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October 11, 2011

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
2300 Yonge Street
PO Box 2319, 27th Floor
Toronto, ON
M4P 1E4

Dear Ms. Walli:

RE: Application by Canadian Distributed Antenna Systems Coalition ("CANDAS");
Board File No.: EB-2011-0120

We represent CANDAS in connection with its application to the Board regarding access to the power poles of licensed electricity distributors for the purpose of attaching wireless telecommunications equipment ("**Application**").

In accordance with Procedural Order No. 3, CANDAS is filing Reply Evidence of Dr. Roger Ware. We expect to file one additional piece of reply evidence shortly.

CANDAS will file two paper copies of the above-noted evidence as soon as possible.

Yours very truly,

(signed) H.T. Newland

HTN/ko
Encls.
cc: Mr. George Vinyard

ExteNet Systems, Inc.
Mr. Mark Rodger
Borden Ladner Gervais
All Intervenors

REPORT ON THE REGULATION AND COMPETITIVE EFFECTS OF WIRELESS ATTACHMENTS ON JOINT-USE POLES

Dr. Roger Ware
Professor of Economics, Queen's University

October 11, 2011

Professor Roger Ware
Department of Economics
Queen's University
Kingston, ON K7L 3N6

Table of Contents

I. INTRODUCTION

1. I have been asked by counsel for the Canadian Distributed Antenna Systems Coalition (CANDAS) to review and comment on certain materials filed regarding its Application dated April 21, 2011 to the Ontario Energy Board (OEB) for certain orders under the *Ontario Energy Board Act, 1998*.

2. The following is a summary of my qualifications in the area of Economics, Competition Policy and Industrial Organization. I am a Full Professor of Economics at Queen's University, Kingston, Ontario. I have held full-time faculty positions for 31 years at the University of Toronto and Queen's University, and a visiting position at the University of California, Berkeley in 1987-88. I have published many articles in the area of Industrial Organization and Competition Policy, and a major textbook on the Economics of Industrial Organization, much of which is devoted to Antitrust Economics and Regulation.[1] I teach three or four courses each year at both the undergraduate and graduate level, covering the Economics of Regulation and Industrial Organization and have taught Competition Law in the Queen's Faculty of Law on several occasions. From 1993-94, I held the T.D. MacDonald Chair at the Competition Bureau, and provided advice to the Director and other officers on many cases and issues. I have testified, given evidence, and consulted in several matters involving competition and regulatory issues. Finally, I have been an invited speaker to the Canadian Bar Association Annual Competition Law Conference on several occasions.

3. A full version of my *curriculum vitae* is attached as an Appendix to this report.

4. In preparation for my report, I have reviewed the documents that have been filed in this proceeding, and in particular:

[1] Church, J.R. and R. Ware, *Industrial Organization: A Strategic Approach,* San Francisco: McGraw-Hill-Irwin, 2000.

a) the Application of CANDAS Regarding Access to the Power Poles of Electricity Distributors for Purposes of Wireless Telecommunications dated April 21, 2011, together with the attached exhibits;

b) the Notice of Motion of Toronto Hydro-Electric Systems Limited (THESL) filed with the OEB on September 2, 2011;

c) the Affidavit of Michael Starkey sworn on September 1, 2011 and filed on behalf of THESL;

d) the Affidavit of Dr. Adonis Yatchew sworn on September 1, 2011 and filed on behalf of THESL;

e) the Written Evidence of Brian O'Shaughnessy, dated July 26, 2011 and filed on behalf of CANDAS; and

f) all other documents and websites referenced as footnotes herein.

II. EXECUTIVE SUMMARY

5. My conclusions are as follows:

- Pole networks are a public good and there is a public interest in the sharing of these facilities. Both federal and provincial regulatory agencies have endorsed this view and have mandated access by communications carriers for attachments.
- The duplication of pole networks is highly undesirable from a public interest standpoint, because of the wasteful investment required and because of the negative environmental consequences. This conclusion has also been endorsed in major regulatory decisions over the past decade.
- The success of new entrants in Canadian wireless markets is a stated goal of government policy. Consumers have already benefited from enhanced competition

created by new entrants. DAS and other small cell technologies are likely to play a significant role in the development of increased competition in these markets.

III. POLE NETWORKS ARE A PUBLIC GOOD

6. The economic definition of a public good implies that sharing is socially optimal.[2] Public goods are not efficiently supplied by private markets. A degree of regulation is required in order to produce and allocate such goods efficiently. Not only will private markets fail to supply public goods, but private owners of existing public goods may fail to provide access to such goods at efficient prices.

7. Certain public goods exhibit both "economies of scale" and "economies of scope." Economies of scale are the reductions in cost (i.e., cost per unit) that occur when the scale of production of a single product is increased. Economies of scope, on the other hand, are the reductions in total cost in respect of two or more products, where the production of such products results in cost efficiencies.

8. Hydro Pole networks, which require the investment of large sunk costs, exhibit the characteristics of both economies of scale and economies of scope.[3] As for the former, pole networks can, once constructed, accommodate increased electricity loads without the need for further investment in the network. As for the latter, the use of the pole network for multiple uses (eg., electricity distribution and telecommunications) results in lower costs for both applications. In the result, Hydro pole networks are public goods that should be regulated in the public interest.[4]

[2] Public goods are not restricted to large scale investments that can be shared by an entire population, such as national defence and public museums and galleries – they include also goods and services that should efficiently be shared by smaller groups, e.g. neighbourhood parks.
[3] Technically, these conditions are sufficient for subadditivity of costs. See, for example, Church, J.R. and R. Ware *Industrial Organization*, pp. 781-782.
[4] This was the conclusion of the CRTC in Telecom Decision CRTC 2008-17, ¶ 92-93.

9. Natural monopolies create a classic rationale for regulation[5]. Absent regulation, it can be expected that monopoly control and pricing will be exercised, to the detriment of consumers and efficiency. The regulation of a natural monopoly is often said to create a "regulatory compact" amongst the firm, its investors, and its ratepaying customers, whereby investors receive a reasonable return on their investment and customers pay fair, cost-based rates for service.

10. If entrants with a new or different technology are refused access to the pole network, they may be forced to construct a new and duplicative network, in the current case, for the purpose of attaching DAS wireless equipment. This would be wasteful duplication as has been recognized as such by Canadian regulators.[6] Duplication wastes financial resources and results in unnecessary and negative environmental and aesthetical impacts. Moreover, the permissions required to construct a duplicate network would likely not be forthcoming.

11. The overriding principle of avoiding wasteful and environmentally detrimental duplication of pole networks has been recognized by both provincial and federal regulatory decision-makers boards. Representative excerpts from some of these decisions are set out below.

> *CCTA Decision* (2005)[7]: "The Board agrees that power poles are essential facilities. It is a well established principle of regulatory law that where a party controls essential facilities, it is important that non-discriminatory access be granted to other parties. Not only must rates be just and reasonable, there must be no preference in favour of the holder of the essential facilities. Duplication of poles is neither viable nor in the public interest."

[5] Church and Ware, *supra*, footnote 1.
[6] See, for example: Ontario Energy Board Decision and Order on the CCTA Application (RP-2003-0249); New Brunswick Board of Commissioners of Public Utilities, In the Matter of an Application by the NBP Distribution and Customer Service Corporation (DISCO) for Changes to its Charges, Rates and Tolls; and Telecom Decision CRTC 2008-17,¶ 92-93.
[7] Decision and Order of the OEB dated March 7, 2005 in RP-2003-0249.

New Brunswick Public Utility Commission (2005)[8]: "However, it would be uneconomic and wasteful if all utilities and persons seeking to provide services in New Brunswick were required to acquire their own easements and poles in areas already served by electric power poles." ……. "It is not in the public interest that there be a proliferation of poles".

Telecom Decision CRTC 2008-17 at para. 93: "The Commission considers that engaging in the construction of duplicate support structure facilities would result in an inefficient use of public and private resources and would be an inconvenience to the public. Accordingly, the Commission determines that support structure services are to be classified as public good services."

British Columbia Utilities Commission (2010)[9]: "The Commission Panel notes that the Commission is required to consider the public interest in its regulation of public utilities….In the Commission Panel's view, the policy objective against duplication of infrastructure is clear on a reading of the Act as a whole, for the reasons discussed above."

Court of Appeal for British Columbia (2010)[10]: "In my view, avoidance of duplication achieves an important policy goal within the scheme."

12. Both Mr. Starkey and Dr. Yatchew acknowledge that there are important and valid uses for distribution poles, other than the distribution of electricity. At page 6 of his written evidence, Dr. Yatchew states as follows: "The evaluation of the public interest involves balancing many relevant factors to ensure that resources under the control of a public corporation are put to their best use, and that shareholders, ratepayers and the public

[8] Oral Ruling of the New Brunswick Board of Commissioners dated October 27, 2005 in DISCO Rate Application.
[9] In the Matter of an Application by Shaw Cablesystems et al., B.C.U.C. Order No. G-63-10, at p. 8.
[10] FortisBC Inc. v. Shaw Cablesystems Limited, 2010 BCCA 552 at para. 58.

receive the full measure of value for those resources". Further, at page 16 he acknowledges that "the costs of augmenting (pole) space can be quite substantial". Dr. Yatchew also draws attention to other potential users of the THESL pole network, stating that "there are multiple future uses that should be considered, including wireline facilities, various electric utility needs, the needs of the City of Toronto and the Toronto Transit Commission".[11] This notwithstanding, Dr. Yatchew does not go on to draw the obvious conclusion that it is in the public interest to expand permitted shared pole uses to include the attachment of wireless telecommunication equipment. The efficient way to allocate access to the THESL poles is to mandate access at just and reasonable rates – not to discriminate among categories of users as Dr. Yatchew seems to be advocating.

13. In his written evidence Mr. Starkey notes at page 22 that: "It is the ability to use utility poles in combination along a given route so as to convey necessary transmission cables contiguously from point A to point B that makes traditional utility pole attachments so valuable and unique". What he fails to note is that this also renders pole networks as "valuable and unique" for wireless networks as he concedes that they are for attaching wireline cables and other equipment.

IV. THE CASE FOR ENHANCING COMPETITION IN THE WIRELESS INDUSTRY

14. Canada's wireless industry has been evolving rapidly: its annual growth rate is three times higher than any other industry within the Canadian telecommunications sector, and its revenues are the largest component of total telecommunications revenues.[12] According to the Canadian Radio-television Telecommunications Commission ("CRTC") in its annual Monitoring Report, "the wireless market sector consists of three large facilities-based

[11] Affidavit of Dr. Adonis Yatchew dated September 2011, p.16.
[12] Sources: IDC, "Wireless Wars 2: Canadian Wireless Forecast and Analysis, 2005–2009," and CRTC Communications Monitoring Report 2011.

national WSPs [(wireless service providers)], a number of smaller regional facilities-based WSPs, and a small number of MVNOs [(mobile virtual network operators)]."[13]

15. More and more people have turned toward mobile devices, sometimes "cutting the cord" on their landlines, with now half of all phone connections being wireless.[14] The number of mobile subscribers has gone from approximately 18 million in 2006, to nearly 26 million in December 2010, and is projected to be 29.5 million by the end of 2014.[15] This has stimulated rapid growth in mobile broadband, and the advanced wireless network capable of supporting smartphones and turbosticks is now available to 97% of Canadians.[16] As of 2009, 30% of mobile phones were smartphones, and this is forecasted to reach 50% by 2014.[17]

16. By some measures, Canada's wireless industry has lagged behind other developed nations. In the latest data available (dating from 2009) from the Organization for Economic Co-operation and Development (OECD), Canada ranked lowest in terms of mobile subscribers per 100 inhabitants across 30 OECD counties, at 62% compared to the overall average of 96%.[18] Canadians also tended to pay more for their mobile service than citizens in most other industrialized countries.[19] In an effort to spur demand and increase competition, the Canadian government conducted a wireless spectrum auction in 2008, with 40 MHz of the 90MHz of additional advanced wireless services (AWS) spectrum dedicated to new entrants only, along with 10 MHz of spectrum in the personal communication wireless services (PCS)

[13] Source: CRTC Communications Monitoring Report 2011.
[14] Sources: CRTC Communications Monitoring Report 2011, and CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[15] Sources: CRTC Communications Monitoring Report 2011, and CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[16] Source: CRTC Communications Monitoring Report 2011.
[17] Source: eMarketer "Canadian Mobile Subscriptions to Climb 20% by 2014," June 10, 2010 [http://www.emarketer.tv/Article.aspx?R=1007747].
[18] Source: OECD Communications Outlook 2009 [www.oecd.org/sti/telecom/outlook].
[19] Source: OECD website at http://www.oecd.org/document/20/0,3343,en_2649_201185_43471316_1_1_1_1,00.html (accessed 20/09/2011).

and the 1670-1675 MHz bands.[20] As more and more people use wireless phones, and as more mobile devices are used to access bandwidth-intensive services, wireless spectrum will become increasingly valuable. The CRTC notes that "some stakeholders have suggested that there is a potential for a spectrum crunch and have called for new spectrum for mobile services."[21] A lack of sufficient bandwidth would translate into subscribers experiencing poor service, poor quality and lack of reliability.[22] However, it is predicted that price increases and data caps for wireless service would occur before the network's performance suffers from excessive use.[23] In response to the growing need for spectrum, the Canadian government recently announced the end of analog over-the-air television, with the released spectrum to be auctioned off in the near future.[24]

17. With regards to incumbents' and new entrants' prospects for success, the CRTC notes that "[t]o meet the demand of consumers, carriers will need to invest in their networks to reduce cell sizes, add cells, use any additional spectrum and adopt more efficient technical solutions."[25] Mobile service providers will also have to ensure that their services operate seamlessly and continue to integrate advanced features as consumers' preferences change and demand grows.

18. As described above, the spectrum auction of 2008 was structured so as to set aside spectrum in the AWS and PCS ranges for bidding exclusively from new entrants to the wireless market. The rationale for this policy initiative was the lack of competition in

[20] Source: Industry Canada, "Policy Framework for the Auction for Spectrum Licenses for Advanced Wireless Services and other Spectrum in the 2 GHz range," November 2007 [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/$FILE/awspolicy-e.pdf].
[21] Source: CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[22] Source: CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[23] Source: CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[24] Sources: OECD Communications Outlook 2011 [http://www.oecd.org/document/44/0,3746,en_2649_34223_43435308_1_1_1_1,00.html], and CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].
[25] Source: CRTC Navigating Convergence II, 2011 [http://www.crtc.gc.ca/eng/publications/reports/rp1108.htm].

Canada's wireless market[26] that had led to some of the highest average prices for service and some of the lowest adoption rates for mobile service among OECD countries.[27] As a result of the auction, four new entrants – Wind Mobile (Globalive), Public Mobile, Videotron and Mobilicity – have now begun service offerings in large cities, notably Toronto and Montreal.[28] A recent report by Convergence Consulting Group found that new entrant providers can offer combined voice and data plans that are at least 58% cheaper than those of the incumbents (including Telus, Rogers and Bell) and data plans that are as much as 83% less.[29] This same study also found that some of the incumbents' discount brands (e.g., Fido) are in some cases matching or undercutting new entrants' prices in order to remain competitive.[30]

19. The new carriers operate within the 1700, 1900 and 2100 MHz spectrum ranges for advanced wireless services ("AWS") and personal communication services ("PCS"), compared to the 800 MHz band for cellular services used predominantly by the incumbents.[31] There are several consequences of being restricted to a higher frequency bandwidth:

    a) The quality of the signal is not as good inside buildings as the lower frequency signal used by the "majors".[32]

    b) The range of the 1900 MHz signal licensed to Public Mobile is less than that of the 800 MHz signal, so that antennae must be located closer to users than with an 800 MHz

[26] Source: Industry Canada, "Policy Framework for the Auction for Spectrum Licenses for Advanced Wireless Services and other Spectrum in the 2 GHz range," November 2007 [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/$FILE/awspolicy-e.pdf].
[27] Source: OECD Communications Outlook 2009 [www.oecd.org/sti/telecom/outlook] and OECD website at http://www.oecd.org/document/20/0,3343,en_2649_201185_43471316_1_1_1_1,00.html (accessed 20/09/2011).
[28] Source: Convergence Consulting Group, "Canadian Wireless 2009-2014," September 2011. [http://www.convergenceonline.com/downloads/CanWireless2011.pdf].
[29] Source: Convergence Consulting Group, "Canadian Wireless 2009-2014," September 2011. [http://www.convergenceonline.com/downloads/CanWireless2011.pdf].
[30] Source: Convergence Consulting Group, "Canadian Wireless 2009-2014," September 2011. [http://www.convergenceonline.com/downloads/CanWireless2011.pdf].
[31] The incumbents also use other ranges of spectrum, including AWS and PCS.
[32] Written Evidence of Brian O'Shaughnessy, 26 July, 2011, Q.8, p. 6.

signal.[33] This rules out siting on the top of tall buildings, for example, as the distance would be too far from the customer. A second important implication is that a substantially greater number of wireless antennae must be installed to reach a given customer base.

c) The impact of point b) on the costs of expanding the network of mobile antenna is significant. As traffic expands, the carrier operating at 1900 MHz must add *four times* as many new antenna sites as a carrier operating in the 800 MHz band.[34]

d) Adding new tower or rooftop antenna sites is not a simple matter, and far from the routine procedure alleged in the Starkey and Yatchew affidavits of accessing a "vibrant" and competitive market for antenna sites.[35] In many cases suitable sites might require accessing a rooftop already occupied by a rival carrier, or the construction of a new site for which permission may not be granted or may only be achieved after long delays.

e) Construction of new poles when existing poles could be used implies waste and duplication.

20. The ability to install a DAS network on existing power poles would mitigate or solve many of the above problems. The power pole network is an *existing network* and so rights of access or construction do not have to be acquired or purchased through hundreds or thousands of discrete transactions with various and different owners and municipal authorities. The impact on the environment will be minimal, given that the pole network with existing cables is already in place. Moreover, the pole height is ideally suited to the mounting of antenna for carriers restricted to higher frequencies of operation and the need to transmit signals closer to the end-user. Furthermore, the DAS network, once constructed, is a multi-carrier network, and can provide service for several different carriers.

[33] Written Evidence of Brian O'Shaughnessy, 26 July, 2011, Q.8, p. 5-6.
[34] Written Evidence of Brian O'Shaughnessy, 26 July, 2011, Q.9, p.6.
[35] Affidavit of Dr. Adonis Yatchew dated September 2011, p. 18; Affidavit of Michael Starkey dated September 2, 2011, p. 26-27.

V. REPLY TO SPECIFIC POINTS IN THE WRITTEN EVIDENCE OF STARKEY AND YATCHEW

21. In this section I reply to certain specific statements made in the written evidence of Michael Starkey and Dr. Adonis Yatchew. My comments are grouped under a series of topic headings.

The importance of power pole networks for Canadian carriers

22. Contrary to the statements made by both Mr. Starkey and Dr. Yatchew (pp. 5-21 and 13, respectively), the CCTA Decision applies to wireless attachments. It applies to all telecom carriers, including wireless providers are telecom carriers within the meaning of the Act.

The "market for siting wireless attachments"

23. Both Mr. Starkey and Dr. Yatchew refer to a vibrant market for siting wireless antennae - Mr. Starkey claims at p. 25 of his written evidence that the market for wireless attachments provides a "complete substitute" for attachment to Toronto Hydro poles. Other evidence contradicts this assertion and suggests that there are few if any good substitutes available and that there is virtually no market for siting antennae in Toronto. In reality, the alternatives to power poles that are available for siting are much inferior in quality, and will not allow new entrants such as Public Mobile to grow, to offer service to a larger percentage of the Ontario population and to achieve a critical mass competitively in the long run. Finally, the behaviour of CANDAS contradicts the assertion of Mr. Starkey. If a complete substitute to attachment on the poles were actually available, why would CANDAS undertake the costs and delays inherent in this Application? Mr. Starkey's bald assertion that "[T]hose locations clearly exist as alternatives to THESL utility poles" hardly constitutes evidence of a competitive market for siting (p. 29).

24. On pp. 46-47 Mr. Starkey cites the deployment of DAS networks in the United States without the benefit of attachment to utility poles. For example, he cites an installation in

Paradise Valley, Arizona involving "dozens of new, decorative installations that were designed to conceal the wireless antenna equipment". In fact, this example reinforces the need for attachment to existing poles. It is precisely to avoid the proliferation of new poles and duplication of pole networks that the attachment of wireless equipment to existing poles is in the public interest.

25. At pages 18-20 of his written evidence, Dr. Yatchew discusses the activities of certain U.S. companies who operate in the siting market, implying that these companies are actively engaged in a Canadian siting market. For example, Dr. Yatchew points to the activities of American Tower Corporation and Crown Castle USA.[36] However, neither of these companies operates in Canada, nor to my knowledge has any plans to do so. Moreover, it is my understanding that the so-called siting market only creates access opportunities to tall buildings and macro-cell towers, neither of which are substitutes for the low level siting attachments that are required for an efficiently designed micro-cell network.

[36] Affidavit of Dr. Adonis Yatchew dated September 2011, pp. 18-22.

APPENDIX 1

CURRICULUM VITAE

July 2011

NAME: Roger Ware

CURRENT POSITION: Professor, Queen's University

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Queen's University
Kingston, Ontario K7L 3N6

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HOME ADDRESS: 241 Alwington Place
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(613) 544 7043

DATE AND PLACE OF BIRTH: February 23, 1951 - England

CITIZENSHIP: Canadian and U.K.

EDUCATION:

B.A. Honours (Economics)
Cambridge University
Awarded June 1972

M.A. (Cantab) awarded July 31, 1976

M.A. (Industrial Economics)
University of Sussex, England
Awarded December 1973

Ph.D., Queen's University, Kingston, Canada, Awarded October 1981

POSITIONS HELD:

July 1997 - present	Professor, Queen's University
January 1991 - June 1997	Associate Professor, Queens University
August 1993 - August 1994	Holder of T.D.MacDonald Chair in Industrial Economics, Bureau of Competition Policy, Ottawa
1989 - December 1990	Associate Professor, University of Toronto
1987-88	Visiting Associate Professor, Department of Economics, University of California, Berkeley.
1986-87	Sabbatical Leave. Visiting Research Scholar, Carleton University and National Bureau of Economic Research, Stanford University
July 1986	Promoted to Associate Professor with Tenure, University of Toronto.
1981-86	Assistant Professor (Economics), Erindale College, University of Toronto.
1980-81	Lecturer in Economics, Erindale College, University of Toronto.
1979-80	Instructor, Introductory Economics, Queen's University
1977-79	Various Tutorial and Research Assistantship Positions held, Queen's University.

POSITIONS HELD (continued)

1975-1977	U.K. Department of Industry, Industrial Policy Analysis and Briefing Division. Provided advice on government support for research and development, and special assistance schemes for industry. During this period I completed a cost-benefit study of cost sharing support for industrial development projects.
1973-1975	U.K. Department of Industry. Economic Assistant, working on an econometric forecasting model of U.K. trade flows. Promoted to Senior Economic Assistant, October 1974.

AWARDS:

Holder of R. Samuel Mclaughlin Scholarships for graduate studies at Queen's University, 1977-78, 1978-79, 1980-81 sessions.

Awarded a Social Sciences and Humanities Research Council Post Doctoral Fellowship for 1983-84, renewed for 1984-85.

SSHRC Research Grants:
1983: $6,760
1989: $14,250
1992: (3 year grant in the amounts of:) $19,500, $4,300, $2,300.

Awarded an SSHRC Leave Fellowship, 1986-87.

MAJOR FIELDS OF RESEARCH INTEREST:

Industrial Organization:

- Antitrust Economics and Competition Policy
- Strategic Behaviour
- Research and Development
- Dynamic Modelling
- Trade and Industrial Policy

Public Economics

BOOKS

Industrial Organization: a Strategic Approach. (with Jeffrey Church, University of Calgary) 2000. Boston: Irwin McGraw-Hill.

JOURNAL PUBLICATIONS

"Identifying Market Power in Natural Gas Storage" with David Brown and David Harding, 2008 *Canadian Competition Record.* Vol 23, No. 1.

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"Public Pricing Under Imperfect Competition" (1986), with Ralph Winter, *International Journal of Industrial Organization*, 4, 87-97.

"On the Shapes of Market Lattices in Loschian Spatial Models" (1986), with Mukesh Eswaran, *Journal of Regional Science*."Inventory Holding as a Strategic Weapon to Deter Entry" (1985) *Economica*, 52, 93-102.

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"Strategic Timing and Pricing of a Substitute in a Cartelized Resource Market" (1983), with Nancy Gallini and Tracy Lewis, *Canadian Journal of Economics*, XVI, 429-446.

Three Essays on the Economics of Differentiated Markets (1981), Ph.D. Thesis, Queen's University,

"The Relationship Between Efficiency and Technical change" (1977), in *Industrial Efficiency and the Role of Government*, edited by C.Bowe, HMSO, London.

ARTICLES IN BOOKS

Publication (on CD) of paper “The Role of Price Correlations" contained in proceedings of Canadian Bar Association 2004 Annual Fall Conference on Competition Law

Publication (on CD) of paper “Recent legislative changes: is competition law becoming too industry specific?"contained in proceedings of Canadian Bar Association 2002 Annual Fall Conference on Competition Law

“The Effect of Uncertainty on theValue of Strategic Commitment.” 2002. With B.C.Eaton, in volume, Applied Microeconomic Theory: Selected Essays of B. Curtis Eaton. Northampton, MA: Edward Elgar.

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“Network Industries, Intellectual Property Rights, and Competition Policy.” 1998. in N. Gallini and R. Anderson ed., *Competition Policy, Intellectual Property Rights and International Economic Integration* Industry Canada Research Series, The University of Calgary Press.

"Entry Deterrence" (1991) chapter in *New Developments in Industrial Organization* ed. by Manfredi La Manna and George Norman, Edward Elgar Publishing, London.

Review of Market Structure and Innovation, by M.I.Kamien and N.L.Schwartz (1983), *Canadian Journal of Economics*.

ARTICLES SUBMMITTED TO JOURNALS

“Market Power in Natural Gas”, co-authored with David Brown, Ontario Energy Board, and David Harding, Competition Bureau submitted to *Canadian Competition Record*

WORKING PAPERS

"Forbearance, Regulation, and Market Power in Natural Gas Storage: The Case of Ontario" co-authored with David Brown, Ontario Energy Board, presented at *World Energy Congress*, Rome, November 2007

RECENT PROFESSIONAL ACTIVITIES

Participated in a panel session on Competition Policy at the CEA Meetings, Vancouver, June 2008.

Presented the paper "Market Power in Natural Gas", co-authored with David Brown, Ontario Energy Board, and David Harding, Competition Bureau at the 2007 Canadian Economics Association Meetings, Halifax, June 2007.

Refereeing on a regular basis for *American Economic Review, Canadian Journal of Economics, The International Journal of Industrial Organization, The Journal of Industrial Economics*, and occasionally for *Journal of International Economics*, and *International Economic Review.*

Presentations at the Canadian Bar Association annual conference, 2001, 2002, 2003, 2004.

Presentation of a paper "Efficiencies and the Propane Case" at the CBA Competition Law Section Meetings, Ottawa, September 2000.

Organizer, Paper presenter and Chair of two Sessions on *Competition Act* at 1997 Canadian Economics Association Annual Conference, St. John's, Nfld., June 1997.

Organizer and Chair of Panel Session on Canadian Competition Policy at 1992 Canadian Economics Association Annual Conference, Charlottetown, June 1992.

Co-Organizer of UBC Conference on Industrial Organization, July 1993

Organizer of a Conference on *Barriers to Entry*, March 1995, at the Bureau of Competition Policy, Ottawa.

Holder of the T.D.McDonald Chair in Industrial Organization at the Competition Bureau, Ottawa, from 1993-94.

Membership of Professional Societies -

Member of Canadian Economics Association

RECENT EXPERT CONSULTING WORK

2011

Retained by Cogeco, Inc. to prepare a report on vertical integration in broadcasting and to testify before the Canadian Radio Telecommunications Commission (CRTC) in hearing in June, 2011.

Filed two reports for TDL (parent company of Tim Hortons) on aspects of the franchisor-franchisee relationship.

2010

August 2010 retained by the Ontario Energy Board as a member of the Market Surveillance Panel, an oversight body on electricity pricing.

April-June 2010 retained for Porter Airlines in litigation involving Air Canada and the Toronto Island Airport.

April 2010 retained by Pet Valu, Inc. to prepare a report on aspects of franchisor pricing.

2009

December 2009: retained by Interac, Inc. to give expert advice on competition issues involving the Interac debit card network. (This file is now closed).

August 2009 retained by TekSavvy, Inc. to prepare several reports and testify before the Canadian Radio Telecommunications Commission (CRTC) on competition and mandatory access in high speed internet services

August 2009 retained by TDL (parent company of Tim Hortons) to prepare a report on aspects of the franchisor-franchisee relationship.

2008

Retained by Microsoft for economic analysis of the search advertising industry.

Filed an expert report and presented oral testimony for Nadeau in a hearing under section 75 of the Competition Act at the Competition Tribunal, November 2008.

2007

Filed an expert report and testified before the CRTC in the October 2007 Hearing on Essential Facilities in Telecommunications

2006

Filed an expert report, presented oral testimony for Agricore United in a hearing under section 106 of the Competition Act, heard at the Competition Tribunal, March-April 2006.

Filed an expert report, presented oral testimony for Rogers Communications in a hearing at the New Brunswick Public Utilities Board concerning the pricing of access to utility poles owned by N.B. Power.

2004

Provided extensive economic advice, filed an expert report and presented oral testimony for Canada Pipe in a hearing under section 79 of the Competition Act, heard at the Competition Tribunal, April-May 2004 (regarded as the most important Abuse of Dominance case heard at the Tribunal in the past ten years).

2003

Provided extensive economic advice, filed an expert report and presented oral testimony for Canada Waste Services in a hearing under section 106 of the Competition Act, heard at the Competition Tribunal, November 2003.

Other Testimony

Appeared before the Senate Banking Committee and the House of Commons Industry and Banking Committee in 2009 on the subject of credit and debit card regulation.