firms with lower recapture rates do not have the facilities to offer reasonable wholesale wireless service. For instance, in many parts of Alberta Bell likely relies on TELUS for its wireless service, while TELUS relies on Bell for service in Newfoundland and Labrador.
23. The incentive to raise a rival's cost depends also on the incumbent carrier's retail service markup, which we also calculated in the original Brattle Report.²⁸ We can multiply these markups by the above diversion percentages to estimate the RRC-UPP. Table 2 shows these RRC-UPP values for each carrier if it were able to provide wholesale wireless services in the corresponding province.
24. The RRC-UPP measures the total value to the incumbent of all of the lost entrant subscribers. For example, suppose that in British Columbia a small price increase by the entrant would lead to 100 lost subscribers. Rogers is predicted to capture 29 of those lost subscribers and would earn a markup on each of the captured subscribers of \$33.²⁹ The expected value to Rogers of each of the entrant's lost subscribers is $\$33 \times 0.29 = \10 .

²⁸ See Supplemental Report Appendix A, Table 6 for a list of post-entry markups by incumbent carrier.

²⁹ See Supplemental Report Appendix A, Table 6.

Table 2: Value of RRC-UPP Incentive by Incumbent Carrier
\$/month per entrant subscriber lost

Province	Rogers [1]	Bell [2]	TELUS [3]	Regional [4]	Share-Wtd Average [5]
Alberta	\$7.27	\$6.89	\$20.82		\$14.27
British Columbia	\$9.54	\$3.57	\$9.90		\$8.60
Manitoba	\$6.65	\$0.79	\$1.47	\$13.18	\$9.41
New Brunswick	\$2.88	\$12.96	\$3.61		\$8.97
Newfoundland and Labrador	\$0.33	\$23.73	\$4.92		\$18.74
Nova Scotia	\$2.76	\$13.62	\$5.62		\$9.58
Ontario	\$11.15	\$6.01	\$3.99	\$0.17	\$7.97
Prince Edward Island	\$2.00	\$11.77	\$3.99		\$8.27
Quebec	\$4.18	\$4.94	\$4.00		\$4.40
Saskatchewan	\$1.76	\$1.97	\$1.97	\$26.36	\$19.50
Canada	\$8.93	\$6.99	\$9.40	\$18.80	\$8.98

Source: Calibrated Values from the Logit Model

Notes:

[1]-[4]: Markup x Diversion Ratio

[5]: Average of [1]-[4] weighted by inside-good share.

* Canada summary is a weighted average over provinces by post-entry subscribers.

25. The cost to the MNO of implementing an increase in the entrant's costs, if it is the provider of wholesale roaming services to the entrant, is the existing markup per rival's subscriber on wholesale services multiplied by the rival's lost subscribers.³⁰ The optimal markup for wholesale service fees is therefore the value that makes the MNO indifferent between the wholesale profits it would receive if it does not further raise its rival's wholesale input costs versus the additional retail customers it could capture if it does. If the rival's cost pass through is one-to-one, then this markup would be equal to the RRC-UPP calculated in Table 3.³¹ For example, the optimal wholesale markup per subscriber would be approximately \$10 for Rogers in British Columbia.³²

³⁰ This is net of gains on remaining subscribers from the higher wholesale markup.

³¹ For example, WIND has had to pass high roaming costs on to customers (see WIND Intervention in 2013-685, January 29, 2014, at ¶¶ E6 and 55). In addition, pass-through need not be direct to lead to

26. On average, across all of Canada, we find a RRC-UPP of almost \$9 per subscriber.³³ In order to place that value in perspective, we compare the RRC-UPP values in each province to the entrant carrier's marginal costs. In the original Brattle Report, we assumed that an entrant's marginal costs would be equal to the average of the three large vertically integrated incumbents' marginal costs in each province.³⁴ If it were the case that the entrant was serving the province as an MVNO with no network facilities, this assumption would be approximately equivalent to assuming that the MNOs in that province sell roaming services at their own marginal costs.³⁵
27. Assuming one-to-one pass through of costs, the RRC-UPP approximates the markup that an incumbent carrier would prefer to charge on roaming services to the entrant carrier. Table 3 below describes the increase in the entrant's marginal costs from imposition of the predicted roaming markup.

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subscriber losses that would be recaptured by the vertically integrated MNO. For example, Eastlink reports that it has attempted to minimize its roaming costs by restricting LTE access to its subscribers when they roam. This degradation of quality drives away potential Eastlink subscribers, a share of which end up at Eastlink's roaming services provider. See Eastlink intervention in 2013-685, January 29, 2014, at ¶ 32.

³² It is helpful to recall here that UPP is a first-order approximation of the effects of integration (vertical or horizontal). In practice, other carriers may alter their retail and wholesale prices in response, such that the equilibrium price change (from integration) will differ somewhat from the UPP prediction.

³³ This overall average includes the regional carriers, which have a dominant position, and the broadest network coverage, in Manitoba and Saskatchewan. Exclusion of the regional carriers reduces the overall average to \$8.49.

³⁴ See Supplemental Report Appendix A, Table 5 for a list of marginal costs by carrier in each province.

³⁵ The marginal cost includes handset subsidies levelized over the expected lifetime of the subscriber. Our assumption about the entrant's marginal costs also implies that the entrant bears similar handset subsidy costs to the incumbent carriers.

Table 3: Increase in Entrant Marginal Cost from Preferred Roaming Markups

Province	Rogers	Bell	TELUS	Regional	Share-Wtd Average
Alberta	24%	22%	68%		46%
British Columbia	30%	11%	31%		27%
Manitoba	21%	2%	5%	41%	30%
New Brunswick	10%	44%	12%		30%
Newfoundland and Labrador	1%	93%	19%		74%
Nova Scotia	9%	46%	19%		32%
Ontario	35%	19%	13%	1%	25%
Prince Edward Island	7%	40%	13%		28%
Quebec	13%	15%	13%		14%
Saskatchewan	5%	6%	6%	82%	61%
Canada	28%	22%	30%	60%	29%

Source: Calibrated Values from the Logit Model

* All values equal to RRC-UPP divided by corresponding Marginal Cost

28. For example, TELUS' RRC-UPP, or preferred wholesale markup, would increase entrant marginal costs by about 68% in Alberta. In New Brunswick, Bell's preferred roaming markup would increase entrant marginal costs by 44%. Across Canada overall, we would expect the entrant's costs to increase by approximately 29% as a result of incumbent's incentives to raise wholesale wireless service rates. Whether the incumbent carriers would be able to achieve wholesale roaming markups at these levels depends on the competitive structure of the wholesale market. We discuss the effects on the MNOs' *ability* to raise wholesale services costs of the wholesale market's competitive structure in Section III.

C. VERTICAL FORECLOSURE WITH PRICE CAPS

29. Budget 2014 of the Canadian legislature amended the *Telecommunications Act* to include a provision restricting the pricing of wholesale wireless services between Canadian carriers. Section 27.1 of the act now limits roaming charges to be no higher than the average retail usage fees charged by the selling carrier to its own retail

customers.³⁶ This pricing restriction appears to be in response to claims by the AWS entrants and MVNOs that they were paying excessively high roaming fees in their contracts with Canadian MNOs.³⁷ With carriers such as Eastlink and WIND claiming to have faced roaming fees that are many times higher than retail rates,³⁸ we expect Budget 2014 to be a binding constraint for Canadian MNOs' preferred roaming markups.

30. When the integrated wholesale supplier can no longer optimally set price to foreclose its rival, it is liable to choose an optimal level of quality for its wholesale service so as to divert market share from its rival and maximize its own profits. Lower quality can be achieved through either discriminatory means or potentially through sabotage of network quality.³⁹

31. As indicated by the intervener filings in the present CRTC proceeding, large integrated carriers already appear to be implementing several potential non-price and quality reducing mechanisms for foreclosure. For instance, interveners complain that their wholesale service providers refused to offer seamless roaming and enforced exclusivity

³⁶ Specifically, subsections (1)-(3) limit voice, data, and text messages respectively, where the cap is equal to total retail revenues for each service divided by the number of minutes/megabytes/messages during the preceding year. Subsection (4) further limits roaming service fees to disallow any non-usage charges, such as a fixed fee. See CRTC 2014-398, Footnote 8.

³⁷ MVNOs may be facing particularly strict terms leading to nearly full foreclosure. Lycamobile claims in its filing that

MVNOs have simply been unable to obtain wholesale access to national networks and spectrum on reasonable and competitive terms. Either the cost of access is exorbitant or access comes attached with burdensome restrictions and requirements.

See Lycamobile Intervention in 2014-76, May 15, 2014 at ¶ 32, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=215465&Lang=e>.

³⁸ See Eastlink Intervention in 2014-76, May 15, 2014, at ¶ 24; Eastlink Intervention in 2013-685, January 29, 2014, at ¶ 10, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=212279&Lang=e>;

WIND Intervention in 2013-685, January 29, 2014, at ¶ ES4, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=212270&Lang=e>

³⁹ See, for example, Nicholas Economides, "The Incentive for Non-Price Discrimination by an Input Monopolist," *International Journal of Industrial Organization*, 16, 1998; Alvaro E. Bustos and Alexander Galetovic, "Vertical Integration and Sabotage with a Regulated Bottleneck Monopoly," *The B.E. Journal of Economic Analysis and Policy*, 9(1), 2009.

restrictions in their contracts, which may limit the carrier's network breadth in a given region.⁴⁰ Discriminatory strategies could also take the form of refusals to socialize joint network expansion project costs in instances when both carriers stand to benefit from the combined network.

32. Moreover, in the presence of the Budget 2014 price caps, wholesale providers may develop additional non-price foreclosure strategies.

III. Potential for Vertical Foreclosure in Canadian Wireless Industry

33. Having discussed above the incentive for a vertically integrated carrier to foreclose, we now present possible mechanisms through which a vertically integrated wireless carrier could have the ability to foreclose (partially or fully) on downstream rival carriers in the Canadian wireless industry. Such foreclosure could occur either through raising prices for wholesale services or reducing the quality of rivals' wholesale service, so as to shift demand away from its downstream rivals' retail services. In each case, we discuss the circumstances that are likely to result in increased wholesale prices, particularly in the wireless industry, and how one might identify whether these circumstances exist.
34. One possible mechanism for foreclosure is the standard "raising rivals' costs" story associated with the supply of an input by a vertically integrated monopolist. The presence of an upstream monopoly, however, is not a necessary condition for the raising rivals' cost strategy to result in downstream foreclosure. When there is either product differentiation between upstream suppliers or asymmetric information regarding price, vertically integrated firms might have the incentive to negotiate wholesale prices to downstream rivals that are higher than their marginal cost. Multiple vertically integrated firms may also have the incentive to coordinate their wholesale pricing in order to foreclose additional downstream rivals.

⁴⁰ On seamless roaming, see WIND Intervention in 2014-76, May 15, 2014, at ¶ 99. On exclusive terms, see Videotron Intervention in 2013-685, January 29, 2014, at ¶ 47, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=212257&Lang=e>

35. Consumers of wholesale wireless services, including smaller MNOs and MVNOs, may be forced to accept prices for wholesale wireless services that are substantially above marginal cost, even when there are multiple providers of such services. Even when wholesale service providers compete directly with each other, they may have both the incentive and ability to foreclose on downstream competitors. This ability is likely to occur particularly in the presence of switching costs between suppliers, variability in network quality offerings (notably coverage), and information uncertainty regarding rival network costs and the valuation of different suppliers' service offerings by customers. Coordination in wholesale pricing among roaming service providers is not required for foreclosure, but it may further improve the ability to foreclose smaller rivals from the retail market.

A. VERTICALLY INTEGRATED MNOs AND THE POTENTIAL TO FORECLOSE DOWNSTREAM RIVALS

36. The standard economic model of foreclosure and raising rivals' costs assumes that a dominant firm controls access to an essential input.⁴¹ This is recognized also in submissions filed by the carriers. According to Margaret Sanderson in her filing on behalf of Bell, a "fundamental condition" for raising the cost of inputs to rivals is that:

"... rivals cannot effectively substitute away from the essential input when its price increases if they are to continue to provide the same level of services to downstream customers. Rivals are either forced to continue to purchase the essential input at much higher prices, or they must cede share to the dominant firm in the downstream market if they reduce their consumption of the essential input."⁴²

37. Evidence from the current and previous proceedings suggests that there are geographic areas in Canada where small wireless carriers and MVNOs have only one effective

⁴¹ See *supra* note 11.

Under certain conditions, multiple input suppliers may compete input prices down to marginal cost. In this report, we assume that fixed-fee competition is inappropriate in Canadian wholesale wireless services markets, as usage fees are evidently commonplace. Tower sharing agreements do appear to exhibit fixed monthly or annual fees, but such arrangements are not the focus of this report.

⁴² See Margaret Sanderson, "Wireless Retail and Wholesale Services in Canada Assessing the State of Competition," prepared for Bell Mobility, May 14, 2014, pp 6 - 7.

roaming service provider. In these cases vertically integrated wholesale service providers appear to have strong incentives to use price and non-price mechanisms to raise rivals' costs and sabotage the quality of rivals' retail wireless service.

38. In their CRTC filings, Eastlink and WIND have argued that since the completion of the AWS auction,⁴³ Rogers has been the only potential roaming services provider offering a compatible network.⁴⁴ Though redacted in specificity, it is clear from the filings⁴⁵ and a recent CRTC ruling⁴⁶ that Rogers charged excessive fees in its roaming services agreements with Eastlink and WIND. Rogers' fees were apparently many times greater than the fees paid by Rogers' own retail customers for equivalent services. By increasing their marginal cost, these higher wholesale input prices may have forced Eastlink, WIND and other small wireless providers to increase their base retail service fees to customers. In some cases, small wireless providers claim that high rates have led them to throttle their offerings of data services for their customers while roaming.⁴⁷

39. Vertically integrated wholesale suppliers have also apparently used non-price mechanisms for reducing the quality of their downstream rivals. For instance, Eastlink claims that Rogers and Bell have prevented seamless roaming for Eastlink customers on

⁴³ The AWS auction was completed on July 21, 2008. Eastlink (d.b.a. Bragg Communications Inc.) successfully acquired AWS spectrum in Ontario, Atlantic Canada, and Grande Prairie (Alberta), while Globalive Wireless LP (d.b.a. WIND Mobile) picked up spectrum in Quebec, Ontario, Alberta, British Columbia, PEI, Nova Scotia, Newfoundland and Labrador, and the North.

⁴⁴ Evidently this is largely a technological hurdle resulting from legacy handsets using different 2G technologies. The Bell and TELUS networks were CDMA-based, while the Rogers network was GSM-based. WIND claims to have needed access to a GSM-based network for roaming services that would be compatible with their legacy handsets, and Eastlink also has a GSM contract with Rogers. This issue may be resolving with newer handsets, decreased reliance on 2G networks and increased reliance on LTE. It is not clear in the intervener filings the extent to which Bell and TELUS are now able to provide competitive wholesale roaming services compared to Rogers. See WIND Intervention in 2014-76, May 15, 2014, at ¶ 68; Eastlink's response in 2014-76, Bragg (Rogers) 9Jun2014-7, p 22.

⁴⁵ See Wind Intervention in 2014-76, May 15, 2014, at ¶ 54; Eastlink Intervention in 2014-76, May 15, 2014, at ¶ 19 -20.

⁴⁶ See CRTC 2014-398.

⁴⁷ For example, Eastlink does not offer LTE roaming to its customers due to high wholesale rates. See Eastlink intervention in 2013-685, January 29, 2014, at ¶ 32.

and off of its network, reducing the quality of roaming for its customers.⁴⁸ Rogers has also imposed exclusivity restrictions in its contracts, preventing its roaming partners from entering into any other wholesale agreements.⁴⁹ Such exclusivity restrictions may hinder small carriers and MVNOs from filling out their network coverage in areas where multiple roaming partners would be required.

B. BIDDING BEHAVIOR WITH IMPERFECT INFORMATION

40. Competition among two or more upstream suppliers⁵⁰ to offer wholesale wireless services to a downstream rival provides no guarantee that input prices and service quality will be offered on competitive terms. Wholesale suppliers' *incentives* to foreclose downstream rivals will remain regardless of the number of upstream suppliers. Moreover, only under certain circumstances will the presence of multiple upstream suppliers limit their *ability* to raise rivals' costs or sabotage quality, even when they bid non-cooperatively against each other to secure wholesale agreements.
41. Under pure price competition with homogenous products and complete information, economists generally expect competitors to compete prices down to the higher marginal cost of the two (lowest-cost) suppliers.⁵¹ However, such an outcome generally requires that:
- competitors have complete information regarding each other's costs;
 - the products are homogenous, or undifferentiated;
 - buyers can costlessly shift to an alternative supplier; and
 - suppliers are not subject to capacity constraints.

⁴⁸ See Eastlink Intervention in 2014-76, May 15, 2014, at ¶ 30.

⁴⁹ See Videotron Intervention in 2013-685, January 29, 2014, at ¶ 47.

⁵⁰ In the CRTC's 2014-76 proceeding, WIND Mobile noted that there are frequently just two potential roaming partners because there are typically only two MNOs of sufficient size in each province/metropolitan area. See WIND Mobile (Bureau) 9Jun14-1, p 2.

⁵¹ Assuming each competitor is not capacity constrained, it is willing to provide the service, provided it can cover its marginal costs. This competitive price outcome requires, among many assumptions, that products are homogeneous and capacity is not constrained. See Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization*, Third Edition (1999), p 170.

42. Assuming that it can increase capacity to supply the potential customer, in such models each supplier is aware of its wholesale competitors' costs and is willing to offer a price at least as high as its own marginal cost. The winning bidder will be the supplier who can offer a price higher than its own marginal cost, but below that of its competitors. A similar competitive pricing outcome occurs when the products are differentiated, but the suppliers are each aware of what value the purchaser places on each of their service offerings.⁵²
43. If any of these assumptions (complete information, undifferentiated products, no switching costs, or no capacity constraints) are removed, however, suppliers may have the incentive and ability to divert downstream demand to the supplier of roaming services. For example, if a wholesale service provider does not know its rival's wholesale costs, then it has an incentive to raise its unit price offer above its own associated cost and possibly that of its rival.⁵³
44. The wholesale service provider with imperfect information faces a tradeoff. Raising its bid reduces the probability that it wins the service agreement, but increases its profits in two ways if it does win. First, a higher winning bid results in greater wholesale revenue and margin per unit, and causes its downstream rival to raise its retail prices. Second, as discussed above, when its rival raises its retail price, this diverts downstream demand to the wholesale provider's own retail service. A similar result would occur in the case of differentiated products if the wholesale supplier did not know the relative value that its potential customer placed on the quality of its roaming service.
45. As exhibited in this proceeding, at least two of these necessary assumptions do not hold for the Canadian wireless industry. First, carriers are generally not aware of their competitors' marginal costs for networked services. Even in this proceeding, wireless carriers are reluctant to release cost information and generally treat their costs as

⁵² See, for example, Jean Tirole, *The Theory of Industrial Organization*, The MIT Press, Cambridge, (1988), pp 277-281.

⁵³ This is a direct analogy to the winner's curse, where in a common-values auction the losing bids are those who have more discouraging information about the value of the auctioned good. The winning bidder is on the wrong side of the information distribution and in expectation pays too much. See Paul Klemperer, *Auctions: Theory and Practice* (2004), pp 54-55.

proprietary.⁵⁴ Second, wholesale wireless services appear to be differentiated across carriers. WIND has argued that there are differences in its ability to use Rogers' and Bell's networks.⁵⁵

46. The report submitted by Baziliauskas and Mathewson on behalf of Rogers (the "B&M Report") ignores the possibility of imperfect information.⁵⁶ The B&M Report argues that there is no evidence to indicate any existing incumbent coordination, and that vertically integrated carriers have little incentive to increase costs to downstream rivals.⁵⁷ However, the model presented in the B&M Report depends on an assumption of perfect information, both of the suppliers' costs and of customers' valuations.⁵⁸ As explained above, relaxing this critical assumption reintroduces the possibility of incentive and ability for vertical foreclosure.

C. MULTIMARKET CONTACT COORDINATION

47. The Canadian wireless industry may also be a candidate for explicit or tacit coordinated behavior facilitated by multimarket contact. The large incumbent, vertically integrated carriers have substantial multimarket contact. Each of these carriers has a retail presence in each province.⁵⁹ Moreover, Bell and TELUS are co-dependent on each other through several network sharing agreements. This multimarket contact could facilitate

⁵⁴ See, for example, Rogers response in 2014-76, Rogers (CRTC) 9June14-4, pp 2-3.

⁵⁵ See WIND Intervention in 2014-76, May 15, 2014, at ¶ 68.

⁵⁶ See Andy Baziliauskas and Frank Mathewson, "Wholesale Competition in the Canadian Wireless Industry," prepared for Rogers Communications, May 15, 2014.

⁵⁷ *Id.* at p 20.

⁵⁸ *Id.* at p 39. The model in the B&M Report also makes several other unrealistic assumptions, including a lump sum payment, as opposed to per unit wholesale pricing, and full foreclosure. However, evidence from this proceeding suggests that a per-unit roaming fee is a more realistic payment mechanism. See Eastlink's suggested per volume rates in Eastlink's response in 2014-76, Bragg (Rogers) 9Jun2014-7, at p 21.; Eastlink Intervention in 2014-76, May 15, 2014, at ¶ 31; and SakTel's intervention in CRTC 2013-685, January 29, 2014, pp 3-5, available at:

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=212274&Lang=e>

Moreover, partial foreclosure, or increasing downstream rivals' costs in order to raise prices and limit competition in the downstream market, may be more realistic than fully preventing a downstream rival from entry.

⁵⁹ See the Brattle Report at Table 1.

identification of cheating (*e.g.*, through a bid rotation scheme), raise the cost of punishment to the cheater, and lower the cost of administering punishment, for any deviation from coordinated behavior.

48. For example, suppose TELUS was willing to sell competitive roaming services to an entrant carrier in Alberta. This could potentially lead to lost market share for Rogers in Alberta to the entrant carrier, lowering Rogers' profits in Alberta. If Rogers recognized (ex-post) that it had lost market share due to TELUS' wholesale service agreement in Alberta, it could retaliate in one or more provinces in which it was a significant network provider. For instance, Rogers could sell competitive roaming services to entrants in multiple provinces across Canada, potentially harming TELUS's market share and profits.
49. These threats are tantamount to mutually assured punishment that could reinforce any other disincentives to providing competitive roaming services to entrants. Indeed, Bell and TELUS' network sharing agreement may provide further potential reinforcement to attempts at coordination.
50. Although direct monitoring of wholesale service pricing may be challenging in Canadian wireless markets, the large, incumbent vertically integrated carriers could have several mechanisms for monitoring the network coverage of entrants and regional providers. For instance, competitors could be able to identify who a downstream rival is partnering with for wholesale services by reviewing their coverage maps. An existing wholesale service partner could also be able to monitor when its downstream rival has signed an alternative agreement with another wholesale provider. If a wholesale provider sees a drop in demand from its wholesale services customer, it could conclude that the rival has signed an alternative agreement with another wholesale provider.
51. Detection of tacit coordination can be challenging for antitrust enforcers and regulators. Even so, access to unredacted information and contract terms may be sufficient to identify any facilitating factors that would support coordinated behavior in the wholesale wireless services market. Contract terms that reference rivals are likely to be particularly helpful in supporting coordinated foreclosure efforts. For instance, a downstream firm might find it difficult to contract with another vertically integrated

wireless carrier even in places where there exists more than one carrier, either by specific exclusionary terms⁶⁰ or because no further carriers are willing to deal at reasonable terms. Another example of a contract term referencing rivals would be most favored nation (MFN) or similar clauses in cross-regional roaming agreements among the large incumbent MNOs. Such terms might serve to support an equilibrium where smaller carriers face roaming charges significantly higher than might be faced by the MNOs, limiting their ability to offer competitive downstream product offerings.

IV. Conclusion

52. Vertical foreclosure (partial or full) is a potential concern in the Canadian wireless services market. The incumbent MNOs in Canada have incentives to pursue nontrivial markups on wholesale wireless services. In this report we find that the average raising rivals cost upward pricing pressure on wholesale wireless services could be as much as \$9 per subscriber per month across Canada nationally, and much higher for the dominant carriers in certain provinces.
53. Intervener filings in this proceeding and its antecedent suggest that Canadian MNOs have responded to these pricing incentives. The resulting fees charged in recent years for wholesale wireless services may have contributed to the small market penetration experienced by AWS entrants and the MVNOs. The wholesale price caps enacted in Budget 2014 have the potential to blunt the ability of MNOs to foreclose rival carriers from the downstream retail wireless services market.
54. Nevertheless, there may be additional scope for regulatory scrutiny of, or intervention in, the Canadian wholesale wireless services market. Implementing price caps alone does not remove the incentive and ability of large vertically integrated Canadian wireless carriers to employ *non-price* foreclosure mechanisms. The CRTC may wish ultimately to consider remedies that would limit the ability of large MNOs to engage in

⁶⁰ CRTC 2014-398 suggests that terms which limit the ability of AWS entrants and MVNOs to contract with multiple MNOs in a given region may have been a feature of this market. See CRTC 2014-398 at ¶30.

non-price mechanisms that reduce downstream rivals' quantities or skew such rivals' quality offerings in ways that protect the MNOs' own market positions.

Appendix A: Backup Tables for the RRC-UPP Analysis

The following tables are post-entry results from the logit model estimated in the Brattle Report.

Table 4: Post-Entry Shares by Province by Carrier

Province	Rogers	Bell	TELUS	Regional	AWS Entrants	New Entrant	Outside Good
Alberta	17.5%	16.7%	37.4%		2.1%	6.8%	19.4%
British Columbia	26.6%	12.0%	27.3%		2.0%	6.9%	25.1%
Manitoba	20.9%	3.1%	5.6%	34.2%		6.8%	29.3%
New Brunswick	11.6%	36.6%	14.1%			7.3%	30.4%
Newfoundland and Labrador	1.1%	44.5%	14.5%			7.4%	32.4%
Nova Scotia	10.0%	35.1%	18.4%			7.2%	29.4%
Ontario	29.2%	18.3%	13.0%	0.6%	3.9%	7.4%	27.7%
Prince Edward Island	9.1%	36.6%	16.5%			7.3%	30.5%
Quebec	18.0%	20.6%	17.4%		6.1%	7.2%	30.7%
Saskatchewan	5.6%	6.3%	6.3%	46.7%		5.5%	29.6%

Source: Calibrated Values from the Logit Model

Table 5: Marginal Cost by Province by Carrier

Province	Rogers	Bell	TELUS	Regional	Other	New Entrant
Alberta	\$36.49	\$32.32	\$23.36		\$19.84	\$30.72
British Columbia	\$31.50	\$33.43	\$31.10		\$20.40	\$32.01
Manitoba	\$29.31	\$31.58	\$34.39	\$24.10		\$31.76
New Brunswick	\$34.26	\$21.08	\$33.48			\$29.61
Newfoundland and Labrador	\$35.75	\$9.36	\$31.03			\$25.38
Nova Scotia	\$35.42	\$21.23	\$32.53			\$29.73
Ontario	\$28.77	\$29.86	\$35.65	\$40.71	\$18.86	\$31.43
Prince Edward Island	\$34.64	\$21.87	\$32.61			\$29.71
Quebec	\$33.21	\$29.17	\$33.33		\$19.25	\$31.90
Saskatchewan	\$33.45	\$29.44	\$33.18	\$10.71		\$32.02
Canada	\$30.89	\$28.62	\$30.98	\$18.68	\$19.21	\$31.35

Source: Calibrated Values from the Logit Model

Table 6: Markup by Province by Carrier

Province	Rogers	Bell	TELUS	Regional	Other	New Entrant
Alberta	\$38.79	\$38.42	\$51.84		\$32.23	\$33.76
British Columbia	\$33.39	\$27.54	\$33.73		\$24.49	\$25.74
Manitoba	\$29.62	\$23.79	\$24.48	\$35.89		\$24.66
New Brunswick	\$23.08	\$32.80	\$23.80			\$21.76
Newfoundland and Labrador	\$26.71	\$49.33	\$31.36			\$28.48
Nova Scotia	\$25.54	\$36.06	\$28.37			\$24.50
Ontario	\$35.40	\$30.43	\$28.45	\$24.62	\$25.52	\$26.39
Prince Edward Island	\$20.38	\$29.83	\$22.36			\$19.79
Quebec	\$21.53	\$22.27	\$21.36		\$18.62	\$18.74
Saskatchewan	\$29.43	\$29.64	\$29.63	\$53.31		\$29.25

Source: Calibrated Values from the Logit Model

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