

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

248963

STB Ex Parte No. 756

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**MARKET DOMINANCE STREAMLINED APPROACH
COMMENTS OF CN**

On September 11, 2019, the Surface Transportation Board promulgated its Market Dominance Streamlined Approach Notice of Proposed Rulemaking.¹ The U.S. rail operating subsidiaries of Canadian National Railway Company (“CN”) understand and appreciate the Board’s efforts to simplify the market dominance inquiry in “smaller cases.”² CN supports the comments by the Association of American Railroads, and offers these supplemental comments regarding one of the Board’s proposed *prima facie* factors: movement length greater than 500 highway miles. As described below, the Board should rely on publicly available real-world data to determine an appropriate *prima facie* factor for truck competitive movements.

In the NPRM, the Board proposes a threshold that movements in excess of 500 highway miles would not likely be competitive for trucks because such movements could not be completed in one day.³ The Board requests comment on the proposal, including “detailed quantitative and qualitative information in support of

¹ *Market Dominance Streamlined Approach*, STB Ex Parte No. 756, *Notice of Proposed Rulemaking* (STB served Sept. 11, 2019) (“NPRM”).

² *Id.* at 6.

³ *Id.* at 7-8.

any alternative mileage threshold.”⁴ Through these comments and the attached verified statement from Dr. Michael W. Tretheway, Chief Economist and Executive Vice President of InterVISTAS Consulting, CN offers such information.

In particular, CN observes that the 500-mile figure lacks data in the NPRM to support its use as a threshold for a *prima facie* determination regarding the competitiveness of truck versus rail. Using publicly available federal data, however, the Board can set a higher and supportable threshold for its *prima facie* factor of 750 miles or less for when trucking is likely to provide effective competition. Use of a *prima facie* factor based on data supports the Board’s practice of relying on “evidence-based policy and program decision-making,” including in “substantive matters of case adjudication.”⁵ The Board has wisely pledged to Congress that it will use “historical data” to evaluate its initiatives.⁶ Such data is available for application by the Board here.

Since 1993 and every five years thereafter, the United States Census Bureau has conducted the Commodity Flow Survey, a data set that captures information on shipments originating in all 50 states and the District of Columbia. The commodity flow data includes 20 variables for each shipment record in the data set, including sufficient data to analyze the share of shipments by traffic mode and distance. The data can be analyzed in different ways, but the method shown here is by tons carried by each mode for different distance bands.

⁴ *Id.* at 8.

⁵ Surface Transportation Board, Budget Request Fiscal Year 2020, at 10, <https://www.stb.gov/stb/docs/Budget/STB%20FY%202020%20Budget.pdf>.

⁶ *Id.*

The most recent complete Commodity Flow Survey data set available is from 2012 and is displayed in Table 1, and for 2007 in Table 2.⁷

Table 1

U.S. Traffic Share by Mode by Distance				
2012				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	82%	4%	0%	13%
50 - 99 miles	77%	10%	1%	12%
100 - 249 miles	70%	15%	3%	13%
250 - 499 miles	55%	29%	4%	12%
500 - 749 miles	39%	43%	4%	14%
750 - 999 miles	28%	57%	7%	8%
1,000 - 1,499 miles	29%	61%	6%	4%
1,500 - 1,999 miles	50%	34%	10%	6%
2,000+ miles	69%	13%	8%	10%
<i>* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other</i>				
<i>* "Intermodal" is truck/rail.</i>				
<i>* "other modes" also includes other intermodal (e.g., truck-barge)</i>				
traffic share based on tons carried				
source: 2012 Commodity Flow Survey, US Census Bureau. Table CF1200A11				

⁷ Complete data for 2017 will be available in 2020.

Table 2

U.S. Traffic Share by Mode by Distance				
2007				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	83%	4%	0%	13%
50-99 miles	76%	8%	2%	14%
100-249 miles	61%	22%	2%	15%
250-499 miles	51%	32%	4%	13%
500-749 miles	38%	42%	5%	15%
750-999 miles	26%	56%	5%	14%
1,000-1,499 miles	27%	60%	7%	7%
1,500-1,999 miles	52%	26%	13%	9%
2,000+miles	59%	9%	16%	16%
<i>* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other</i>				
<i>* "Intermodal" is truck/rail.</i>				
<i>* "other modes" also includes other intermodal (e.g., truck-barge)</i>				
traffic share based on tons carried				
source: 2007 Commodity Flow Survey, US Census Bureau. Table CF0700A11				

As shown in both the 2007 and 2012 data, trucks have the lion's share of tons of traffic that moves less than 500 miles. However, it also shows that using 500 miles as the cutoff is too conservative. Truck and rail have equal market shares for tons moved between 500 and 750 miles, a feature that is consistent between 2007 and 2012. In 2012, 39% of tons shipped between 500 to 749 miles were by truck and 43% of such tonnage was shipped by rail. In 2007, 38% of tons shipped between 500 and 749 miles were by truck and 42% of such tonnage was shipped by rail. In other words, at this mileage band, the data in the Commodity Flow Survey demonstrates that rail and truck compete on equal terms. And after 750 miles, rail's market share has an almost 2-1 margin over trucking.⁸

⁸ There is an unexpected feature of the data, where the market share of trucking increases dramatically for movements of over 1500 miles. However, the number of observations in the Commodity Flow Survey in that range is very small compared to the number of observations in the bands below 1500 miles. For example, for 2007 there are approximately 60 million tons for which data is available for shipments

The real world marketplace data demonstrates at what distances shippers find truck and rail modes competitive with one another. While there is some attraction to the simplification that assumes that trucking is “less viable” if a trip cannot be completed in one day, the data of real-world shipments suggest this is not the case given how evenly distributed tons shipped between 500 and 750 miles are over rail and truck.

The Board should rely on publicly available real-world data to set an appropriate *prima facie* factor for truck competitive movements.

Respectfully submitted,

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Dated: November 12, 2019

that move over 2,000 miles, compared to almost 620 million tons for which data is available for trips between 500 and 749 miles.

Verified Statement
Of
Dr. Michael W. Tretheway

November 12, 2019

Contains Color Images

Statement of identity

My name is Michael William Tretheway. I am Chief Economist of InterVISTAS Consulting Inc. (InterVISTAS), an aviation, transportation and tourism consulting practice of which I am a co-founder. I work out of both its Vancouver Canada and Washington, DC offices. I am a U.S. citizen and earned a PhD in economics (speciality in econometrics) from the University of Wisconsin. From 1983 to 1996 I was Associate Professor of Transportation and Logistics at the University of British Columbia and have held an appointment as Adjunct Professor in many of the years since I left university teaching and research to co-found InterVISTAS. From 1979 to 1983 I was a senior economist at the consultancy Christensen Associates.

A copy of my curriculum vitae is appended to this statement.

I note that I provided testimony to the Interstate Commerce Commission in two proceedings: the development of the Uniform Rail Costing System ("URCS") and the development of the productivity adjustment to the rail cost adjustment factor. I was the principal investigator of the 2016 study of railway regulation commissioned by the Surface Transportation Board (Project FY14-STB-157) and participated in a Board roundtable on railway regulation issues (October 25, 2016).

Question I address

I have been engaged by counsel for the US rail operating subsidiaries of the Canadian National Railway Company (CN) to provide factual information on the market share of different transportation modes in the shipment of goods. I understand that this is to be submitted as part of CN's comments in *Market Dominance Streamlined Approach*, STB Docket Ex Parte 756. I reviewed the STB's decision dated September 12, 2019.

Source of the data

To address the question using publicly available data, I utilized the U.S. Census Bureau's Commodity Flow Survey (CFS), a component of the Economics Census. I accessed this data from the Census Bureau's website:

<https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>.

This survey is conducted every 5 years. The most recent finalized data is from 2012 and this is the data I have used. I have also used the data from 2007 to assess whether the relative shares of trucking versus rail have changed significantly.

There are some preliminary summary tables for the 2017 survey available, but the Census Bureau web site for the CFS (<https://www.census.gov/programs-surveys/cfs.html>) indicates that it will not be finalized until 2020. The preliminary data tables currently available do not enable development of modal shares by distance bands.

The survey indicates market share of each mode and allows this to be categorized by distance band. The survey provides estimates of tons shipped, ton miles (TM) and value of shipments. I have utilized the tons shipped data to indicate market shares. While TM is another commonly used traffic measure for transportation services, because I categorize market shares by distance band, my tons-based market shares are roughly indicative of TM market shares.

I developed a table that displays shares by mode for various distance blocks (*e.g.*, less than 50 miles, 50-99 miles, etc.). The data displayed are for

- shipments only by truck;
- shipments only by rail;
- “rail-truck intermodal” shipments that move both by rail and truck; and
- other, which includes water, air, pipeline, parcel, truck/water, and rail/water.

Regarding the “other” category, as there are a number of intermodal pairs (*e.g.*, truck-rail, water-rail), I have highlighted the truck-rail traffic shares in their own column, including truck-rail intermodal, and aggregated other modes and intermodal combinations in a column labeled “other modes.”

2012 Mode Share Table

U.S. Traffic Share by Mode by Distance				
2012				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	82%	4%	0%	13%
50 - 99 miles	77%	10%	1%	12%
100 - 249 miles	70%	15%	3%	13%
250 - 499 miles	55%	29%	4%	12%
500 - 749 miles	39%	43%	4%	14%
750 - 999 miles	28%	57%	7%	8%
1,000 - 1,499 miles	29%	61%	6%	4%
1,500 - 1,999 miles	50%	34%	10%	6%
2,000+ miles	69%	13%	8%	10%
* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other				
* "Intermodal" is truck/rail.				
* "other modes" also includes other intermodal (e.g., truck-barge)				
traffic share based on tons carried				
source: 2012 Commodity Flow Survey, US Census Bureau. Table CF1200A11				

Source: CF1200A11: Shipment Characteristics by Mode by Distance Shipped for the United States: 2012

2007 Mode Share Table

U.S. Traffic Share by Mode by Distance				
2007				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	83%	4%	0%	13%
50-99 miles	76%	8%	2%	14%
100-249 miles	61%	22%	2%	15%
250-499 miles	51%	32%	4%	13%
500-749 miles	38%	42%	5%	15%
750-999 miles	26%	56%	5%	14%
1,000-1,499 miles	27%	60%	7%	7%
1,500-1,999 miles	52%	26%	13%	9%
2,000+miles	59%	9%	16%	16%
* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other				
* "Intermodal" is truck/rail.				
* "other modes" also includes other intermodal (e.g., truck-barge)				
traffic share based on tons carried				
source: 2007 Commodity Flow Survey, US Census Bureau. Table CF0700A11				

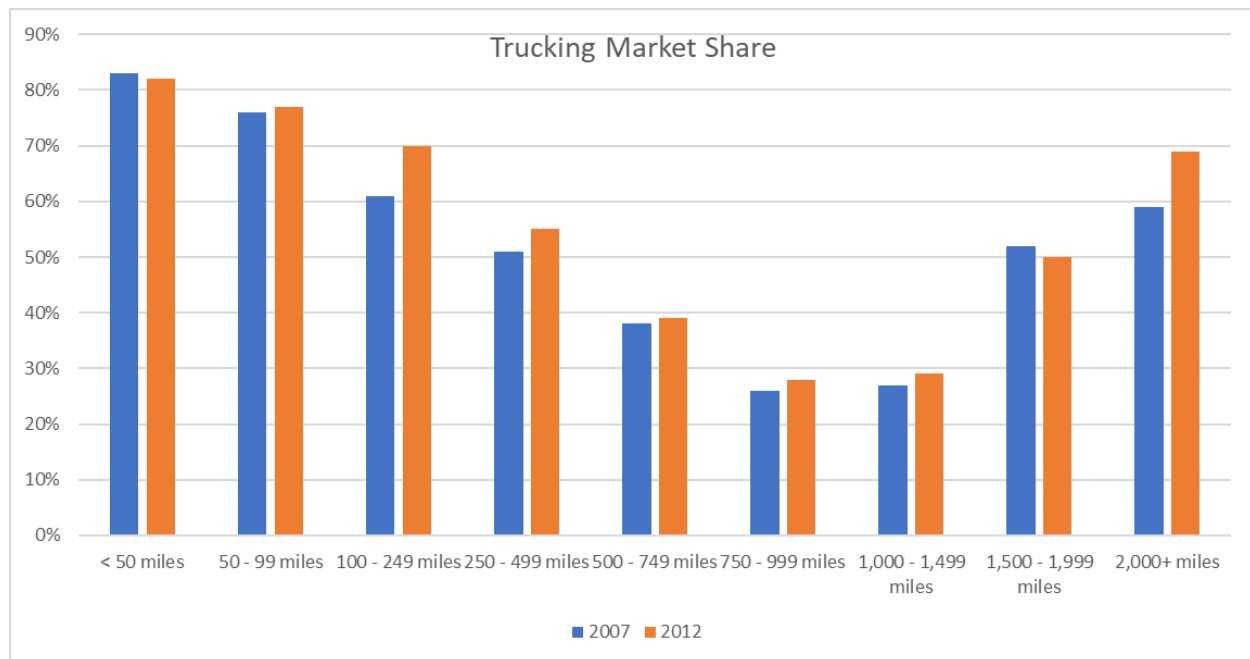
Source: CF0700A11: Shipment Characteristics by Mode by Distance Shipped for the United States: 2007

Changes in Mode Shares: 2007 to 2012

The following table compares the 2012 and 2007 mode shares to indicate changes in mode shares by distance band between the years. For convenience, an additional table is provided that indicates the direction of change of the individual mode shares. I also provide a bar chart that compares the mode shares in each distance band.

Trends in percentage changes (2012 vs 2007)				
<i>Trends are shown by change in market share.</i>				
<i>A positive number in a column indicates a gain of market share by that mode</i>				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	-1%	0%	0%	0%
50 - 99 miles	1%	2%	-1%	-2%
100 - 249 miles	9%	-7%	1%	-2%
250 - 499 miles	4%	-3%	0%	-1%
500 - 749 miles	1%	1%	-1%	-1%
750 - 999 miles	2%	1%	2%	-6%
1,000 - 1,499 miles	2%	1%	-1%	-3%
1,500 - 1,999 miles	-2%	8%	-3%	-3%
2,000+ miles	10%	4%	-8%	-6%
* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other				
* "Intermodal" is truck/rail.				
* "other modes" also includes other intermodal (e.g., truck-barge)				
traffic share based on tons carried				

Trends (2007-2012)				
<i>Trends are shown by change in market share.</i>				
<i>A down red arrow indicates a decline in market share</i>				
Distance Block	Truck	Rail	Rail-Truck Intermodal*	Other Modes
< 50 miles	↓	→	→	→
50 - 99 miles	↑	↑	↓	↓
100 - 249 miles	↑	↓	↑	↓
250 - 499 miles	↑	↓	→	↓
500 - 749 miles	↑	↑	↓	↓
750 - 999 miles	↑	↑	↑	↓
1,000 - 1,499 miles	↑	↑	↓	↓
1,500 - 1,999 miles	↓	↑	↓	↓
2,000+ miles	↑	↑	↓	↓
* Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other				
* "Intermodal" is truck/rail.				
* "other modes" also includes other intermodal (e.g., truck-barge)				
traffic share based on tons carried				



The underlying tons carried data

As the basis for the market shares by mode are tons carried, I provide a table with this data, as reported by the CFS. I emphasise that the CFS data is survey based, and the survey will not necessarily reconcile with the exact tons measure of the STB's own traffic data on total revenue tons carried by the rail mode. As well, the survey coverage will vary somewhat from survey to survey and comparison of the CFS total tons carried would not be an appropriate indicator changes in total traffic of the modes.

Tons (Thousands)					
2012					
Distance	Truck	Rail	Rail-Truck Intermodal*	Other Modes*	Total
Less than 50 miles	5,177,784	279,879	30,554	827,311	6,315,528
50 - 99 miles	881,039	111,698	15,169	131,806	1,139,712
100 - 249 miles	933,051	200,457	36,027	169,288	1,338,823
250 - 499 miles	526,850	271,773	37,567	113,557	949,747
500 - 749 miles	229,177	253,876	26,222	80,225	589,500
750 - 999 miles	123,767	247,553	31,156	32,838	435,314
1,000 - 1,499 miles	104,277	222,520	22,864	13,247	362,908
1,500 - 1,999 miles	50,850	34,663	10,164	6,603	102,280
2,000+ miles	33,369	6,119	4,090	4,849	48,427
Total	8,060,166	1,628,537	213,814	1,396,892	11,299,409
<i>*Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other.</i>					
<i>* "Intermodal" is truck/rail.</i>					
<i>* "other modes" also includes other intermodal (e.g., truck-barge).</i>					
traffic share based on tons carried.					
source: 2012 Commodity Flow Survey, US Census Bureau Table CF0700A11					

Tons (Thousands)					
2007					
Distance	Truck	Rail	Rail-Truck Intermodal*	Other Modes*	Total
Less than 50 miles	5,748,633	254,502	29,994	915,614	6,948,743
50 - 99 miles	959,521	104,388	19,050	172,230	1,255,189
100 - 249 miles	970,213	344,973	30,788	239,341	1,585,315
250 - 499 miles	543,977	337,749	39,056	143,673	1,064,455
500 - 749 miles	232,932	262,159	33,096	90,794	618,981
750 - 999 miles	132,224	288,916	24,760	71,769	517,669
1,000 - 1,499 miles	105,344	238,163	26,993	26,772	397,272
1,500 - 1,999 miles	50,127	24,940	12,297	8,147	95,511
2,000+ miles	35,741	5,516	9,555	9,478	60,290
Total	8,778,712	1,861,306	225,589	1,677,818	12,543,425
<i>*Other includes water, air, pipeline, parcel, truck/water, rail/water, other multiple modes, other.</i>					
<i>* "Intermodal" is truck/rail.</i>					
<i>* "other modes" also includes other intermodal (e.g., truck-barge).</i>					
traffic share based on tons carried.					
source: 2007 Commodity Flow Survey, US Census Bureau Table CF0700A11					

VERIFICATION

I, Michael Tretheway, declare under penalty of perjury that the foregoing Verified Statement is true as stated to the best of my knowledge, information and belief.



Michael Tretheway
Chief Economist and Executive Vice President
InterVISTAS Consulting Inc.

Executed on November 12 2019.

Appendix

Curriculum Vitae of Dr. Michael William Tretheway

Curriculum Vitae

MICHAEL WILLIAM TRETHEWAY

Updated August 2019

EDUCATION

- a) Graduate
 - 1981: University of Wisconsin-Madison, Ph.D. (Economics)
 - 1978: University of Wisconsin-Madison, M.S. (Economics)
 - 1976: University of Wisconsin-Milwaukee, M.A. (Economics)
- b) PhD - Thesis Title
 - "Productivity Growth and Returns to Scale in the U.S. Trunk Airline Industry, 1972-1978"
- c) Undergraduate
 - 1974: University of Wisconsin-Milwaukee, B.A. (Economics)

PROFESSIONAL EMPLOYMENT RECORD

- 1999-present Executive Vice President & Chief Economist, InterVISTAS Consulting Group. Various times served as Chief Strategy Officer and Chief Operating Officer
- 1997-1998 Vice President, Marketing Services, Vancouver International Strategic Services Ltd., subsidiary of the Vancouver International Airport Authority
- 1997-2017 Adjunct Professor, University of British Columbia, Faculty of Commerce and Business Administration/Sauder School of Business, (most years)
- 1994-1996 Special Advisor to the President, Vancouver International Airport Authority
- 1988-96 Associate Professor, Faculty of Commerce and Business Administration, University of British Columbia
- 1983-88: Assistant Professor, Faculty of Commerce and Business Administration, University of British Columbia
- 1978-83: Senior Economist/Research Associate, Laurits R. Christensen Associates, Inc., Research Associate, Department of Economics, University of Wisconsin
- 1976-81: Research Assistant, Economics, University of Wisconsin
- 1973-75: Tutor, Department of Learning Skills, University of Wisconsin-Milwaukee

FELLOWSHIPS

1994 Visiting Fellow, Australian Bureau of Transport and Communications Economics

PROFESSIONAL MEMBERSHIPS

Various years

Air Transport Research Society
 American Economics Association
 Association for Public Policy Analysis and Management
 Canadian Economics Association
 Canadian Transportation Research Forum
 Econometric Society
 German Aviation Research Society
 Midwest Economics Association
 National Association of Business Economists
 Transportation and Public Utilities Group, AEA
 Transportation Research Forum
 Western Economics Association

PROFESSIONAL PAPERS**A. Books and Monographs**

1. *Airline Economics: Foundations for Strategy and Policy*, 1992, Centre for Transportation Studies, Vancouver.
2. *Productivity in the Canadian Lumber Industry: An Inter-regional Comparison*, Forestry Canada, Information Report 0-X-411, Great Lakes Forestry Centre, 1990 [with A. Ghebremichael and D.G. Roberts].
3. *Airline Deregulation, a special issue of the Logistics and Transportation Review*, editor and author of introduction, Volume 22 (4), December 1986.
4. *Identifying and Measuring the Impact of Government Ownership and Regulation on Airline Performance*, report submitted to Economic Council of Canada and Consumer and Corporate Affairs Canada, March 1985, revised October 1986, published as a refereed technical report by the Economic Council of Canada 1987 [with T.H. Oum and D.W. Gillen].
5. *The Growth and Performance of the Canadian Transcontinental Railways: 1956-1981*, Centre for Transportation Studies, University of British Columbia, Vancouver, 1987 [with K.D. Freeman, T.H. Oum and W.G. Waters II].
6. *Deregulation and Airline Employment: Myth Versus Fact*. Centre for Transportation Studies, University of British Columbia, Vancouver, 1986 [with R.J. Andriulaitis, D.L. Frank and T.H. Oum].
7. *Airline Cost and Performance: Implications for Public and Industry Policies*, Centre for Transportation Studies, University of British Columbia, Vancouver, 1986 [with T.H. Oum and D.W. Gillen].

8. *Canadian Airline Deregulation and Privatization: Assessing Effects and Prospects*, Centre for Transportation Studies, University of British Columbia, Vancouver, 1985 [with T.H. Oum and D.W. Gillen].

B. Chapters in Books

1. "Airport Competition for Freight," (with R. Andriulaitis), in P. Forsyth, D.W. Gillen, J Mueller and H.M. Niemeier (eds.), *Airport Competition, the European Experience*, Ashgate publishing, 2010, pp. 137-147.
2. "Competition between airports: occurrence and strategy", (with I. Kincaid), in P. Forsyth, D.W. Gillen, J Mueller and H.M. Niemeier (eds.), *Airport Competition, the European Experience*, Ashgate publishing, 2010, pp. 119-136.
3. "Airport Policy in Canada: Limitations of the Not-for-Profit Governance Model," (with R. Andriulaitis), in C. Winston and Gines de Rus (eds), *Aviation Infrastructure Performance: A study in comparative political economy*, Brookings, 2008, pp. 136-155.
4. "Airport Marketing: An Oxymoron?" in G. Butler (eds.), *Handbook of Airline Marketing*, McGraw Hill, 1998.
5. "Impediments to Liberalization in Asia Pacific International Aviation," in C. Findlay (ed.), *Asia Pacific Air Transport*, 1997, pp. 65-73.
6. "Canada-U.S. Open Skies" in C. Findlay (ed.), *Asia Pacific Air Transport*, 1997, pp.154-169.
7. "Costing the Movement of Hazardous Materials by Rail," (with W.G. Waters II) in L. Moses and D. Lindstrom, eds., *Transportation of Hazardous Materials: Issues in Law, Social Science and Engineering* (Kluwer Academic Press) 1993, pp.277-294.
8. "Island Programs: The UBC Experience with a Summer Program in France," in A.M. Rugman and W.T. Stanbury (eds.), *Global Perspective: Internationalizing Management Education*, University of British Columbia Centre for International Business Studies, 1992, pp. 345-352.
9. "Canada and the Changing Regime in International Air Transport," in M. Zacher (ed.) *Canadian Foreign Policy and International Economic Regimes*, UBC Press, 1992, pp. 189-214 [with M.E. Dresner].
10. "Costing the Movement of Hazardous Materials by Rail," in L. Moses ed.). *Transportation of Hazardous Materials: Issues in Law, Social Science and Engineering*, Kluwer Academic Publishers, 1991, pp. 6-39 to 6-58 [with W.G. Waters II].
11. "Airline Deregulation in Canada," in K. Button (ed.), *Airline Deregulation: International Experiences*, David Fulton Publishers, London, 1991, pp. 124-179 [with T.H. Oum and W.T. Stanbury].
12. "Airline Deregulation in Canada and Its Economic Effects," in Hayashi (ed.), *The New Dimensions for Public Utility*, (in Japanese), 1990 [with T.H. Oum and W.T. Stanbury].
13. "An Assessment of the Efficiency Effects of U.S. Airline Deregulation via an International Comparison," in E.E. Bailey (ed.), *Public Regulation: New Perspectives on Institutions and Policies*, MIT Press, Cambridge, 1987, pp. 285-320 [with D.W. Caves, L.R. Christensen, and R.J. Windle].
14. "Air Canada," in Mark C. Baetz and Paul W. Beamish (eds.) *Strategic Management: Canadian Cases*, 1986, pp. 127-144 [with D.W. Gillen and T.H. Oum].

15. "Network Effects and the Measurement of Returns to Scale and Density for U.S. Railroads," in Andrew F. Daughety, (ed.), *Analytical Studies in Transport Economics*, Cambridge University Press, 1985, pp. 97-120 [with D.W. Caves, L.R. Christensen and R.J. Windle].
16. "Economic Performance of U.S. and Canadian Railroads: The Significance of Ownership and the Regulatory Environment," in W.T. Stanbury and F. Thompson, editors, *Managing Public Enterprises*, Praeger, New York, 1982, pp. 123-151 [with D.W. Caves, L.R. Christensen and J.A. Swanson].
17. "U.S. Trunk Air Carriers, 1972-1977: A Multilateral Comparison of Total Factor Productivity," in Thomas G. Cowing and Rodney E. Stevenson, editors, *Productivity Measurement in Regulated Industries*, Academic Press, 1981, pp. 47-76 [with D.W. Caves and L.R. Christensen].

C. Papers in Refereed Journals or Conference Proceedings

1. "Analysis of Airfares in An Era Of Significant Airline Ancillary Charges, *Proceedings of the Canadian Transportation Research Forum, 2019*. [with J Kositsky]
2. "Observations on Rail Costing in Canada," *Proceedings of the Canadian Transportation Research Forum, 2019*. [with J Kositsky and R Andriulaitis]
3. "What do we mean by a level playing field in international aviation," *Transport Policy*, October 2015, Volume 43, pp. 96-103. [with R. Andriulaitis]
4. "The Aviation Value Chain: Economic Returns and Policy Issues," *Journal of Air Transport Management*, 2014. [with K. Markhvida]
5. "Introduction," Introduction to proceedings of the 1st European Aviation Conference," *Journal of Air Transport Management*, 2014. [with H.M. Niemeier]
6. "Introduction," Introduction to proceedings of the 13th Hamburg Aviation Conference," *Journal of Air Transport Management*, forthcoming (expected January 2012). [with H.M. Niemeier]
7. "Introduction," Introduction to proceedings of the 12th Hamburg Aviation Conference," *Journal of Air Transport Management*, January 2011, Vol. 17 (1), pp. 1-2. [with H.M. Niemeier]
8. "Introduction," Introduction to proceedings of the 11th Hamburg Aviation Conference," *Journal of Air Transport Management*, July 2009, Vol. 15 (1), pp. 103-105. [with H.M. Niemeier]
9. "Emerging Tourism Markets: Ageing and Developing Economies," (with D Mak) *Journal of Air Transport Management*, 2006.
10. "The Effect of Market Structure on Airline Prices: A Review of Empirical Results", (With I Kincaid), *Journal of Air Law and Commerce*, 2005, Vol. 70 (3), pp. 467-498.
11. "Distortions of Airline Revenues: why the network airline business model is broken," *Journal of Air Transport Management*, 2004, Vol. 10, pp. 3-14.
12. "The Economics and Politics of Taxation and Subsidies for Ports and Airports," *Proceedings of the International Association of Maritime Economists*, Panama, November 2002, pp. 12 (with Trevor Heaver).
13. "Labour Payouts, Productivity Measurement and Price Cap Regulation," (with W.G. Waters II), *Proceedings*, (U.S. Transportation Research Forum, San Antonio, TX (October 1996) Vol. 2, 688-698, 2000. Also published in *Journal of the Transportation Research Forum* (2000), Vol. 39 (1), pp. 131-144.
14. "Labour payouts, productivity measurement and the price cap approach to regulation" (with W.G. Waters II) *Journal of Transportation Research Forum*, 2000.

15. "Comparing Total Factor Productivity and Price Performance: Concepts and Applications to Canadian Railways", (with W.G. Waters II) *Journal of Transport Economics & Policy*, Vol. 33 (2), pp. 209-220, 1999.
16. "Reregulation of the Airline Industry -- Could Price Cap Regulation Make a Contribution?" (with W.G. Waters II), *Journal of Air Transport Management*, Vol. 4, 1998, 47-53.
17. "The Total Factor Productivity of Canadian Railways, 1956-1991," (with W.G. Waters II and A.K. Fok) *Journal of Transport Economics and Policy*, January 1997, pp.93-113.
18. "Aggregation and Accuracy in Measuring Total Factor Productivity: Evidence from Rail Productivity Studies," (with W.G. Waters II) *Journal of Transportation Research Forum*, Vol. 25:2, 1995.
19. "A Sensitivity Analysis of Total Factor Productivity Measurement: Evidence from Rail Productivity Studies," (with W.G. Waters II), *World Transport Research (refereed Proceedings of the World Conference on Transport Research)* Vol. 4, Transport Management, (New York: Elsevier), 1995.
20. "Modelling and Testing the Effect of Market Structure on Price: The Case of International Air Transport," *Journal of Transport Economics and Policy*, 1992, pp.171-184 [with M.E. Dresner].
21. "ICAO and the Economic Regulation of International Air Transport," *Annals of Air and Space Law*, Vol. 17, Part II, 1992, pp. 195-211 [with M.E. Dresner].
22. "Concepts, Methods and Purposes of Productivity Measurement in Transportation," *Transportation Research-A*, 1992, Vol. 26A No. 6, pp.493-505 [with T.H. Oum and W.G. Waters II].
23. "A Comparison of the Productivity Performance of the U.S. and Canadian Pulp and Paper Industries," *Journal of Business Administration*, Vol. 20 (1), 1992, pp. 212-235, [with T.H. Oum], also in *Emerging Issues in Forest Policy*, P.N. Nemetz (ed.) 1992, UBC Press, Vancouver, pp. 212-235.
24. "A Note on Capacity Utilization and the Measurement of Scale Economies," *Journal of Business and Economic Statistics*, January 1991, Vol. 9 (1), pp. 119-123 [with T.H. Oum and Y. Zhang].
25. "Airline Deregulation in Canada and its Economic Effects," *Transportation Journal*, Vol. 30 (4), Summer 1991, pp.4-22 [with T.H. Oum and W.T. Stanbury].
26. "Productivity Adjustment to Price Levels in Regulated Rail Markets: Recent Developments in Canada and the United States," *Journal of the Transportation Research Forum*, 1991 Vol. 32 (1), pp. 172-181.
27. "Globalization of the Airline Industry and Implications for Canada," *The Logistics and Transportation Review*, Vol. 26(4), December 1990, pp. 357-367; paper also appeared in *Proceedings*, Canadian Transportation Research Forum, University of Saskatchewan Printing Services, June 1990, pp. 150-159; paper appeared in *The Advocate*, Vancouver Bar Association.
28. "Allocation of Airline Seats Between Stochastically Dependent Demands," *Transportation Science*, August 1990, Vol. 24(3), pp. 183-192 [with S.L. Brumelle, J.I. McGill, T.H. Oum, and K. Sawaki].
29. "Productivity Performance of the Canadian Pulp and Paper Industry," *Canadian Journal of Forest Research*, Vol. 20, No. 6, pp. 825-836, June 1990 [with A. Ghebremichael, D. Frank and T.H. Oum].
30. "Airline Cost Structure and Policy Implications: A Multi-product Approach for Canadian Airlines," *Journal of Transport Economics and Policy*, January 1990, pp.9-34 [with D.W. Gillen and T.H. Oum].

31. "Airline Hub and Spoke Systems," *Journal of the Transportation Research Forum*, Vol. XXX (2), 1990, pp. 380-393 [with T.H. Oum].
32. "Frequent Flyer Programs: Marketing Bonanza or Anti-Competitive Tool?" *Proceedings*, Canadian Transportation Research Forum, University of Saskatchewan Printing Service, May 1989, pp. 433-446. Won honourable mention for best paper. Also published in *Journal of the Transportation Research Forum*, Vol. XXX (1), 1989 pp. 195-201.
33. "Privatization of Air Canada: Why is it Necessary in a Deregulated Environment," *Canadian Public Policy*, Vol. 15 (3), September 1989, pp. 285-299 [with D.W. Gillen and T.H. Oum].
34. "Hedonic versus General Specifications of the Translog Cost Function," *Logistics and Transportation Review*, Vol. 25 (1), March 1989, pp. 3-21 [with T.H. Oum].
35. "The Canada - U.S. Air Transport Bilateral: Will It Be Freed?" *Transportation Practitioners Journal*, Vol. 56 (4), Summer 1989, pp. 393-405, also in *Proceedings*, Canadian Transportation Research Forum, University of Saskatchewan Printing Services, May 1988 [with M.E. Dresner and C. Hadrovic]. Excerpts also appear in *Air Transport Management*, March/April 1988, Vol. 1 (1).
36. "Ramsey Pricing in the Presence of Externality Costs," *Journal of Transport Economics and Policy*, September 1988, pp. 307-317 [with T.H. Oum].
37. "Duopoly in Canada's Airline Industry: Consequences and Policy Issues," *Canadian Public Policy*, Vol. 14 (1), March 1988, pp. 15-31 [with D.W. Gillen and W.T. Stanbury].
38. "The Changing Role of IATA: Prospects for the Future," *Annals of Air and Space Law*, Vol. 13, 1988 pp. 3-23 [with M.E. Dresner].
39. "Airport Pricing Policies: An Application to Canadian Airports," *Journal of the Transportation Research Forum*, Vol. XXIX, No. 1, 1988. This paper won the A.T. Kearney Inc. Best Paper award at the Transportation Research Forum, Toronto, 1988 [with D.W. Gillen and T.H. Oum].
40. "Policy Choices for Canada in International Air Transport," in *International Business*, Ann Gregory (ed.), refereed proceedings of the Administrative Sciences Association of Canada, Vol. 8, No. 8, June 1987, pp. 83-94 [with M.E. Dresner].
41. "Airline Deregulation: A Bibliography," *Logistics and Transportation Review*, Volume 22 (4), December 1986, pp. 449-489 [with W.T. Stanbury].
42. "Airline Seat Management," *Logistics and Transportation Review*, Vol. 22 (2), June 1988, pp.115-130. Paper also appeared in *Proceedings*, Canadian Transportation Research Forum, University of Saskatchewan Printing Services, May 1986, pp. 232-245. This paper won the 1986 award for best paper on a management topic. Because of the award, the paper also appeared in the September 1986 *Proceedings of the Transportation Research Forum* [with D.J.H. Kraft and T.H. Oum].
43. "Entry Barriers and Anti-competitive Behaviour in a Deregulated Airline Market: The Case of Canada," in *International Journal of Transport Economics*, Vol. 15 (1), February 1988; also published in *Proceedings*, Canadian Transportation Research Forum, University of Saskatchewan Printing Services, May, 1986, pp. 483-493. This paper won the 1986 award for best paper on a policy topic. Because of the award, the paper also appeared in the Sept. 1986 *Proceedings of the Transportation Research Forum*, [with D.W. Gillen and T.H. Oum].
44. "The Effect of New Entry on Productivity Growth in the U.S. Airline Industry: 1947-1981," *Logistics and Transportation Review*, Vol. 21, No. 4, December 1985, pp. 299-335 [with D.W. Caves, L.R. Christensen, and R.J. Windle].

45. "The Total Factor Productivity of the Canadian Class I Railways: 1956-1981," *Logistics and Transportation Review*, Vol. 21, No. 3, September 1985, pp. 249-276 [with K.D. Freeman, T.H. Oum and W.G. Waters II].
46. "Economies of Density Versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ," *Rand Journal of Economics*, Winter, 1984, pp. 471-489 [with D.W. Caves and L.R. Christensen].
47. "Reforming Canadian Airline Regulation," *Logistics and Transportation Review*, Vol. 20 No. 3, September 1984, pp. 261-284 [with T.H. Oum].
48. "Productivity Performance of U.S. Trunk and Local Service Airlines in the Era of Deregulation," *Economic Inquiry*, July 1983, Vol. 21, No. 3, pp. 312-324 [with D.W. Caves and L.R. Christensen].
49. "Flexible Cost Functions for Multiproduct Firms," *Review of Economics and Statistics*, August 1980, pp. 477-481 [with D.W. Caves and L.R. Christensen].

D. Selected Non-consulting Reports

1. "The Feasibility of Grain-Specific Productivity Measurement for Regulating Railway Grain Rates in Canada," (with W.G. Waters II), for the Canadian Transportation Agency, Ottawa/Hull, 18pp. 14 March 1997.
2. "The Economic Impact of the Vancouver International Airport: Summary Report" February 1995.
3. "The Employment and Economic Impact of the Vancouver International Airport," February 1995 [with L. Erbe and K. Tse].
4. "A Study of Economic Multipliers and their Application to the Economic Impact of the Vancouver International Airport," February 1995 [with K. Tse].
5. "The Employment Impact of a South Airport Floatplane operator: Harbour Air", February 1995 [with L. Erbe and K. Kotlarchuk.].
6. "The Employment Impact of Cathay Pacific's three times weekly cargo service," February 1995 [with S. Lui].
7. "The Economic Impact of a Transpacific Cargo Service" November 1994, for the Vancouver International Airport [with S. Lui].
8. "The Economic Impact Of A South Airport Operator: The Case Of Harbour Air," November 1994, for the Vancouver International Airport [with K. Kotlarchuk and L. Erbe].
9. "The Potential for Separating Rail track infrastructure from rail transportation," November 1994, for the Bureau of Competition Policy.
10. "Measuring Productivity Performance and Financial Returns for Canadian National and CP Rail, 1956-1991", UBC Centre for Transportation Studies. March 1994, 302pp.
11. "Report of the Ministerial Task Force on International Airline Policy," July 1992. [I was Director of Research for the Task Force].
12. "Monopoly versus Duopoly in Canada's Airline Industry: Policy Alternatives and Consequences," prepared for the Economic Research Branch, Transport Canada, October 1991 [with T.H. Oum].
13. "Comments on Transport Canada's Proposed New Cost Recovery Policy: Phase II Discussion Paper," March 1991 [with T.D. Heaven, G.C. Chow, T.H. Oum and W.G. Waters II].

14. "Critical Review of Economic Analysis of Capacity Enhancement Strategies for Vancouver International Airport," review submitted to Vancouver International Airport's Airside Capacity Enhancement Management Team, November 1989.
15. "Review of Research Report on URCS Regression Equations," in U.S. Interstate Commerce Commission, Uniform Railroad Costing System: Research Report, July 1988, Washington, DC [with W.G. Waters II].
16. "A Study of Peak Period Pricing with an Application to Toronto International Airport," report submitted to Airports Authority Group and Cost Recovery and Evaluation, Transport Canada, May 1988 [with D.W. Gillen and T.H. Oum].
17. "Alberta's Air Transportation System: Strategic Forces and Structural Alternatives," report submitted to Alberta Economic Development, April 1988 [with D.G. Dale, D.L. Frank, S.J. Ling and T.H. Oum].
18. "Logistical Marketing and Vancouver International Airport: The Need for a Strategic Approach," report prepared for Asia Pacific Committee and B.C. Department of Regional and Industrial Expansion, October 1987.
19. "Development of Vancouver International Airport: Environment and Factors Affecting Success," report prepared for Asia Pacific Committee, and B.C. Department of Regional and Industrial Expansion, September 1987.
20. "Bill C-18 Rail Labour Impact Study," submitted to Transport Canada, March 1987 [with the Trade and Transportation Group and the Productivity Study Group, UBC].
21. "The Impact of Bill C-18 on Employment in the Canadian Railway Industry," published as a Technical Report, Transport Canada, February 1987, [with F.W. Trotter].
22. "The Emergence of Airline Families: Issues of Control," report prepared for the Canadian Airline Pilots Association, February 1987.
23. "Grain Costing Indices," confidential report prepared for Trade and Transportation Group for submission in regulatory hearings, Ottawa, November 1986.
24. "Pricing Policies for Canadian Airports with an Emphasis on Airfield Operations," a report prepared for Airports Task Force, Transport Canada, September 1986, [with D.W. Gillen and T.H. Oum].
25. "Pricing Principles for Canadian Airports," a report prepared for Airports Task Force, Transport Canada, July 1986, [with A. Manoucheri, D.W. Gillen and T.H. Oum].
26. "Predatory Pricing in a Deregulated Canadian Airline Industry," confidential report submitted to Bureau of Competition Policy, Consumer and Corporate Affairs Canada, February 1986, [with D.W. Gillen and T.H. Oum].
27. "The Structure of the Canadian Airline System and the Expected Impact of the Movement Toward Deregulation," Three volume report submitted to Treasury Board of Canada, March 1985, [with T.H. Oum and D.W. Gillen].

E. Papers Under Review

1. "Benchmarking Airport Performance," accepted for publication in forthcoming book by Routledge, 2019. [with I. Kincaid]

F. Other Publications

1. "Open Skies at Last," Connector, Canadian Business Travel Association, June 1995.
2. "The Role of the Airport in the Post-Resource Economy," published as a working paper of the Vancouver International Airport, and as an appendix to the airport's strategic plan. First published June 1994.
3. "Regionalism in International Air Regulations," Working Paper 92-TRA-011, Faculty of Commerce and Business Administration, The University of British Columbia, Vancouver, December 1992.
4. "On the Urge to Merge," letter to editor, Policy Options, Vol. II (5), June 1990.
5. "Prom Night: Choosing Partners for the Global Airline Dance," *Air Transport Management*, Vol. 3 (2), May/June 1990, pp. 13-19.
6. "New Runways and the Environment," *Air Transport Management*, Vol. 3 (1), March/April 1990, p.19.
7. "Peak Period Pricing: An Idea Whose Time Has Come," *Air Transport Management*, Vol. 2 (1), January/February 1990, pp.16-17.
8. "Airport Pricing and Capacity Expansion: Economic Evaluation of Alternatives," *Transport Review*, published by Transport Canada, 1990 [with D.W. Gillen and T.H. Oum].
9. "Hidden Agendas are Distorting the Safety Issue," *Air Transport Management*, Vol. 1 (3), September/October 1988, p.11.
10. "Survival Under Freer Skies," *Air Transport Management*, Vol. 1 (2), May/June 1988, pp. 10-12 [with D.W. Gillen and T.H. Oum].
11. "Selling Air Canada: A No-Lose Situation," *Globe and Mail*, 16 May 1988, p. A7 [with W.T. Stanbury].
12. "The Canada-U.S. Air Transport Bilateral: Will It Be Freed?" *Air Transport Management*, Vol. 1 (1) March (April) 1988, pp.9-12 [with M.E. Dresner and C. Hadrovic].
13. "Airline Productivity Under Deregulation," *Regulation*, Nov./Dec. 1982, pp. 25-28, [with D.W. Caves and L.R. Christensen].
14. Many articles written for YVR Skytalk under pen name of Harold Michaels
15. Various articles written in industry trade magazines, including Airport World and Centerlines.
16. Issues in the Regulation of Railways in Mexico. International Transportation Forum of the OECD, forthcoming 2015.

G. Computer Program Papers and Reference Manuals

1. Econometric Programming Language: Programmer's Reference Manual, Computer manual available from Christensen Associates, 810 University Bay Drive, Madison, WI 53705, August 1981 [with S.A. Novogoratz].
2. Econometric Programming Language: Reference Manual, Computer manual available from Christensen Associates, 810 University Bay Drive, Madison, WI 53705, December 1981.
3. Econometric Programming Language: Primer, Computer manual available from Christensen Associates, 810 University Bay Drive, Madison, WI 53705, March 1981.

4. Econometric Programming Language: User's Manual, Computer manual available from Christensen Associates, 810 University Bay Drive, Madison, WI 53705, November 1980 [with D.W. Caves].
5. "Time Series Processor at the University of Wisconsin, Programmer's Reference Manual," mimeo., Department of Economics, University of Wisconsin-Madison, July 1979 [with C. Franklin].
6. "Time Series Processor at the University of Wisconsin (TSP-WISC)," Computer manual available from Madison Academic Computing Center, University of Wisconsin-Madison, October 1977, June 1978 [with D.W. Caves].
7. "Econometric Estimation Using the Time Series Processor at the University Wisconsin (TSP-WISC)," SSRI Discussion Paper #7711, Department of Economics, Madison, September 1977 [with D.W. Caves].

H. Work in Progress

1. Railway Freight Economics.
[with R.A. Andriulaitis, J. Kositsky]
2. Airport Economics.
3. Airline Economics, 2nd edition.
[with J. King]

COURSES TAUGHT

Air Transportation

Business Logistics

Business Statistics

Government and Business

International Business Logistics and Shipping

Introduction to Transportation

Logistics and Operations Management

Managerial Economics

Project Evaluation (Social Cost Benefit Analysis, and Environmental Impact Statements)

Seminar in Transportation Economics

Transportation Economics

Transportation in Economic Development

Transportation Policy

Urban Transportation

In addition, I have taught short courses in various countries on topics of business logistics, international business logistics, airport management, airport planning, airport strategic planning, airport marketing and airport finance.

OTHER SERVICE

Editorial Boards

Associate Editor, Logistics and Transportation Review, (1987-2001)

Advisory Editor, Quarterly Journal of Economics and Business (1991-2006) (renamed in next entry)

Advisory Editor, Quarterly Journal of Finance and Accounting (2006-present)

Associate Editor, Journal of Air Transport Management (1994-2002)

Referee for the following academic journals:

Air Policy and Management

American Economic Review

Bell/Rand Journal of Economics

Canadian Journal of Economics

Canadian Public Policy

Economic Development and Cultural Change

International Journal of Transportation Economics

Journal of Air Transport Management

Journal of Econometrics

Journal of Economic Education

Journal of Industrial Economics

Journal of Political Economy

Journal of Public Economics

Journal of the Transportation Research Forum

Logistics and Transportation Review

Managerial and Decision Economics

Papers of the Regional Science Association

Quarterly Journal of Business and Economics

Quarterly Review of Economics and Business

Social Science and Humanities Research Council of Canada

Transport Reviews

Transportation Research

Water Resources Research

Reviewer for following publishers:

MIT Press

North Holland Publishers

Transport Research Centre, Australia

Irwin Books

McGraw Hill

Ashgate Publishing

Routledge

Reviewer for the following funding agencies:

Earhart Foundation

Federal Environmental Assessment Review Panel

National Research Council/Transportation Research Board

Natural Sciences and Engineering Research Council of Canada

Social Science and Humanities Research Council of Canada

Transportation Research Board, National Academy of Sciences