CT-2022-002

THE COMPETITION TRIBUNAL

IN THE MATTER OF the *Competition Act*, R.S.C. 1985, c. C.34;

AND IN THE MATTER OF the proposed acquisition by Rogers Communications Inc. of Shaw Communications Inc.;

AND IN THE MATTER OF an application by the Commissioner of Competition for one or more orders pursuant to section 92 of the *Competition Act*.

B E T W E E N:

COMMISSIONER OF COMPETITION

Applicant

- and -

ROGERS COMMUNICATIONS INC. and SHAW COMMUNICATIONS INC.

Respondents

- and -

ATTORNEY GENERAL OF ALBERTA and VIDEOTRON INC.

Intervenors

WITNESS STATEMENT OF PAUL ALAN JOHNSON, PHD

I, PAUL ALAN JOHNSON, of the City of Ottawa, in the Province of Ontario, MAKE OATH AND SAY:

1. I have been a professional competition economist for over 20 years. I am the owner of Rideau Economics, a competition economics consultancy located in Ottawa. From 2016 to 2019, I served as the T.D. MacDonald Chair in Industrial Economics at the Competition Bureau. In that capacity, I was the Competition Bureau's Chief Economist.

2. I have been retained on behalf of Shaw Communications Inc. to prepare a Report concerning the alleged competitive impact of the July 2020 launch of the "Shaw Mobile" brand of wireless services.

3. My Report is attached to this Witness Statement as **Exhibit "1"**. I have appended to my Report my Acknowledgment of Expert Witness and a list of the materials I relied upon in preparing my Report. My curriculum vitae is also appended to my Report.

SWORN by Paul Alan Johnson in the City of Ottawa, in the Province of Ontario, before me in the City of Toronto, in the Province of Ontario this 23rd day of September, 2022 in accordance with O. Reg. 431/20 Administering Oath or Declaration Remotely.

Connia Chen

Commissioner for Taking Affidavits
Connia Chen

Paul Alan Johnson

PAUL ALAN JOHNSON

THIS IS EXHIBIT “1” REFERRED TO IN THE AFFIDAVIT OF PAUL ALAN JOHNSON SWORN BY PAUL ALAN JOHNSON OF THE CITY OF OTTAWA, IN THE PROVINCE OF ONTARIO, BEFORE ME IN THE CITY OF TORONTO, IN THE PROVINCE OF ONTARIO THIS 23RD DAY OF SEPTEMBER, 2022 IN ACCORDANCE WITH O. REG. 431/20, ADMINISTERING OATH OR DECLARATION REMOTELY.

Connia Chen

A Commissioner for Taking Affidavits
Connia Chen

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I. Qualifications

(1) My name is Paul Alan Johnson. I have been a professional competition economist for over 20 years. I am the owner of Rideau Economics, a competition economics consultancy located in Ottawa.

(2) From 2016 to 2019, I served a three-year tenure as the T.D. MacDonald Chair in Industrial Economics at the Canadian Competition Bureau. In that capacity, I was the Bureau's Chief Economist. At the Bureau, I worked with case teams, worked on special projects, directly engaged with stakeholders, and advised the Commissioner of Competition on all significant competition matters, including work related to the Bureau's enforcement and advocacy mandates. I was also a principal contributor to the Bureau's outreach efforts on emerging competition issues related to big data. A copy of a news release issued by the Bureau announcing my appointment is appended to this report in section V.D.

(3) At the time of my appointment as Chief Economist at the Competition Bureau, I was a Partner in the antitrust practice at Bates White Economic Consulting in Washington, DC. Bates White is a leading consulting firm that provides advanced economic, financial and econometric analysis to its clients, including government agencies. During my career at Bates White, I worked on a variety of civil antitrust litigation matters and mergers, including before antitrust authorities in the United States and Europe. I remained a Partner at Bates White throughout my term as Chief Economist of the Competition Bureau through the government of Canada's interchange program.

(4) I founded Rideau Economics and formally left Bates White following the end of my term at the Bureau. I do, however, retain an affiliation with Bates White. In conducting the analyses that I set out in this report, I have received support from staff at Bates White.

(5) I regularly publish articles on issues related to competition law enforcement and competition economics. I am also regularly invited to speak on topics pertaining to competition law enforcement and competition economics at various conferences, continuing education events, and other fora.

(6) In 2021, I was appointed a Member of the Competition Policy Council at the C.D. Howe Institute. The C.D. Howe Institute is a prominent Canadian thinktank. Its objective is to raise standards of living by promoting public policies that are economically sound. The Competition Policy Council provides analysis and commentary on emerging competition policy issues, including by issuing public reports from time-to-time. Other members of the Policy Council include academics, senior competition lawyers, and other competition practitioners. Several former Commissioners of Competition currently sit on the Policy Council.

(7) I received a PhD in economics from Université de Montréal and a BA in economics from the University of North Carolina.

(8) A copy of my curriculum vitae, including a list of significant competition-related matters I have been involved in over the years, my publications, and my speaking engagements, is appended to this report in section V.C.

II. My assignment

(9) I have been retained on behalf of Shaw Communications Inc. ("Shaw") as an independent expert in connection with an Application commenced by the Commissioner of Competition under section 92 of the Competition Act (the "Section 92 Application") to block a proposed business combination between Shaw and Rogers Communications Inc. ("Rogers").

(10) Although I have been retained on behalf of Shaw, I acknowledge that I am bound by and will comply with the Competition Tribunal's code of conduct for expert witnesses. Specifically, I acknowledge that:

- My duty is to assist the Competition Tribunal impartially on matters relevant to my areas of expertise;
- That duty overrides any duty I might have to a party to this proceeding, including Shaw; and
- I am to be independent and objective, and not an advocate for a party.

(11) I have signed an Acknowledgment of Expert Witness and have appended it to this report in appendix section V.E.

(12) I am being compensated for my involvement in this matter at my standard hourly rate. My compensation does not depend on the contents of this report or on the outcome of this proceeding. Bates White is also being compensated only for the time spent by its staff who are supporting me in connection with this matter at their standard hourly rates. Similarly, Bates White's compensation does not depend on the content of this report or on the outcome of this proceeding.

(13) I have reviewed the Expert Report of Dr. Nathan H. Miller dated May 6, 2022. I understand that Dr. Miller prepared his Report in connection with an Application commenced by the Commissioner of Competition under section 104 of the Competition Act for short-term and interim orders prohibiting Shaw and Rogers from closing their proposed business combination until such time as the Section 92 Application is finally disposed of. I also understand that the Application under section 104 of the Competition Act was resolved via a Consent Agreement.

(14) In his Expert Report, Dr. Miller purports to assess the likely effects on competition of the proposed business combination of Shaw and Rogers. He opines that his economic analyses of the competitive effects "demonstrate that the loss of competition between Rogers and Shaw is likely to be significantly adverse to consumers in Alberta, British Columbia, and Ontario," and that the alleged competitive effects of the proposed business combination "are not well mitigated by the proposed divestiture" of Freedom Mobile Inc. to an investment vehicle owned by Stonepeak Infrastructure Partners LP ("Red Fox").

(15) Shaw and Rogers are no longer proposing a divestiture of Freedom Mobile to Stonepeak. Instead, on June 17, 2022, Shaw, Rogers, and Quebecor Inc. announced that they had entered into a letter agreement and term sheet for the sale of Freedom Mobile to Videotron Ltd., a subsidiary of Quebecor. On August 12, 2022, Shaw, Rogers, and Quebecor announced that they had entered into a definitive Share Purchase Agreement in respect of that sale. I understand that, pursuant to the Share Purchase Agreement, the sale of Freedom to Videotron will occur before the acquisition of Shaw by Rogers.

(16) Because Dr. Miller delivered his Expert Report in May 2022, before the announcements in June and August 2022 described above, he did not address the transaction that Shaw and Rogers are actually proposing to proceed with.

(17) That said, I have been asked to assess one issue raised by Dr. Miller in his Expert Report: namely, his analysis and conclusions concerning the alleged competitive impact of the launch by Shaw on July 30, 2020 of a wireless service under the brand "Shaw Mobile." I summarize my opinions in section III of this Report and provide my detailed analysis in section IV.

III. Summary of conclusions

(18) In his Expert Report, Dr. Miller uses a well-known and relatively simple merger simulation model to quantify the alleged price and welfare effects in wireless markets of the acquisition of Shaw by Rogers and the simultaneous divestiture of Freedom Mobile to Red Fox. The results from that merger simulation model indicate that the competitive effects from the merger and divestiture of Freedom Mobile turn critically on Shaw Mobile.

(19) As a result, a central issue raised by Dr. Miller in his Expert Report is whether Shaw Mobile, a wireless service whose subscribers are almost exclusively also subscribers of Shaw's wireline internet offerings, represents a significant competitive constraint on wireless competition. If not, Dr. Miller's merger simulation predicts that the proposed sale of Freedom Mobile by Shaw to Videotron would address any anticompetitive effect from the proposed acquisition of Shaw by Rogers. For the sake of

simplicity, in this Report I will occasionally refer to the proposed sale of Freedom Mobile to Videotron and the proposed acquisition by Rogers of Shaw collectively as the "proposed transaction".

(20) Dr. Miller conducted three separate empirical analyses of the launch of Shaw Mobile. He asserts that the results of these analyses indicate that "the launch of Shaw Mobile promoted vigorous competition between Shaw's brands and competitor carriers."[1] In particular, he concludes that the Shaw Mobile launch promoted vigorous competition in wireless markets by (1) causing more subscribers to sign up to various wireless brands, (2) causing subscribers to various wireless brands to increase their data usage, and (3) causing subscribers to various wireless brands to pay a lower average price of data.

(21) I agree with Dr. Miller that it is important to empirically assess the competitive significance of Shaw Mobile. Nevertheless, Dr. Miller's execution of his empirical analyses falls well short of the standards that economists apply when making *causal inferences*. And, critically, these shortcomings dramatically change Dr. Miller's conclusions. In particular, I find that Dr. Miller's analysis is insufficient to support a conclusion that the launch of Shaw Mobile *caused*: (1) an increase in the number of wireless subscribers across carriers; (2) an increase in data usage; or (3) a decrease in the average price of data.

IV. Dr. Miller's analysis of the effect of the Shaw Mobile launch on market outcomes

(22) Shaw Mobile was launched on July 30, 2020 in Alberta (AB) and British Columbia (BC) (but not Ontario), principally as a wireless service for existing subscribers to Shaw's wireline offering.[2] Because the proposed sale of Freedom Mobile ("Freedom") to Videotron does not include Shaw Mobile subscribers or the Shaw Mobile brand, an analysis of the competitive effects of the proposed transaction should assess the competitive constraint imposed by Shaw Mobile.

(23) When Dr. Miller's merger simulation model is applied to a sale of Freedom to a third party,[3] it predicts anticompetitive effects that turn solely on the competitive significance of Shaw Mobile.[4] As stated above, a key question raised by Dr. Miller's analysis is therefore whether Shaw Mobile represents a significant competitive constraint on wireless competition. If not, Dr. Miller's own

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1 Expert Report of Nathan H. Miller, PhD, May 6, 2022, ¶ 128 [hereinafter "Miller Report"].

2 "Shaw Mobile Has Arrived — Fast LTE And Shaw's Fibre+ Network Combine to Give Customers an Innovative Wireless Experience with Unprecedented Savings," Shaw, News Releases, July 30, 2020, available at https://newsroom.shaw.ca/corporate/newsroom/article/materialDetail.aspx?MaterialID=6442452394.

3 See Miller Report, section 7.1.

4 Dr. Miller's merger simulation model assumes logit demand. In such a model, a brand's competitive significance is reflected solely by its market share. As Shaw Mobile's competitive significance disappears (i.e., as its market share approaches zero), the model predicts that the proposed transaction creates no anticompetitive effects.

merger simulation model predicts that the sale of Freedom would remedy any anticompetitive effect from the proposed transaction.

(24) Dr. Miller analyzed the competitive constraint imposed by Shaw Mobile in section 6.1.3. of his Expert Report by conducting three separate empirical analyses. Those analyses assess the effects of the Shaw Mobile launch on (1) new subscribers that sign up to the Freedom, Bell, Virgin, and Telus brands (paragraphs 111-115), (2) data usage by subscribers to the Freedom, Bell, Virgin, and Telus brands (paragraphs 116-121), and (3) average price of data paid by subscribers to the Freedom, Bell, Virgin, and Telus brands (paragraphs 122-126). (As I discuss below, Dr. Miller's concept of "average price of data" is very different from the price of wireless plans.)

(25) Dr. Miller did not analyze data from Rogers because "the format in which that data was provided made a similar analysis infeasible."[5]

(26) Dr. Miller concluded from those analyses that "the launch of Shaw Mobile promoted vigorous competition between Shaw's brands and competitor carriers."[6] Intuitively, entry of a new competitor that spurs competition within the industry would force wireless carriers to offer better plans on more generous terms. Canadians would respond by signing up in greater numbers to wireless plans, consuming more wireless data, and paying a lower average price for a gigabyte of wireless data. With that dynamic in mind, it appears reasonable to measure the effect of the Shaw Mobile launch on those market outcomes.[7]

(27) I agree with Dr. Miller that a careful data-driven analysis can, in appropriate circumstances, provide better insight from a competition economics perspective than reviewing documentary evidence whose exact meaning can be open to debate. For instance, Dr. Miller notes a document sent from [redacted]."[8] That document does not speak to the *actual* effects of the Shaw Mobile launch on competition and, thus, drawing inferences from that document differs from a careful empirical analysis of how the Shaw Mobile launch actually affected outcomes like enrollment of new wireless subscribers, data usage, and average price of data.

(28) Unfortunately, Dr. Miller's execution of his empirical analysis falls well short of the standards that economists apply when making *causal inferences*—i.e., in assessing whether the Shaw Mobile launch

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5 Miller Report, footnote 173.

6 Miller Report, ¶ 128.

7 Estimating the effects of entry in order to make inferences in competition analysis is common. I have written about that in the past. *See* Paul A. Johnson. "Entry and exit event analysis," *Issues in Competition Law and Policy* 2 (2008): 1385.

8 [redacted] ROG00333914.

caused an increase in the number of subscribers, an increase in data usage, or a decrease in the average price of data.

(29) This criticism is not merely of theoretical interest. It is fundamental and cuts to the very core of Dr. Miller's conclusions. Recognizing this criticism changes Dr. Miller's conclusions in obvious and intuitive ways.

(30) It bears noting that I use Dr. Miller's own data processing assumptions in conducting my analysis. Thus, my criticism of Dr. Miller's approach and conclusions does not involve the application of assumptions that are necessary to work with the data produced in this matter.

(31) My analysis proceeds as follows.

- It begins in section IV.A, where I briefly describe the theoretical underpinnings for my critique of Dr. Miller's analysis and my rejection of his methodology. I emphasize how central causal inference is to modern empirical economics and introduce some important terminology and concepts. I outline two distinct steps that a proper analysis of causality must take that Dr. Miller's analysis omits.
- In section IV.B, I summarize evidence related to the first of these steps and show that Dr. Miller's causal conclusions are driven by confounding factors for which he does not account. Most intuitively, his conclusion that the Shaw Mobile launch caused an increase in new subscriber sign-ups wrongly attributes natural seasonal variation in new subscriber sign-ups to the Shaw Mobile launch.
- In section IV.C, I summarize evidence related to the second of these steps, which requires making explicit assumptions about what outcomes the Shaw Mobile launch might have affected. In particular, whether Ontario, where Shaw Mobile is not available, could have been affected by the launch. Dr. Miller takes multiple, contradictory positions on whether Ontario was affected by the Shaw Mobile launch in his Expert Report, which turns out to have substantial implications for his conclusions.
- Because the Telus data differ from data produced by other carriers, I treat that data separately in section IV.D.
- In section IV.E, I very briefly discuss Dr. Miller's review of documentary evidence with respect to the Shaw Mobile launch.

IV.A. A reliable empirical analysis of the effects of the Shaw Mobile launch on market outcomes must deploy valid methods of causal inference

(32) Proper empirical analysis requires valid "causal inference," that is, a conclusion that a certain outcome results from a particular event. Dr. Miller himself recognized the importance of making proper inferences about causation in a recent paper he published with a large number of prominent coauthors. The main point of that paper was to not "mistake correlation for causation" in the context of regressions of price on HHI.[9] In the current matter, all three of Dr. Miller's empirical analyses of the effects of the Shaw Mobile launch rely on a causal inference: whether the Shaw Mobile launch *caused* an increase in wireless subscribers, an increase in data usage, and a decrease in the average price of data.

(33) Analysis of causal inference is core to the modern practice of economics and economists can draw on an enormous methodological literature that describes analytical tools for this purpose.[10] In fact, the 2021 Nobel Prize in Economics was awarded to economists who made important contributions to that literature.[11] Appropriate application of these tools allows economists to avoid, for example, the logical fallacy known as *post hoc ergo propter hoc* (since X preceded Y, X caused Y). Dr. Miller's conclusions that the Shaw Mobile launch increased the number of wireless subscribers, increased data consumption, and decreased the average price of data are examples of this fallacy.

(34) More generally, the mere fact that an event coincides with a change in outcomes does not mean that the event caused the outcomes to change. For example, while tulip blossoms precede warm temperatures, tulip blossoms clearly do not cause temperatures to warm. An economist attempting to understand whether a change in some variable was caused by a specific event would be expected to provide an analysis of how the variables of interest would have evolved over time absent the event or

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9 Nathan Miller, Steven Berry, Fiona Scott Morton, Jonathan Baker, Timothy Bresnahan, Martin Gaynor, Richard Gilbert et al. "On the misuse of regressions of price on the HHI in merger review," *Journal of Antitrust Enforcement* 10, no. 2 (2022): 248-259.

10 The topic of causal inference is so central to economics that presenting a single reference (or even several references) may understate the importance of the topic. With that caveat given, see:

- Susan Athey and Guido W. Imbens. "The state of applied econometrics: Causality and policy evaluation." *Journal of Economic Perspectives* 31, no. 2 (2017): 3-32.
- Joshua D. Angrist and Jörn-Steffen Pischke. *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press, 2009.

Both heavily emphasize causal inference. For example, the second paragraph of the Angrist and Pischke text begins: "In the beginning, we should ask: *What is the causal relationship of interest?*"

11 "The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2021," The Nobel Prize, accessed September 16, 2022, https://www.nobelprize.org/prizes/economic-sciences/2021/summary/. Joshua Angrist and Guido Imbens, the winners for "methodological contributions to the analysis of causal relationships," are co-authors of the references cited in footnote 10.

"treatment." Such an analysis would account for confounding events and conditions as well as seasonal and other trends that pre-existed the event of interest.[12] In this respect, the seasonal patterns in new subscriber sign-ups and the longer-term trends for Canadians to consume increasing amounts of wireless data and pay decreasing prices are all relevant to consider.[13]

(35) Before proceeding further, I introduce some widely-used terminology that is useful in discussing causal inference:

- Treatment group: observations affected by the event (or "intervention") of interest. In the current case, the event of interest is the Shaw Mobile launch.
- Control group: observations not affected by the event of interest but similar in other aspects to observations in the treatment group.

(36) With this terminology established, I next describe two fundamental insights from the literature on causal inference that are relevant to the Shaw Mobile launch, and that provide a framework for the formal empirical analysis that follows in section IV.C of this Report.

(37) *First*, valid causal inference requires that the effects of the intervention of interest be isolated from other effects. Effects other than the event of interest are termed "confounds" or sometimes "confounders" in the literature. One common confound is seasonal, which turns out to be important in the current context. Examples of seasonal confounds include periods like back-to-school or Christmas that systematically affect outcomes in wireless markets. Another confound is the onset of the COVID pandemic in Canada.

(38) An additional challenging confound is the federal government's announcement in March 2020 that it expected Bell, Rogers, and Telus to cut prices on certain wireless plans by 25% over two years,

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[12] *See*, for example, Jeffrey M. Wooldridge, *Introductory Econometrics: A Modern Approach, 4th ed.*, Mason: South-Western Cengage Learning, 2009, 360. ("We must recognize that some series contain a *time trend* in order to draw causal inference using time series data. Ignoring the fact that two sequences are trending in the same or opposite directions can lead us to falsely conclude that changes in one variable are actually caused by changes in another variable."). [Emphasis original]

[13] The trend down in wireless prices has been acknowledged by the federal government (see footnote 15) as well as the CRTC in its Telecom Regulatory Policy 2021-130 ("Regardless, with retail prices clearly trending downwards, the Commission acknowledges that the market is moving in the right direction, and that it is reasonable to expect that this trend will continue in the future as wireless carriers' network capacity increases as a result of ongoing investments and innovation.").

The Competition Bureau also appears to have acknowledged that trend but took issue with its magnitude or relevance in its Canadian Radio-television and Telecommunications Commission, "Telecom Notice of Consultation CRTC 2019-57 - Final Comments of the Competition Bureau," July 15, 2020. ("The launch of 'unlimited plans' has not yielded the scope or amount of price reductions indicative of a lessening of market power. 'Unlimited plans' marked a 25% decrease in plan prices for just a segment of customers. Yet, corresponding reductions in device subsidies meant that a customer's total monthly bill decreased by far less than 25%. This is well below price reductions realized in markets with strong regional competition, which can be upward of 50% overall.").

indicating that the government would "take action with other regulatory tools to further increase competition and help reduce prices" if that target was not achieved.[14] The federal government announced in January 2022 that the targeted reduction had been achieved.[15] The explicit threat of additional regulation poses a fundamental obstacle to isolating the effects of the Shaw Mobile launch on not only average price, but also usage, and new subscribers—as wireless prices decline, we would expect more subscribers to sign up and to use more data under more generous plans. Dr. Miller does not appear to have considered this admittedly very difficult issue. I do not address it either, beyond noting that any estimate of the alleged effects of the Shaw Mobile launch that does not consider these government actions taken shortly before the launch will necessarily overstate any potential competitively beneficial effects of the Shaw Mobile launch if the government's threat did, in fact, put meaningful pressure on wireless carriers to reduce their prices.

(39) Dr. Miller makes no attempt to examine and remove any such confounds from his analyses. My discussion in section IV.B intuitively demonstrates how fundamentally important that failure is.

(40) *Second*, valid causal inference must explicitly identify a treatment group and a control group. In his analyses of the alleged effect of the Shaw Mobile launch, Dr. Miller either fails to identify a treatment and control group or does so implicitly and unclearly. This failure is prominent in his treatment of outcomes across provinces because Shaw Mobile has no (or de minimis) presence in Ontario but is present in AB and BC.

(41) Dr. Miller takes multiple, contradictory positions on whether Ontario was affected by the Shaw Mobile launch.

- Initially, Dr. Miller appears to assume that the Shaw Mobile launch affected outcomes in Ontario to the same extent that it did in BC and AB.[16] That assumption implicitly assigns Ontario to the treatment group.

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[14] "Offering Canadian consumers more affordable options for their wireless services", March 5, 2020, https://www.canada.ca/en/innovation-science-economic-development/news/2020/03/offering-canadian-consumers-more-affordable-options-for-their-wireless-services.html;

News release entitled "Minister Bains announces next steps to help reduce wireless prices and promote competition", March 5, 2020, https://www.canada.ca/en/innovation-science-economic-development/news/2020/03/government-of-canada-takes-action-to-offer-more-affordable-options-for-wireless-services.html;

"Liberals give big 3 wireless providers two years to cut prices by 25 per cent," CBC News, Politics, March 5, 2020, https://www.cbc.ca/news/politics/wireless-cellphone-fees-1.5484080

[15] "Government of Canada delivers on commitment to reduce cell phone wireless plans by 25%," Government of Canada, Innovation, Science and Economic Development Canada, January 28, 2022, https://www.canada.ca/en/innovation-science-economic-development/news/2022/01/government-of-canada-delivers-on-commitment-to-reduce-cell-phone-wireless-plans-by-25.html

[16] Miller Report, ¶ 109 [redacted]).

- Elsewhere, Dr. Miller appears more agnostic or uncertain as to which group Ontario should be assigned.[17] That agnosticism provides insufficient guidance in order to proceed with an empirical analysis. Treatment and control groups must be delineated clearly.
- Dr. Miller explicitly states that the Shaw Mobile launch should affect AB and BC more than Ontario.[18] Elsewhere his language strongly suggests, at the very least, that the Shaw Mobile launch enhanced competition only in AB and BC.[19] On that basis, Ontario certainly ought not be assigned to the treatment group and could be assigned to the control group.

(42) There is no principled basis to assign Ontario to the treatment group when analyzing one outcome but then assign Ontario to the control group when analyzing another outcome. Doing so risks tailoring results to corroborate a hypothesis rather than using results to test a hypothesis. Yet that is what it appears Dr. Miller may have done. At a minimum, he has neither clearly articulated nor justified his approach.

(43) In my empirical analysis in section IV.C of this Report, I highlight the implications of assigning Ontario to the treatment group or the control group. In several places, those implications are very important as the choice of assignment reverses the conclusions that may be drawn from the analysis.

IV.B. Dr. Miller's conclusions ignore confounds and wrongly attribute changes in outcomes to the Shaw Mobile launch

(44) In paragraph 110 of his Expert Report, Dr. Miller states that he analyzes "the effect that the launch of the Shaw Mobile brand had on the market for wireless services in Alberta, British Columbia, and Ontario using the same wireless subscriber billing data and porting data for Shaw, Bell, and Telus …."[20] In this section of my Report, I provide an intuitive discussion of some of the problems that underlie Dr. Miller's analysis and the causal conclusions he draws.

(45) In section IV.B.1, I examine Dr. Miller's first analysis: the manner in which the Shaw Mobile launch allegedly affected the number of new wireless subscribers. Dr. Miller's second and third analyses—the manner in which the Shaw Mobile launch allegedly affected data usage and the average price of

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17 Miller Report, ¶ 124 ("To the extent that Shaw Mobile provided the impetus for these promotions that may not have otherwise been introduced, the launch of Shaw Mobile in Western Canada provided additional benefit to consumers in Ontario through more vigorous price competition."). [Emphasis added.]

18 Miller Report, ¶ 119 ("The larger effect in Western Canada is consistent with the fact that Shaw Mobile is only offered in these provinces leading to particularly intense price competition between Shaw's brands and the Big 3 in Western Canada.").

19 Section 6.1.3. of Dr. Miller's Expert Report is titled "Shaw's launch of the Shaw Mobile brand also enhanced competition in Alberta and British Columbia." Notably, that title makes no reference to Ontario.

20 Miller Report, ¶ 110.

data—share similarities and so are discussed together in section IV.B.2. The analysis I present in these sections considers data from Freedom, Bell, and Virgin. The Telus data processed by Dr. Miller does not permit me to conduct the analyses that I conduct on data for Freedom, Bell, and Virgin. Thus, I discuss the Telus data separately in section IV.D.

IV.B.1. Dr. Miller's analysis provides no basis to conclude that the Shaw Mobile launch caused an increase in the number of new wireless subscribers

(46) Dr. Miller offers several comparisons to analyze "the effect of the introduction of the Shaw Mobile brand and the associated price promotions on each carriers' [sic] addition of new data subscribers."[21] Thus, the hypothesis that he purports to test is that the Shaw Mobile launch spurred competition in the wireless industry thereby causing more Canadians to sign up for wireless plans.

(47) To illustrate the fundamental flaws in Dr. Miller's approach, I first focus on Dr. Miller's assessment of the alleged impact of the Shaw Mobile launch on the number of new Freedom subscribers. (For clarity, the Freedom subscribers do not include new subscribers to Shaw Mobile, which of course had zero new subscribers prior to July 30, 2020.) I then turn to the data for the Bell and Virgin brands.

(48) With respect to Freedom, the data that Dr. Miller graphs in the top panel of his Exhibit 11 show the following:

- From March through July 2020, combining new subscribers across all three provinces, Dr. Miller estimates that an average of [redacted] new subscribers signed up with Freedom per month.
- From August 2020 through February 2021, Dr. Miller estimates that an average of [redacted] subscribers signed up with Freedom per month.[22]

(49) Thus, an average of [redacted] more subscribers per month *did* sign up with Freedom just after the launch of Shaw Mobile compared to the months that just preceded the launch. From this Dr. Miller concludes that the Shaw Mobile launch spurred competition generally among wireless carriers, forcing them to offer better plans at more generous terms. However, it is simply wrong to conclude that "the introduction of the Shaw Mobile brand and the associated price

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21 Miller Report, ¶ 111.

Specifically, Dr. Miller presents his Exhibits 11 and 12 as visual evidence that the number of new Freedom, Bell, and Virgin subscribers increased after the launch of Shaw Mobile. Those exhibits show new subscribers by brand by month starting in March 2020 and ending in February 2021. In paragraph 114, he reports a monthly average of Telus new subscribers from January to July 2020 compared to August to November 2020.

22 These numbers have been obtained from Dr. Miller's backup code and data submitted with his report. They reflect the total number of subscribers across all three provinces reported in his exhibit 11.

promotions"[23] *caused* that difference. Even a superficial consideration of potential alternative explanations reveals the dangers associated with drawing such a causal inference.

(50) Specifically, the industry understands that post-July periods like back-to-school or Christmas are "heavy" months for new activations.[24] I also understand that it is widely recognized within the industry that the fall is when the new iPhone is launched, which can lead to carriers offering sales to move inventory of older model phones. Such annual "peak season" periods begin after July 30 and fundamentally confound and invalidate Dr. Miller's causal inference.

(51) I can assess the relevance of such peak season effects with data on new subscribers in 12-month periods other than the period from March 2020 to February 2021 on which Dr. Miller focuses. Figure 1 shows new Freedom subscribers in the 12-month period beginning in March 2020, following Dr. Miller's convention of showing data from March 2020 through February 2021. Figure 1 also shows new Freedom subscribers in the 12-month period starting a year earlier and a year later.[25] A strong increase in subscribers is present in all three 12-month periods in August and September (presumably capturing the back-to-school period as well as effects related to new iPhone models) as well as in December (presumably capturing Christmas). A very substantial COVID-related effect is also obvious in Figure 1: the number of new Freedom subscribers in the period starting in March 2019 was roughly [redacted] that in the periods beginning March 2020 or 2021.[26]

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[23] Miller Report, ¶ 111.

[24] *See*, for example, SJRB-CCB00271884 [redacted]).

[25] While the year-earlier data was available to Dr. Miller at the time he submitted his report, the year-later data was not.

[26] [redacted] SJRB-CCB00874447, page 4.

Figure 1: New Freedom subscribers by month

(52) For completeness and clarity, in Figure 2 I report the average number of new Freedom subscribers per month for the period March-July and the period August-February for the three 12-month periods graphed above. Figure 2 shows that the difference in average new subscribers per month as between the March-July and August-February portions of the 12-month period on which Dr. Miller focuses is [redacted] the differences in the preceding and following 12-month periods.

Figure 2: Average number of new Freedom subscribers per month: March-July vs. August-February

(53) Put simply, Dr. Miller wrongly attributes natural seasonal variation in new subscriber sign-ups to the Shaw Mobile launch. This error confuses precedence with causality, which is a well-known logical fallacy (*post hoc ergo propter hoc*).

(54) To be abundantly clear, the Shaw Mobile launch simply could not have caused the differences in new subscribers as between the March-July and the August-February periods in the year prior and following the year that Dr. Miller assessed in his Expert Report. The period beginning in March 2019 *preceded* the Shaw Mobile launch. Additionally, every month of the period beginning in March 2021 would have been affected by the Shaw Mobile launch. There is no legitimate theory under which the July 2020 launch of Shaw Mobile would have caused more new subscribers of any brand to sign up after July 2021 but not during the period between March and July 2021. Thus, review of the data starting in March 2019 and in March 2021 tests Dr. Miller's conclusion with two "placebo" time periods. The fact that [redacted] means that Dr. Miller was wrong to conclude that the increase in subscribers in the period he studied was caused by the Shaw Mobile launch.

(55) Seasonal trends in new subscriber sign-ups are not restricted to Freedom. Those trends are obvious for Bell, as seen in Figure 3, as well as for Virgin, as seen in in Figure 4. (Unlike Freedom, data from Bell and Virgin are not available after mid-2021.)

Figure 3: New Bell subscribers by month

Figure 4: New Virgin subscribers by month

(56)

(57) For clarity, I summarize the average monthly number of subscribers for Bell and Virgin in the period from March to July and the period from August to February for the two 12-month periods available to me in Figure 5.

Figure 5: Average number of new subscribers by month for Bell and Virgin

Brand	Year	Mar-July	Aug-Feb	Difference
[redacted]				

IV.B.2. Dr. Miller's analysis provides no basis to conclude that the Shaw Mobile launch caused an increase in data usage or a decrease in the average price of data

(58) Following his analysis of the effect of the Shaw Mobile launch on new subscribers, Dr. Miller assesses the alleged effects of the launch of Shaw Mobile on data usage and on the average price of data. Thus, the hypothesis he purports to test is that the Shaw Mobile launch spurred competition in the wireless industry thereby causing Canadians to use more data and pay lower average prices per gigabyte of data.

(59) To illustrate the fundamental flaws in Dr. Miller's approach, I first focus on Dr. Miller's assessment of the alleged impact of the Shaw Mobile launch on Freedom. I then turn to the data for the Bell and Virgin brands.

(60) Dr. Miller's analyses of data usage and the average price of data differ from his analysis of new subscribers. In assessing both usage and the average price of data, he compares two distinct groups of subscribers:[27]

- Pre-launch group: subscribers who signed up with Freedom between January and July 2020 (i.e., prior to the Shaw Mobile launch), and
- Post-launch group: subscribers who signed up with Freedom between August and December 2020 (i.e., after the Shaw Mobile launch).

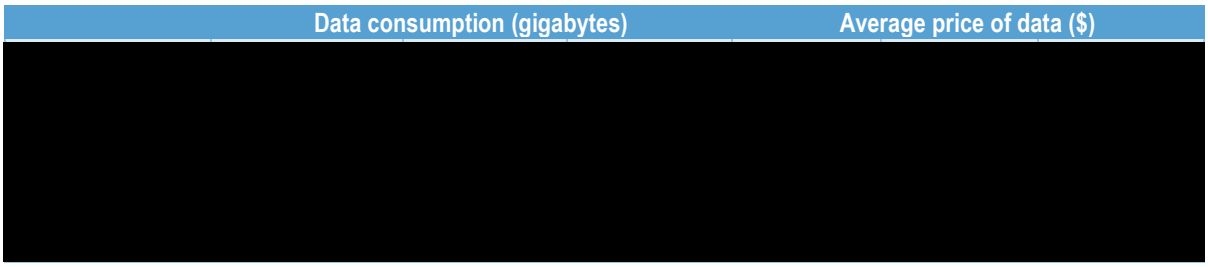
(61) Dr. Miller compares data usage and average price of data of the pre-launch and post-launch groups in the last months of 2020 and the first months of 2021.[28] For ease of reference, Figure 6 simply reproduces the Freedom data points reflected in the graphs in the top half of his Exhibit 13 and his Exhibit 15. Dr. Miller highlights a comparison that shows that, on average, the post-launch group

[27] Miller Report, Exhibit 13 and Exhibit 15.

[28] In his graphical analysis presented in Exhibits 13 and 15, Dr. Miller analyzes outcomes from October 2020 through February 2021. However, in his statistical analysis presented in Exhibits 14 and 16, he restricts the months of analysis to December 2020-February 2021. Dr. Miller asserts that billing irregularities suggest dropping the first two months after a Freedom subscriber's activation. He does not offer a justification for the different time periods analyzed in the graphical analysis and the statistical analysis.

consumed 0.32 gigabytes more data per month and paid $1.00 less per gigabyte of data than the pre-launch group.

Figure 6: Dr. Miller's estimates of data usage and average price of data for pre-launch and post-launch Freedom subscribers (Miller Report, Exhibits 13 and 15)



(62) Dr. Miller then proceeds, with no further analysis, to conclude that the Shaw Mobile launch *caused* these differences. Generally, as I explained in section IV.A, making such a claim without further analysis is neither standard nor acceptable practice in economics.

(63) In this specific case, the pre-launch and post-launch groups differ for reasons other than whether they signed up with Freedom before or after the Shaw Mobile launch. For one, the pre-launch group had a longer tenure with Freedom than did the post-launch group during the period in which Dr. Miller compared them. Additionally, it is possible that subscribers who sign up in the latter half of a year (back-to-school) have different propensities to consume data than those that sign up earlier. I also understand that carriers react to various stimuli (e.g., being long on iPhone inventory) and generally run more promotions in the fall than they do earlier in the year. Dr. Miller did not analyze the effects of those possibilities

(64) In this light, Figure 7 and Figure 8 are instructive. They are identical to Figure 6 except that they show usage and average price of data in periods before and after the period on which Dr. Miller focuses.[29] This additional data permits the comparison of the pre-launch and post-launch groups in Figure 6 to two analogous groups, which I refer to as the "pre-July" group and the "post-August" group, in different years.

[29] Dr. Miller had access to the earlier data at the time he submitted his report. He did not have access to the later data.

Figure 7: 2019 data usage and average price of data for pre-July and post-August Freedom subscribers

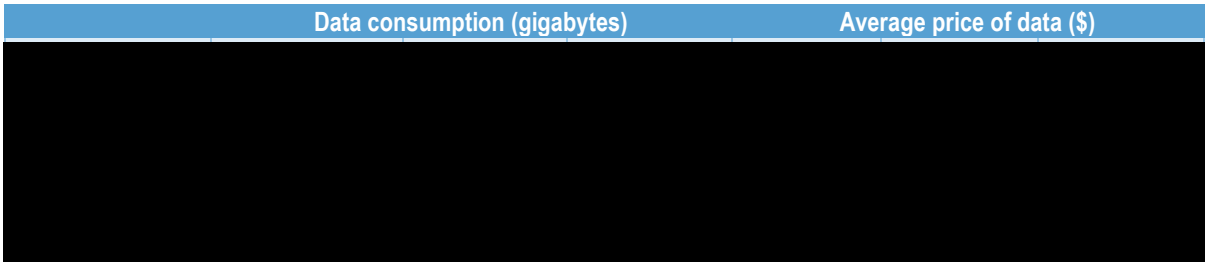
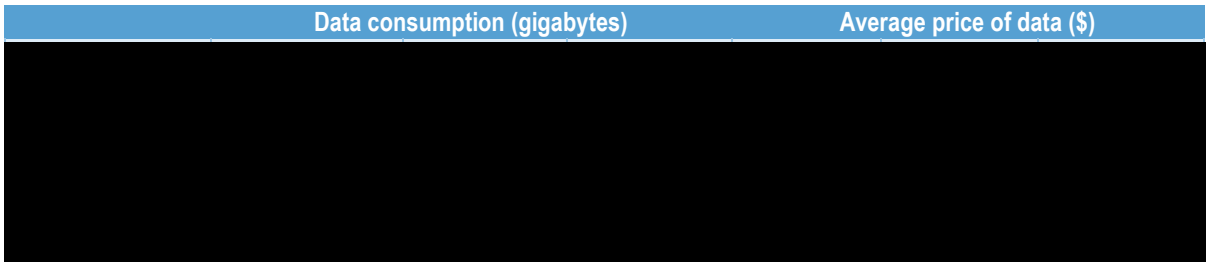


Figure 8: 2021 data usage and average price of data for pre-July and post-August Freedom subscribers



(65) Consider first the analysis of data consumption. I summarize the average monthly differences between the two groups in each year in Figure 9. Dr. Miller's focus is on the difference between the pre-launch and post-launch groups in the time period represented in the middle of the graph. However, differences in data consumption are clearly present in the preceding and following years. In the year on which Dr. Miller focuses, the difference between the two groups is [redacted] than the difference in the preceding and following years. It is also [redacted] than the difference in the following year. More specifically:

- [redacted]
- [redacted].

Figure 9: Differences in October-February data consumption between pre-July and post-August subscriber groups by year (in gigabytes)

(66) Consider next the analysis of average price of data. I summarize the differences between the two groups in each year in Figure 10. Dr. Miller's focus is on the difference between the pre-launch and post-launch groups in the time period represented in the middle of the graph. But differences in average price paid for data are clearly present in the preceding and following years. While the difference that Dr. Miller highlights appears to be [redacted].[30] More specifically:

- In 2020 post-August subscribers paid $[redacted] per gigabyte of data ([redacted]) than did pre-July subscribers,
- In 2019 post-August subscribers paid $[redacted] less per gigabyte of data ([redacted]) than did pre-July subscribers,
- In 2021 post-August subscribers paid $[redacted] less per gigabyte of data ([redacted]) than did pre-July subscribers.

[30] Later in my Report, I note the strong downward trends in wireless pricing and upward trends in data usage. Such trends pre-existed the Shaw Mobile launch and pose particular challenges in studying its causal effects.

Figure 10: Differences in October-February average price of data between pre-July and post-August subscriber groups by year (in dollars per gigabyte)

(67) Again, to be abundantly clear, for the same reasons that I explained in the context of new Freedom subscribers, the launch of Shaw Mobile could not possibly have caused the differences present in Figure 7 and Figure 8. That is easiest to appreciate in Figure 7 where all subscribers signed up prior to the Shaw Mobile launch. But it is equally true in Figure 8 where all subscribers signed up after the Shaw Mobile launch. There is no basis to believe that the July 30, 2020 Shaw Mobile launch would have affected subscribers that signed up between August and December of 2021 but not subscribers that signed up between January and July of 2021.

(68) I next turn to the same analysis applied to data from Bell and Virgin. To ease exposition, I separate my discussion of data usage from my discussion of the average price of data into two subsections.

IV.B.2.a. Data usage: Bell and Virgin data

(69) Figure 11 shows data consumption by new Bell and Virgin subscribers during the period from September 2019 to February 2020, as well as during the period from September 2020 to February

2021. The Shaw Mobile launch would have been relevant to data consumption only in the later period as the earlier period preceded the Shaw Mobile launch.

(70) Following Dr. Miller's approach, I divided subscribers into two groups: those who activated wireless accounts with Bell and Virgin during the period from January to July and those who did so in the period from August to December. The bottom half of the figure—starting September 2020—reflects a portion of what is shown in Dr. Miller's Exhibit 13. The top half of the figure reflects data from a year earlier (i.e., before the Shaw Mobile launch). Unlike Freedom, whose equivalent data I showed above, more recent data is not available for Bell and Virgin.

Figure 11: Bell and Virgin data use (gigabytes)

	Bell			Virgin		
	Activation Jan-Jul	Activation Aug-Dec	Difference	Activation Jan-Jul	Activation Aug-Dec	Difference
[redacted]						

(71) [redacted]

- [redacted]

- [redacted]
- Recall that for Freedom (as shown in Figure 6, Figure 7, Figure 8), the difference was [redacted] gigabytes for the year on which Dr. Miller focuses, [redacted] gigabytes in the prior year and [redacted] gigabytes in the following year. [redacted], [redacted]

(72) On this basis, Dr. Miller errs in attributing the 2020 difference in data consumption between the two groups of subscribers—those who activated in the period before the Shaw Mobile launch and those who activated in the period after—to the Shaw Mobile launch. He makes no attempt to remove confounding effects between his two groups of subscribers that are unrelated to the Shaw Mobile launch.

(73) I acknowledge that, viewed narrowly, Figure 11 may provide some support for the notion that the Shaw Mobile launch caused [redacted]. However, that narrow perspective would ignore the other implications of the data: that the Shaw Mobile launch caused a [redacted] data consumption among [redacted] subscribers.

(74) These disparate effects contradict Dr. Miller's conclusion that the Shaw Mobile launch spurred an increase in data consumption in the markets he defines. If Dr. Miller's conclusion were correct, one would observe an increase in data consumption across all three carriers: Freedom, Bell, and Virgin. Instead, for [redacted] of those carriers the effect appears to have been the opposite.

IV.B.2.b. Average price of data: Bell and Virgin data

(75) Before I summarize the data for Bell and Virgin, I make several general observations on what I have been terming the "average price of data." These remarks are broadly pertinent—they should be understood to be relevant for all brands and all analyses that consider the average price of data.

(76) This analysis does not study price, per se, but studies a construct defined by Dr. Miller: "[redacted]."[31] For the sake of simplicity, I refer to this as the "average price of data." There are three points that are important to understand with respect to the average price of data:

[31] Miller Report, Note to Exhibit 15. [redacted]."

- Dr. Miller refers to his construct as the "incremental" price of data, which is misleading. I prefer the term "average" price of data. Dr. Miller's definition itself implies an average price per gigabyte of data as his measure does not examine what the price is on the margin for an incremental gigabyte of data. The only sense in which it could reflect an incremental price is if the average and incremental price were equal.
- Taken at face value, Dr. Miller's estimates of the alleged effect of the Shaw Mobile launch on the average price of data charged by Freedom, Bell, Virgin (in Exhibit 16 of his Expert Report), and Telus (in his paragraph 126) are remarkable. For Bell, Virgin, and Telus, the reductions in average prices of data that Dr. Miller attributes to the launch of Shaw Mobile are [redacted]. For Freedom effects are [redacted] with reductions of up to [redacted]. These results appear to be, at least in part, driven by changes that carriers made to their wireless offerings in which they left the plan prices unchanged but increased the data allowance. For example, Dr. Miller refers to promotions that involved [redacted].[32] Such promotions would decrease the average price of data by [redacted]. I discuss such promotions in section IV.E of my Report.
- Standard microeconomics implies that a given consumer values the 20th gigabyte of data allocation less than he or she does the first gigabyte of data allocation.[33] The average price of data does not reflect this implication, however. That is not to say that an increase in data allocation has no value: even if higher data allocations are used infrequently, there is an ex-ante option value to having a higher data limit than a lower data limit. Nevertheless, the average price of data should be understood to be very different from the price of wireless plans.

(77) Against that backdrop, I now turn to the average price of data charged by Bell and Virgin.

(78) Figure 12 shows the average price of data for new Bell and Virgin subscribers based on whether their accounts were activated in the period from January to July or the period from August to December of the relevant calendar year. The bottom half of the figure—starting September 2020—reflects a portion of the data that underlies Exhibit 16 to the Expert Report of Dr. Miller. The top half of the figure reflects data from a year earlier. Unlike Freedom, more recent data is not available for Bell and Virgin.

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32 Miller Report, footnote 171.

33 This is an implication of strict convexity of preferences, which implies diminishing marginal rates of substitution. *See* Hal R. Varian. *Microeconomic Analysis*. W.W. Norton & Company, 1992, Chapter 7.

Figure 12: Bell and Virgin average price of data ($ per gigabyte)

	Bell			Virgin		
	Activation Jan-Jul	Activation Aug-Dec	Difference	Activation Jan-Jul	Activation Aug-Dec	Difference
[redacted]						

(79) Figure 12 illustrates [redacted]

(80) [redacted]

- [redacted]
- [redacted]
- [redacted]

(81) On this basis, Dr. Miller errs in attributing the difference between the two groups of subscribers—those who activated in the period from January to July, and those who activated in the period from August to December—in 2020 to the Shaw Mobile launch. He makes no attempt to remove existing and substantial confounds.

(82) While Figure 12, viewed narrowly, would appear to support the notion that the Shaw Mobile launch caused a [redacted] in the period September 2020 to February 2021, that perspective ignores that the data suggests that the Shaw Mobile launch caused an [redacted] subscribers. (The interpretation of the effect on [redacted] less clear for the reasons set out in my discussion above.)

(83) Such disparate effects contradict Dr. Miller's conclusion that the Shaw Mobile launch caused lower average prices of data in the markets he defines.

IV.C. Dr. Miller's conclusions are highly sensitive to the assignment of Ontario to the control group

(84) As I discussed in section IV.A, valid causal inference must explicitly identify a treatment group and a control group. In this case, an important question about assignment concerns Ontario, where Shaw Mobile is not available. As I discussed in section IV.A, Dr. Miller appears to recognize the implications of this fact in parts of his Expert Report but does so inconsistently. In this section, I apply a standard tool used to make causal inferences to assess the implications of assigning Ontario to the control group. This analysis shows that Dr. Miller's conclusions about the effects of the Shaw Mobile launch are highly dependent on this assignment.

IV.C.1. Overview of my analytical approach to assess the implications of assigning Ontario to the control group

(85) To assess the implications of assigning Ontario to the control group, I use a technique known as difference-in-differences, which I implement in a regression framework. Difference-in-differences is a standard and commonly used method to make causal inferences.[34] It was used by the Competition Bureau's expert in its intervention in the CRTC proceedings initiated by Telecom Notice of Consultation CRTC 2019-57.[35]

(86) The difference-in-differences methodology is easiest to explain through an example.

(87) In paragraph 114 of his Expert Report, Dr. Miller reports average monthly new subscribers to Telus Mobility "promotional plans" in AB, BC, and Ontario for the period immediately before (January

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[34] See, for example, Jeffrey M. Wooldridge. *Econometric Analysis of Cross Section and Panel Data*. MIT Press, 2002, p. 130.

[35] See "Report Studying the State of Competition in the Retail Wireless Marketplace and the Benefits of Additional Competition among Wireless Service Providers" Prepared by Dr. Tasneem Chipty of Matrix Economics on behalf of the Competition Bureau of Canada for CRTC 2019-57: Review of Mobile Wireless Services, November 22, 2019.

2020 to July 2020) and after (August 2020 to November 2020) the Shaw Mobile launch on July 30, 2020.[36] For convenience, I summarize that information in Figure 13.

Figure 13: New Telus subscribers to "promotional plans" (in 1000s per month) before and after the Shaw Mobile launch[37]

(88) Figure 13 reports differences between the "before" and "after" periods for each province in terms of new subscribers per month as well as the percentage change in the number of new subscribers. The difference-in-differences technique compares the change over time for the treatment group to the same change over time for a control group.[38] In this way, it can remove seasonal and other confounds that are the same across groups. Evidence of an effect of the treatment is obtained if that "difference in differences" is statistically different from zero. (I use an equivalent regression framework to assess statistical significance.)

(89)

(90) This example illustrates why it is critical to be explicit in the assignment of observations to either the control or the treatment group. It also illustrates the manner in which Dr. Miller's conclusions are affected by that assignment. Without reference to a valid control group, Dr. Miller cannot legitimately draw any causal conclusions.

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36 I discuss Dr. Miller's definition of Telus "promotional plans" in section IV.D.

37 Miller Report, ¶ 114.

38 Equivalently, a difference-in-differences analysis may compare the difference between the treatment and control groups during the period after treatment with the same difference prior to treatment.

39 Miller Report, ¶ 119 .

IV.C.2. Difference-in-differences analysis of new subscribers per month

(91) In Figure 14 below, I provide a summary of the estimated difference-in-differences regression coefficients that capture the effect of the Shaw Mobile launch on the number of new subscribers per month of each brand assigning Ontario to the control group. The regressions use only the data that Dr. Miller relied on in his Exhibits 11 and 12. Figure 14 also reports a t-statistic, which is a measure of whether the estimated coefficient is statistically different from zero.[40,41]

Figure 14: Difference-in-differences analysis applied to numbers of new subscribers per month assigning Ontario to the control group

	AB		BC	
	Coefficient	t-statistic	Coefficient	t-statistic
[redacted]				

(92) The fundamental take-away from Figure 14 is that, subsequent to the Shaw Mobile launch, the number of new subscribers per month [redacted]. To be clear, I do not interpret Figure 14 as evidence that the Shaw Mobile launch lessened competition in

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40 The t-statistic is used for hypothesis testing, for which many references exist. The following passage, which describes using t-statistics to test whether gender matters in determining salaries, may be helpful to anyone unfamiliar with hypothesis testing and t-statistics:
"The t-statistic is the estimated value divided by its standard error. For example, in (A15), the estimate for d is $700. If the standard error is $325, then t is $700/$325 = 2.15. This is significant—that is, hard to explain as the product of random error. Under the null hypothesis that d is zero, there is only about a 5% chance that the absolute value of t is greater than 2. (We are assuming the sample is large.) Thus, statistical significance is achieved (supra Section IV.B.2). Significance would be taken as evidence that d—the true parameter in the model (A13)—does not vanish. According to a viewpoint often presented in the social science journals and the courtroom, here is statistical proof that gender matters in determining salaries. On the other hand, if the standard error is $1400, then t is $700/$1400 = 0.5. The difference between the estimated value of d and zero could easily result from chance. So the true value of d could well be zero, in which case gender does not affect salaries." David H. Kaye & David A. Freedman, "Reference Guide on Statistics," *US Federal Judiciary Reference Manual on Evidence* (2011): 282. Available at https://www.fjc.gov/sites/default/files/2015/SciMan3D01.pdf.

41 I follow the usual convention and denote with a single asterisk a coefficient that is statistically different from zero at a 10% level; a double asterisk to denote a 5% level; and a triple asterisk to denote a 1% level.

I report "robust" t-statistics that have certain desirable statistical properties. Alternatively, for regressions done at the level of individual subscribers (i.e., data usage and the average price of data), I could have calculated standard errors that are "clustered" at the level of individual subscribers. Doing so generally tends to move the t-statistic towards zero.

42 [redacted]

AB and BC. Instead, Figure 14 highlights the significance of the assignment of Ontario to either the control or the treatment group.

IV.C.3. Difference-in-differences analysis of wireless data usage

(93) I next assess Dr. Miller's conclusion that the Shaw Mobile launch caused subscribers of Freedom, Bell, and Virgin to consume more wireless data.[43] I follow Dr. Miller's framework as closely as possible—except that I remove Ontario from the treatment group and instead assign it to the control group. In his framework, Dr. Miller compares data usage in either October-February (for Freedom) or September-February (for Bell and Virgin) for two groups of subscribers.[44] The first group activated accounts before the Shaw Mobile launch in the period from January to July, and the second group activated accounts after the Shaw Mobile launch in the period from August to December.

(94) In his discussion of data usage, Dr. Miller suggests that assigning Ontario to the control group is appropriate.[45] While he makes that suggestion only in the context of his analysis of the alleged effect of the launch of Shaw Mobile on data usage by Freedom subscribers, an increase in competition caused by the Shaw Mobile launch ought to affect other brands in the market (e.g., Bell and Virgin) as well as other outcomes (i.e., new subscribers, average price of data). Dr. Miller appears to recognize that logic without recognizing its implications.[46]

(95) In Figure 15, I provide a summary of the estimated difference-in-differences regression coefficients that capture the effect of the Shaw Mobile launch on data usage for each brand, measured in gigabytes, assigning Ontario to the control group. The regressions use only the data that Dr. Miller relied on in his Exhibit 13 disaggregated by province. Figure 15 also reports a t-statistic.[47]

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43 Miller Report, ¶ 116-121.

44 Dr. Miller analyzes a shorter time period for Freedom because he believes that data irregularities suggest dropping the first two months of a subscriber's billings. For Bell and Virgin, Dr. Miller only drops a single month. See footnote 28.

45 Miller Report, ¶ 119 ("The larger effect in Western Canada is consistent with the fact that Shaw Mobile is only offered in these provinces, leading to particularly intense price competition between Shaw's brands and the Big 3 in Western Canada.").

46 *See*, e.g., Miller Report, ¶ 110 ("I analyze the effect that the launch of the Shaw Mobile brand had on the market for wireless services…"). [Emphasis added.]

47 As I did above, I follow the usual convention and denote with a single asterisk a coefficient that is statistically different from zero at a 10% level; a double asterisk to denote a 5% level; and a triple asterisk to denote a 1% level.

Figure 15: Difference-in-differences analysis applied to data usage (in gigabytes) assigning Ontario to the control group

	AB		BC	
	Coefficient	t-statistic	Coefficient	t-statistic
[redacted]				

(96) [redacted]

(97) Moreover, the change in data usage is substantially smaller than the estimates Dr. Miller provides in Exhibit 14 to his Expert Report where, for example, he found an effect of [redacted]. As seen in Figure 11, the average data usage for [redacted]l subscribers that activated in 2020 prior to July was [redacted] gigabytes. [redacted]

(98) These results demonstrate the importance of the assignment of Ontario to the control group or treatment group and the sensitivity of Dr. Miller's conclusions to that assignment.

IV.C.4. Difference-in-differences analysis of the average price of data

(99) Finally, I assess Dr. Miller's conclusion that the Shaw Mobile launch caused subscribers of Freedom, Bell, and Virgin to pay lower average prices for data.[48] Following Dr. Miller's framework as closely as possible (except assigning Ontario to the control group), I compare average prices of data paid by subscribers who activated accounts before the Shaw Mobile launch in the period January-July to subscribers who activated accounts after the Shaw Mobile launch in the period August-December. Following Dr. Miller's convention, I compare the average price of data they paid during the period between either October and February (for Freedom) or September and February (for Bell and Virgin).

(100) Before presenting results from my difference-in-differences analysis, I re-emphasize that this analysis does not study price, per se, but studies a construct defined by Dr. Miller that I refer to as the average price of data. See my discussion in section IV.B.2.b of this Report.

[48] Miller Report, ¶¶ 122-127.

(101) In Figure 16, I provide a summary of the estimated difference-in-differences regression coefficients that capture the effect of the Shaw Mobile launch on the average price of data measured in dollars per gigabyte. The regressions use only data from the period that Dr. Miller considers, which is mainly restricted to 2020. Figure 16 also reports a t-statistic.[49]

Figure 16: Difference-in-differences analysis applied to average price of data ($ per gigabyte) assigning Ontario to the control group

	AB		BC	
	Coefficient	t-statistic	Coefficient	t-statistic
[redacted]				

(102) Figure 16 shows that, subsequent to the Shaw Mobile launch, the average price of data decreased in AB or BC relative to Ontario in [redacted]

(103) Moreover, the change in average price of data is substantially smaller than the estimates Dr. Miller provides in his Exhibit 16 where, for example, he found effects in excess of a [redacted] in the average price of data for [redacted]. Per Figure 12, the average price of data for Virgin subscribers that activated in 2020 prior to July was [redacted]. The [redacted] effect in AB means that the average price of data [redacted] a [redacted] effect in BC means that the average price of data [redacted] by [redacted]

(104) Again, I do not believe it is appropriate to interpret Figure 16 as evidence that the Shaw Mobile launch lessened competition in AB from Bell but increased competition in BC from Bell. Rather, Figure 16 once again highlights the significance of the assignment of Ontario to either the control or treatment group, especially when contrasted with Dr. Miller's conclusions as laid out in Exhibit 16 to his Expert Report.

IV.D. Insights from the Telus data

(105) Dr. Miller conducts different analyses for Telus than he does for Freedom, Bell, and Virgin because "the format of the Telus data… differs from that of Shaw and Bell in that it reports information at the plan level rather than the subscriber level."[50] In particular, Dr. Miller analyzes the impact of the Shaw

[49] Once again, I follow the usual convention and denote with a single asterisk a coefficient that is statistically different from zero at a 10% level; a double asterisk to denote a 5% level; and a triple asterisk to denote a 1% level.

[50] Miller Report, ¶ 114.

Mobile launch on the number of new subscribers, data usage, and average price of data of "Telus Mobility promotional plans" as follows:

- New subscribers: Dr. Miller calculates the monthly number of new subscribers for "the Telus Mobility promotional plans that were offered from January to July 2020 (immediately before the launch of Shaw Mobile) and separately, those offered from August to November 2020 (immediately after the launch of Shaw Mobile)."[51] He finds that new [redacted]
- Data usage and average price of data: Dr. Miller compares data usage and the average price of data for "promotional plans" that Telus introduced after the Shaw Mobile launch with "all other Telus Mobility plans with at least 10 gigabytes of allocated data" during the December 2020 to February 2021 period. He finds that average [redacted].[53]

(106) Dr. Miller imposes a number of assumptions in conducting his analysis of the Telus data that are arbitrary and often inconsistent with his analyses of other data. For example:

- Dr. Miller's analysis focuses on [redacted]. He provides no rationale for this restrictive definition, which he does not impose on Freedom, Bell, or Virgin.
- [redacted]

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51 Miller Report, ¶¶ 114, 121, 126. Dr. Miller states that he analyzes "new subscribers." However, because [redacted], he actually analyzes gross adds, not new-to-brand subscribers in the manner used in his analyses for other carriers.

52 Miller Report, ¶ 114.

53 Miller Report, ¶¶ 121, 126.

54 Miller Report, fn 179.

55 Miller Report, fn 179. [redacted]."

[redacted]. That conclusion with respect to [redacted] is inconsistent with Dr. Miller's overall conclusion that "the launch of Shaw Mobile promoted vigorous competition between Shaw's brands and competitor carriers."[57] Dr. Miller does not acknowledge this tension.

(107) Beyond those issues, Dr. Miller's analysis of the Telus data from Ontario, AB, and BC provides no basis to conclude that the Shaw Mobile launch affected Telus in the ways that he claims. As I demonstrated with respect to Freedom, Bell, and Virgin, Dr. Miller's causal conclusions are without basis. In doing so, I analyzed data from time periods other than the period on which Dr. Miller focused. Unfortunately, I cannot perform such an analysis for Telus because most of the Telus plans that Dr. Miller studies do not exist in the Telus data until June 2019 or later. Due to this limitation, my analysis of the Telus data processed by Dr. Miller differs from my analysis of the Freedom, Bell, and Virgin data. It nevertheless demonstrates Dr. Miller's failure to properly assess the alleged causal effects of the Shaw Mobile launch.

(108) The remainder of this section proceeds as follows. I first analyze the impact of assigning Ontario to the control group for Telus. As I showed for Freedom, Bell, and Virgin, Dr. Miller's results are sensitive to this assignment. I then analyze historical trends in Telus subscribers, data usage, and price per gigabyte for which Dr. Miller does not account.

IV.D.1. Dr. Miller's conclusions for Telus are sensitive to the assignment of Ontario to the control group

(109) As I described in section IV.C.1, Dr. Miller's analysis of average monthly new subscribers to Telus Mobility promotional plans is sensitive to the assignment of Ontario to the control group. Recall that Figure 13 showed that [redacted]. This means that Dr. Miller's conclusion that the Shaw Mobile launch caused an increase in the number of new subscribers on promotional plans is unsustainable when Ontario is assigned to the control group.

(110) As described above, Dr. Miller analyzes Telus data usage and average price of data differently than he analyzes new subscribers. Specifically, instead of comparing outcomes before and after the Shaw Mobile launch, he compares data usage and the average price of data associated with promotional

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56 Miller Report, fn. 179.

57 Miller Report, ¶ 128.

plans that Telus introduced after the Shaw Mobile launch to other available non-promotional plans during the December 2020 to February 2021 period. Nevertheless, that analysis can still be viewed through the difference-in-differences framework and illustrates the importance of the assignment of Ontario to either the control or treatment group.

(111) Figure 17 below lists the average percentage differences in data usage and average price of data between promotional and non-promotional plans that Dr. Miller reports in paragraphs 121 and 126 of his Expert Report. It shows:

- [redacted]
- [redacted]

(112) **Figure 17: Percentage difference in average data usage and average price of data for Telus promotional plans compared to non-promotional plans between December 2020 and February 2021**[58]

Measure	AB	BC	ON
[redacted]			

(113) Thus, Dr. Miller's conclusion that the Shaw Mobile launch promoted vigorous competition from Telus is unsustainable if Ontario is assigned to the control group.

IV.D.2. Historical trends in Telus subscribers, data usage, and price per gigabyte

(114) Figure 18 below shows new subscribers that signed up with Telus in Ontario, AB, and BC to any wireless plan in the period from January 2019 to July 2021; Figure 21 below is restricted to subscribers signing up to a Telus wireless plan with at least 0.5 gigabyte of data. [redacted] On this basis, Dr. Miller errs in concluding that an increase in the number of Telus subscribers in August 2020 and later was caused by the Shaw Mobile launch.

[58] Miller Report, ¶¶ 121, 126.

Figure 18: New Telus subscribers by month

Figure 19: New Telus subscribers to plans with at least 0.5 gigabyte data allocation

(115) For clarity, I summarize the average number of new Telus subscribers in the period from January to July and the period from August to December for 2019 and 2020 in Figure 20. The Telus data provide no indication that [redacted] was caused by the Shaw Mobile launch.

Figure 20: Average number of monthly new Telus subscribers: Jan-July vs. August-Dec

Type of plan	Year	Jan-July	Aug-Dec	Difference
[redacted]				

(116) I next turn to the second outcome that Dr. Miller analyzed in order to gauge the competitive significance of Shaw Mobile: data usage. Careful review of the data I presented above concerning new Telus subscribers suggests that [redacted]

[redacted]

Figure 21: Data usage per Telus subscriber by month

Figure 22: Data usage per Telus subscriber by month for plans with at least 0.5 gigabytes of data allocation

(117)

(118) Finally, I turn to Telus' average price of data. Figure 23 shows that

Figure 23: Average price of data for Telus customers

IV.E. Dr. Miller's "timeline of promotional strategies"

(119) Dr. Miller prefaces his empirical analysis of new subscribers, data usage, and average price of data by "noting the timeline of promotional pricing strategies of each major carrier around the time of the Shaw Mobile launch."[59] That timeline is brief, consisting of several examples of "promotional pricing strategies" offered by Bell, Rogers, Telus, and Freedom in the period after the Shaw Mobile launch. While the conclusions he draws from this timeline are not explicit, it appears that Dr. Miller considers it to support a conclusion that the Shaw Mobile launch *caused* changes in promotional pricing strategies in ways that increased competition. Dr. Miller arrives at this conclusion based on the same type of errors that invalidate his empirical analysis I discussed above. In my view, the evidence relied on by Dr. Miller provides no basis for his causal conclusion.

[59] Miller Report, ¶ 109.

(120) Dr. Miller relies upon certain promotions offered just after the Shaw Mobile launch but recognizes that similar promotions were offered several times earlier in 2020.[60] To understand the alleged causal effects of the Shaw Mobile launch, post-launch promotions must be compared in some way with pre-launch promotions. Because Dr. Miller has not done this, he has not established causality. In fact, the existence of similar promotions prior to the launch of Shaw Mobile would suggest that the Shaw Mobile launch did *not* cause that promotional activity that occurred shortly thereafter.

(121) Dr. Miller's examples mainly focus on promotional price decreases in the period following the Shaw Mobile launch. As I explained above, to draw a causal conclusion from the existence of promotions that followed the launch is to commit the logical fallacy known as *post hoc ergo propter hoc*. Such a conclusion, for example, does not acknowledge the pre-existing downward trend in wireless prices. Nor does it attempt to remove that pre-existing trend so that the alleged effects of the Shaw Mobile launch can be identified.[61]

[60] Miller Report, ¶ 109 [redacted]

[61] See footnote 13.

V. Appendices

V.A. Materials relied upon

V.A.1. Litigation

V.A.1.a. Case filings and legislation

- "Report Studying the State of Competition in the Retail Wireless Marketplace and the Benefits of Additional Competition among Wireless Service Providers" Prepared by Dr. Tasneem Chipty Matrix Economics on behalf of the Competition Bureau of Canada for CRTC 2019-57: Review of Mobile Wireless Services, November 22, 2019.
- Canadian Radio-television and Telecommunications Commission, "Telecom Notice of Consultation CRTC 2019-57 - Final Comments of the Competition Bureau," July 15, 2020.
- Canadian Radio-television and Telecommunications Commission, "Telecom Regulatory Policy CRTC 2021-130," April 15, 2021.

V.A.1.b. Discovery

- [redacted] ROG00333914.
- SJRB-CCB00271884.
- SJRB-CCB00874447.

V.A.1.c. Expert reports and declarations

- Expert Report of Nathan H. Miller, PhD, May 6, 2022.

V.A.1.d. Data

- Bell, Shaw, and Telus billing data.[62]

V.A.2. Publicly available documents

V.A.2.a. Academic literature

- Angrist, Joshua D., and Jörn-Steffen Pischke. *Mostly harmless econometrics: An empiricist's companion.* Princeton University Press, 2009.

[62] These databases were provided to me by Compass Lexecon and reflect the data that Dr. Miller used in his analysis, except that they include more recent data for Shaw. The data in question will be delivered to the Commissioner of Competition in conjunction with my expert report.

- Athey, Susan, and Guido W. Imbens. "The state of applied econometrics: Causality and policy evaluation." *Journal of Economic Perspectives 31*, no. 2 (2017): 3-32.
- Johnson, Paul A. "Entry and exit event analysis," *Issues in Competition Law and Policy 2* (2008): 1385.
- Kaye, David H., David A. Freedman, "Reference Guide on Statistics," *US Federal Judiciary Reference Manual on Evidence* (2011): 282. Available at https://www.fjc.gov/sites/default/files/2015/SciMan3D01.pdf.
- Miller, Nathan, Steven Berry, Fiona Scott Morton, Jonathan Baker, Timothy Bresnahan, Martin Gaynor, Richard Gilbert et al. "On the misuse of regressions of price on the HHI in merger review," *Journal of Antitrust Enforcement 10*, no. 2 (2022): 248-259.
- Varian, Hal R., *Microeconomic Analysis*, 94-115, W.W. Norton & Company, 1992.
- Wooldridge, Jeffrey M., *Econometric Analysis of Cross Section and Panel Data.* MIT Press, 2002, 130.
- Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach,* 4th ed., Mason: South-Western Cengage Learning, 2009, 360.

V.A.2.b. Websites, news articles, and other sources

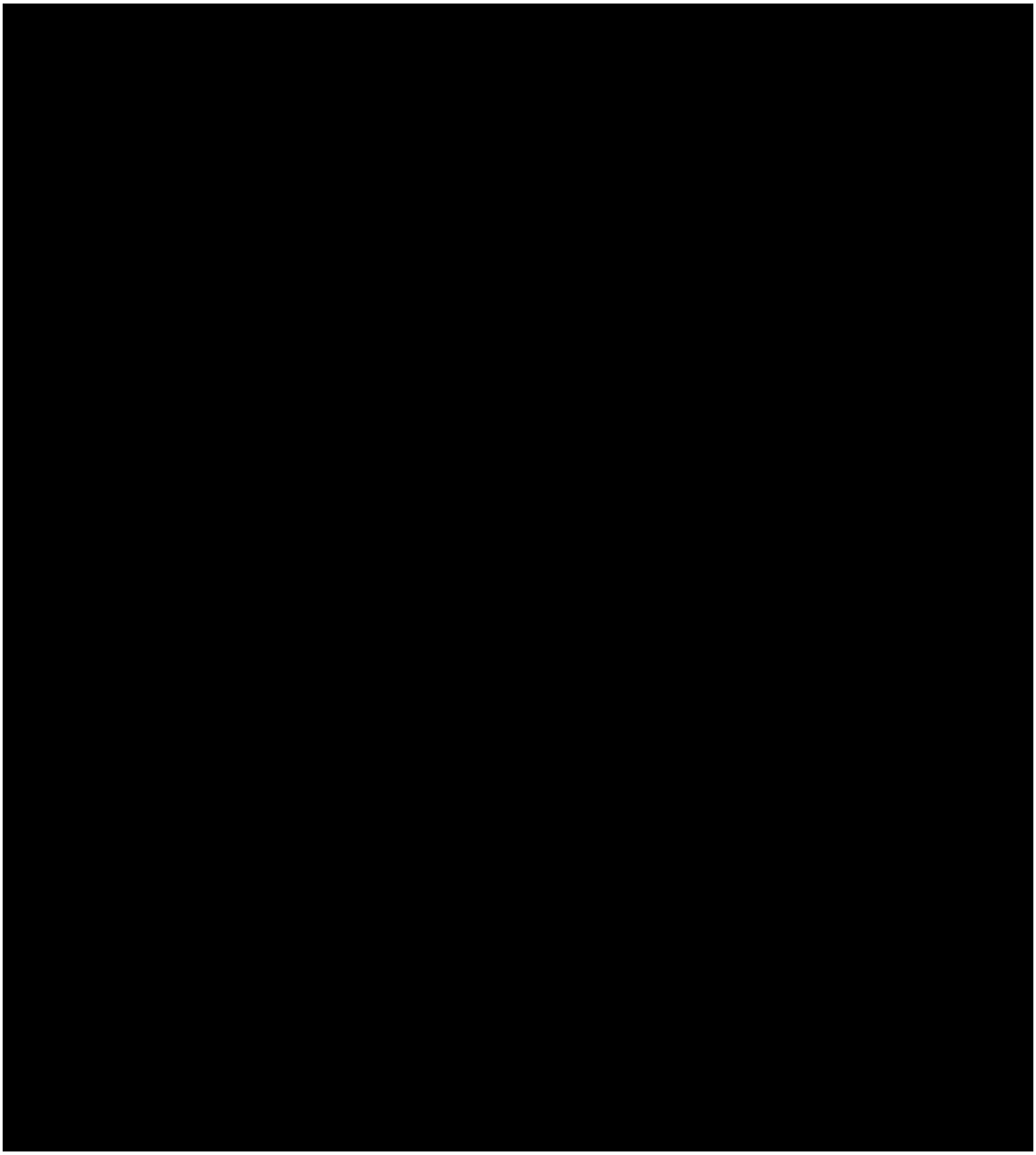
- CBC News. "Liberals give big 3 wireless providers two years to cut prices by 25 per cent." Politics. March 5, 2020. https://www.cbc.ca/news/politics/wireless-cellphone-fees-1.5484080.
- Government of Canada. "Government of Canada delivers on commitment to reduce cell phone wireless plans by 25%." Innovation, Science and Economic Development Canada. January 28, 2022. https://www.canada.ca/en/innovation-science-economic-development/news/2022/01/government-of-canada-delivers-on-commitment-to-reduce-cell-phone-wireless-plans-by-25.html.
- Government of Canada. "Minister Bains announces next steps to help reduce wireless prices and promote competition." Innovation, Science and Economic Development Canada. March 5, 2020, https://www.canada.ca/en/innovation-science-economic-development/news/2020/03/government-of-canada-takes-action-to-offer-more-affordable-options-for-wireless-services.html;
- Government of Canada. "Offering Canadian consumers more affordable options for their wireless services." Innovation, Science and Economic Development Canada. March 5, 2020, https://www.canada.ca/en/innovation-science-economic-development/news/2020/03/offering-canadian-consumers-more-affordable-options-for-their-wireless-services.html;
- Shaw. "Shaw Mobile Has Arrived — Fast LTE And Shaw's Fibre+ Network Combine to Give Customers an Innovative Wireless Experience with Unprecedented Savings." News Releases.

July 30, 2020. https://newsroom.shaw.ca/corporate/newsroom/article/materialDetail.aspx?MaterialID=6442452394.

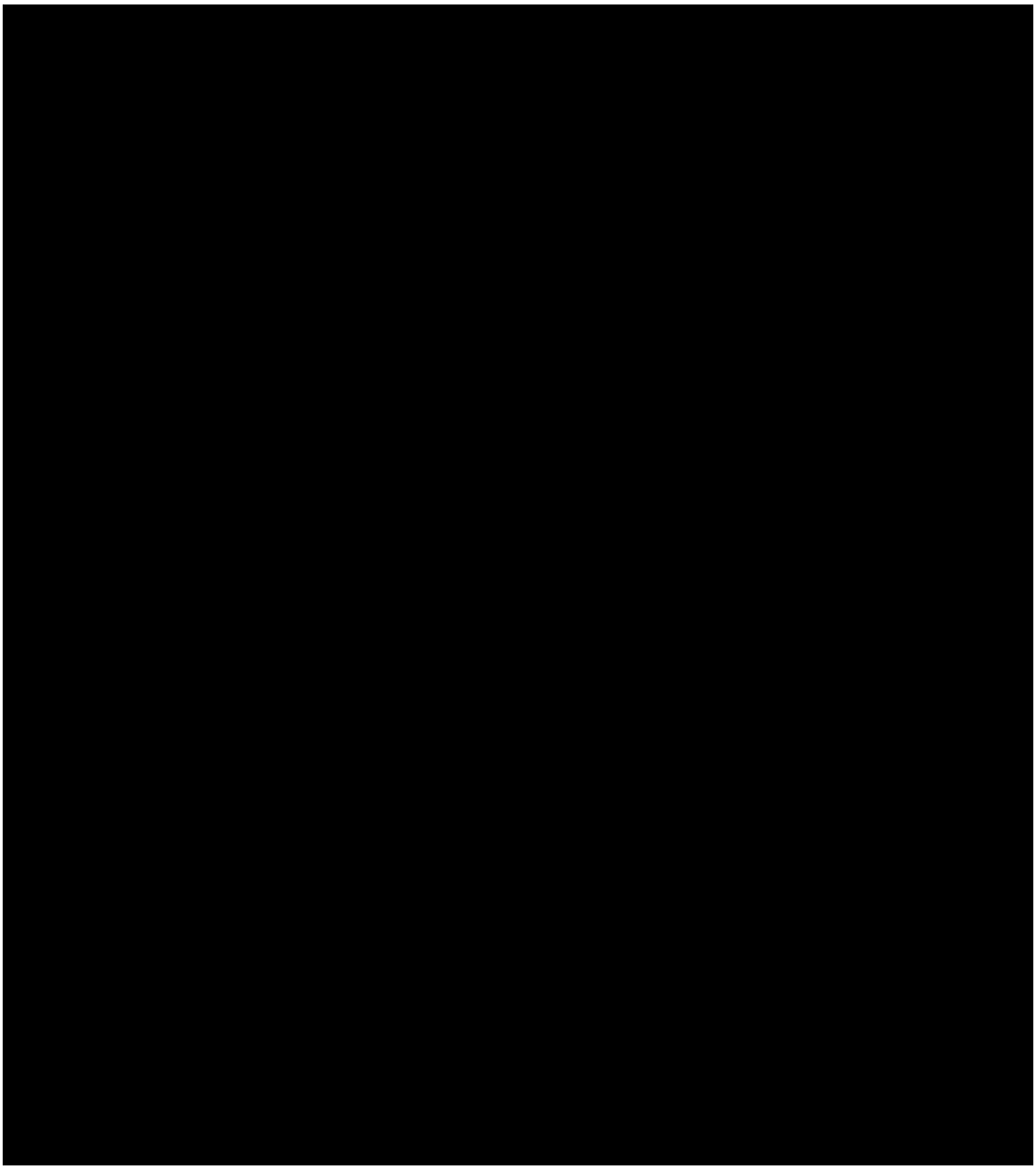
- The Nobel Prize. “The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2021.” Accessed September 16, 2022. https://www.nobelprize.org/prizes/economic-sciences/2021/summary/.

V.B. Econometric regression models

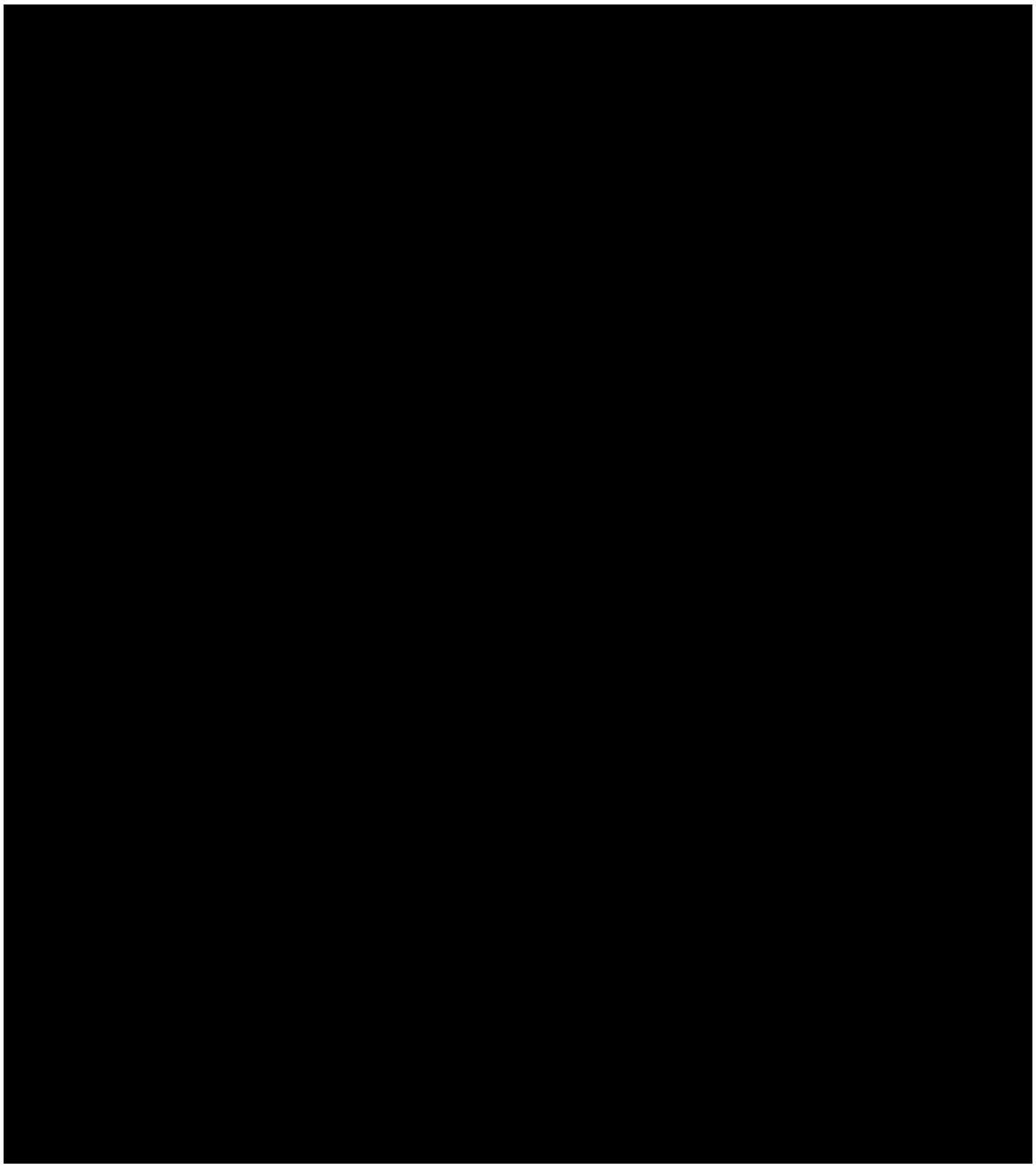
V.B.1. Difference-in-differences analysis applied to numbers of new subscribers per month assigning Ontario to the control group



V.B.2. Difference-in-differences analysis applied to log of numbers of new subscribers per month assigning Ontario to the control group



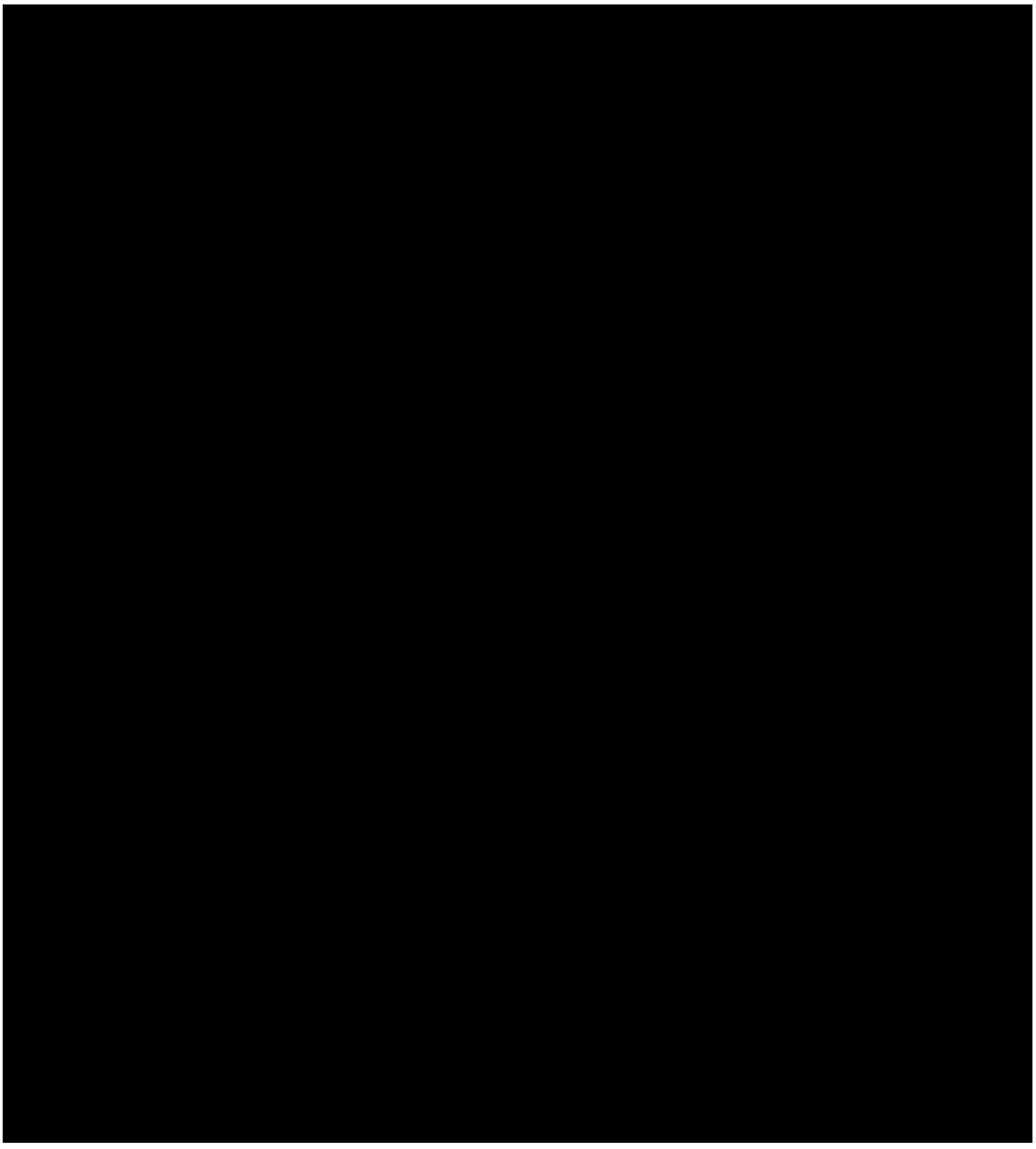
V.B.3. Difference-in-differences analysis applied to data usage (in gigabytes) assigning Ontario to the control group



[redacted]

V.B.4. Difference-in-differences analysis applied to average price of data ($ per gigabyte) assigning Ontario to the control group

[redacted]



V.C. Curriculum vitae

Paul A. Johnson, PhD specializes in competition economics. His experience spans a wide range of industries and all areas of competition economics including mergers and acquisitions, monopolistic practices, cartels, deceptive marketing practices, class certification, and calculation of damages. He has over 20 years of experience working on civil antitrust litigation and on high-profile mergers before antitrust agencies in a wide range of industries. He also served for three years at the Competition Bureau of Canada where he was the chief economist. He is currently the owner of Rideau Economics, located in Ottawa, Ontario.

Dr. Johnson may be reached by phone at [redacted] or by email at [redacted].

V.C.1. Education

- PhD, Economics, Université de Montréal
- BA, Economics, University of North Carolina at Chapel Hill

V.C.2. Professional experience

- Member, Competition Policy Council, C.D. Howe Institute, 2021-present
- Owner, Rideau Economics, 2019-present
- T.D. MacDonald Chair in Industrial Economics, Competition Bureau of Canada, 2016-2019
- Partner, Bates White Economic Consulting, 2013–2019
- Principal, Bates White Economic Consulting, 2007–2013
- Manager, Bates White Economic Consulting, 2005–2007
- Senior consultant, Bates White Economic Consulting, 2004–2005
- Senior economist, LECG, 2001–2004
- Economist, Capital Economics, 2000–2001
- Lecturer, The Pennsylvania State University, 1999–2000

V.C.3. Selected experience

- Analysis of price discrimination markets submitted to Competition Bureau on behalf of parties in Aon/WTW.
- Submitted merger simulation to Competition Bureau on behalf of parties in Alstom/Bombardier.
- Assessed merger in telecommunications sector reviewed by Competition Bureau.
- Assessed merger in recycling sector reviewed by Competition Bureau.
- Assessed merger in agricultural sector reviewed by Competition Bureau.
- At the Competition Bureau, worked with case teams, on special projects, and advised the Commissioner of Competition on all significant antitrust matters. Work included:
  - Development of Bureau white papers on Big Data.
  - Testimony before the Organization for Economic Co-operation and Development (OECD) Competition Committee on "Rethinking the Use of Traditional Antitrust Enforcement Tools in Multi-Sided Markets." June 22, 2017.
  - Testimony before Canadian Radio-Television and Telecommunications Commission on "Examination of differential pricing related to internet data plans." November 4, 2016.
  - Affidavits in the proposed acquisition by BCE Inc. of Manitoba Telecom Services Inc. September 15, 2016.
- Supported expert on behalf of DOJ, in its successful challenge of the proposed $34.6 billion merger of Halliburton and Baker Hughes.
- Supported expert on behalf of DOJ in the matter *U.S. v. AB Electrolux, Electrolux North America, Inc., and General Electric Company*. Expert testified in support of the Antitrust Division's successful challenge of Electrolux's proposed acquisition of General Electric's major appliance business.
- Supported expert analysis to the FCC on behalf of Cogent Communications regarding the proposed merger of Comcast and Time Warner Cable. The submission included an analysis of the declarations submitted by the merging parties' economic experts and an assessment of the competitive effects of the merger on the provision of Internet access for both the consumer and Internet content provider sides of the market
- Conducted detailed economic analysis on behalf of Eli Lilly in connection with its $5.4 billion acquisition of Novartis Animal Health. Both firms were active in developing and marketing animal health products, including medications used to treat pets and livestock. Bates White assessed overlaps in several areas, and presented results of its analysis to the FTC. The FTC approved the merger after an eight month investigation, with divestiture required in one product area, canine parasiticides.

- Provided analysis of terms in contracts between American Express and merchants on behalf of American Express. These terms were alleged to be anticompetitive by the United States Department of Justice and several states, as well as by several direct action merchants in two different matters (EDNY 10-CV-04496 and EDNY 11-MD-02221).
- Analyzed the pricing structure of an entrant payment method in light of the current payments landscape and theory of interchange fees.
- Assessed possible antitrust concerns related to interchange fees associated with a new payment method. Analysis described market definition, market power, and competitive effects.
- Analyzed competitive effects of Grifols' acquisition of Talecris, two companies involved in the manufacture and sale of human plasma-derived therapies. Evaluated possible coordinated effects concerns related to the merger and assessed the merger specificity of claimed efficiencies in analysis presented to Federal Trade Commission (FTC). FTC approved the Grifols/Talecris transaction after Grifols agreed to a consent decree that facilitated entry.
- Analyzed issues related to single-firm conduct and damages on behalf of AMD in the landmark microprocessor antitrust case *AMD v. Intel.*
- Analyzed competitive effects of numerous mergers in healthcare markets.
- Analyzed allegations of global price-fixing by freight forwarders. Provided assistance to attorneys in responding to European and US agency requests for information.
- Assessed damages in the context of allegations of premerger coordination in markets for health insurance.
- Estimated econometric models of consumer demand for electricity.
- Performed analysis of class certification issues in the building materials industry, relying on extensive empirical analysis of defendant data.
- Analyzed natural experiments of refusal-to-deal allegations in the entertainment industry.
- Directed competitive analysis of merger in the financial services sector, including econometric analysis of win-loss data. Provided extensive assistance to client in responding to civil investigative demand. The merger was approved in all jurisdictions.
- Analyzed class certification issues related to market power allegations in hospital pricing.
- Assessed liability and damages related to the presence of contingent commissions in markets for insurance brokerage.
- Analyzed competitive aspects of The Great Atlantic & Pacific Tea Company's (A&P) acquisition of Pathmark, Inc., through an entry and exit event analysis. Provided significant assistance to attorneys in responding to second request from the FTC. The FTC ultimately allowed A&P to acquire Pathmark, requiring a substantially smaller divestiture package than anticipated by industry analysts.

- On behalf of a leading distributor of wine and spirits, analyzed likely effects of a horizontal merger reviewed by the FTC and state authorities. The analysis included retrospective merger analysis and empirical analysis of other natural experiments.
- Investigated the antitrust implications of several proposed acquisitions in the death-care industry, at both the manufacturer and distributor levels. Analysis relied on extensive investigations into industry practices and included natural experiments and testing for the importance of relationships between independent funeral homes and casket sales representatives. Also provided significant assistance to attorneys in responding to the FTC's request for additional information.
- Assisted the testifying expert on issues of common impact and feasible damages methodologies on behalf of a joint defense group of leading pharmaceutical manufacturers opposing class certification. The judge denied certification to the class that represented most of the affected commerce.
- Investigated competition concerns related to a proposed joint venture of regulated telecommunications firms. The joint venture entailed replacing satellite capacity with terrestrial assets and may have reduced satellite capacity available to competitors or potential entrants. The investigation also considered how parties' abilities to change pricing were affected by the presence of regulation.
- Analyzed high-frequency data by using econometric techniques in a diverse range of industries, including agricultural commodities, petroleum, and natural gas.
- In various price-fixing matters, analyzed damages by using advanced econometric modeling techniques and large databases and supported settlement strategies. Industries analyzed included industrial chemicals, technology, and building materials.

V.C.4. Publications

- Johnson, Paul A. "A Competition Conundrum: Winner-Take-All Markets." C.D. Howe Intelligence Memo. November 29, 2021. Available at https://www.cdhowe.org/intelligence-memos/paul-johnson-competition-conundrum-winner-take-all-markets.
- Johnson, Paul A. "Let's Keep Competition the Focus of Canada's Competition Act." C.D. Howe Intelligence Memo. August 3, 2021. Available at https://www.cdhowe.org/intelligence-memos/paul-johnson-%E2%80%93-lets-keep-competition-focus-canadas-competition-act.
- Johnson, Paul A (with John Pecman and Justine Reisler). "Essential facilities fallacy: Big tech, winner-take-all markets, and anticompetitive effects." *CPI Antitrust Chronicle* (2020). Available at https://www.competitionpolicyinternational.com/essential-facilities-fallacy-big-tech-winner-take-all-markets-and-anticompetitive-effects/.

- Johnson, Paul A. "Indirect network effects, usage externalities, and platform competition." *Journal of Competition Law and Economics* 15, issue 2-3 (2019): 283-297. Available at https://academic.oup.com/jcle/article-abstract/15/2-3/283/5627751.
- Johnson, Paul A. (with Matthew Chiasson). "Canada's (In)efficiency Defence: Why Section 96 May Do More Harm than Good for Economic Efficiency and Innovation." *Canadian Competition Law Review* 32, no. 1 (2019): 1-32. Available at http://www.cba.org/Publications-Resources/CBA-Journals/Canadian-Competition-Law-Review.
- Johnson, Paul A. "Suggestions for competition authorities when assessing vertical restraints in multi-sided platforms." In "Rethinking the use of traditional antitrust enforcement tools in multi-sided markets." OECD. April 6, 2018. Available at http://www.oecd.org/competition/rethinking-antitrust-tools-for-multi-sided-platforms.htm.
- Johnson, Paul A. "Network effects, antitrust, and falsifiability." *Journal of Antitrust Enforcement*, September 23, 2017. Available at https://doi.org/10.1093/jaenfo/jnx016.
- Johnson, Paul A. "Should We Be Concerned that Data and Algorithms Will Soften Competition?" *Antitrust Chronicle* 2, (2017): 10-15.
  - Winner of 2018 Concurrences and George Washington University Antitrust Writing Awards in "Business Articles-Economics"
- Johnson, Paul A. "The Economics of Common Impact in Antitrust Class Certification." *Antitrust Law Journal* 77, no. 2 (2011): 533–67. *Available at* http://ssrn.com/abstract=1401366.
- Johnson, Paul A. "Entry and Exit Event Analysis." In *Issues in Competition Law and Policy*, Vol. 2, edited by the ABA Section of Antitrust Law, 1385–1404. Chicago: ABA Publishing, 2008. *Available at* http://ssrn.com/abstract=1115861.
- Johnson, Paul A. (with Richard S. Higgins, and John T. Sullivan). "Merger of Bertrand Competitors Can Decrease Price." *The Antitrust Bulletin* 50, no. 2 (2005): 285–98.
- Johnson, Paul A. (with Richard S. Higgins, and John T. Sullivan). "Spatial Competition and Merger." *Topics in Economic Analysis and Policy* 4, no. 1 (2004): 324. *Available at* http://www.bepress.com/bejeap/topics/vol4/iss1/art3.
- Johnson, Paul A. (with Richard S. Higgins, and James Levinsohn). "The Competitive-Neighbors Approach to Analyzing Differentiated Product Mergers." In *Research in Law and Economics: Antitrust Law and Economics*, Vol. 21, edited by John B. Kirkwood, 459–73. Oxford: Elsevier Ltd., 2004.
- Johnson, Paul A. (with Richard S. Higgins). "The Mean Effect of Structural Change on the Dependent Variable Is Accurately Measured by the Intercept Change Alone." *Economics Letters* 80, no. 2 (2003): 255–9.W

- Johnson, Paul A. (with Christian Calzada and Fei Jiang). "Freight Demand Characteristics and Mode Choice: An Analysis of the Results of Modeling with Disaggregate Revealed Preference Data." *Journal of Transportation and Statistics* 2, no. 2 (1999): 149–58.

V.C.5. Speaking engagements

- "Economists Roundtable with the Bureau." Panel discussion on merger presumptions. Canadian Bar Association, Competition Law Section. June 20, 2022.
- "Labour Markets & the Competition Act." Panel discussion. The Western Law & Economics Research Group and ASCOLA Canada. April 7, 2022.
- "Recent Developments in Competition Bureau Merger Review." Panel discussion. Canadian Bar Association, Competition Law Section. March 21, 2022.
- "Competition Law, Policy, and Environmental Concerns." Panel discussion. Canadian Bar Association Competition Law Fall Conference. Teleconference. October 19, 2021.
- "When Competition and Labour Markets Intersect." Teleconference. Canadian Bar Association Competition Law Section. May 15, 2020.
- "Lessons from the VAA: Competition Issues Involving Vertical Unilateral Conduct." Teleconference. Canadian Bar Association Competition Law Section. November 21, 2019.
- "Canada's (In)efficiency Defence: Why Section 96 May Do More Harm than Good for Economic Efficiency and Innovation." Presentation. Vancouver Competition Policy Roundtable. Vancouver. October 23, 2019.
- "Opening Plenary: Lessons for 2020 from the Year in Review." Panel discussion. Canadian Bar Association Competition Law Fall Conference. Ottawa. October 17, 2019.
- "Algorithmic Collusion." Internal presentation. Competition Bureau of Canada. Gatineau, QC. August 13 and 22, 2019.
- "Future of the Efficiencies Defence in Canadian Competition Law." Panel discussion. Canadian Economics Association. Banff, Alberta. June 2, 2019.
- "Canada's (In)efficiency Defence: Why Section 96 May Do More Harm than Good for Economic Efficiency and Innovation." Presentation. Société Canadienne des Sciences Economiques. Québec, Québec. May 9, 2019.
- "Merger review and economics: The next frontier." Panel discussion. GCR Live. Miami, Florida. February 1, 2019.
- "Big data: International trends in market definition." Teleconference. Canadian Bar Association Competition Law Section. October 24, 2018.

- "Non-price effects in merger analysis." Panel discussion. Canadian Bar Association Competition Law Fall Conference. Ottawa. September 28, 2018.
- "Big Data." Hal White Antitrust Conference. Presentation. Washington, DC. June 12, 2018.
- "Antitrust enforcement and innovation." Presentation. Canadian Economics Association. Montreal. June 2, 2018.
- "Reflections on some Particularities of the Canadian Competition Act." Speech. Canadian Bar Association Economist Roundtable with the Competition Bureau. Toronto. May 16, 2018.
- "Role of Innovation in Merger Review: Important or Overrated?" Panel discussion. Canadian Bar Association Competition Law Spring Conference. Toronto. May 10, 2018.
- "Big Data." Panel Discussion. ICN/OECD/OECD-KPC Competition Economics Workshop for Chief and Senior Economists. Seoul, Korea. May 4, 2018.
- "Multi-Sided Platforms." Panel discussion. Symposium on Competition Policy in the Age of Big Data Net Neutrality and Multi-sided Platforms. University of Toronto Faculty of Law, Law and Economics Program. Toronto. April 26, 2018.
- "Big Data and Innovation: Overcoming the Legal Challenges." Roundtable discussion. Fasken Martineau. Toronto. April 24, 2018.
- "Restricting aeronautical data." Speech. IATA Safety and Flight Ops Conference. Montreal. April 17, 2018.
- "Use of Economic Analysis in Global Antitrust." Panel discussion. Georgetown Law School. Washington, DC. April 10, 2018.
- "Antitrust IP and High Tech Developments in Canada." Webinar. American Bar Association. February 26, 2018.
- "Algorithms and collusion." Webinar. International Competition Network CWG on ex officio investigations. February 13, 2018.
- "Fintech market study." Presentation. OECD workshop on Regulation and Digitalization. January 31, 2018.
- "Algorithms and collusion." Webinar. International Competition Network CWG on ex officio investigations. January 24, 2018.
- "Is Big Data the New IP for Antitrust?" Webinar. American Bar Association. December 12, 2017.
- "Big data: what is the role for competition law?" Panel discussion. Canadian Bar Association. Ottawa, ON. October 26, 2017
- "Big data and implications for competition policy." Webinar. International Competition Network. October 24, 2017.
- "Competition and big data." Panel discussion. McCarthy Tétrault. Toronto, ON. October 18, 2017

- "How to achieve deterrence?" Panel discussion. International Competition Network. Ottawa, ON, October 5, 2017.
- "Can algorithms form price-fixing cartels?" Panel discussion. International Competition Network. Ottawa, ON. October 4, 2017.
- "Network effects, antitrust, and falsifiability." Keynote speech. The Antitrust Enforcement Symposium. Pembroke College, Oxford. June 24, 2017.
- "Competition, Innovation, and quality." Speech. Canadian Bar Association Economics Roundtable, Toronto, ON, May 8, 2017.
- "Big Data." Panel discussion. Canadian Bar Association Economics Roundtable. Toronto, ON, May 8, 2017.
- "Grifols Acquisition of Talecris." Presentation, Bates White 8th Annual Antitrust Conference, Bates White Economic Consulting, Washington, DC, 2011.
- "Entry and Exit Event Analysis." Presentation, Canadian Bureau of Competition, 2008.
- "Entry and Exit Event Analysis in A&P/Pathmark." Presentation, Bates White 5th Annual Antitrust Conference, Bates White Economic Consulting, Washington, DC, 2008.
- "Spatial Competition and Merger." Presentation, Federal Trade Commission, Washington, DC, 2004.
- "On Cartel Stability." Presentation, Canadian Economic Association Annual Meetings, 1999.
- "On Cartel Stability." Presentation, Société Canadienne des Sciences Economiques, 1999.
- "Collusion in a Model of Repeated Auctions." Presentation, Canadian Economic Theory Conference, 1998.
- "Collusion in a Model of Repeated Auctions." Presentation, Econometric Society, 1998.
- "Collusion in a Model of Repeated Auctions." Presentation, Société Canadienne des Sciences Économiques, 1998.

V.D. Bureau news release announcing my appointment as chief economist

Paul Johnson appointed as special economic advisor to the Commissioner of Competition

News Release

Bureau's economic leadership strengthened with appointment of new T.D. MacDonald Chair in Industrial Economics

August 22, 2016 — OTTAWA, ON — Competition Bureau

Paul Johnson

The Commissioner of Competition is pleased to announce that Dr. Paul Johnson has been appointed to the position of T.D. MacDonald Chair in Industrial Economics.

Dr. Johnson will provide advice directly to the Commissioner on economic matters relating to the Bureau's high profile cases, including litigation and advocacy, over the two-year term of his appointment.

Economic analysis plays an important role at the Bureau, including in merger reviews and investigations into abuse of market power. As the "chief economist," the T.D. MacDonald Chair provides economic expertise and leadership to Bureau investigations, policies and emerging issues.

Dr. Johnson is returning home to Canada from Washington DC, where he is partner at Bates White Economic Consulting. He has expertise in applied econometrics and 15 years' experience working on civil antitrust litigation and high profile mergers before United States and European antitrust agencies, over a wide range of industries.

Dr. Johnson holds a PhD in Economics from the University of Montreal and is fluently bilingual. He joins the Bureau via the Government of Canada's Interchange Program.

Quick facts

- The T.D. MacDonald Chair in Industrial Economics was established in 1990 and is named after the late T.D. MacDonald, in honour of his extensive contributions to modern competition law in Canada.
- Mr. MacDonald was the first Director of Investigation and Research, which was the precursor to the role of Commissioner of Competition, and held the position from 1950 until 1962.
- The Government of Canada's Interchange Program facilitates temporary assignments for employees to or from the Federal Public Service.

Quote

> "The Competition Bureau's ability to ensure that Canadian businesses and consumers prosper in a competitive and innovative marketplace has been strengthened with the appointment of Dr. Paul Johnson as T.D. MacDonald Chair in Industrial Economics."
>
> John Pecman
> Commissioner of Competition

Source: Government of Canada. "Paul Johnson appointed as special economic advisor to the Commissioner of Competition." Competition Bureau Canada. August 22, 2016. https://www.canada.ca/en/competition-bureau/news/2016/08/paul-johnson-appointed-as-special-economic-advisor-to-the-commissioner-of-competition.html.

V.E. Acknowledgment of Expert Witness

CT-2022-002

THE COMPETITION TRIBUNAL

IN THE MATTER OF the *Competition Act*, R.S.C. 1985, c. C.34;

AND IN THE MATTER OF the proposed acquisition by Rogers Communications Inc. of Shaw Communications Inc.;

AND IN THE MATTER OF an application by the Commissioner of Competition for one or more orders pursuant to section 92 of the *Competition Act*.

B E T W E E N:

COMMISSIONER OF COMPETITION Applicant

- and -

ROGERS COMMUNICATIONS INC. and SHAW COMMUNICATIONS INC. Respondents

- and -

ATTORNEY GENERAL OF ALBERTA and VIDEOTRON INC. Intervenors

ACKNOWLEDGEMENT OF EXPERT WITNESS

I, PAUL JOHNSON of Rideau Economics, acknowledge that I will comply with the Competition Tribunal's code of conduct for expert witnesses which is described below:

1. An expert witness who provides a report for use as evidence has a duty to assist the Tribunal impartially on matters relevant to his or her area of expertise.

2. This duty overrides any duty to a party to the proceeding, including the person retaining the expert witness. An expert is to be independent and objective. An expert is not an advocate for a party.

Dated: September 23, 2022

PAUL JOHNSON