



FLUID INTELLIGENCE
HOPA-MCMASTER
SUPPLY CHAIN ANALYTICS

Foundational Study on Cross-Border Short-Sea Shipping Opportunities

SEPTEMBER 19, 2023

HOPA
PORTS

 **McMASTER INSTITUTE FOR
TRANSPORTATION
& LOGISTICS**

OUTLINE

1. Context/background
2. Overview of key data sources
3. Statscan Trade, BTS, CFS results
4. Ontario CVS results
5. Closing Thoughts

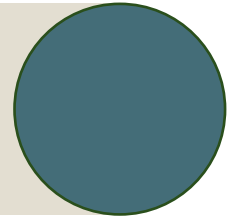


MITL SINCE 2007: ENABLING SAFE, SMART, AND CLEAN MOBILITY OF GOODS AND PEOPLE



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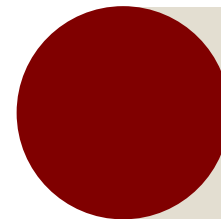
COLLABORATION



- Cross-sectoral
- Inter-disciplinary
- Strategic partnership
- Exchange of ideas



INNOVATION



McMaster's Institute for Transportation & Logistics (MITL) conducts industry- and public policy-relevant research and data analysis into multimodal transportation, logistics challenges and opportunities for the movement of goods and people.

FLUID INTELLIGENCE

- A joint venture between HOPA Ports and MITL, supported by Transport Canada
- With a multimodal approach, that leverages data and analytics, our objectives are:
 - To improve supply chains in Southern Ontario;
 - To support smarter and more integrated solutions in transportation and supply chain;
 - To support decision-making with evidence
 - Public & Private, real-time & strategic, long-term



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HAMILTON
OSHAWA
PORT
AUTHORITY

McMaster
University 

CONTEXT



- The study emphasizes Ontario-Midwest connections, not feeder services
- The study looks beyond SSS challenges and focuses more on opportunity and possibilities.
- Study seeks to make the most of available government data sources.
- Marine data not prominent! Trucking data is.
- Ultimately: can marine do more to complement trucking?

WHY MIGHT THINGS BE DIFFERENT (MORE FAVOURABLE) NOW FOR GREAT LAKES SHORT SEA SHIPPING?



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- Metropolitan traffic congestion is getting worse after pandemic lull
- Big shippers have stated more interested in marine
- Decarbonization is much more prominent
- Fragility of supply chains and the need for redundancy is better appreciated
- Driver issues, their quality-of-life and staying close to home
- Trucks can cycle faster with less long distance, cross-border activity



VARIED DATA SOURCES RELEVANT TO ASSESSING CROSS-BORDER SHORT SEA SHIPPING OPPORTUNITIES



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Ontario
Commercial
Vehicle Survey
(2012 & 2019)

StatsCan Canada-
US detailed trade
data (2016-2020)

U.S. Commodity
Flow Survey (2017)

US Bureau of
Transportation
Statistics Data (up
to 2022)

Stakeholder
Engagement
(2021-2022)

Canadian Freight
Analysis
Framework (2017)

KEY PROS AND CONS OF MAIN DATA SOURCES



Data Source	Pros	Cons
Statistics Canada US-Canada Trade Data	High commodity detail over time, especially in value terms; good high-level geographic context and detail on where goods cross and by what mode	No sub-provincial or sub-state insight and limitations on extracting actual tonnages due to diverse units of measure; not trip or shipment-oriented
Ontario Commercial Vehicle Survey (CVS)	Good characterization of actual sampled cross-border trucks trips in terms of the geography of their movement and <u>good</u> detail on what is carried	Fixed in time, trucking only, and dependent on a complex process to adjust the sample to the true population of truck trips
US Bureau of Transportation Statistics Transborder Freight	A good but not highly detailed all round source that captures tonnages flowing from Canada; updated monthly	No detail on road and rail tonnages into Canada; not trip or shipment oriented
US Commodity Flow Survey	Best source for characterizing individual shipments into Canada by road and rail and offers tonnage estimate for those flows	Fixed in time and last reported for 2017; no coverage of Canada-US flows; subject to the limitations of samples

F07ship2	F08amoacs	F08onecom	F11catc1	F11comcode	F11comgsct	F11comval	
1	Y	13607.8	Y	Mail and parcels	42100	13	204117.0
0	X	0.0	X	Empty	0	99	0.0
1	Y	18143.7	Y	Electrical Cables	35994	8	171240.2
0	X	0.0	X	Empty	0	99	0.0
1	Y	33656.5	Y	LTL	43200	9	227016.5
2-5	Y	8882.2	Y	High Temperature Bonding Mortar	31942	3	4312.3
11-20	Y	16329.3	Y	Frozen and fresh meat for supermarkets	5100	2	50113.0
1	Y	22679.6	Y	Weapons	40110	9	347236.0
0	X	0.0	X	Empty	0	99	0.0
0	Y	6000.0	Y	Medical Biowaste	41299	11	3297.6
1	Y	22634.3	Y	Luminol	20000	5	28236.3
0	X	0.0	X	Empty	0	99	0.0
1	Y	7257.5	Y	Sign - for Shell Gas Station	39030	9	112784.5
1	Y	14968.5	Y	Military Mobile Surgical Hospital	40920	9	62890.2
2-5	Y	6350.3	Y	Filing Cabinets - Metal	33999	7	33297.2
1	Y	38328.6	Y	Newsprint - in Rolls	27200	6	28895.9
0	X	0.0	X	Empty	0	99	0.0
0	X	0.0	X	Empty	0	99	0.0
1	Y	13267.6	Y	Frozen Vegetables	7210	2	25260.2
6-10	Y	2146.9	Y	Acrylic Bathtubs / Shower-Stalls	24223	16	8735.1
1	Y	6000.0	Y	Unknown Freight - Inferred	97000	15	19657.8
1	Y	14000.0	Y	Scooptram - for Mining	34520	8	76309.8
2-5	Y	20865.2	Y	Pump - for Heat Exchanger	34411	8	261228.1
1	Y	13607.8	Y	Mail and parcels (Canada Post)	42100	13	204117.0
1	Y	12700.6	Y	Frozen Pastries	6420	2	44938.5
6-10	Y	9349.0	Y	Fresh and frozen meats and grocery items	43101	2	21035.3
0	Y	8616.4	Y	Unknown Freight - Confidential	97000	15	49679.6
6-10	Y	20411.7	Y	Vehicles (used)	36101	10	382603.0
2-5	Y	19553.0	Y	Carpeting - in Rolls & Flooring Products	30321	9	90276.2
1	Y	24040.4	Y	Unknown Freight - Inferred	97000	15	101421.6
1	E	11100.0	Y	LTL	43200	9	118390.4
6-10	A	29525.0	Y	Office Furniture	39019	9	138649.4
21-50	Y	11339.8	Y	Automotive Parts	36400	10	85749.3
1	E	18600.0	Y	Lumber - for Home Building	26210	6	7817.6
1	Y	9071.8	Y	Mail and parcels (Canada Post)	42100	13	136077.0
1	E	5900.0	Y	Mail and parcels	42100	13	88500.0
1	Y	1995.8	Y	Flowers for Halloween	3600	1	4903.1
1	Y	16533.4	Y	Mixed Freight	43900	9	63885.1
1	Y	15875.7	Y	Mail and parcels	42100	13	238135.5
1	Y	14968.5	N	Sky-Jack Scissor Lift	34519	8	99413.3
1	Y	9071.8	Y	Scrap Metal	41100	11	8537.5
0	E	12690.0	Y	Mixed Freight	43900	9	54699.4
1	Y	9071.8	Y	Furniture	39010	9	42613.0
1	Y	17690.1	Y	Fresh Produce	3000	1	16305.0
0	X	0.0	X	Empty	0	99	0.0
1	Y	4082.3	Y	Store fixtures	39029	9	24390.1
1	Y	18143.7	Y	Fresh Pork	5111	2	67302.2



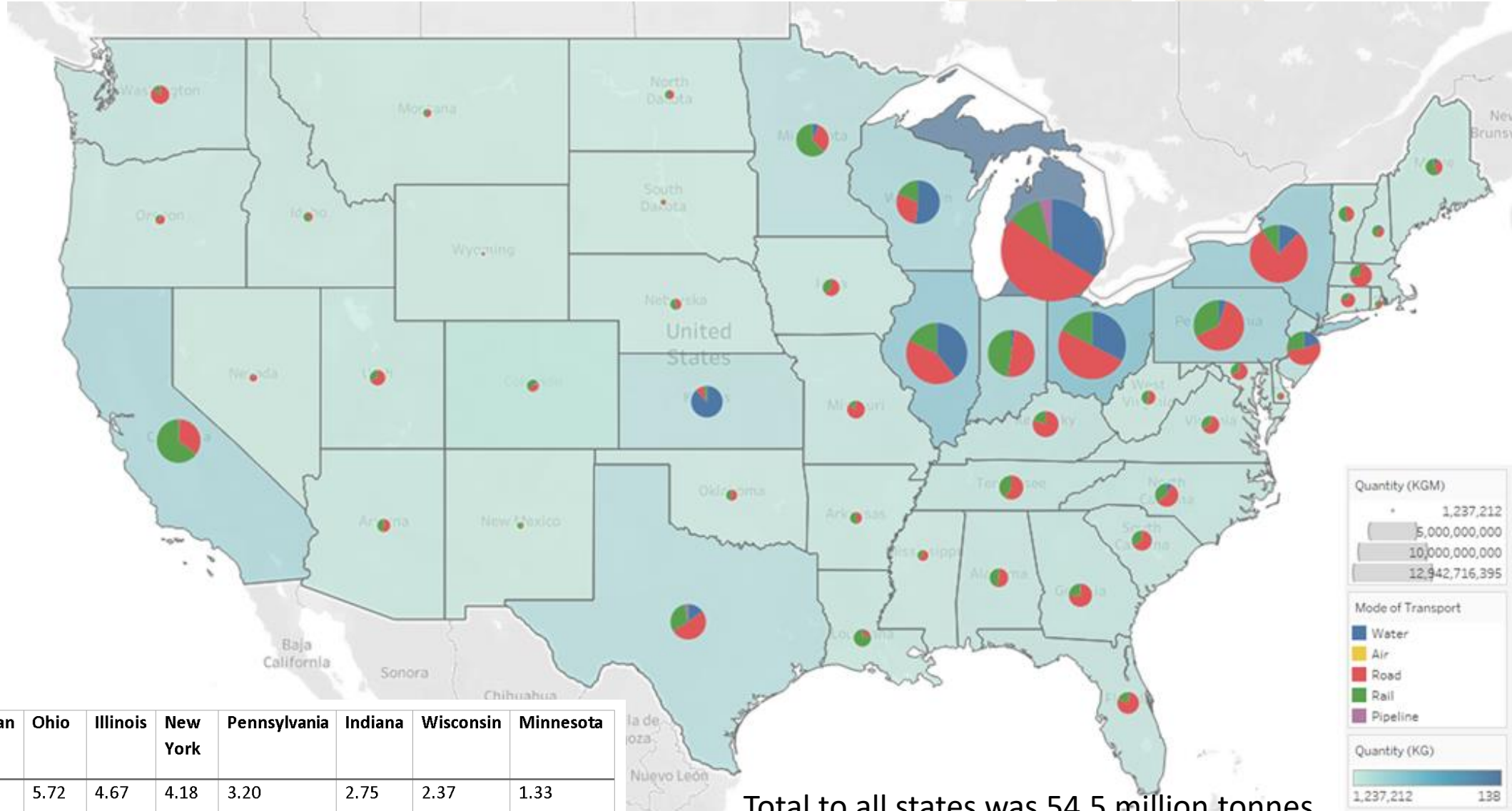
- Excerpt of individual records from Ontario Commercial Vehicle Survey
- These selected fields mostly related to describing the cargo in each sampled truck
- MTO provided truck trips that are 100km+ (not short trips)

MORE DETAILED PROS AND CONS OF STATSCAN TRADE DATA



PROS	CONS
<ul style="list-style-type: none">• Excellent ongoing visibility into detailed commodities that are being traded: by value and quantity and by travel mode of border crossing (not a sample)• Potential to deal with cargoes in an aggregated or disaggregated manner by HS codes• Ability to filter based on specific ports of entry/exit• Very detailed in terms of the value of goods traded• Good temporal characteristics (i.e., monthly empirical variations in trade flows can be evaluated)• Possible to query all available dimensions at once (better than BTS in this regard)	<ul style="list-style-type: none">• The data are not geographically detailed (it is at the level of flows between provinces and states)• Different commodities have different units of measure (making general quantity summaries difficult)• Some of the data is missing any information on the quantity of goods traded• No visibility into individual shipments, truck trips or the like• Imports into Canada not geographically tracked to the province of destination (i.e., not beyond port of entry)• Captures the mode of crossing/clearance but nothing more in a modal sense

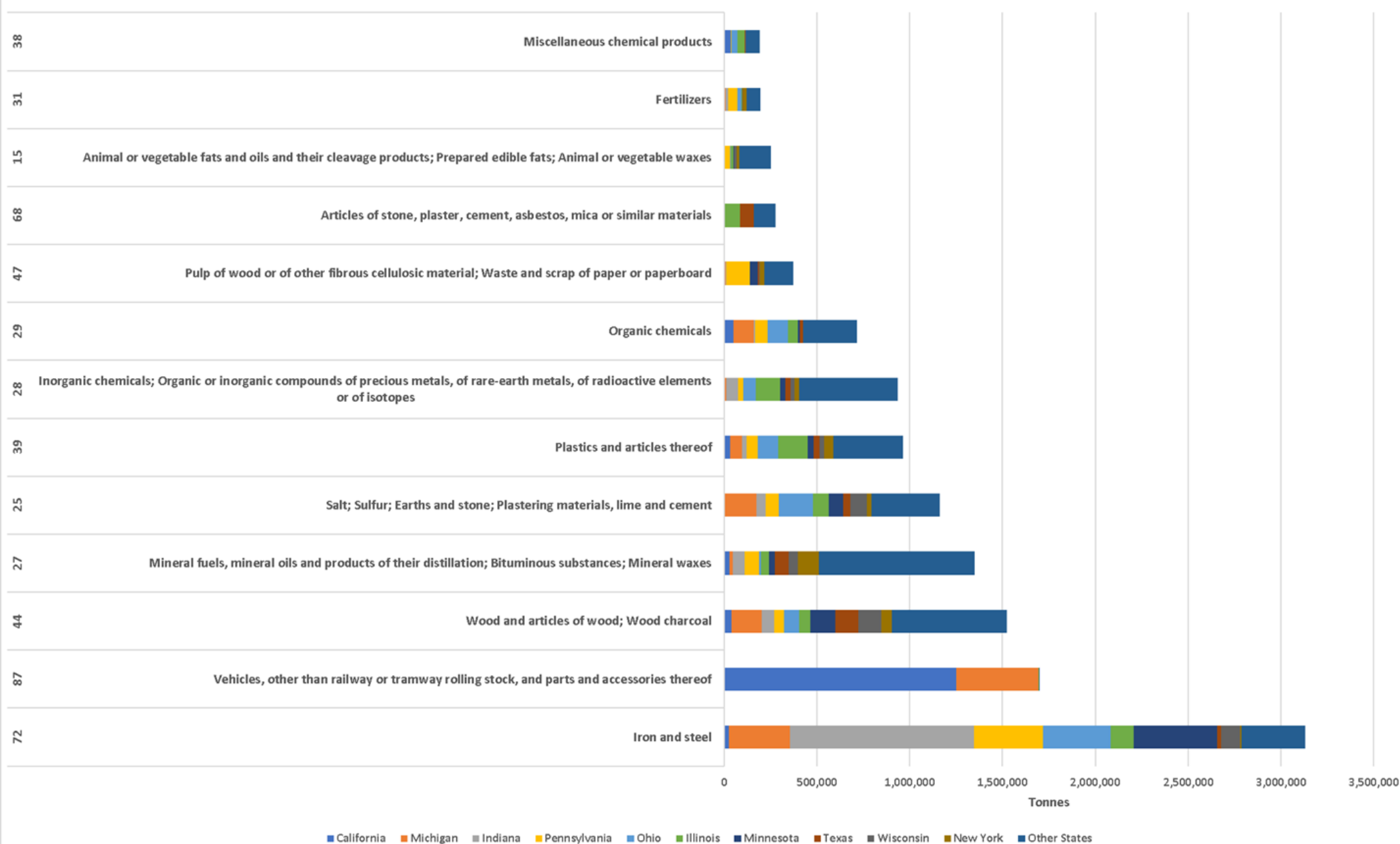
ONTARIO EXPORT QUANTITIES BY MODE FLOWING TO US (2021) – DERIVED FROM BTS



Total	Michigan	Ohio	Illinois	New York	Pennsylvania	Indiana	Wisconsin	Minnesota
37.15	12.95	5.72	4.67	4.18	3.20	2.75	2.37	1.33

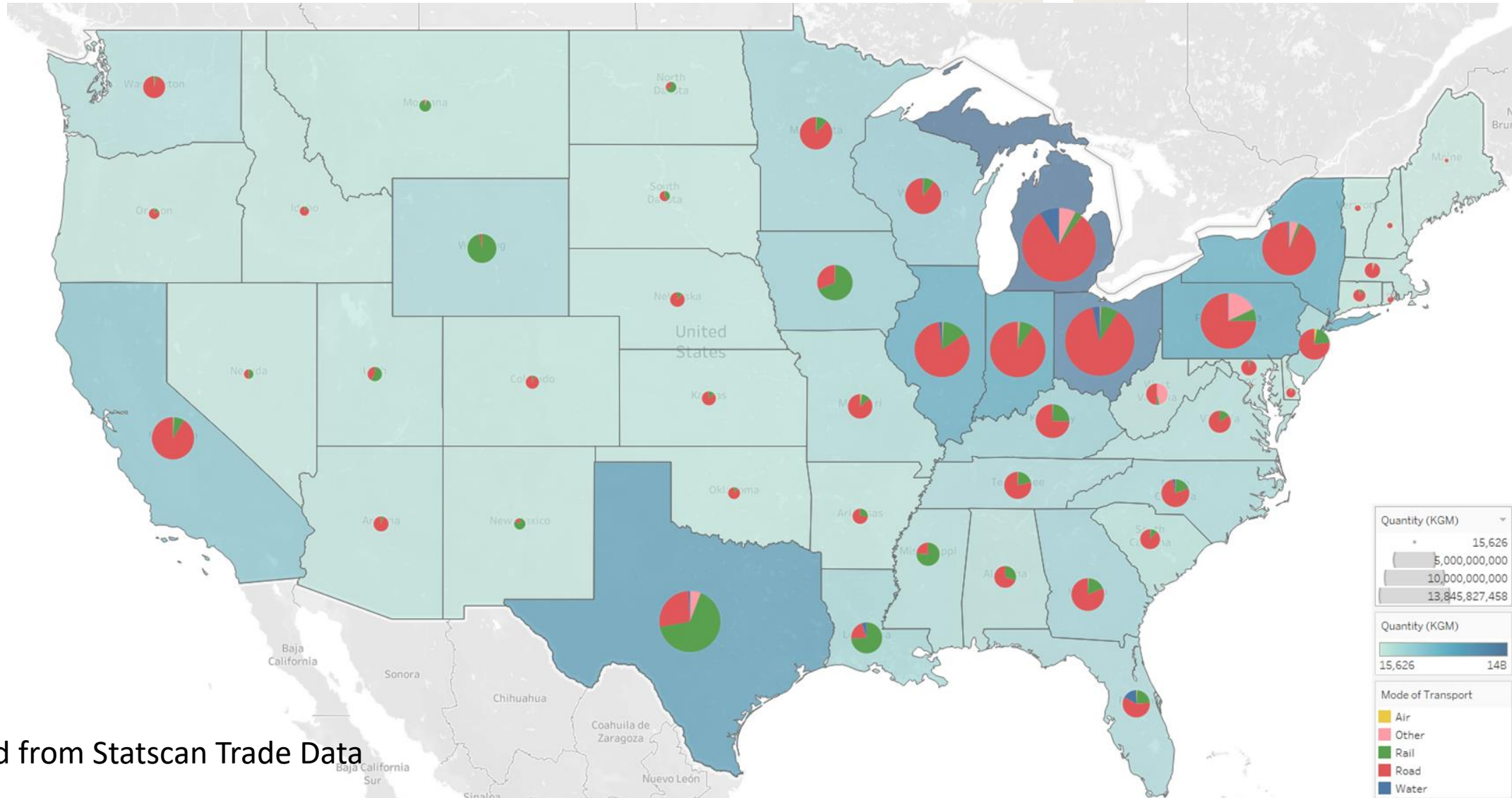
Total to all states was 54.5 million tonnes

RAIL EXPORTS TO THE US – ONTARIO ORIGIN



- 2021: Rail export tonnage from Ontario to US States from BTS)
- Grand total: 13.5M tonnes
- Fairly commodity-oriented
- Geographically diverse destinations in the US

IMPORT QUANTITIES (KGM UOM) CLEARING INTO ONTARIO FROM US STATES (2016-2020)

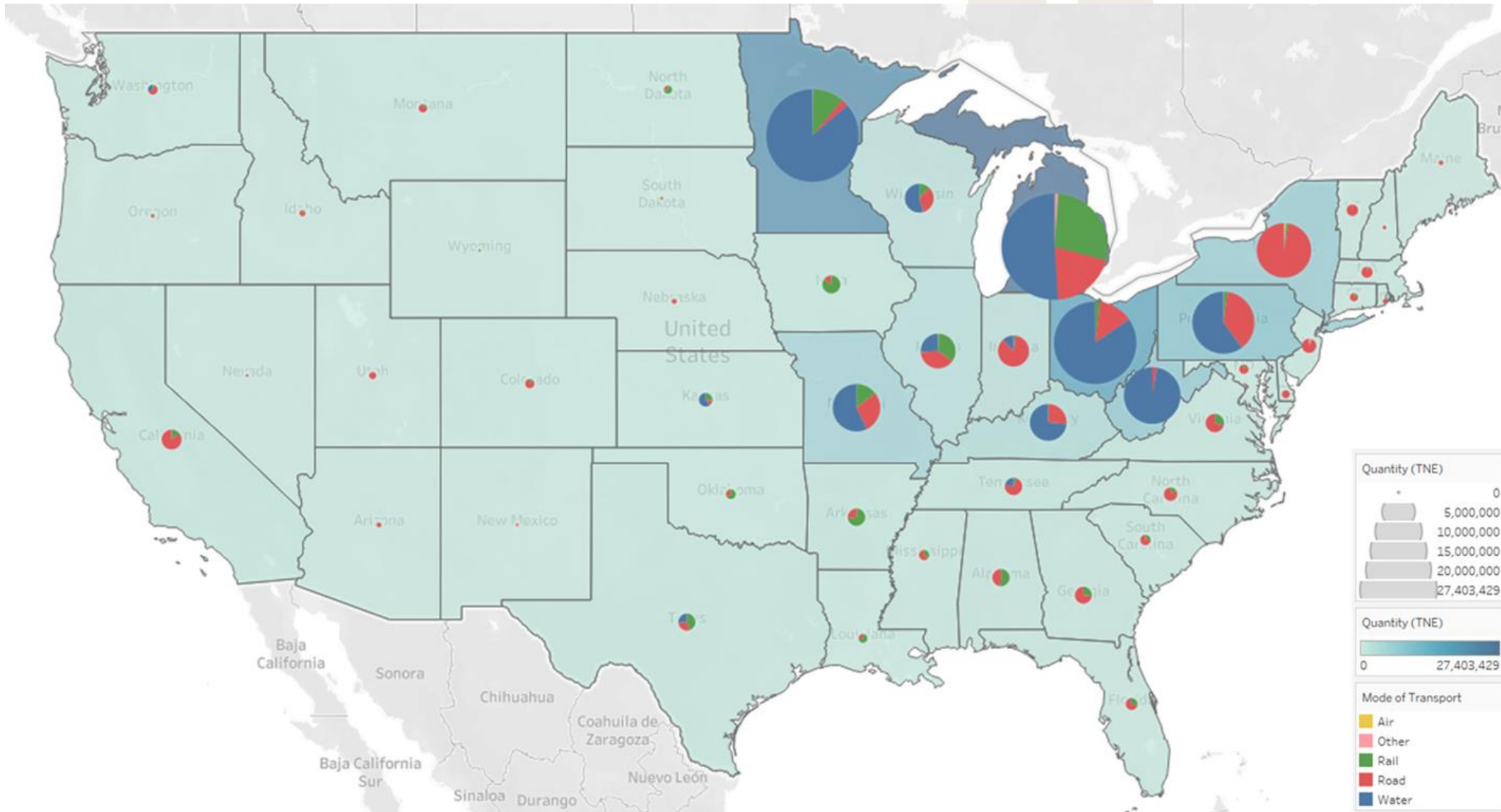


Derived from Statscan Trade Data

IMPORT QUANTITIES (TNE UOM) CLEARING INTO ONTARIO FROM US STATES (2016-2020)



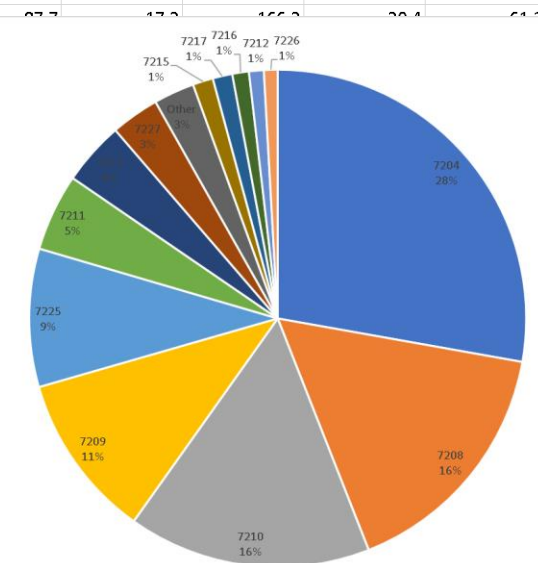
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CUSTOM SPREADSHEET TOOL



code4	code2	desc	units	year	value	value_gl	quantity	q	q_gl	Illinois	Indiana	Michigan	Minnesota	New York	Ohio	Pennsylvania	Wisconsin
7204	72	ferrous waste and scrap; remelting scrap ingots of iron or steel	TNE	2019.0	300.9	286.0	697,207.0	697,207.0	668,139.0	4,108.0	12,287.0	343,122.0	12,788.0	92,229.0	126,228.0	75,961.0	1,416.0
7208	72	flat-rolled iron or nonalloy steel products, 600 mm (23.6 in.) or more wide	KGM	2019.0	366.6	337.2	417,748,858.0	417,748.9	390,346.1	37,471.7	50,968.0	171,306.6	10,496.0	37,926.4	53,941.1	16,830.4	11,405.8
7210	72	flat-rolled iron or nonalloy steel products, 600 mm (23.6 in.) or more wide	KGM	2019.0	925.7	678.5	562,635,087.0	562,635.1	379,965.9	41,490.4	62,583.9	48,677.5	2,953.7	35,929.2	143,334.8	35,966.1	9,030.2
7209	72	flat-rolled iron or nonalloy steel products, 600 mm (23.6 in.) or more wide	KGM	2019.0	327.2	291.9	287,659,312.0	287,659.3	257,561.5	27,976.9	16,866.0	84,809.5	1,756.1	6,955.5	75,900.2	42,869.7	427.6
7225	72	flat-rolled alloy steel (other than stainless) products, 600 mm (23.6 in.) or	KGM	2019.0	386.0	278.9	278,485,672.0	278,485.7	215,751.4	7,146.9	23,372.2	116,037.8	2,922.7	2,770.9	50,090.8	10,175.0	3,235.1
7211	72	flat-rolled iron or nonalloy steel products, less than 600 mm (23.6 in.) wide	KGM	2019.0	136.7	132.5	124,689,690.0	124,689.7	120,653.7	3,907.6	763.3	17,913.4	0.0	86,846.9	9,260.1	1,807.7	154.6
7213	72	bars and rods of iron or nonalloy steel, hot-rolled, in irregularly wound coils	KGM	2019.0	122.0	108.9	110,211,314.0	110,211.3	98,974.0	11,456.9	5,928.7	45,505.2	63.0	78.4	17,219.1	18,331.2	391.4
7227	72	bars and rods of alloy steel (other than stainless), hot-rolled, in irregularly wound coils	KGM	2019.0	87.6	86.5	76,659,082.0	76,659.1	75,677.6	6,525.8	1,530.1	51,866.2	0.0	46.0	6,765.5	8,944.0	0.0
7215	72	bars and rods of iron or nonalloy steel nesoi	KGM	2019.0	82.6	55.7	47,874,532.0	47,874.5	31,860.8	4,416.6	1,425.3	8,851.9	443.5	6,087.9	7,941.5	2,223.0	471.1
7217	72	wire of iron or nonalloy steel	KGM	2019.0	56.2	44.9	38,806,708.0	38,806.7	30,689.4	15,870.0	877.5	8,435.0	244.9	276.0	4,824.2	100.8	61.0
7216	72	angles, shapes and sections of iron or nonalloy steel	KGM	2019.0	82.0	34.9	59,583,504.0	59,583.5	25,942.4	3,513.8	769.7	5,021.6	1,123.4	8,490.2	2,370.4	3,574.4	1,078.9
7212	72	flat-rolled iron or nonalloy steel products, less than 600 mm (23.6 in.) wide	KGM	2019.0	41.6	30.8	29,306,727.0	29,306.7	23,126.2	2,655.3	1,101.9	10,770.3	26.6	3,256.9	2,629.2	2,666.6	19.4
7226	72	flat-rolled alloy steel (other than stainless) products, less than 600 mm (23.6 in.) wide	KGM	2019.0	59.1	35.0	32,580,866.0	32,580.9	21,447.5	629.7	712.3	17,540.0	122.4	421.3	1,699.0	320.1	2.8
7205	72	granules and powders, of pig iron, spiegeleisen, iron or steel	TNE	2019.0	29.3	15.1	20,223.0	20,223.0	10,088.0	1,243.0	526.0	1,105.0	687.0	66.0	3,614.0	436.0	2,411.0
7229	72	wire of alloy steel (other than stainless)	KGM	2019.0	20.4	17.2	12,217,997.0	12,218.0	10,079.7	5,732.2	1,302.7	1,711.1	15.4	30.8	1,165.8	121.7	0.0
7214	72	bars and rods of iron or nonalloy steel nesoi, not further worked than finished	KGM	2019.0	16.9	11.5	14,506,292.0	14,506.3	9,611.3	1,794.2	755.8	1,670.4	549.0	1,442.5	1,967.7	1,103.8	327.7
7218	72	stainless steel in ingots, other primary forms and semifinished products	TNE	2019.0	17.6	17.6	9,015.0	9,015.0	9,015.0	456.0	4,466.0	165.0	0.0	3.0	1,336.0	2,581.0	8.0
7207	72	semifinished products of iron or nonalloy steel	TNE	2019.0	11.9	6.5	15,483.0	15,483.0	8,625.0	0.0	54.0	52.0	0.0	20.0	532.0	7,967.0	0.0
7202	72	ferroalloys	KGM	2019.0	106.8	99.7	10,581,794.0	10,581.8	7,500.7	3,056.7	1,262.4	562.2	0.0	588.5	347.7	1,679.3	4.1
7228	72	bars and rods nesoi, angles, shapes and sections of alloy steel (other than stainless)	KGM	2019.0	11.6	7.4	4,493,198.0	4,493.2	2,801.5	788.0	63.5	759.4	17.5	220.4	507.0	240.0	205.8
7223	72	wire of stainless steel	KGM	2019.0	18.1	11.7	2,813,353.0	2,813.4	1,899.4	85.9	7.7	1,583.8	10.7	79.2	87.0	44.9	0.3
7224	72	alloy steel (other than stainless) in ingots, other primary forms and semifinished products	TNE	2019.0	2.3	1.7	1,562.0	1,562.0	1,028.0	497.0	183.0	32.0	0.0	0.0	122.0	194.0	0.0
7206	72	iron and nonalloy steel in ingots or other primary forms (excluding iron or steel)	TNE	2019.0	1.1	1.1	1,015.0	1,015.0	990.0	0.0	131.0	725.0	0.0	0.0	0.0	134.0	0.0
7219	72	flat-rolled stainless steel products, 600 mm (23.6 in.) or more wide	KGM	2019.0	10.1	2.8	2,928,756.0	2,928.8	2,928.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7220	72	flat-rolled stainless steel products, less than 600 mm (23.6 in.) wide	KGM	2019.0	2.9	2.1	974,738.0	974.7	974.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7222	72	bars and rods of stainless steel nesoi; angles, shapes and sections of stainless steel	KGM	2019.0	4.0	2.2	1,025,858.0	1,025.9	1,025.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7203	72	spongy ferrous products from direct reduction of ore and products in lump form	TNE	2019.0	0.0	0.0	11.0	11.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7201	72	pig iron and spiegeleisen in pigs, blocks or other primary forms	TNE	2019.0	0.0	0.0	23.0	23.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7221	72	bars and rods of stainless steel, hot-rolled, in irregularly wound coils	KGM	2019.0	0.2	0.0	90,000.0	90.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

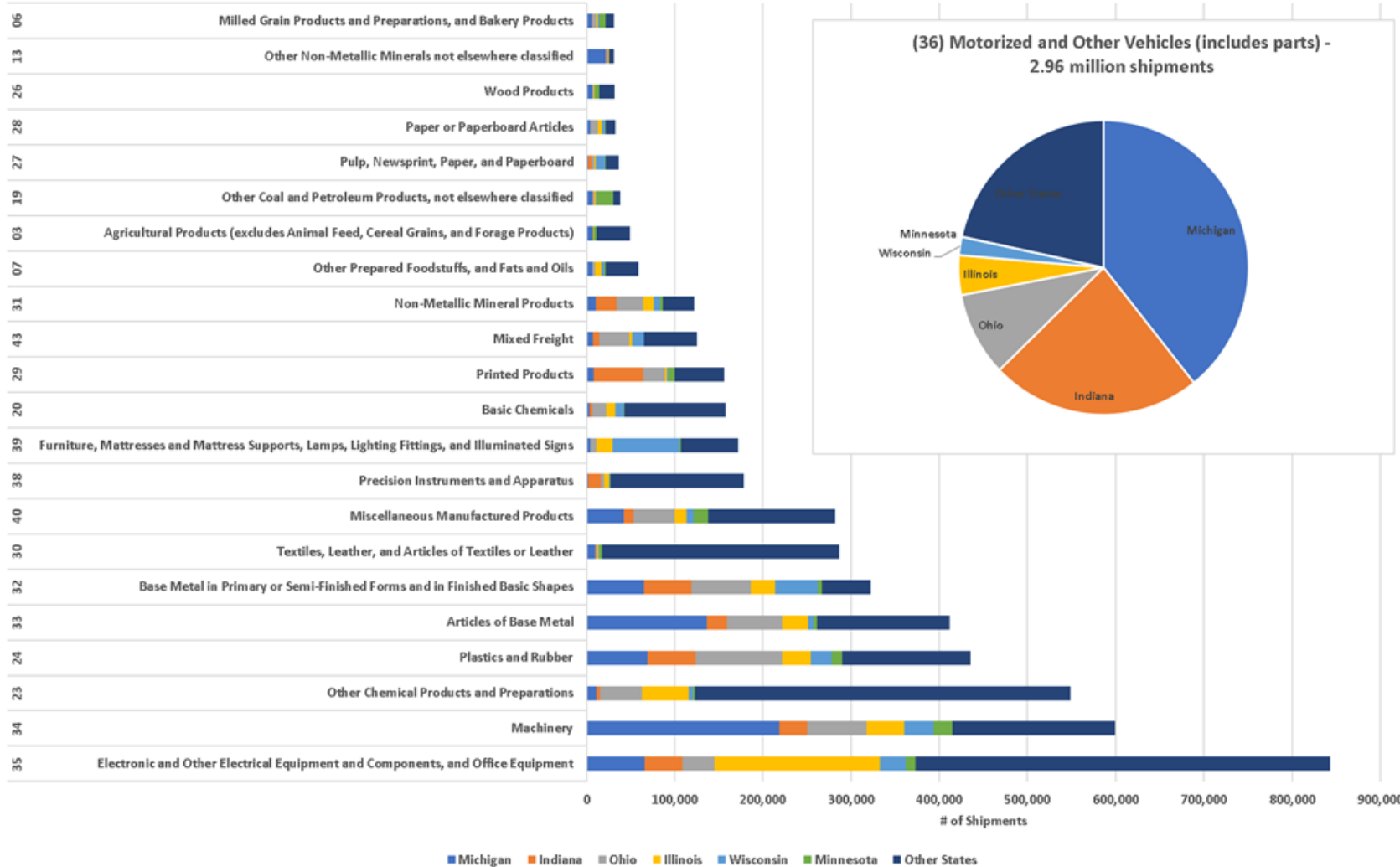


For HS72 goods (Iron and Steel) originating in Ontario in 2019 and crossing the border by truck ... 2.4M tonnes went to the Great Lakes States.

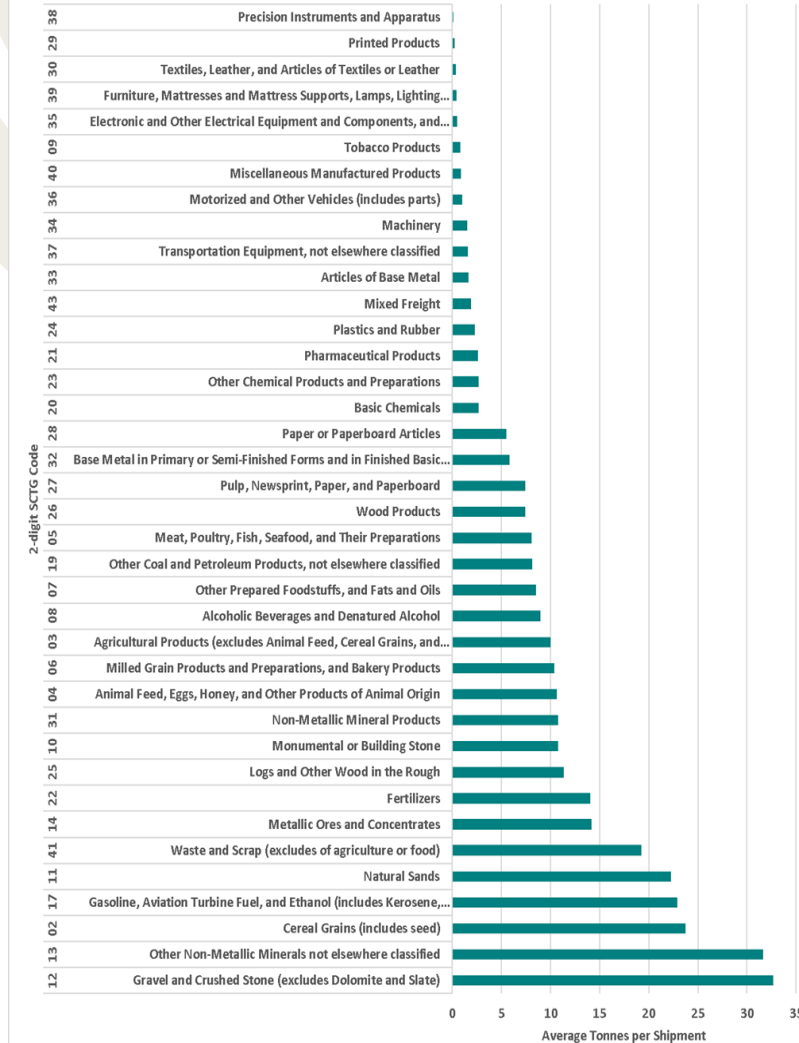
IMPORT SHIPMENTS CROSSING BY TRUCK VIA MICHIGAN



Estimated Number of Shipments Imported by Truck via Primary Michigan Crossings (2017)



Tonnage per Shipment Type Crossing into Ontario via Michigan (2017)

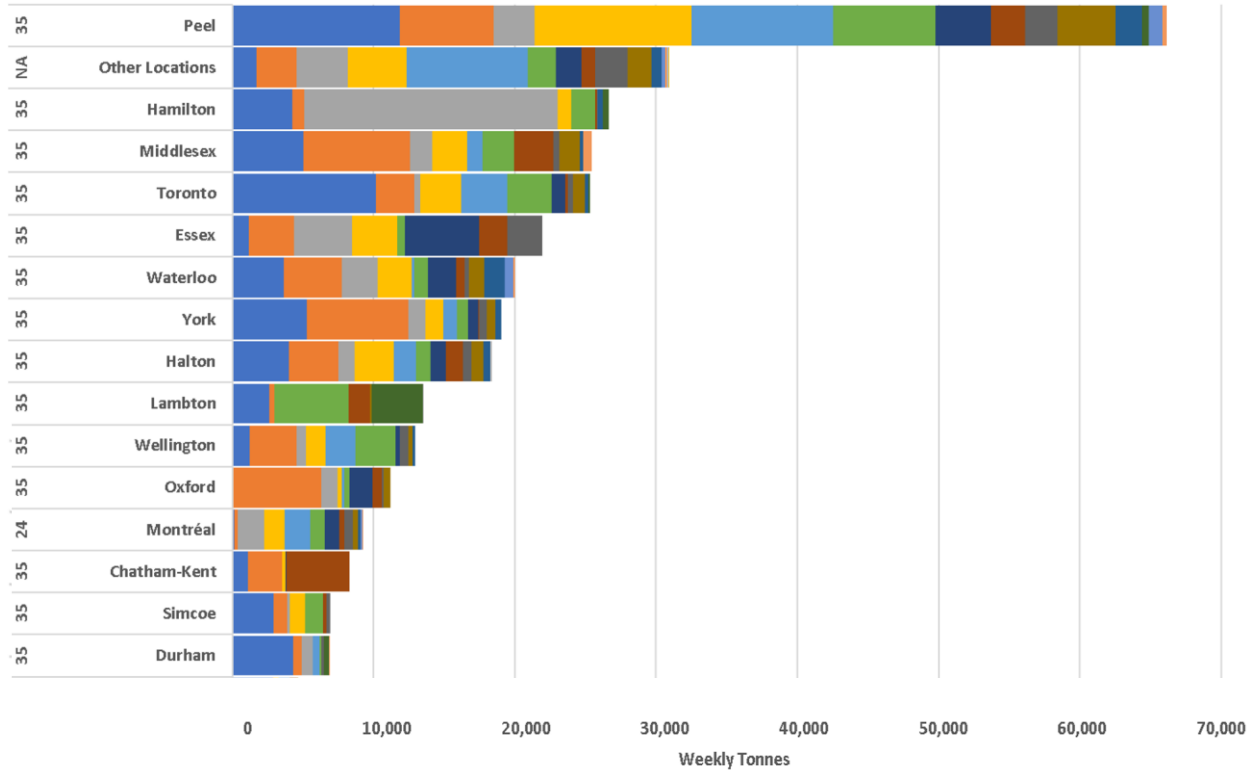


100KM+ TONNAGE FLOWS FROM ONTARIO CROSSING VIA MICHIGAN

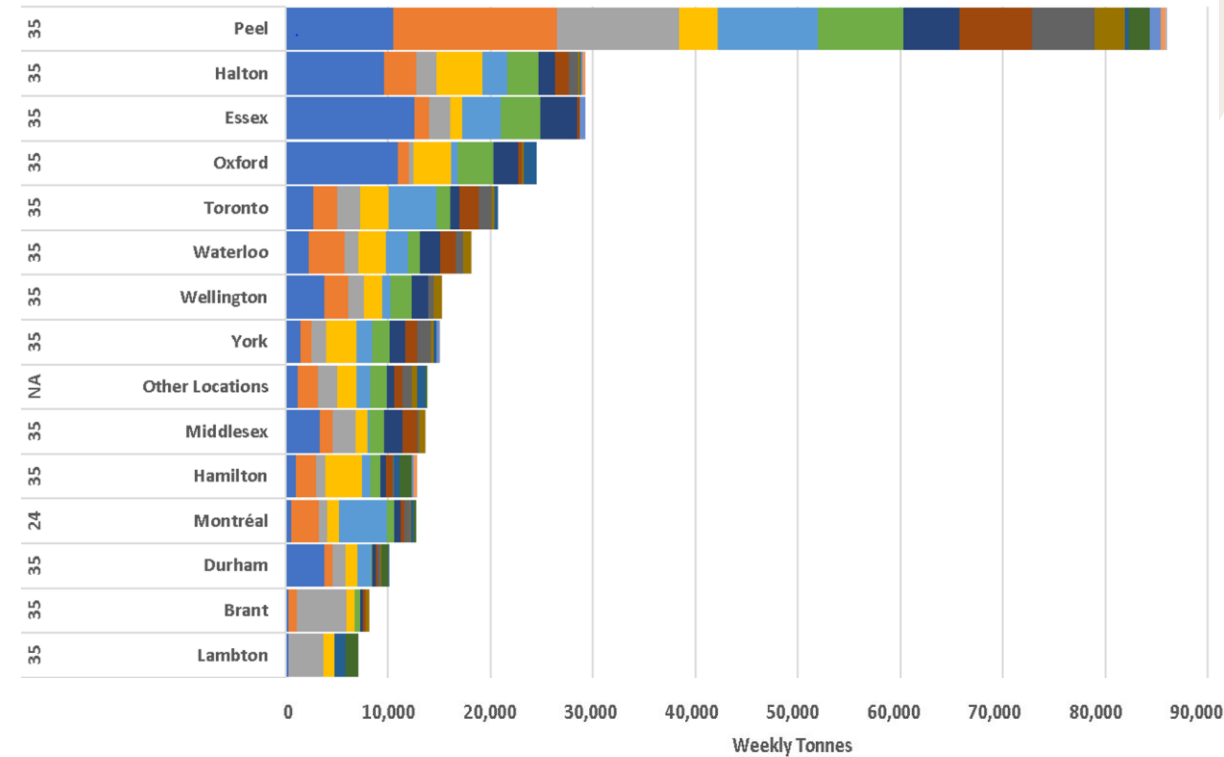


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Truck Tonnage Exports Crossing via Windsor/Sarnia



Truck Tonnage Imports Crossing via Windsor/Sarnia



- Waste and Scrap
- Transportation
- Metals and Products
- Food
- Wood and Products
- Chemicals and Products
- Minerals
- Agricultural Products
- Machinery and Electrical
- Manufactured Products
- Plastics, Rubber and Products
- Petroleum and Products
- Unknown
- Mail and Parcels
- Empty Shipping Containers
- Privately Owned Goods

- Transportation
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TRUCK TRIPS/TONNAGE TO AND FROM US PORT VICINITIES



Flows between US Ports & Ontario/Quebec

US Port	Export Trips (to US)	Import Trips (from US)	Export Tonnes (to US)	Import Tonnes (from US)
Within 100km				
Chicago	2,374	2,786	34,333	34,884
Cleveland	1,154	1,561	16,679	18,789
Detroit	7,111	5,235	116,488	74,456
Duluth	24	94	491	216
Milwaukee	562	591	7,967	7,807
Rochester, NY	1,659	1,913	32,550	29,324
Toledo	4,999	5,610	69,187	74,211
Within 50km				
Chicago	1,936	2,260	27,907	28,320
Cleveland	442	723	6,400	9,368
Detroit	5,593	3,910	91,799	55,606
Duluth	32	213	619	2,804
Milwaukee	296	302	4,631	3,863
Rochester, NY	326	537	3,890	7,294
Toledo	1,144	1,204	15,995	13,850

Source: Derived from 2019 Ontario Commercial Vehicle Survey (100+km trips only)

Note: These trade areas may have modest overlap

Flows between US Ports and GTHA

US Port	Export Trips (to US)	Import Trips (from US)	Export Tonnes (to US)	Import Tonnes (from US)
Within 100km				
Chicago	1,175	1,985	16,920	24,223
Cleveland	651	823	9,146	8,836
Detroit	3,303	2,836	62,380	39,107
Milwaukee	251	341	3,379	4,389
Rochester, NY	1,023	786	19,730	9,622
Toledo	2,451	2,647	37,146	37,131
Within 50km				
Chicago	1,012	1,721	14,798	20,522
Cleveland	207	414	2,434	4,836
Detroit	2,826	2,336	53,176	33,003
Milwaukee	123	199	1,811	2,705
Rochester, NY	244	203	2,368	2,759
Toledo	469	432	8,571	5,584

POTENTIAL GHG REDUCTIONS FROM AN INCREASED MARINE ROLE

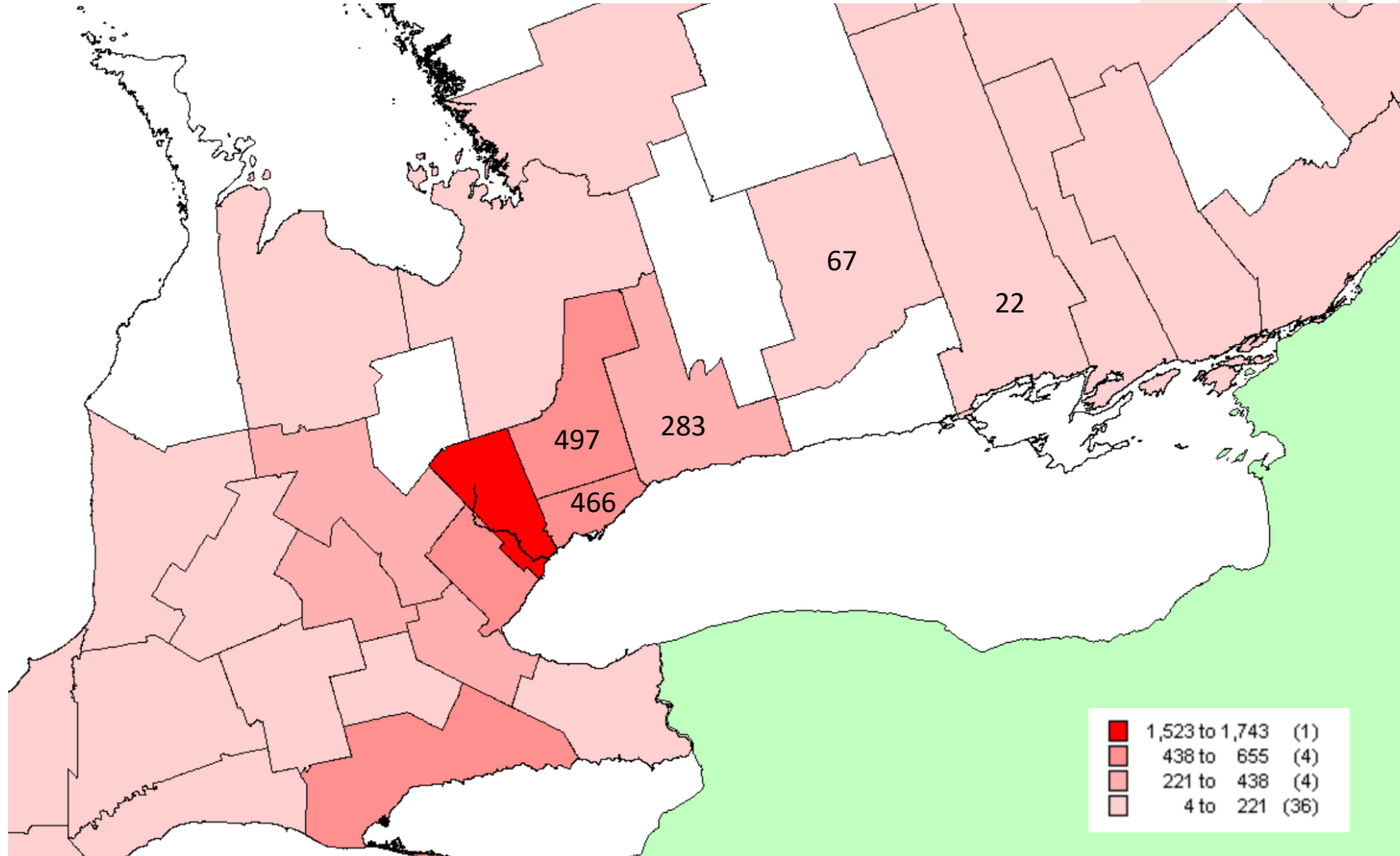


Weekly GHG Emissions Saved from Removal of US Port-GTHA Trucking Legs:

Based on Reallocation of 10% of CVS Estimated Tonnage to Marine

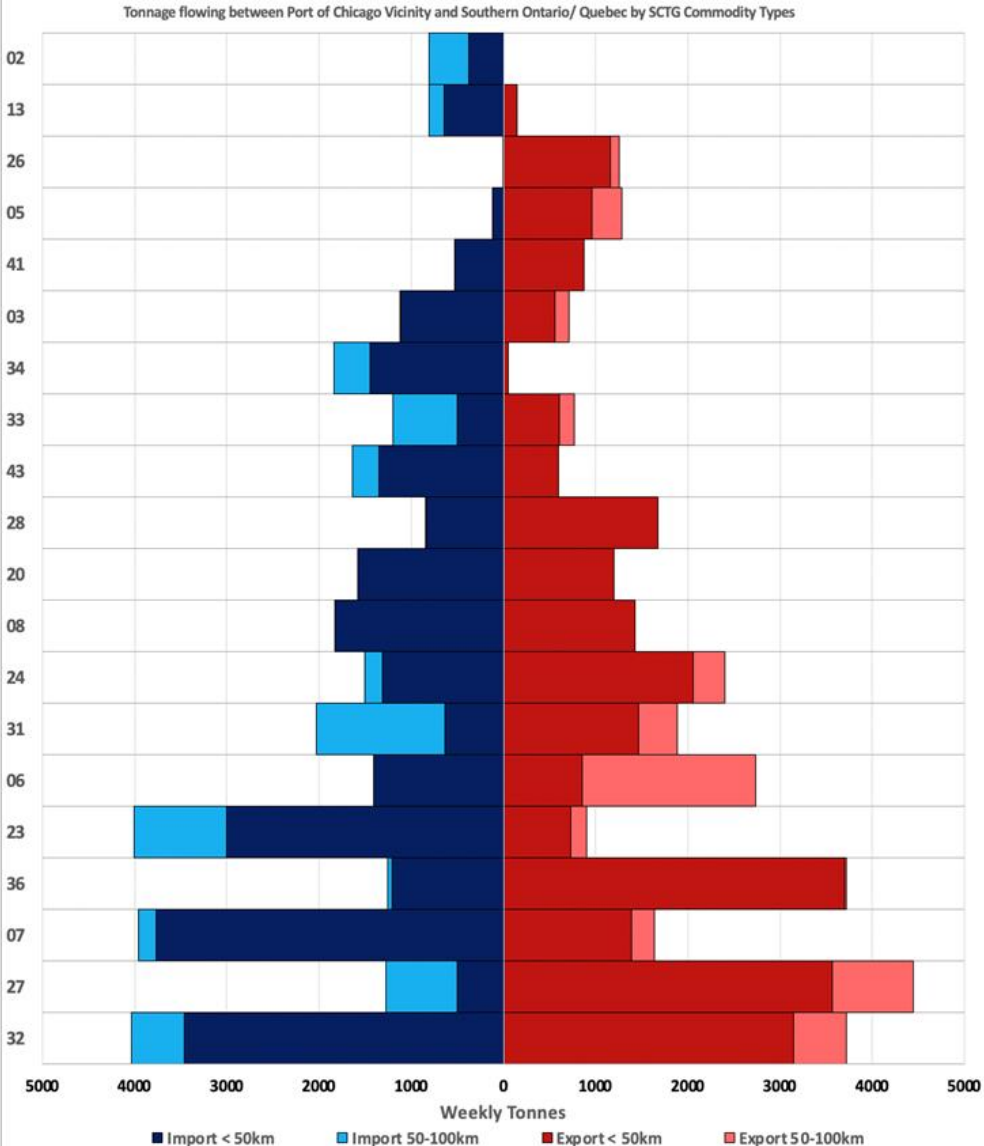
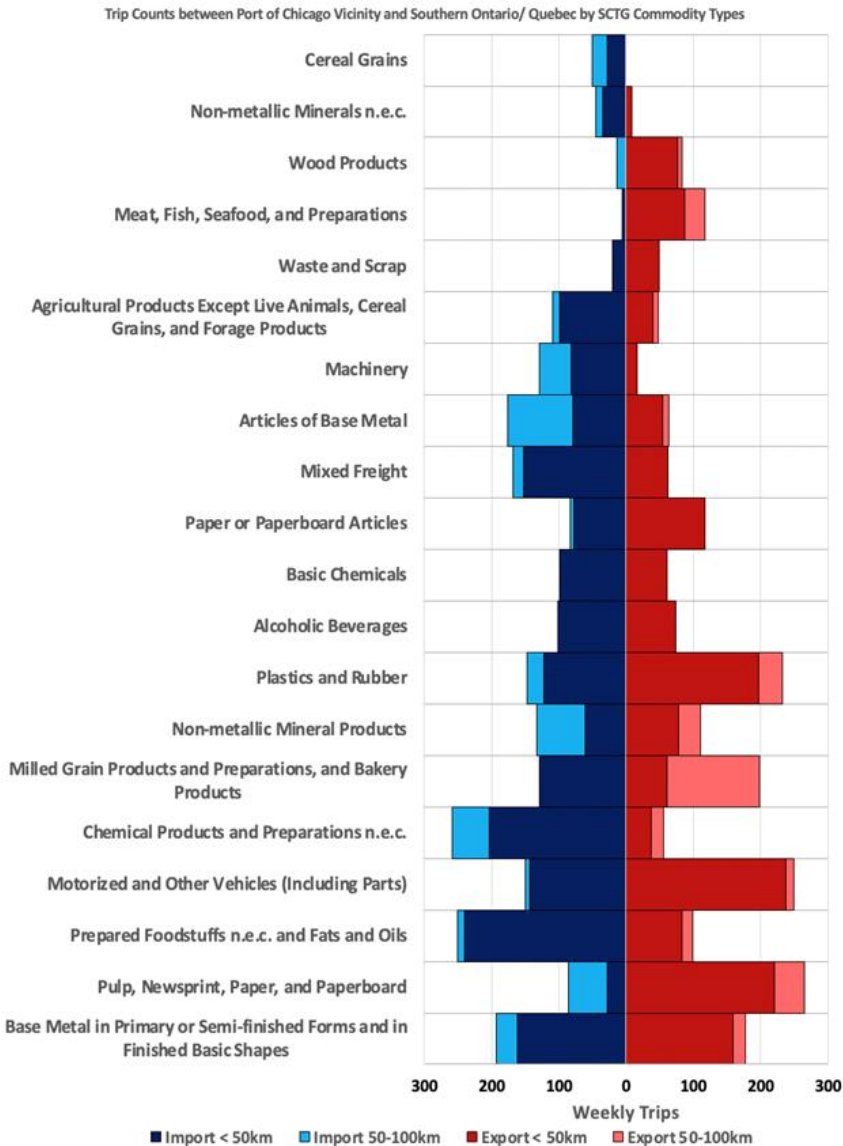
US Port	Export Trips	Export Trips	Import Trips	Import Trips	Total	Total
	50km radius	100km radius	50km radius	100km radius	50km radius	100 km radius
In Tonnes						
Chicago	78.8	89.9	109.5	129.7	188.3	219.6
Cleveland	5	18.3	10.1	18.8	15.1	37.1
Detroit	128.6	151.6	79.7	94.3	208.3	245.9
Milwaukee	11.4	21.4	17.1	27.8	28.5	49.1
Rochester, NY	4.3	36.2	4.7	17	9	53.2
Toledo	25.1	108.8	16.7	111.6	41.8	220.4

CROSS-LAKE ONTARIO SSS POTENTIAL?



- Map depicts weekly truck trips to Western New York
- Cross-Lake Ontario Potential for SSS seems limited
- Most potential is linked to western GTA and is served fairly directly by truck
- Map derived from 2019 CVS

COMMODITY CONNECTIONS TO CHICAGO

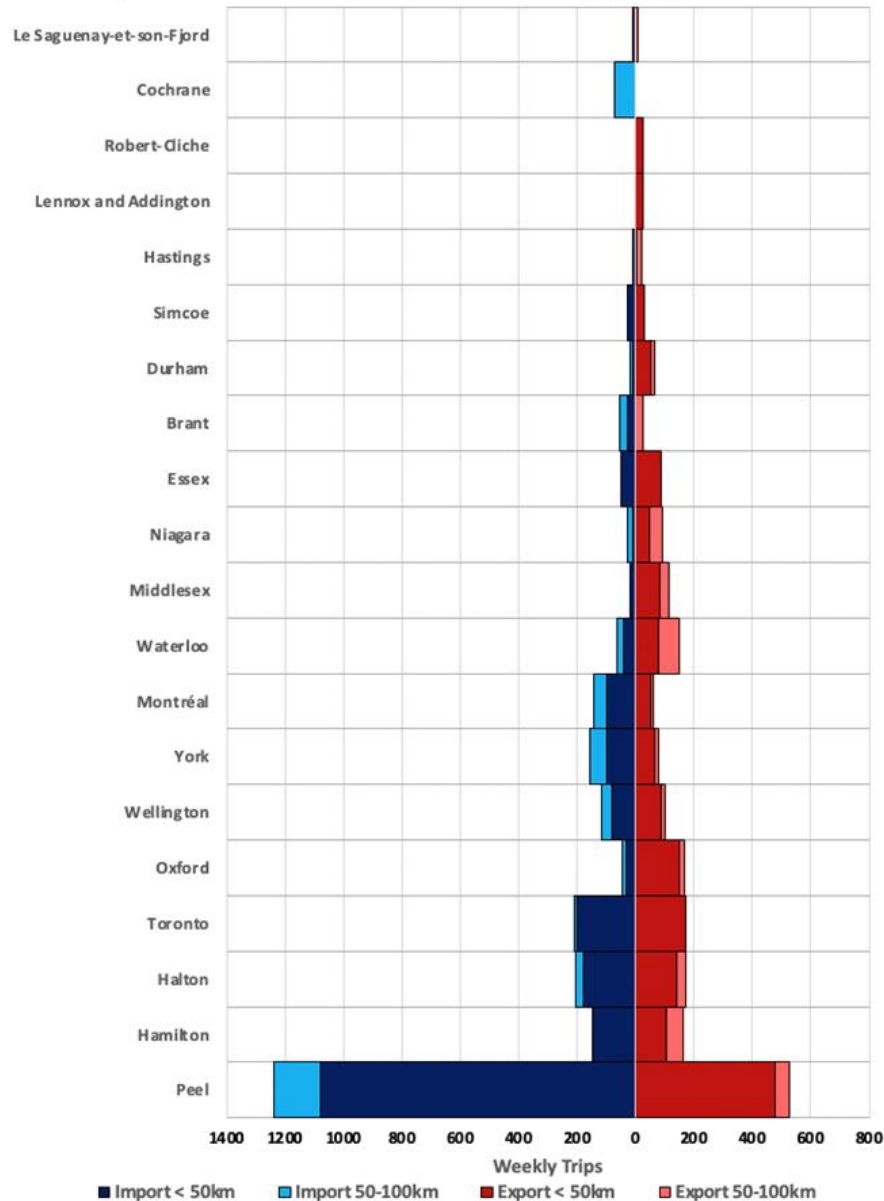


Derived from
 2019 Ontario
 CVS

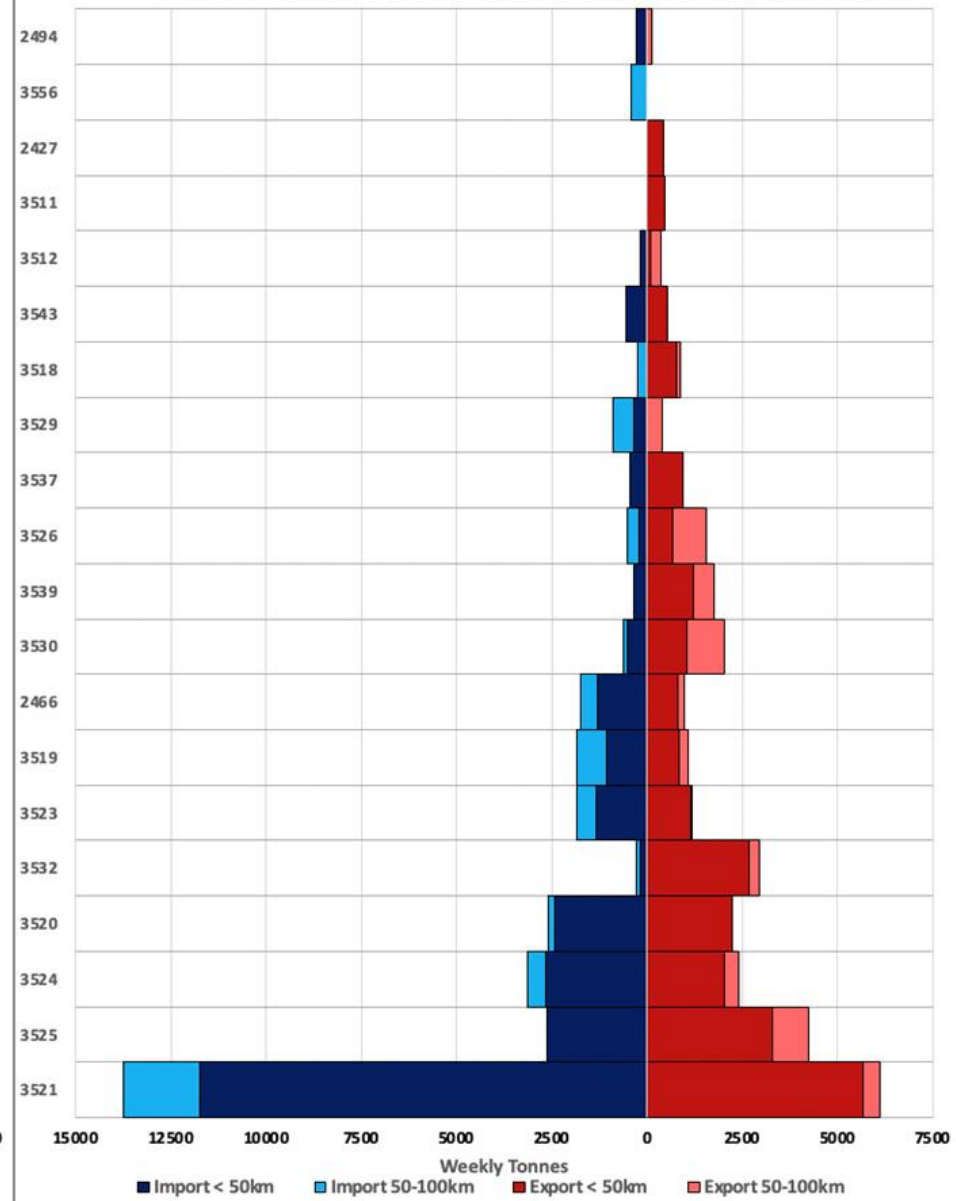
CENSUS DIVISION CONNECTIONS WITH CHICAGO



Trip Counts between Port of Chicago Vicinity and Southern Ontario/ Quebec by Census Divisions

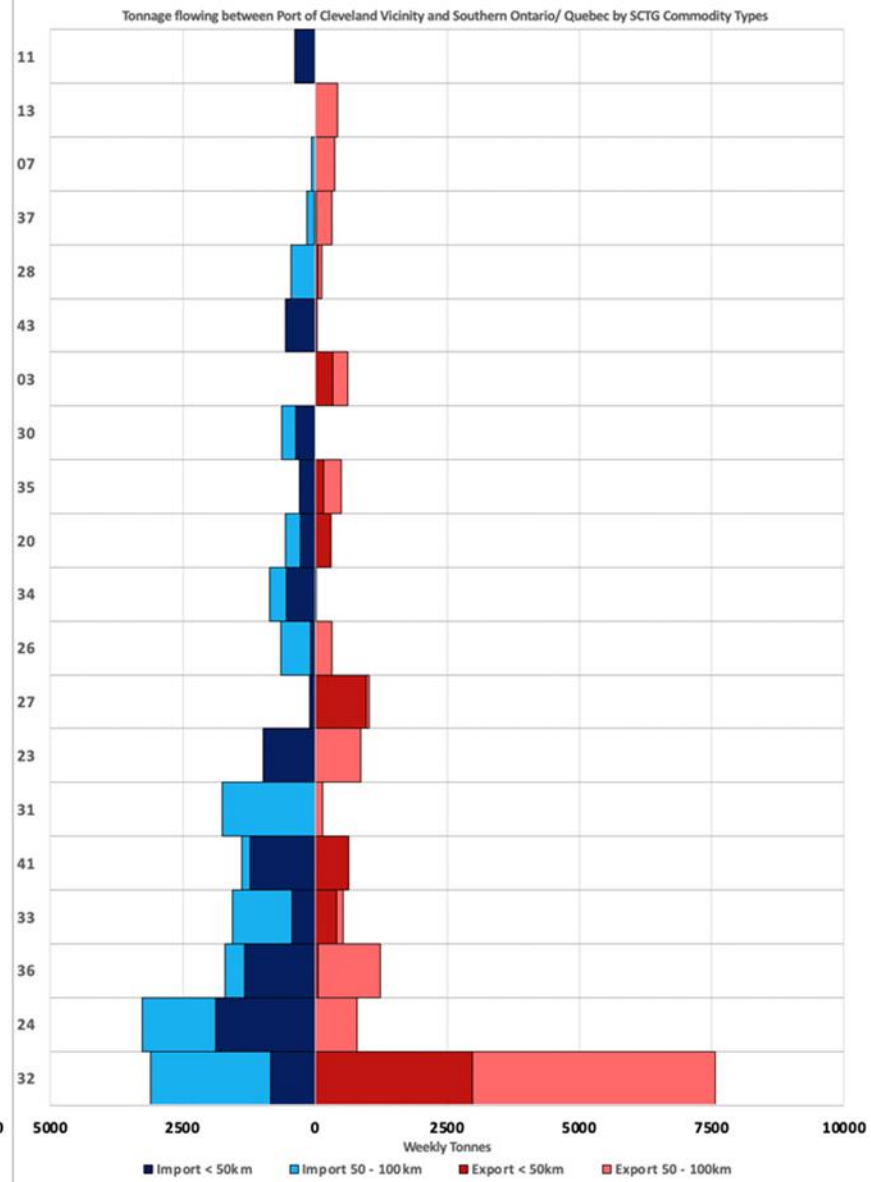
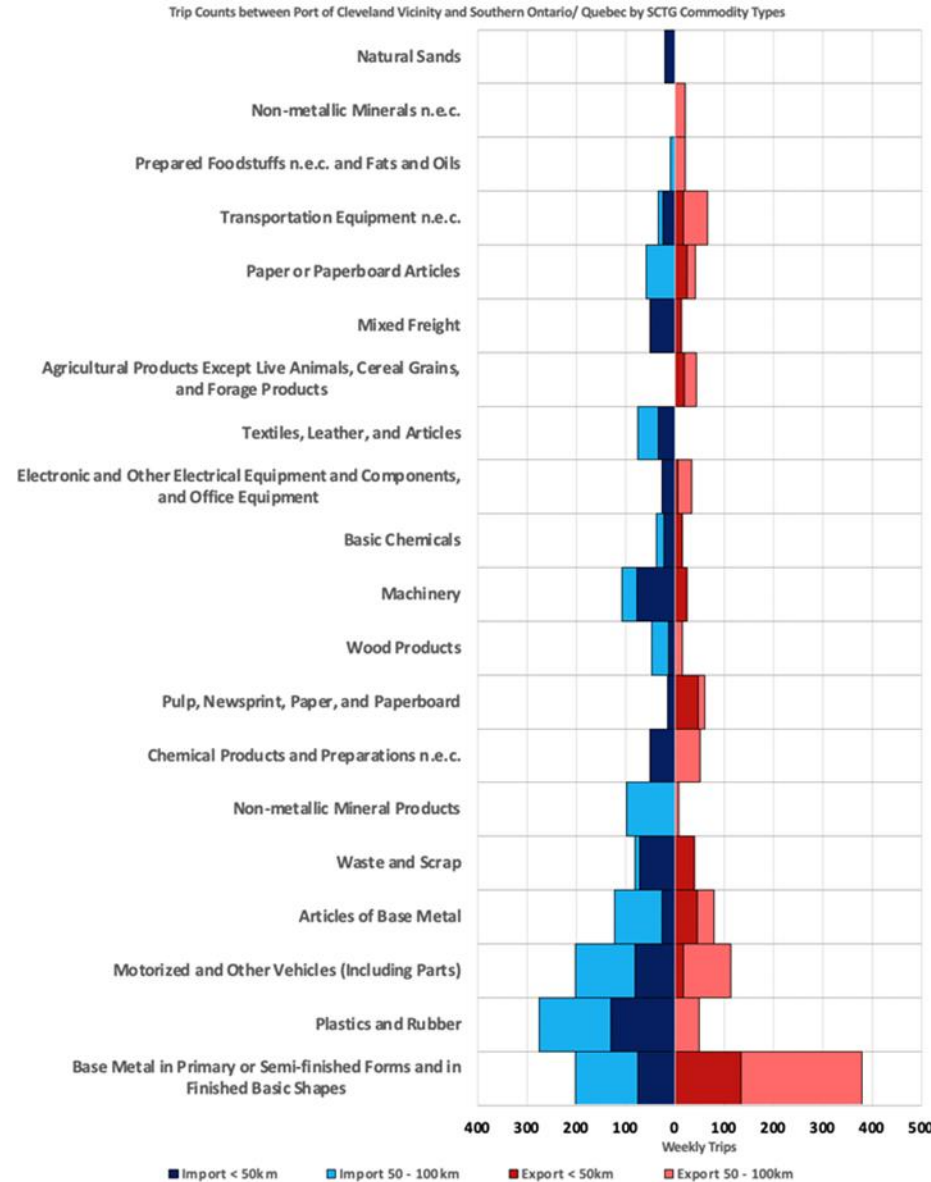


Tonnage flowing between Port of Chicago Vicinity and Southern Ontario/ Quebec by Census Divisions



Derived from
 2019 Ontario
 CVS

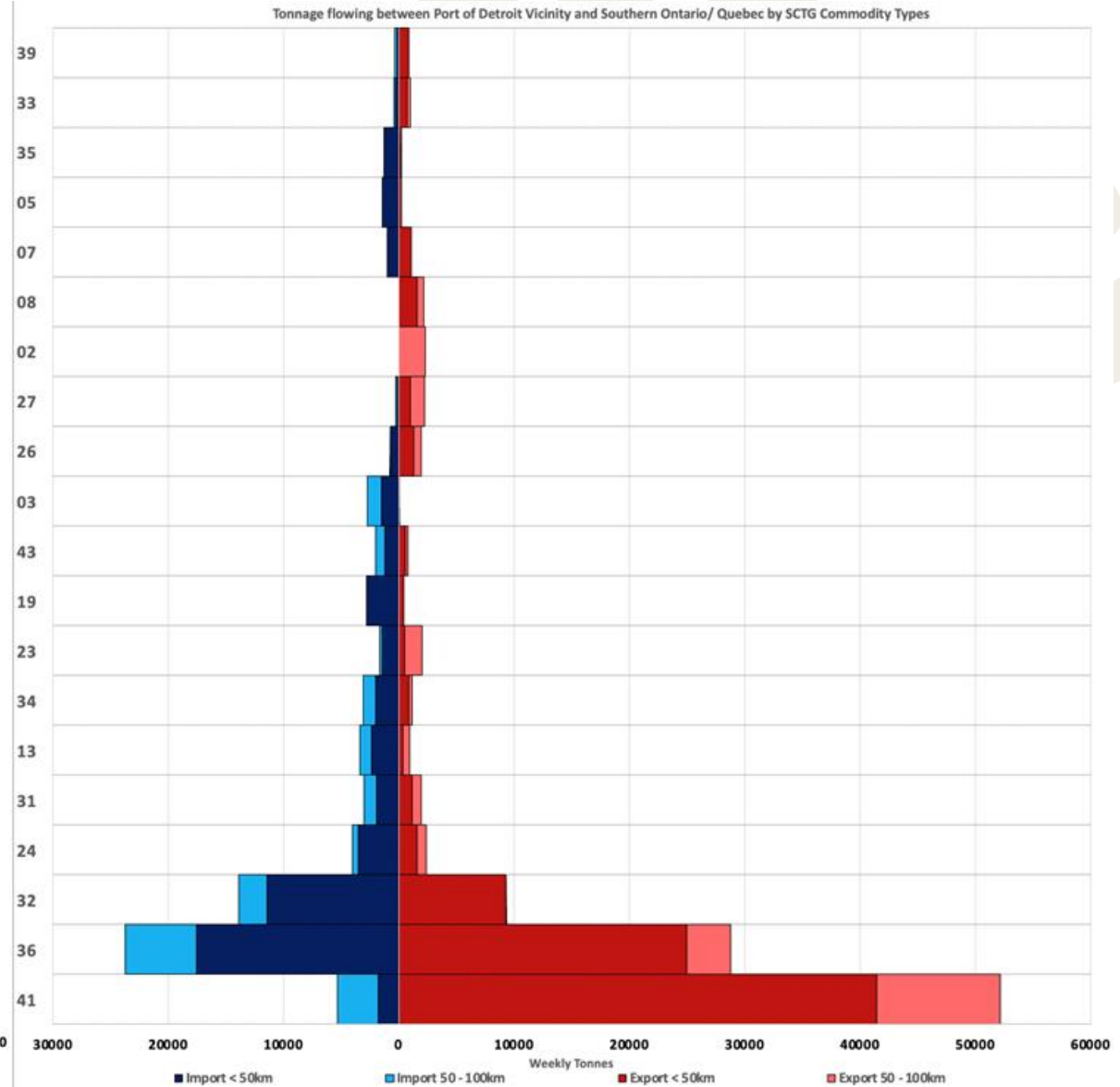
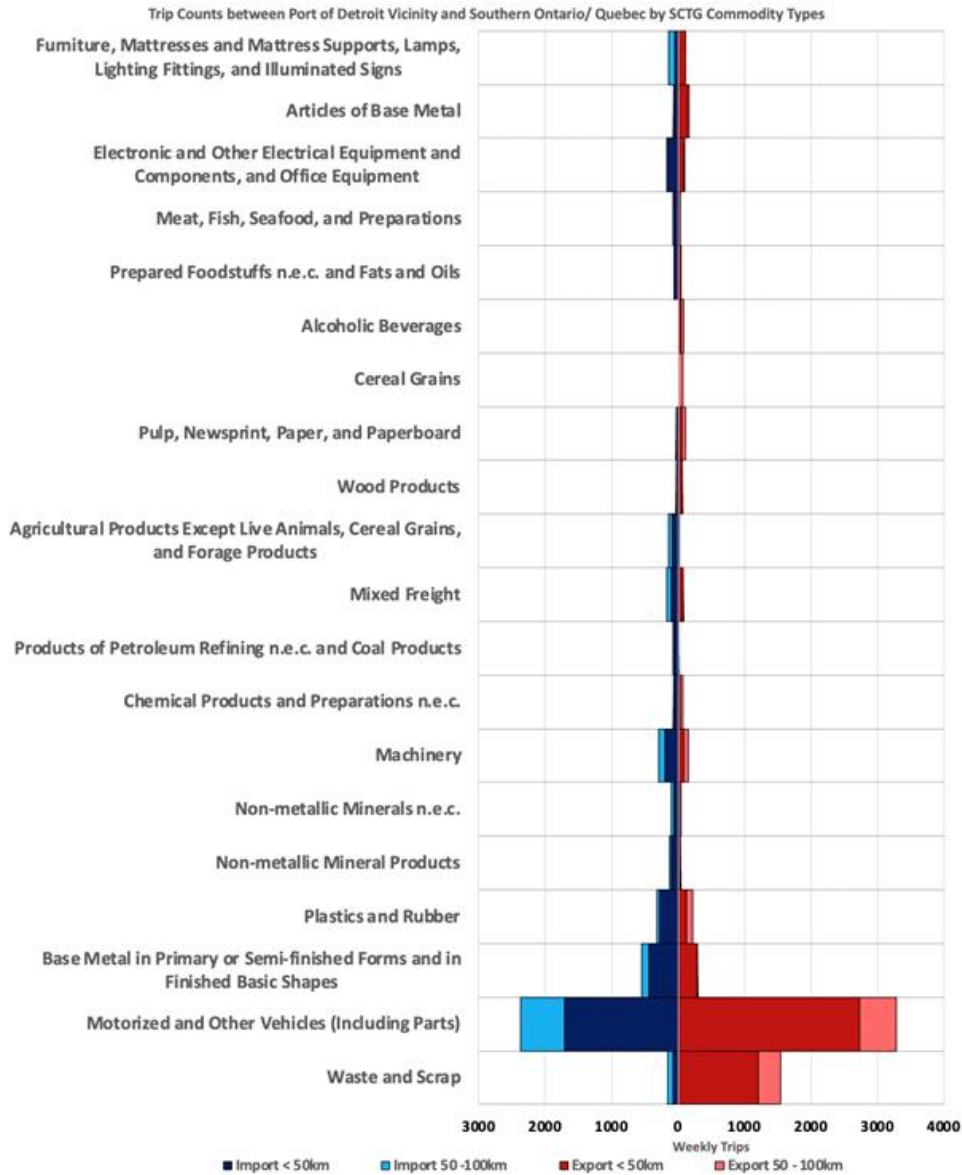
COMMODITY CONNECTIONS LINKED TO CLEVELAND VICINITY



COMMODITY CONNECTIONS LINKED TO DETROIT VICINITY (100KM+ TRIPS)



FLUID INTELLIGENCE
HOPA-MCMMASTER
 SUPPLY CHAIN ANALYTICS



CLOSING THOUGHTS



- There are massive goods flows internal to the Great Lakes Region and over significant distances
- Lake Michigan, Lake Erie opportunities stand out relative to others (iron and steel, waste and scrap and others)
- CVS data, with more detailed geography, was viewed as most impactful for this study
- With improved geographic detail, Statscan Trade Data would be highly useful because it is timely
- Case study would be useful to help facilitate a full, year-round solution
- Ontario Marine Council may provide a good Forum for helping to progress SSS provincially and jointly with the federal government
 - Data, regulatory, infrastructure, research