

Your Sweet Spot Life Canadian Supply Chain Overview

Caleb Clarke

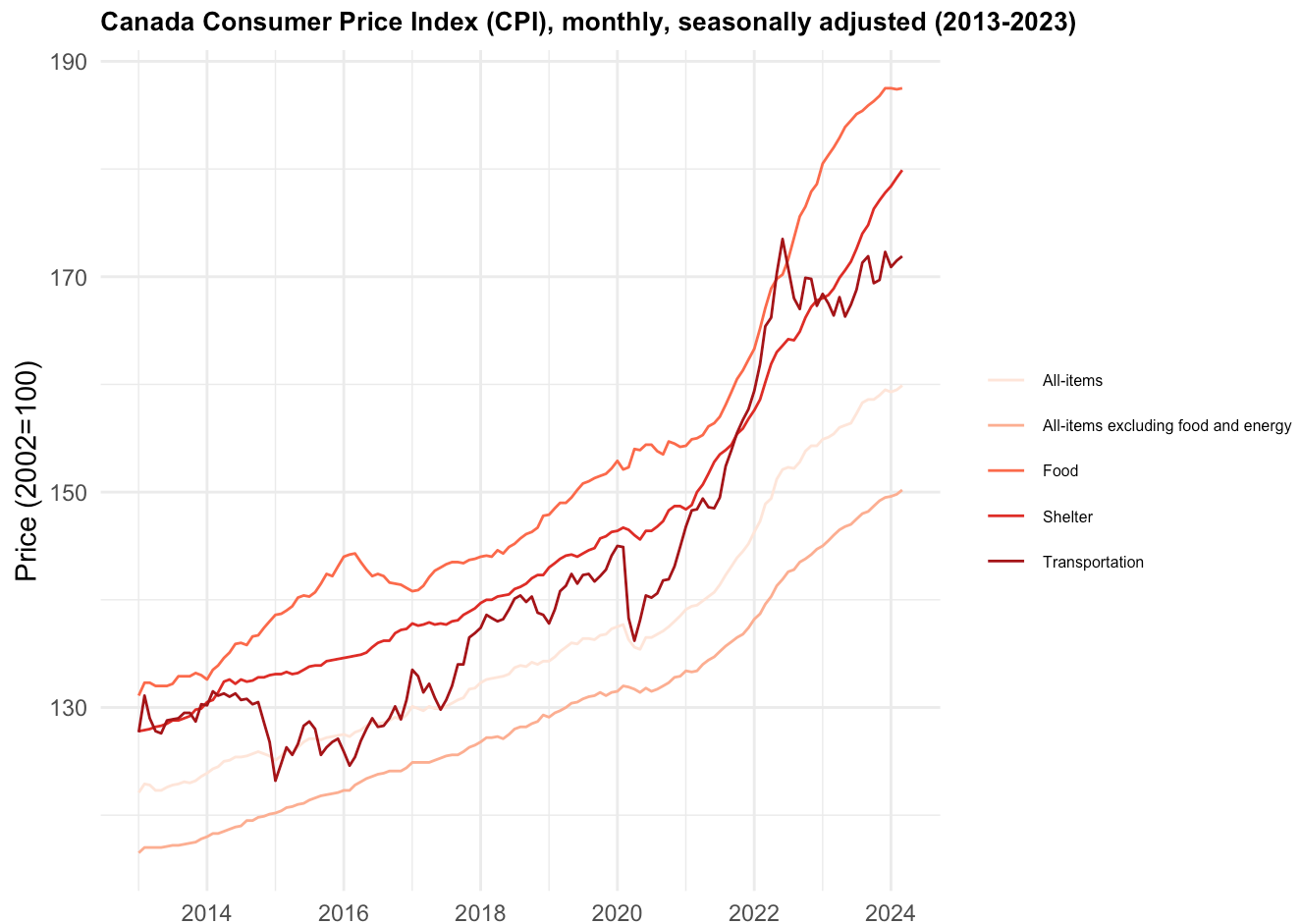
Your Sweet Spot Life (YSS)

Introduction

COVID-19 and Geo-political Tensions

National and global supply chains have faced unprecedented shocks and disruptions due to COVID-19 and international conflicts. In 2020, world trade came almost to a halt, as health mandates restricted trade routes and travel. COVID exposed the frailty in many supply chains, with critical bottlenecks breaking supply chains down both upstream and downstream. Some supply chains have still not fully recovered, increasing pent-up input and consumer demand and adding inflationary pressures on prices. Geo-political conflicts have also had disruptive effects on supply chains. The Ukraine-Russia conflict has led to embargoes on Russian oil-a main world supplier-, leading to an energy crisis and a steep rise in oil prices. Escalating conflict in Israel and Palestine has provoked regional actors to get involved, notably the Iranian-backed Yemeni Houthi rebels and their attacks in the Red Sea. Red sea supply chains, which account for ~15 percent of world seaborne trade, are being re-routed around the Cape of Good Hope in South Africa, taking extra time and resources.

These exogenous shocks to Canada have seen a steep increase in the Consumer Price Index (CPI), a measurement of the cost of goods for households including food, rent and gas. **Figure 1** displays the acceleration of consumer goods starting in 2020. The Canadian CPI has risen 28% since 2013, with more than half of that increase (15%), happening since just since 2020. In key consumer price areas, since 2020, there has been a 20% inflationary increase in both food and transportation prices, while rent prices have increased 17% on average. This acceleration in the last 4 years has a strong correlation with COVID's effect and geo-political effects on supply chains, and have undoubtedly affected Canadian producers and consumers.



Trade and Canadian Supply Chains

Trade is the lifeblood of the Canadian economy, shaping its interconnectedness both domestically and globally. Interprovincial trade forms a vital component of Canada's economic landscape, facilitating the movement of goods and services across provincial boundaries, fostering regional growth, and ensuring resource distribution. Moreover, Canada plays a significant role in global supply chains, leveraging its diverse range of industries, including natural resources, manufacturing, technology, and services, to contribute to the interconnected flow of goods and services worldwide.

Canadian Supply Chain Characteristics

Canada specializes in the early (upstream) production stages of the supply chains or global value chains. In general, Canada's exports will be earlier in the value chain and closer to raw materials, while Canada's imports will come from later in the value chain and be closer to final goods. This means that, in general, the Canadian economy is more susceptible to disruptions that happen in latter stages of supply chains, and is less susceptible to disruptions from the beginning stages of supply chains.

Upstream- and downstreamness

There has been rising participation in global value chains (GVCs) in world trade systems and globalization today. Instead of countries trading final goods, we see firms better allocating resources to their most efficient uses, thus reducing costs and generating within-production specialization but at the expense of longer production times. Take the semiconductor industry: semiconductors have roughly seven steps in its supply chain, from silicon refinement to assembly and packaging, to integration of the chip into a final good, and finally consumption. This GVC process happens in multiple countries, with inputs being shipped around the world multiple times, and an average production time of ~100 days.

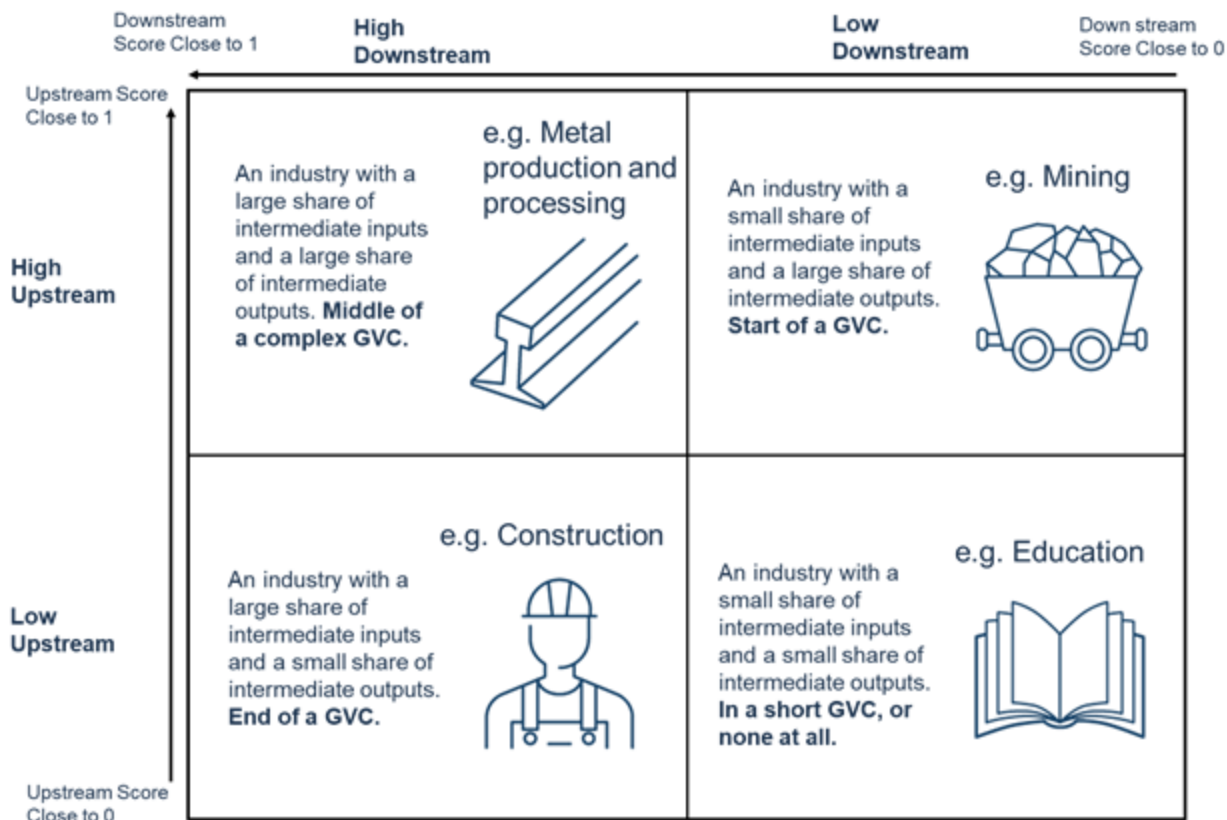
Beyond Borders: Semiconductors are a Uniquely Global Industry

Typical semiconductor production process spans multiple countries:

4+ Countries, 4+ States, 3+ trips around the world, 100 days production time



In general GVCs production steps that happen closer to the final good are considered more downstream, while processes further from the final product (often starting with raw materials) are considered upstream. Mining iron ore for example is considered highly upstream but not downstream. Mining ore required little input but is demanded at the beginning by thousands of supply chains, such as a final good like cars. Conversely construction of a building is considered not upstream but highly downstream, due to the fact that thousands of inputs are required to construct a building, while the building itself is often the final good, thus ending the supply chain.



Due to Canadian abundance of natural resources, Canada finds itself generally more upstream than downstream within global supply chains regardless of its trade partners. Since 1997, Canadian exports have moved to slightly earlier production stages (closer to raw materials) in the value chain, while Canada's import positioning has stayed relatively constant.¹

The shift in exports to earlier stages occurred in the 2000's due to a growing share of oil and gas extraction in exports and a diminishing share of auto vehicle manufacturing. The rise of China in global trade has compounded this trend, with Canada mostly exporting raw materials, in return for importing Chinese manufactured products such as electronics.

Consequences

In general, Canadian exports are more upstream (outputs are further away from final goods) and less downstream (inputs are closer to value added) than Canadian imports. This is consistent with the trade flow maps **Figures A-M** below that suggest the notion that Canada specializes in producing goods in the earlier portion of the value chain while importing goods from the end of the value chain.

This means that Canadian consumption may be more vulnerable to supply shocks as Canada imports many final goods, while Canadian exports are more vulnerable to demand shocks as Canada's production happens mainly at the start of the value chain. There are some major industries that produce final goods and are more susceptible to supply shocks (such as the auto industry and manufacturing in general); but generally, most of Canada's exports are in the earlier portions of supply chains and are more susceptible to demand shocks.

USMCA trade deal

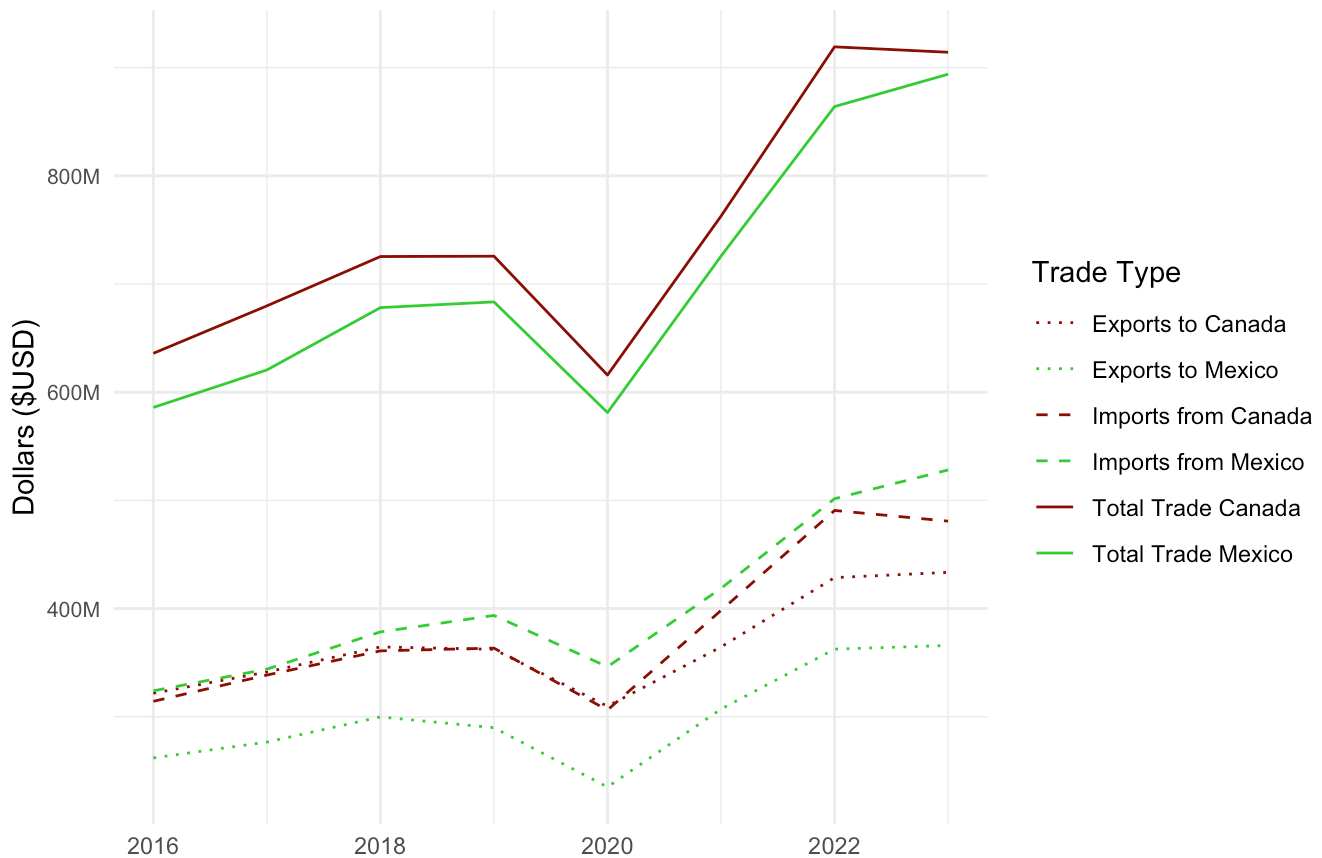
The USMCA (United States-Mexico-Canada Agreement), defines the rules of trade between North America's three countries. USMCA replaced NAFTA (North American Free Trade Agreement) and came into effect on July 1, 2020. Key areas in which the USMCA improved upon NAFTA begin with the inclusion of more modern aspects of trade that were not addressed in NAFTA, including digital trade, intellectual property, and labor and environmental standards. The USMCA introduces changes to the dispute resolution mechanism, allowing for more transparency and effectiveness in resolving trade disputes.

Vitality, the USMCA has been the mechanism of "friendshoring", a ploy the US has implemented in its ongoing trade wars with China. Tensions with China threaten key parts of the global supply chain not only for the US but Canada as well. The supply chain bottlenecks and disruptions due to COVID, reinforced the dependency on China and how vulnerable North American supply chains were to reduced flow from China. Canada and the US have opted to "friendshore" averting manufacturing and supply chain flows away from China to geographically closer and geopolitically similar countries. This protects against supply chain disruptions due to pandemic or political reasons in the future, especially in sensitive industries such as semiconductors.

A notable example of friendshoring has been in the automotive industry. Over time, NAFTA's outdated rules of origin had allowed autos and auto parts with large amounts of non-North American content to receive preferential tariff treatment into the North American (NA) market – undermining the very benefits to NA manufacturing the agreement was intended to create.

The USMCA includes autoindustry rules such as labor provisions and rules of origins, which now require a minimum of 75% of cars and light trucks' parts to be manufactured in NA, and 70% of heavy trucks—both up from 62.5% within the NAFTA framework.² Representative Automobile manufacturing particularly in Mexico has boomed as it replaces Chinese demand. Some argue that this deal can be seen as another form of a 'trade barrier' to globalized free trade flows, undoing the competition and lower prices that globalization provides. Undoubtedly, this deal makes the US, Canada, and especially Mexico better off with increased trade and higher wages in affected sectors.

US Trade in goods and services with USMCA partners, 2016-2023



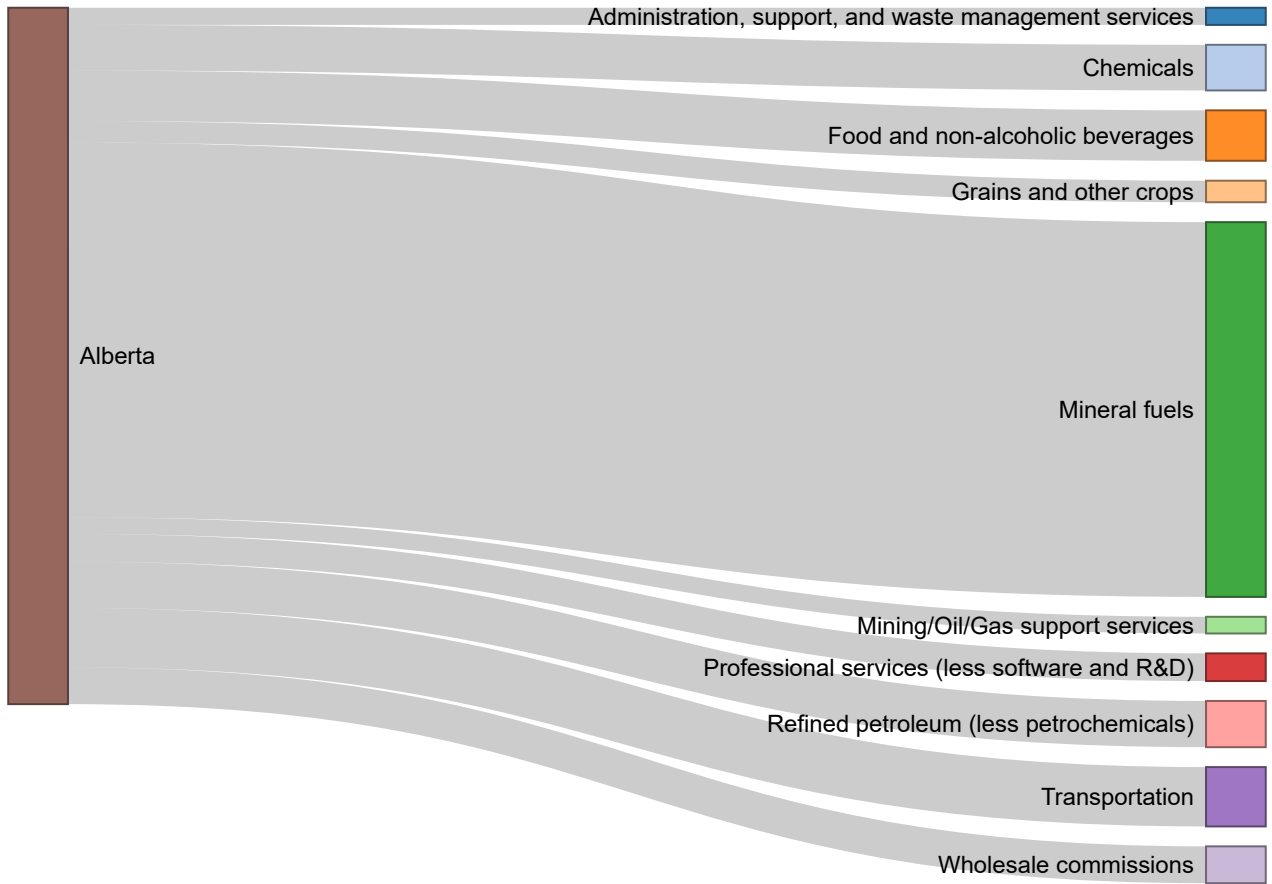
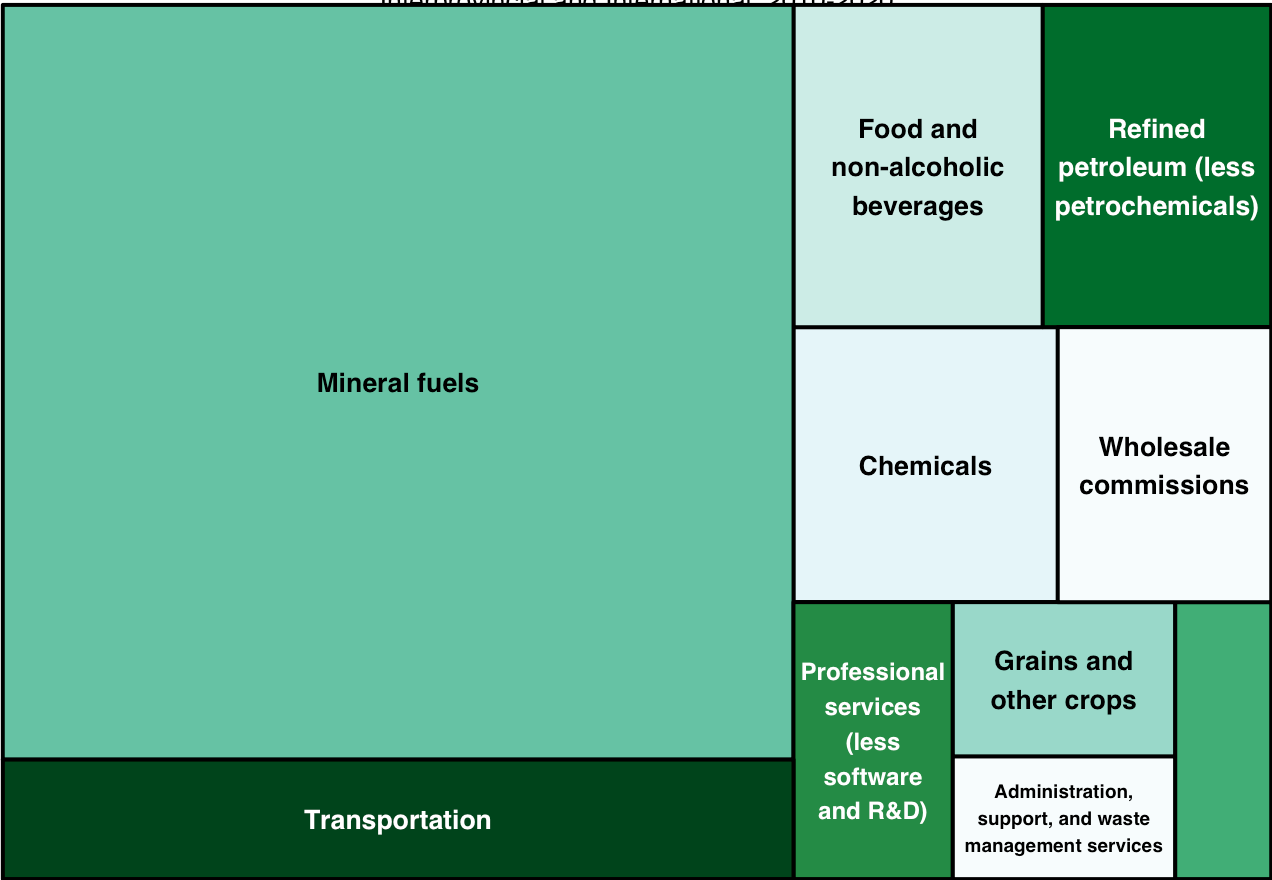
Interprovincial and international exports

Figures A-M Represent top exports by dollar amount in millions of dollars. The Western and prairie provinces have significant exports in areas like mineral fuels, transportation, grains, and wood products; Metal ores, critical minerals dominate Northern territory exports, and to a lesser extent transportation; In Ontario and Quebec, exports are characterized by a diverse makeup of transportation equipment, primary metallic products, wholesale, chemicals and food and non-alcoholic beverages; The Maritime provinces have strong exports in areas like food and non-alcoholic beverages, refined petroleum, plastics, and transportation. In Canada overall, consistent top interprovincial and international exports from coast to coast include transportation, services, energy, metals and minerals, and foodstuffs.

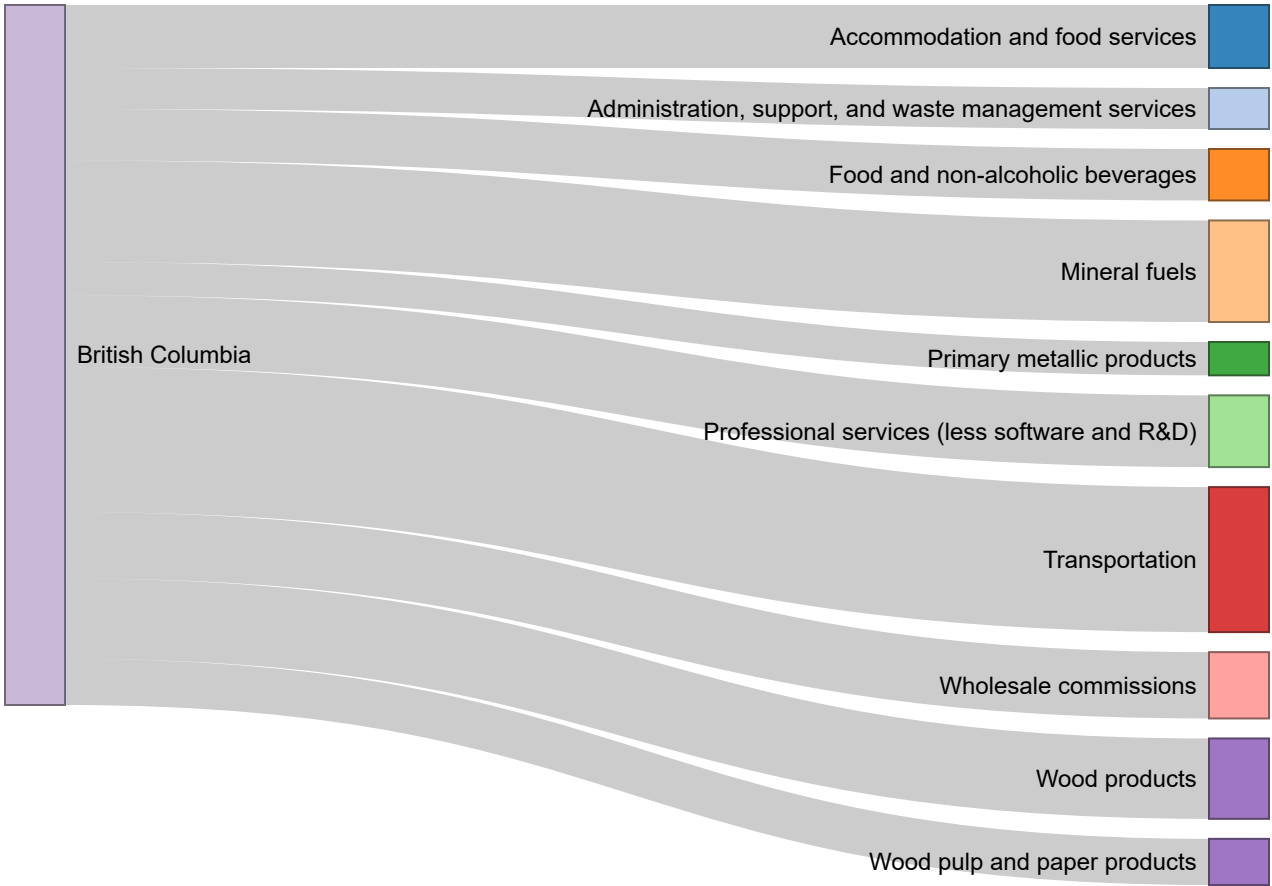
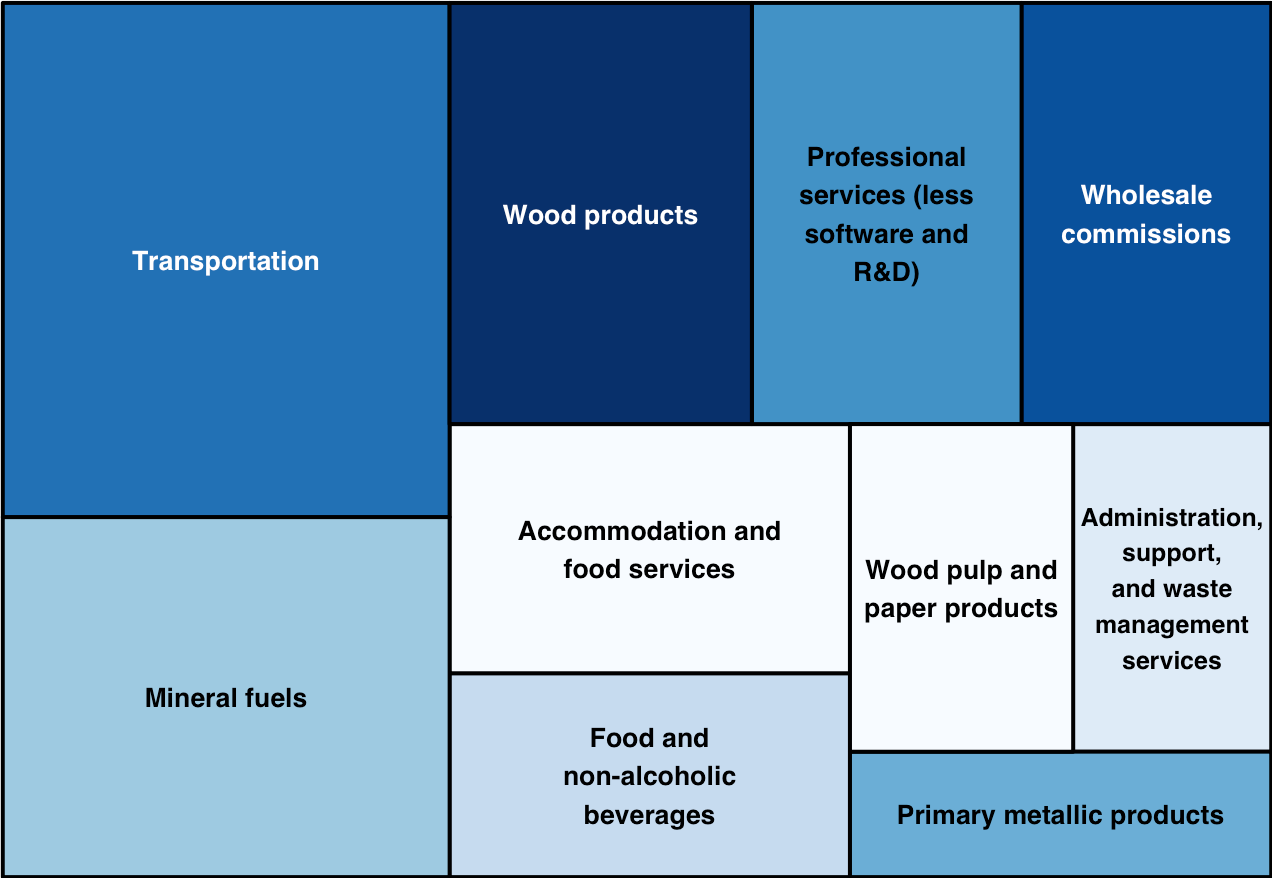
This data is in line with Canada's general upstream trade trends in multiple sectors.

Alberta Top Exports

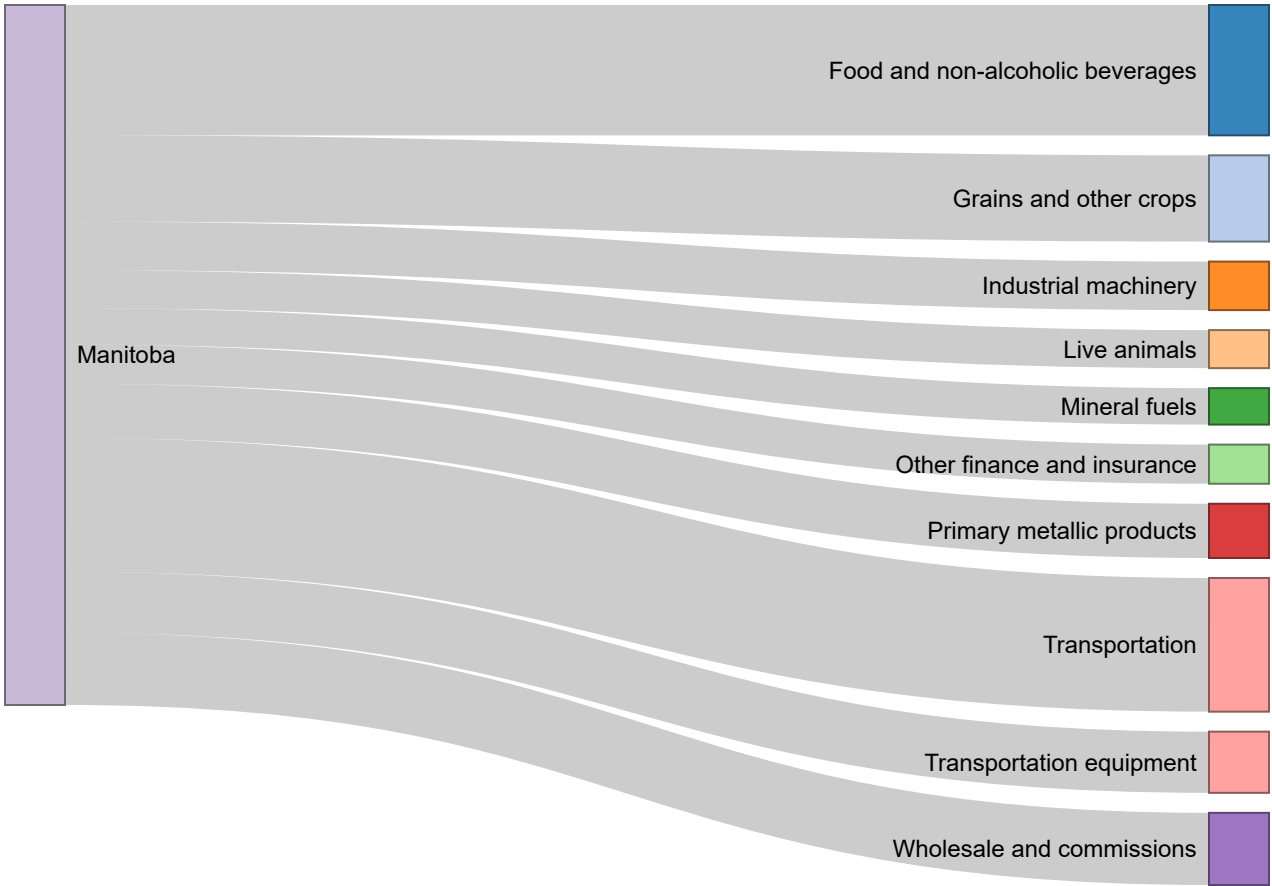
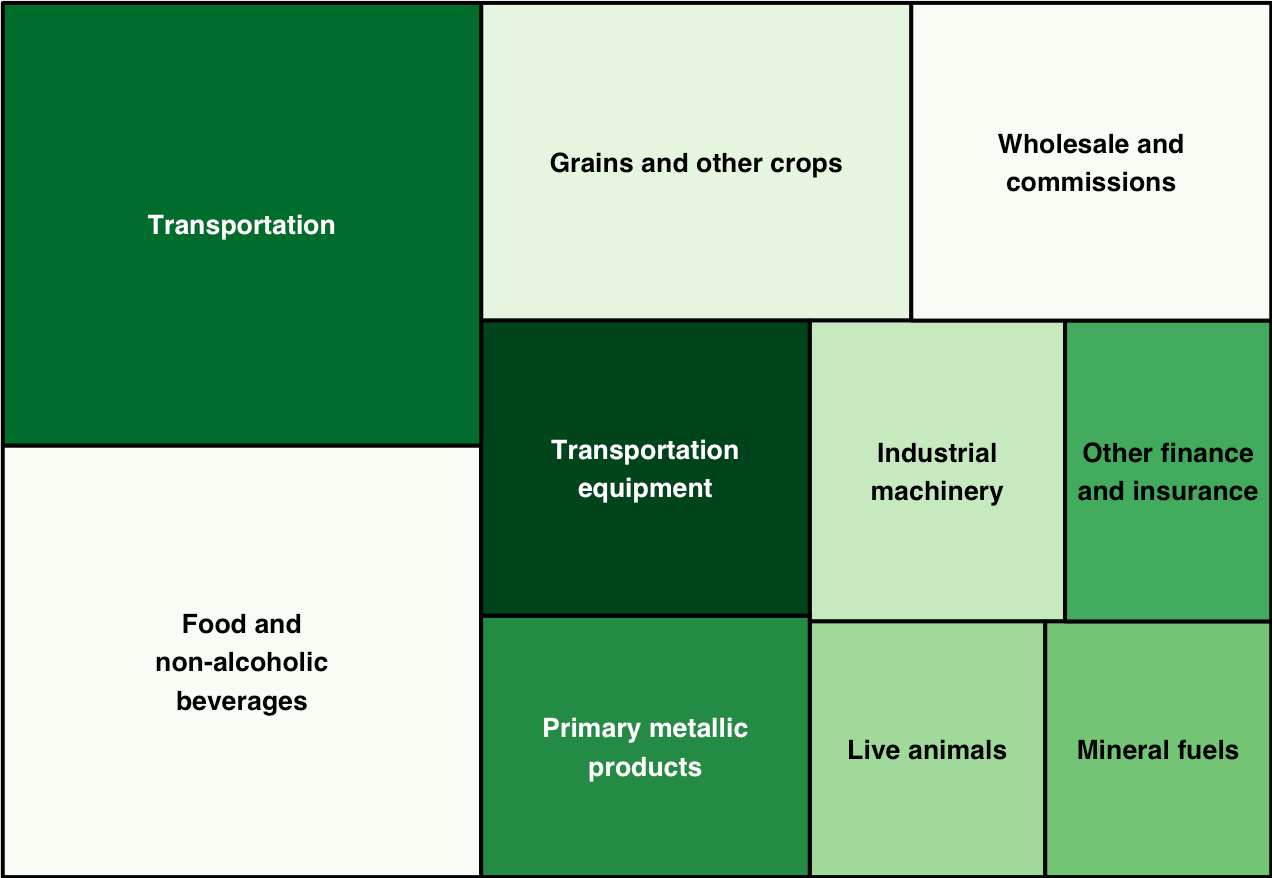
Interprovincial and International, 2010-2020



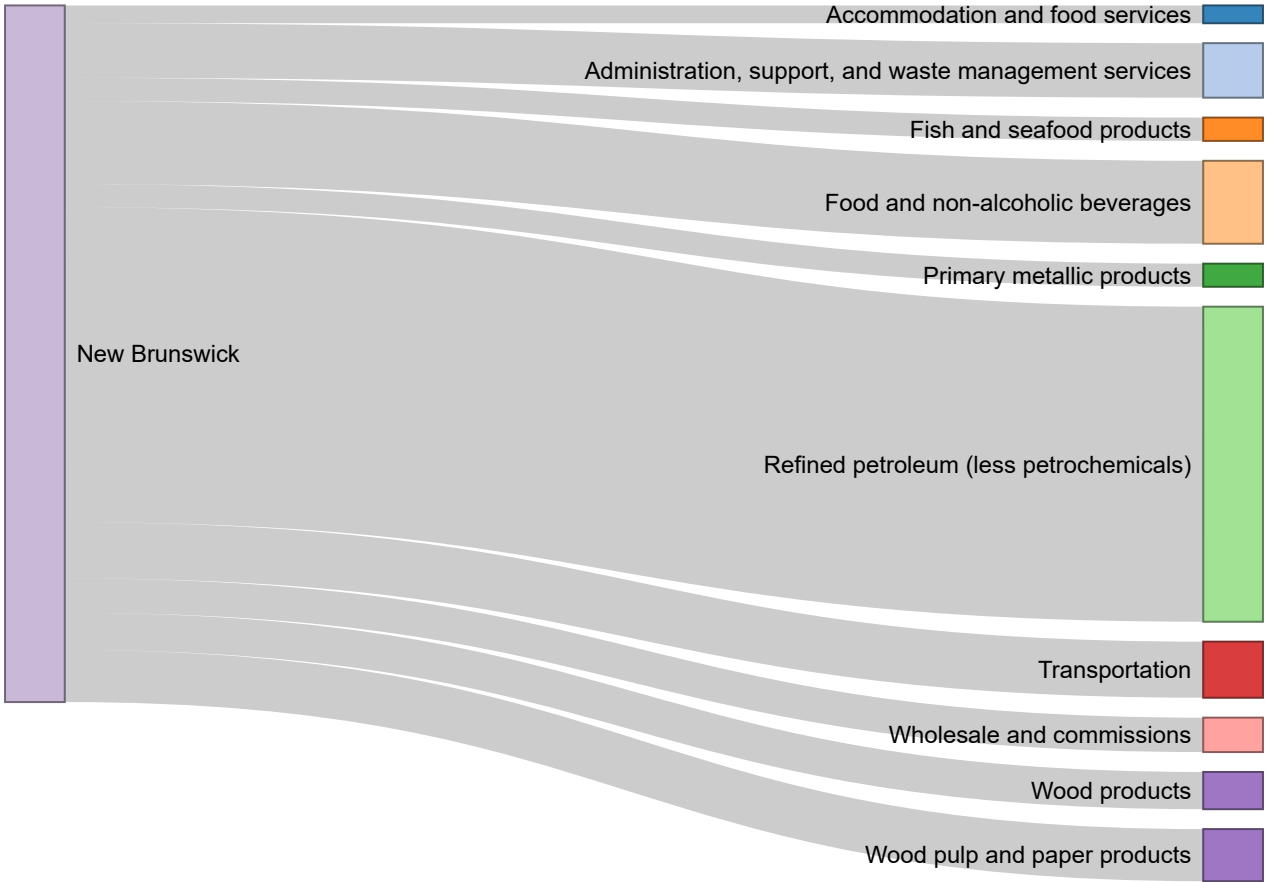
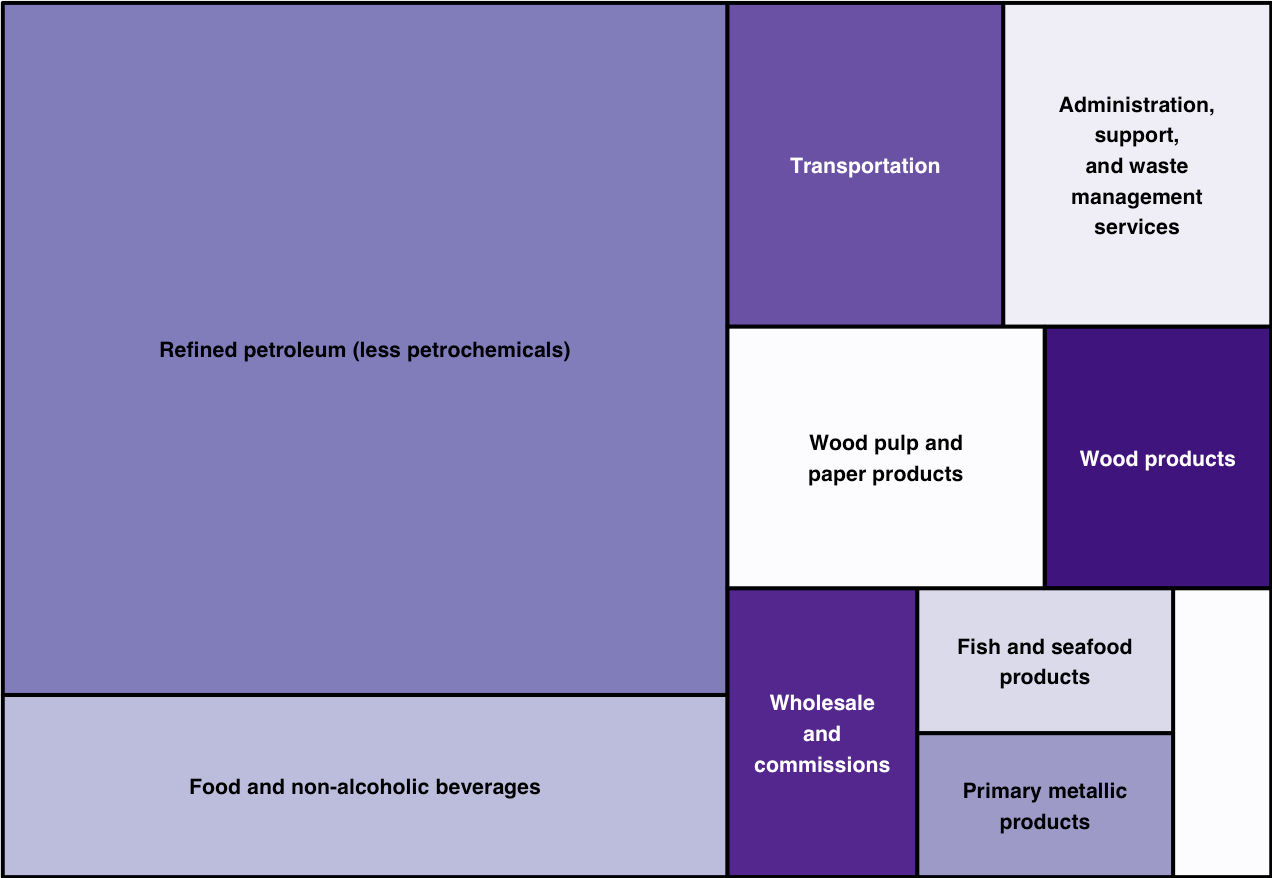
British Columbia Top Exports



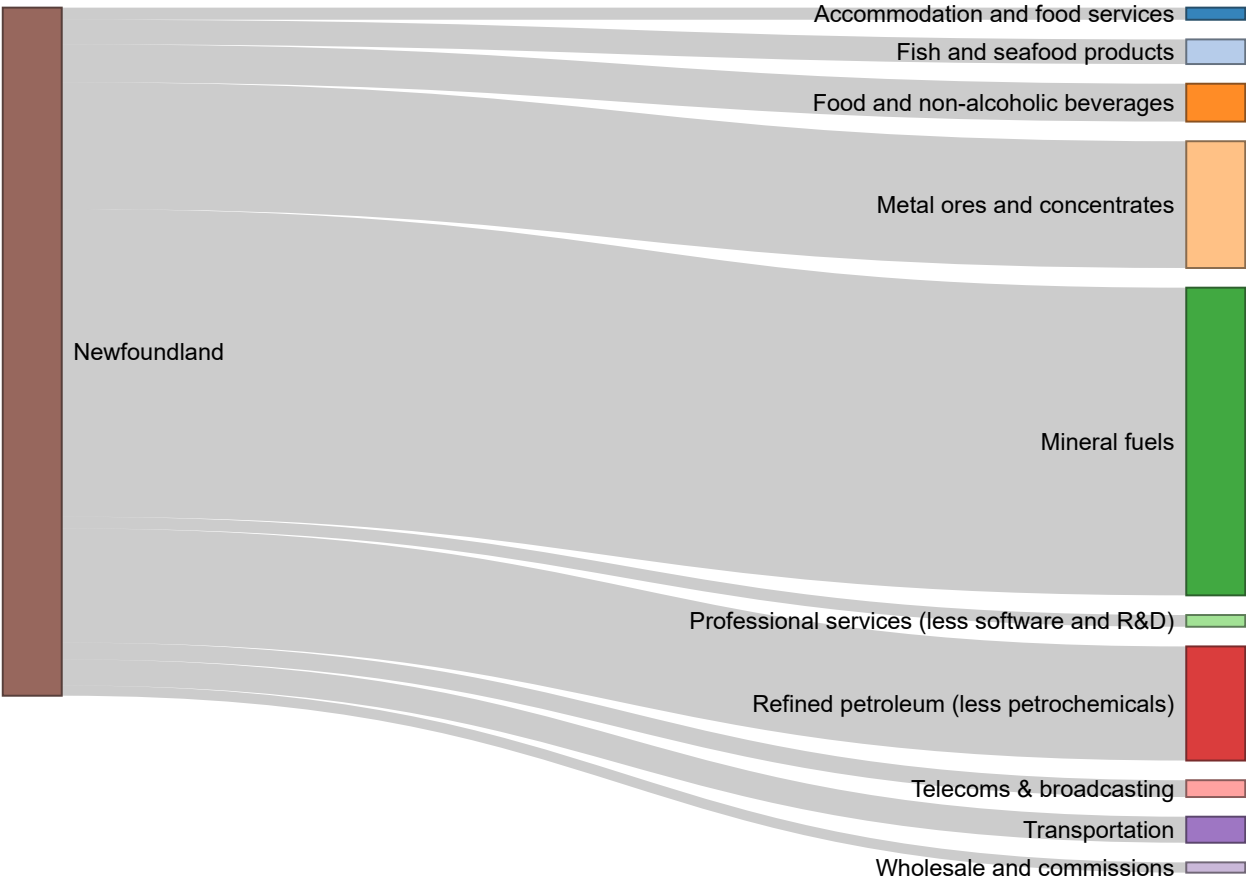
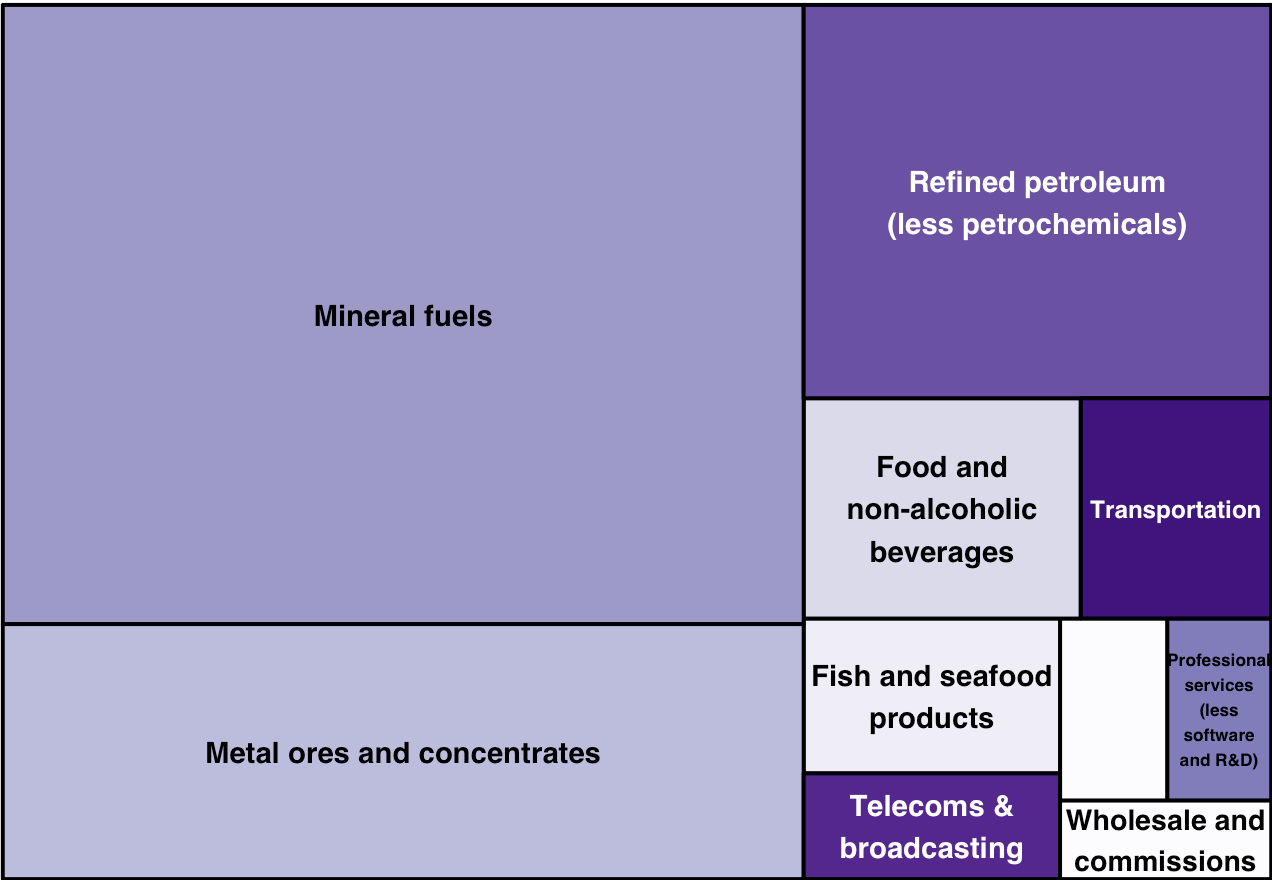
Manitoba Top Exports



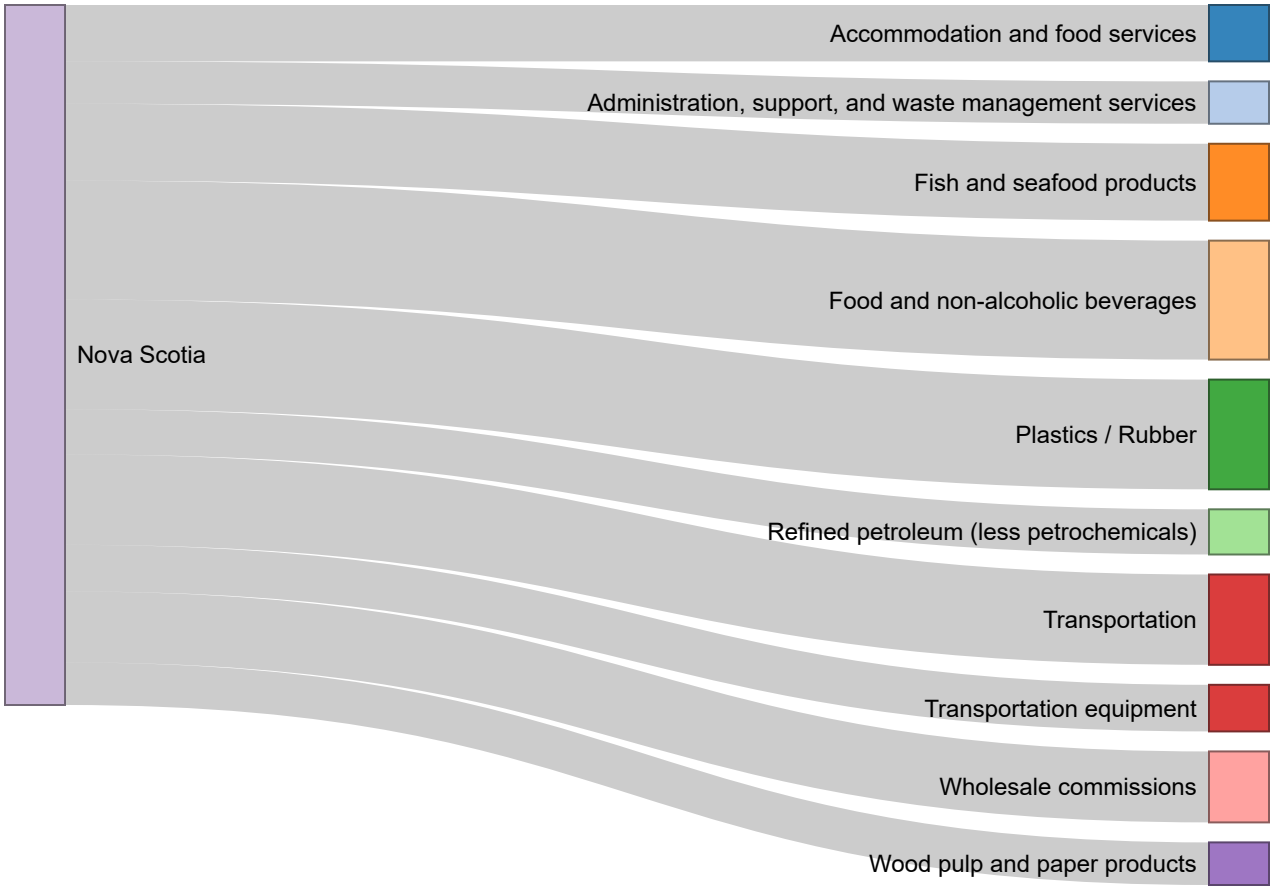
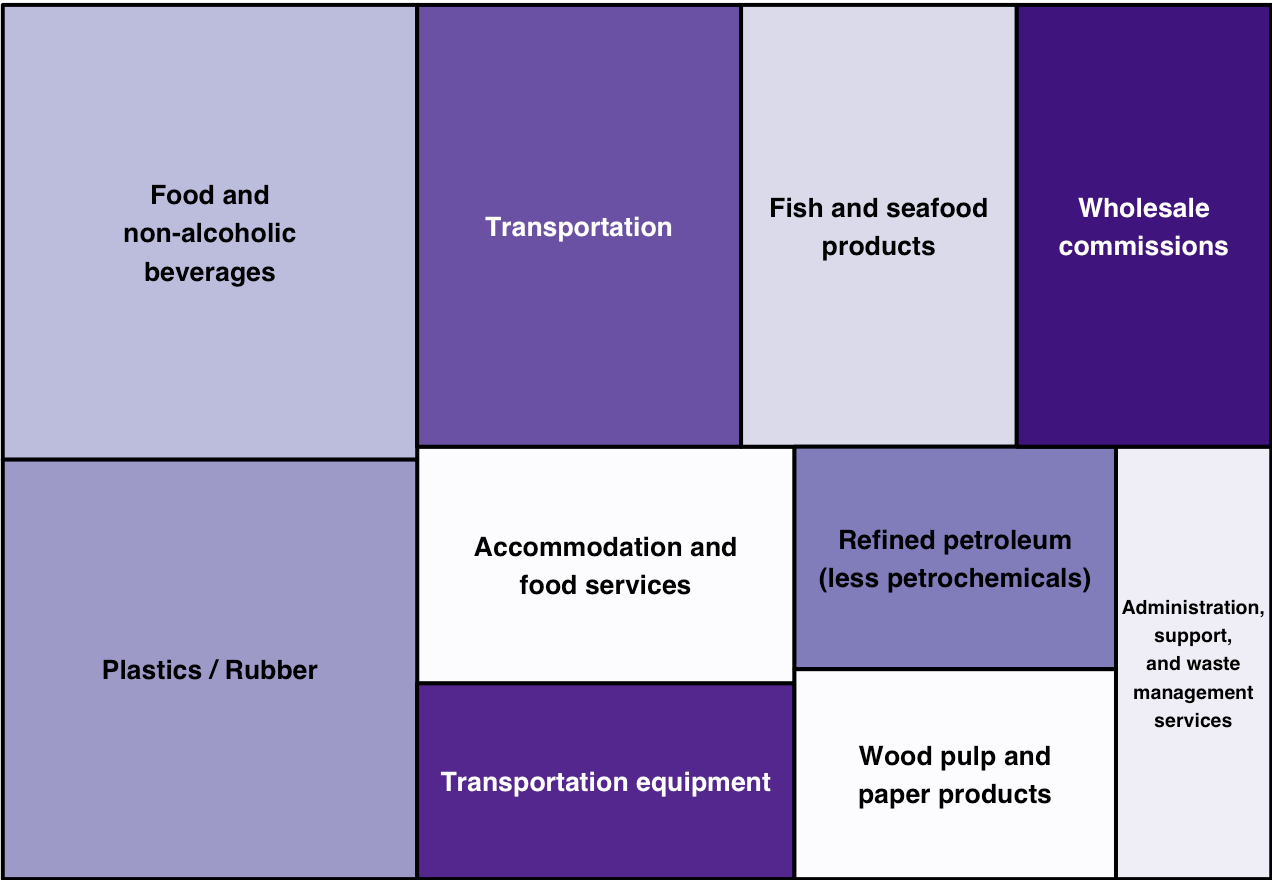
New Brunswick Top Exports



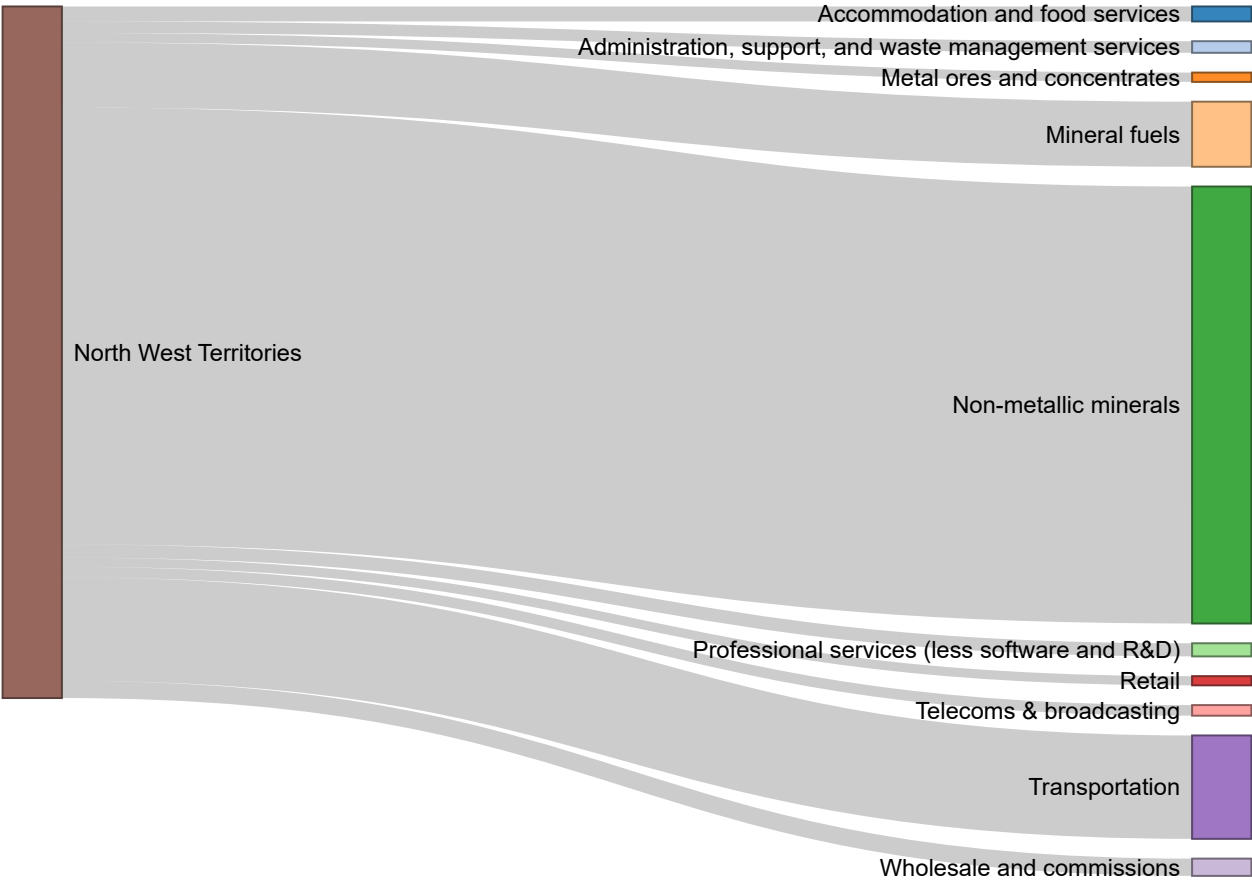
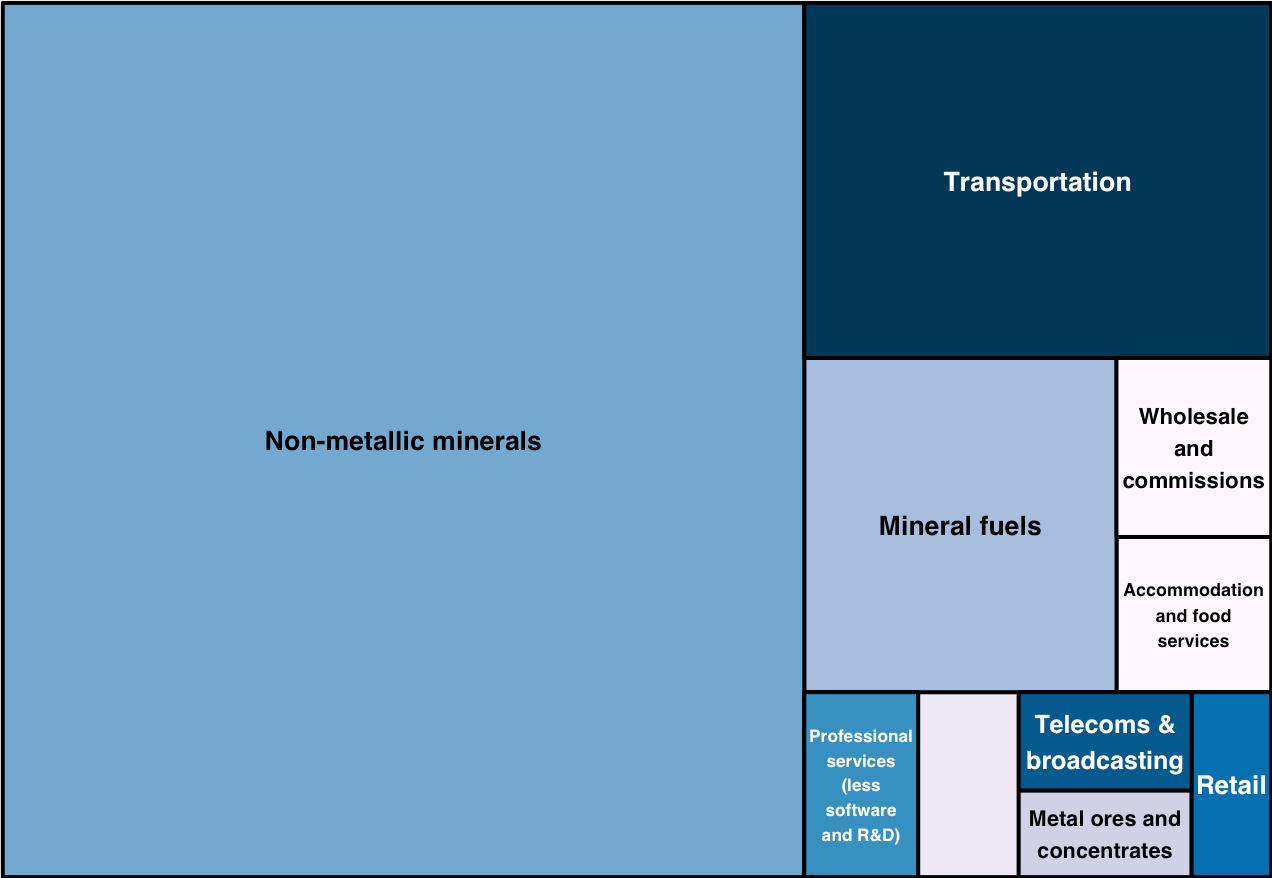
Newfoundland Top Exports



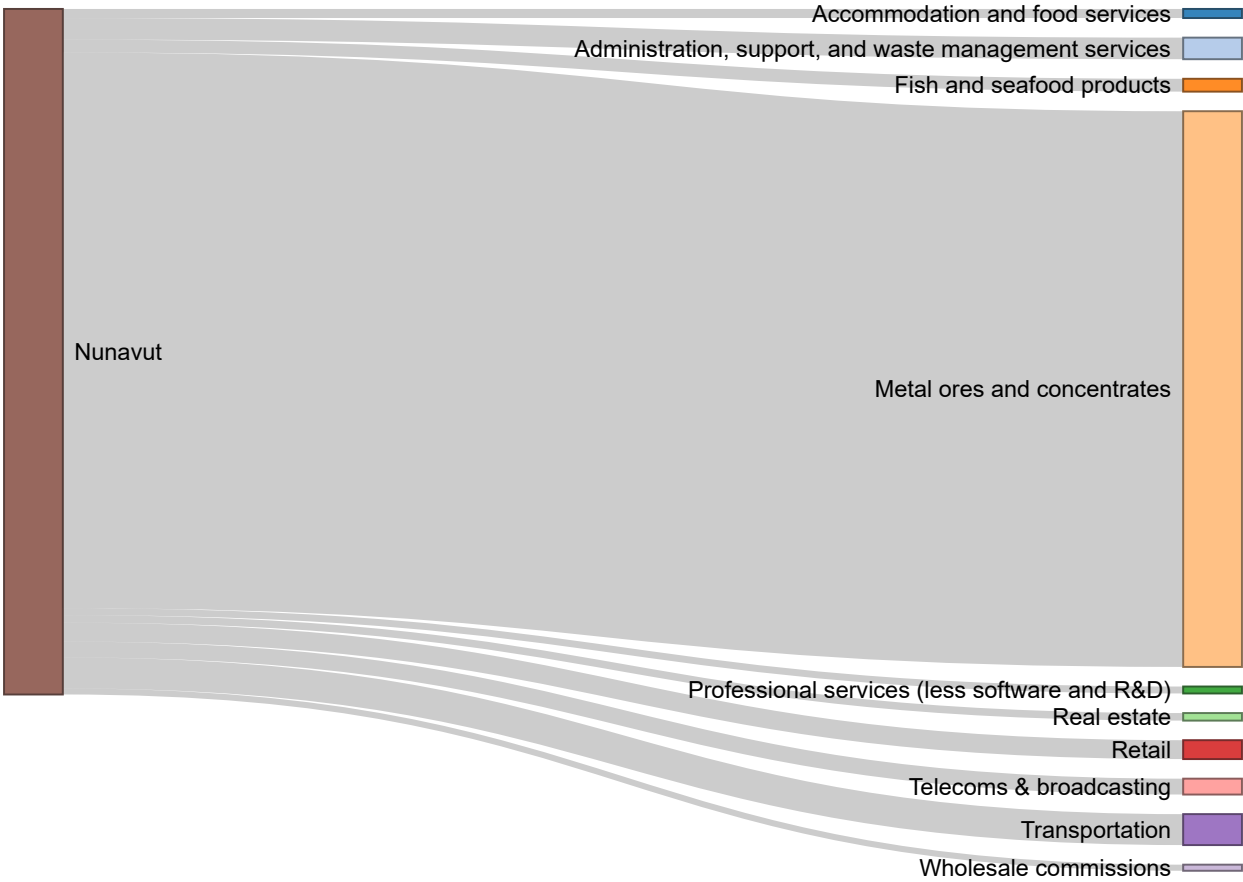
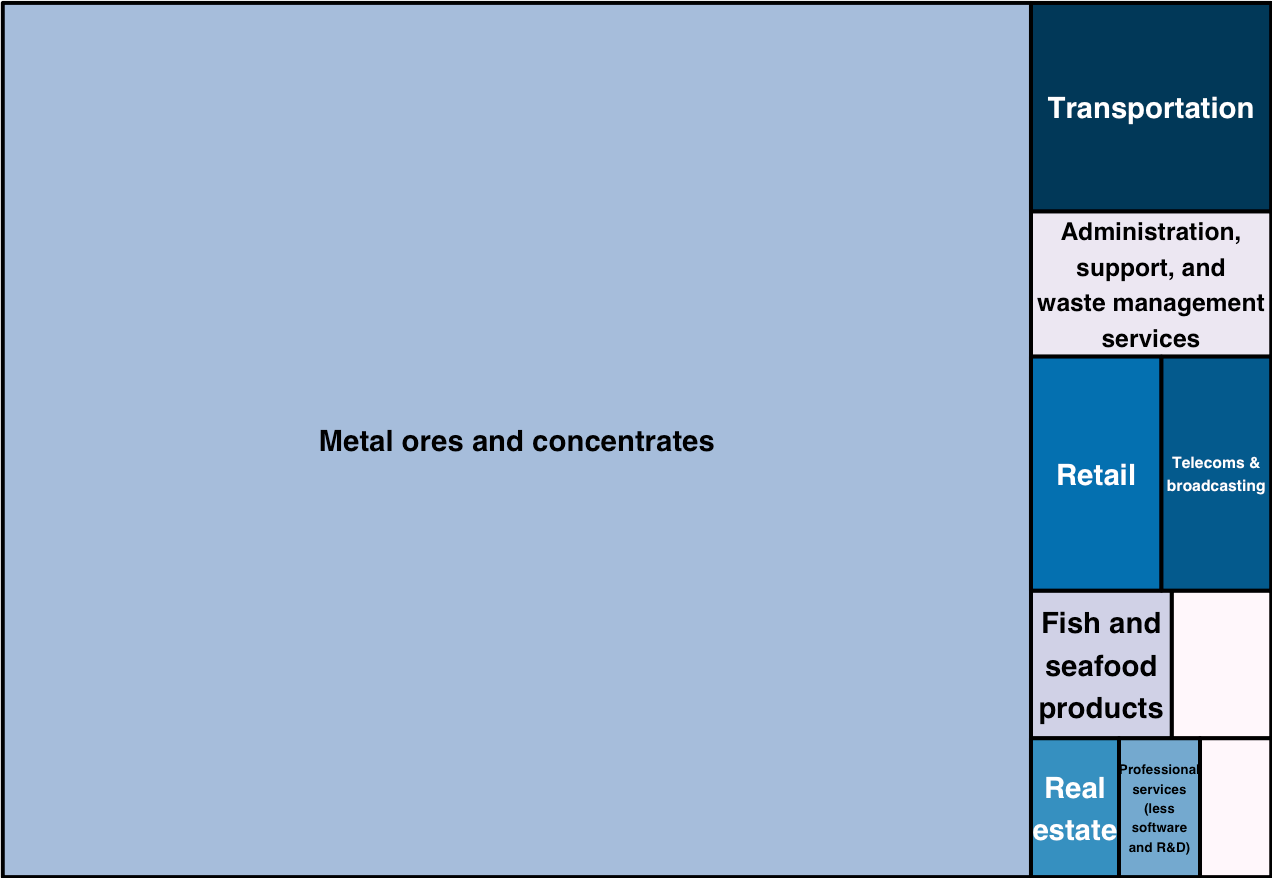
Nova Scotia Top Exports



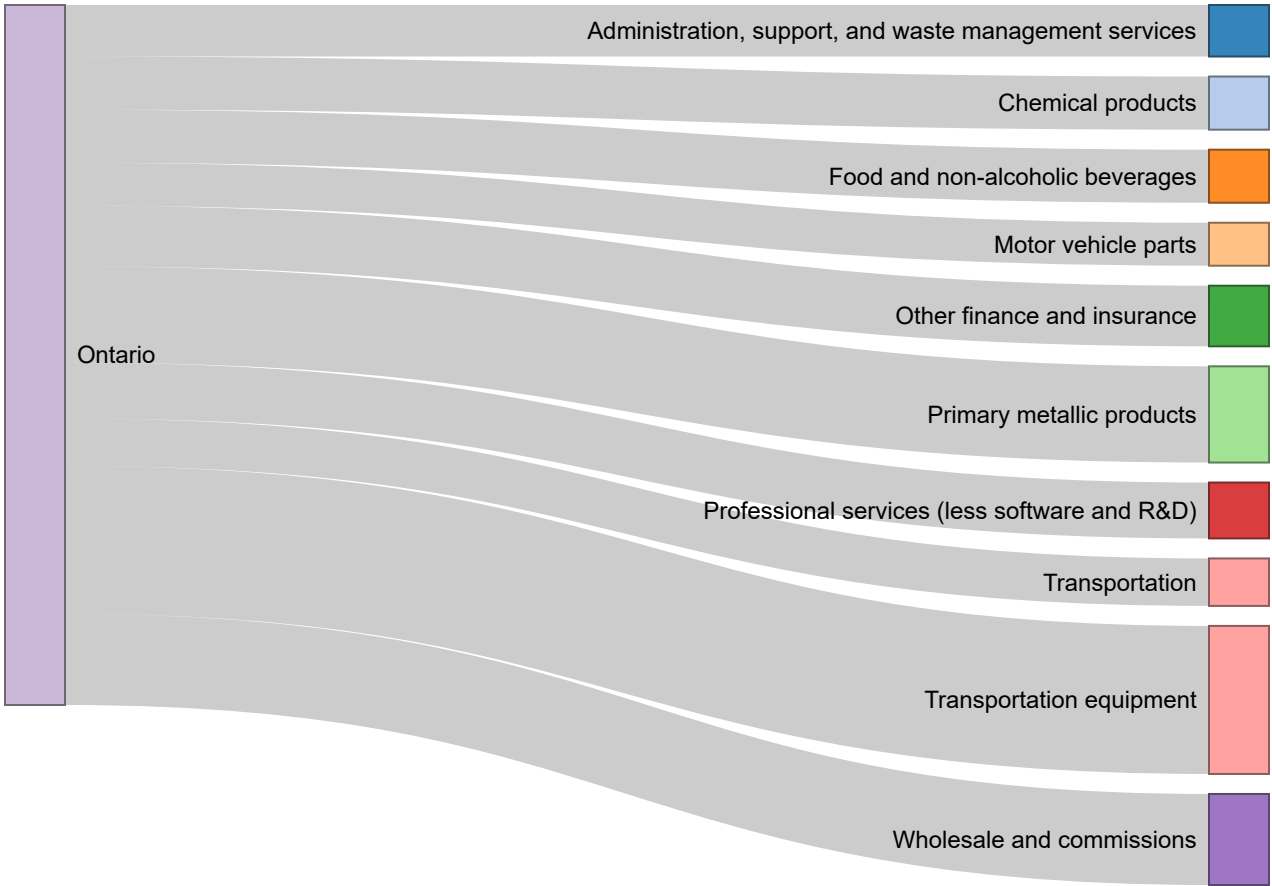
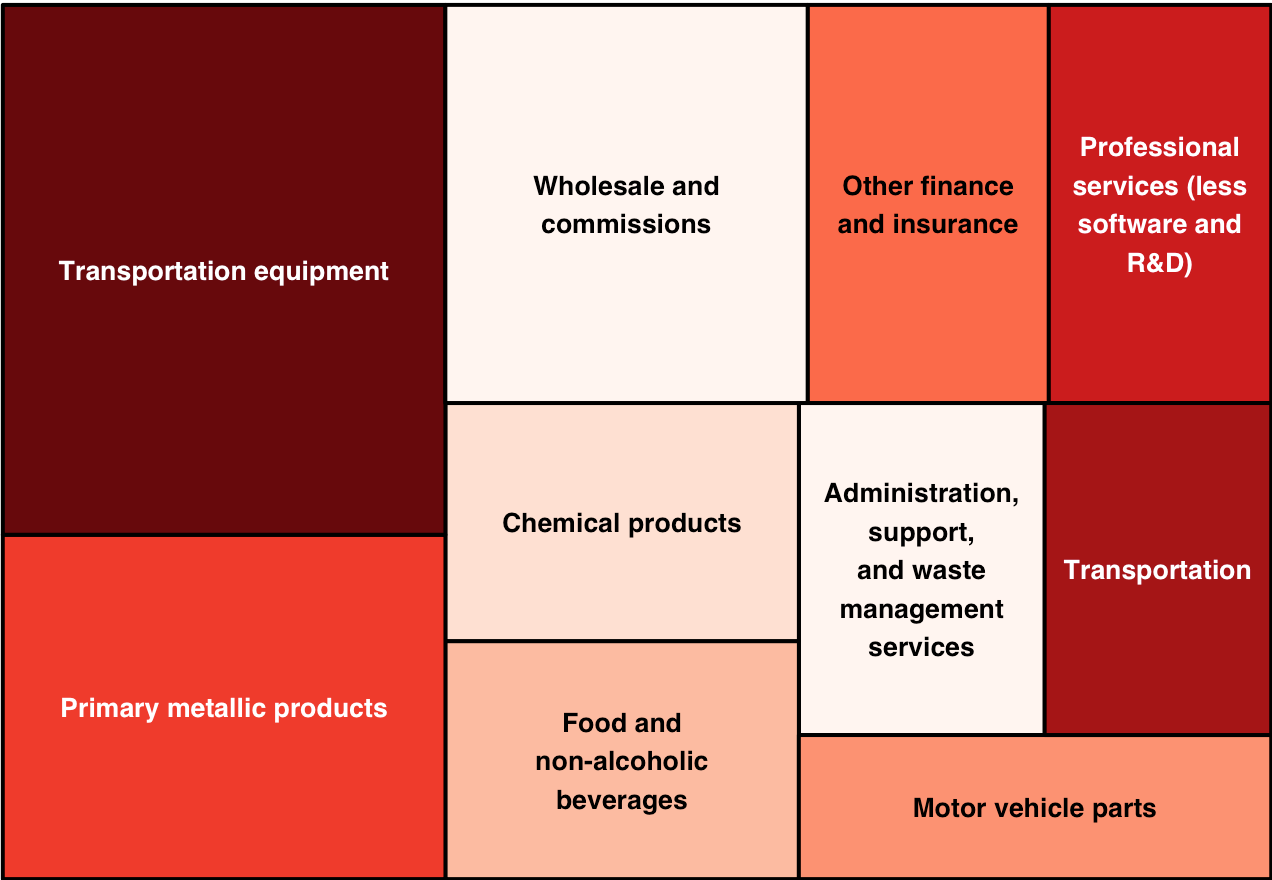
Northwest Territories Top Exports



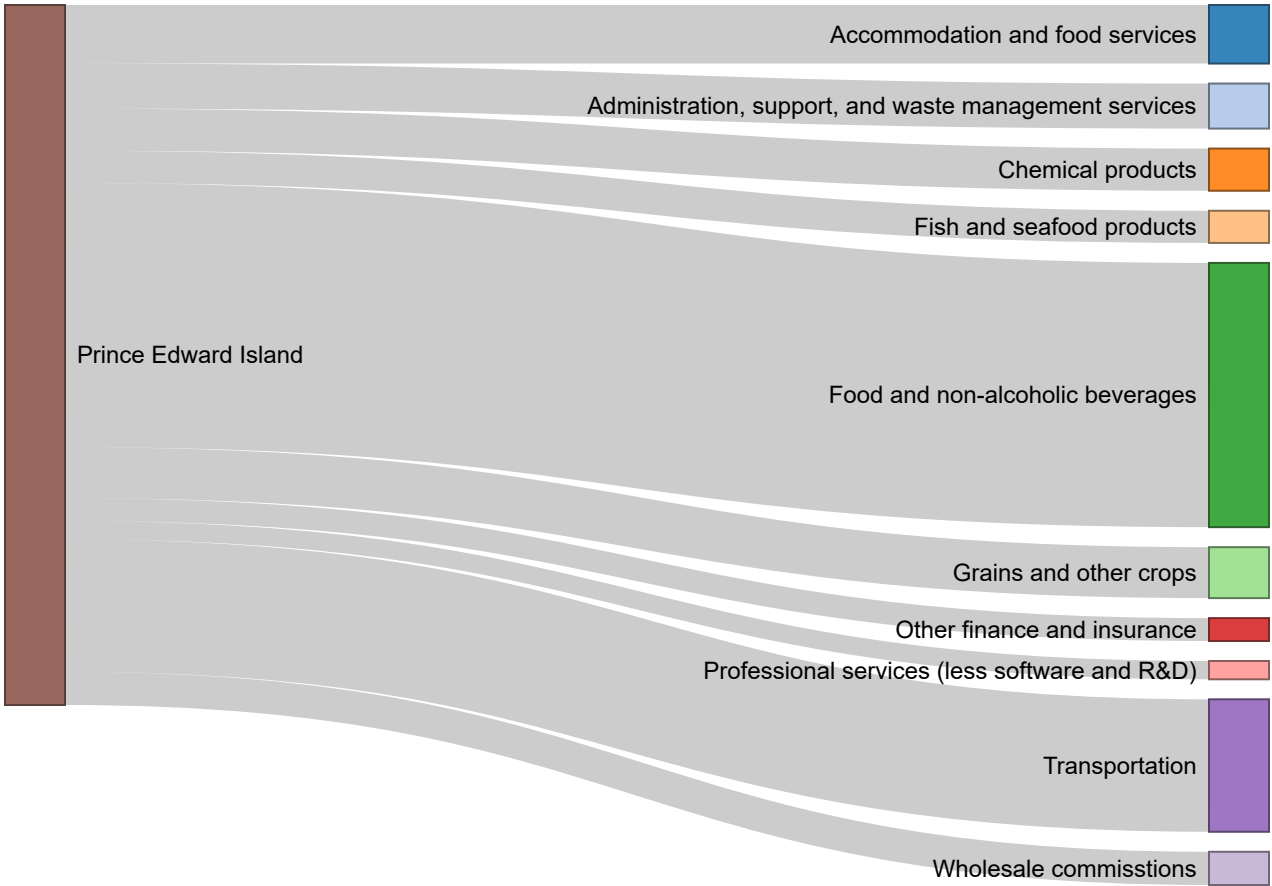
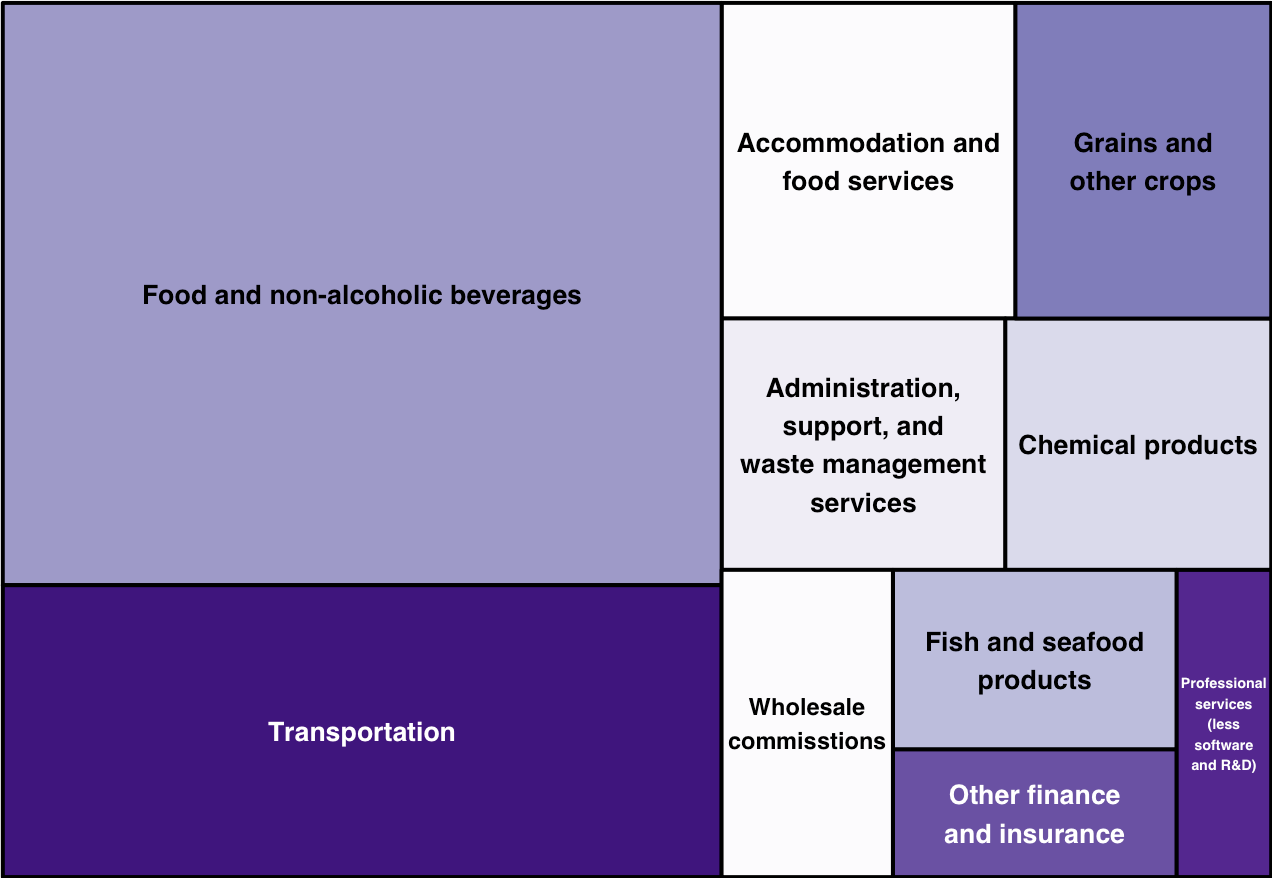
Nunavut Top Exports



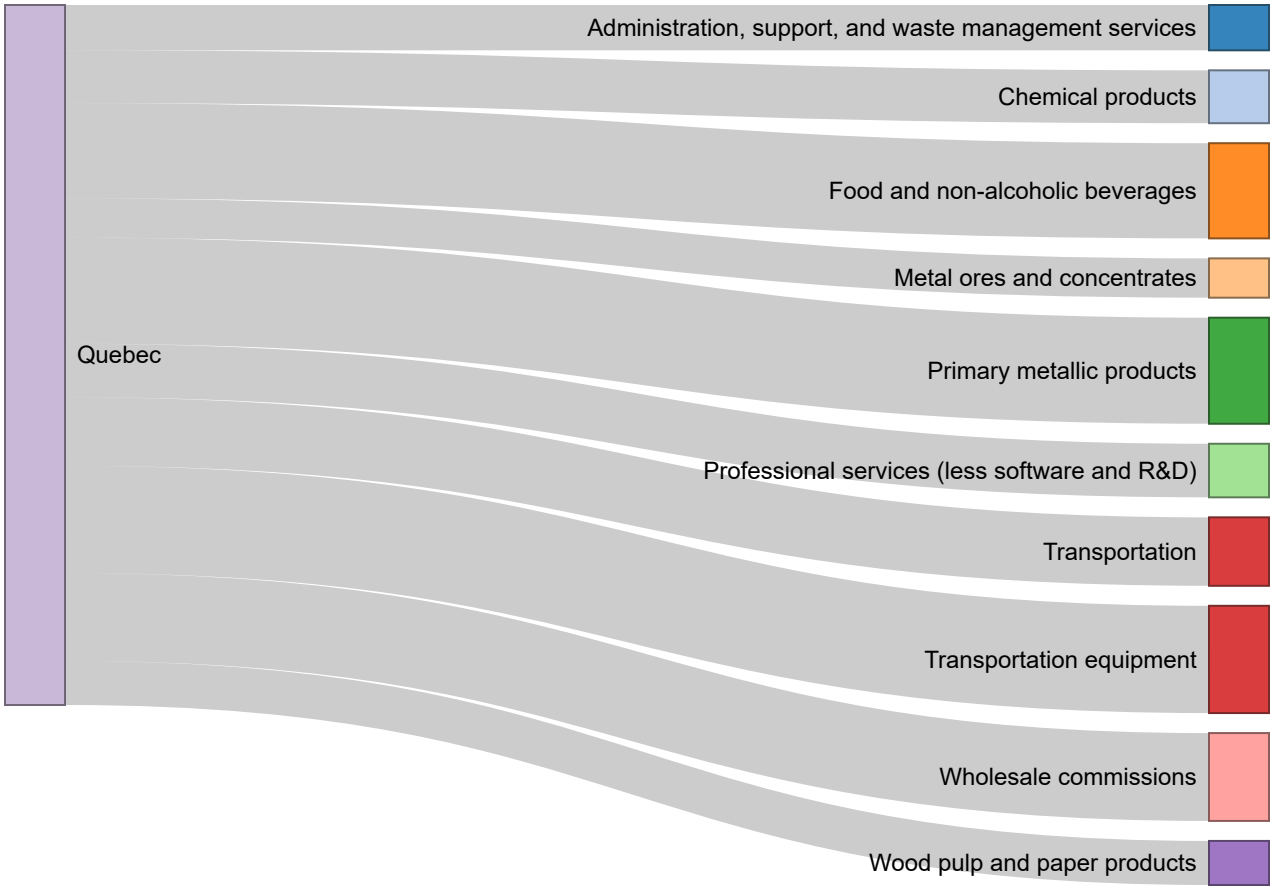
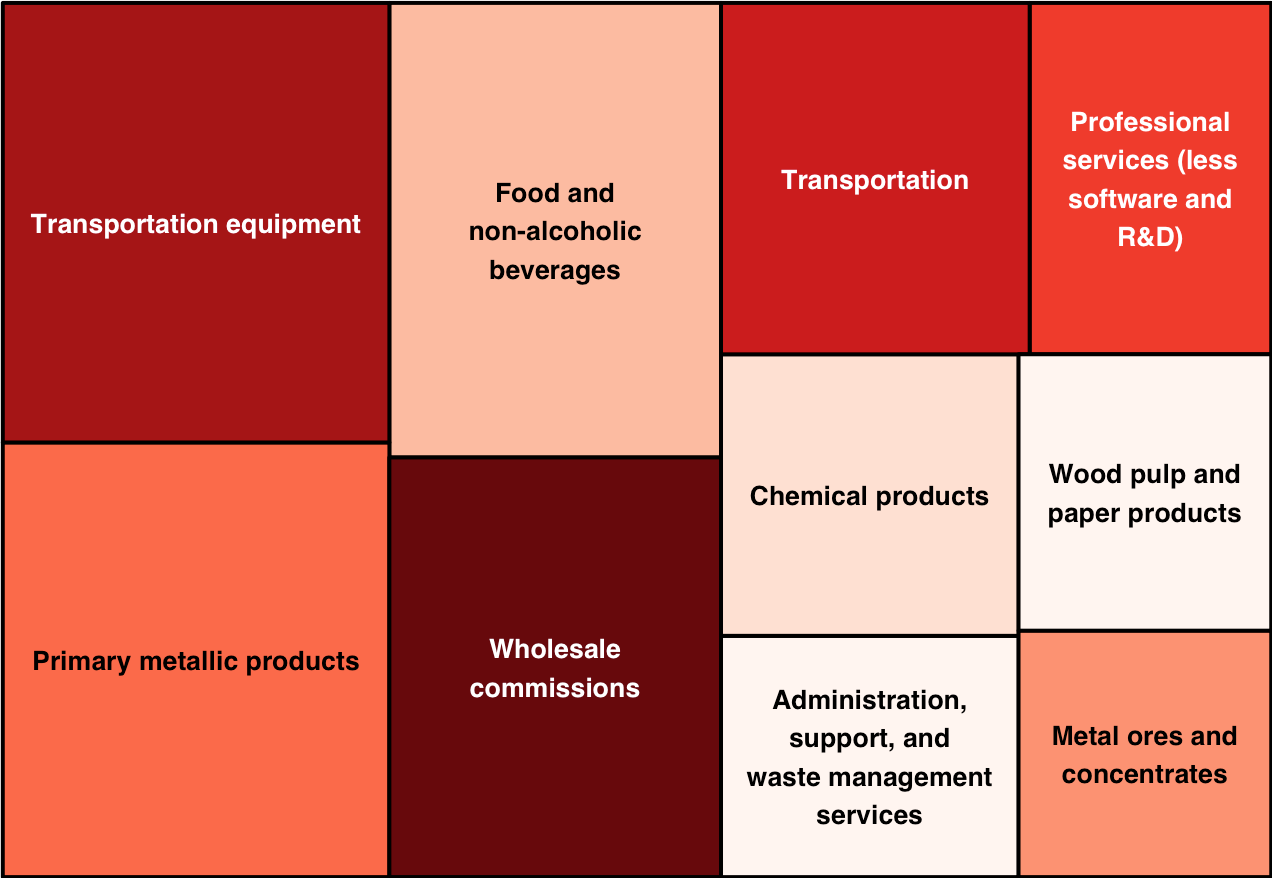
Ontario Top Exports



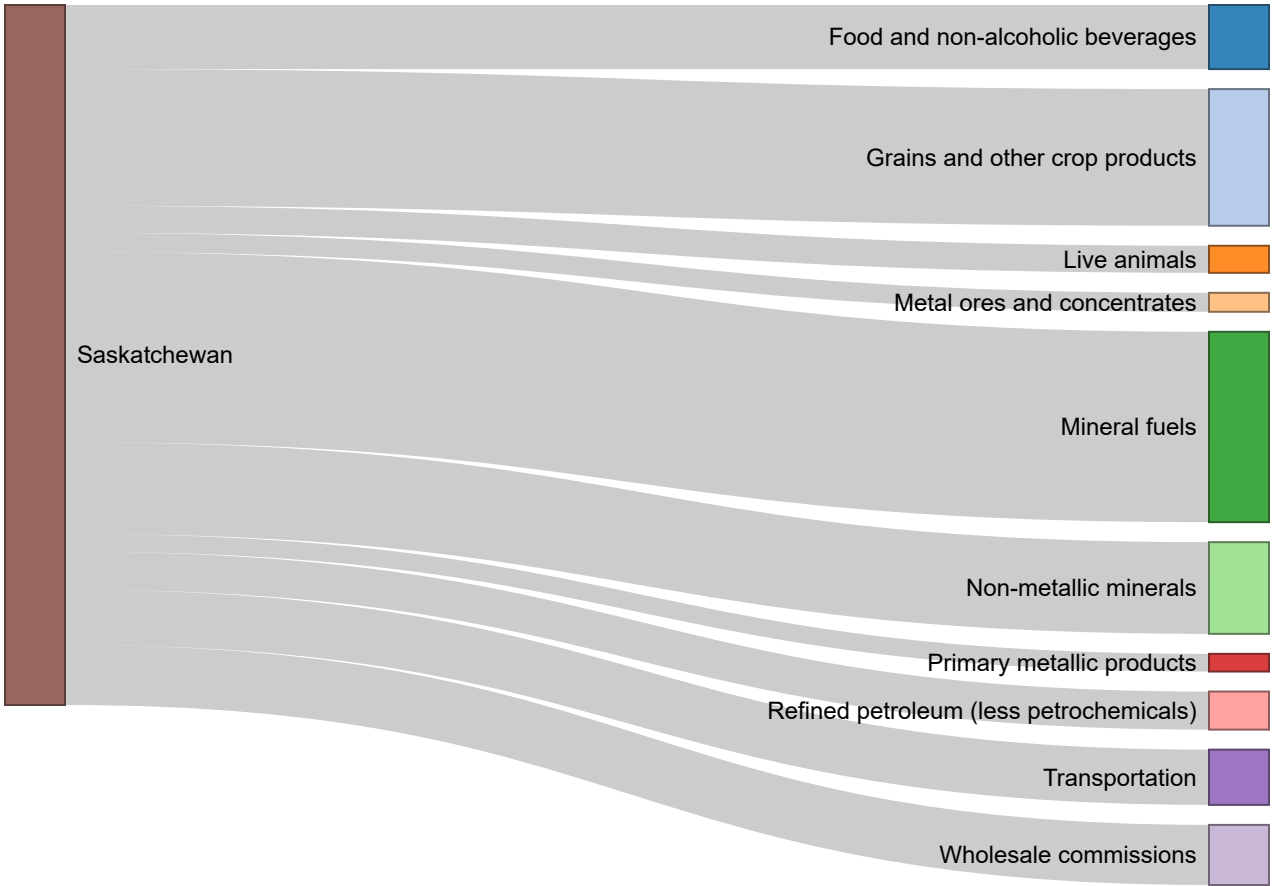
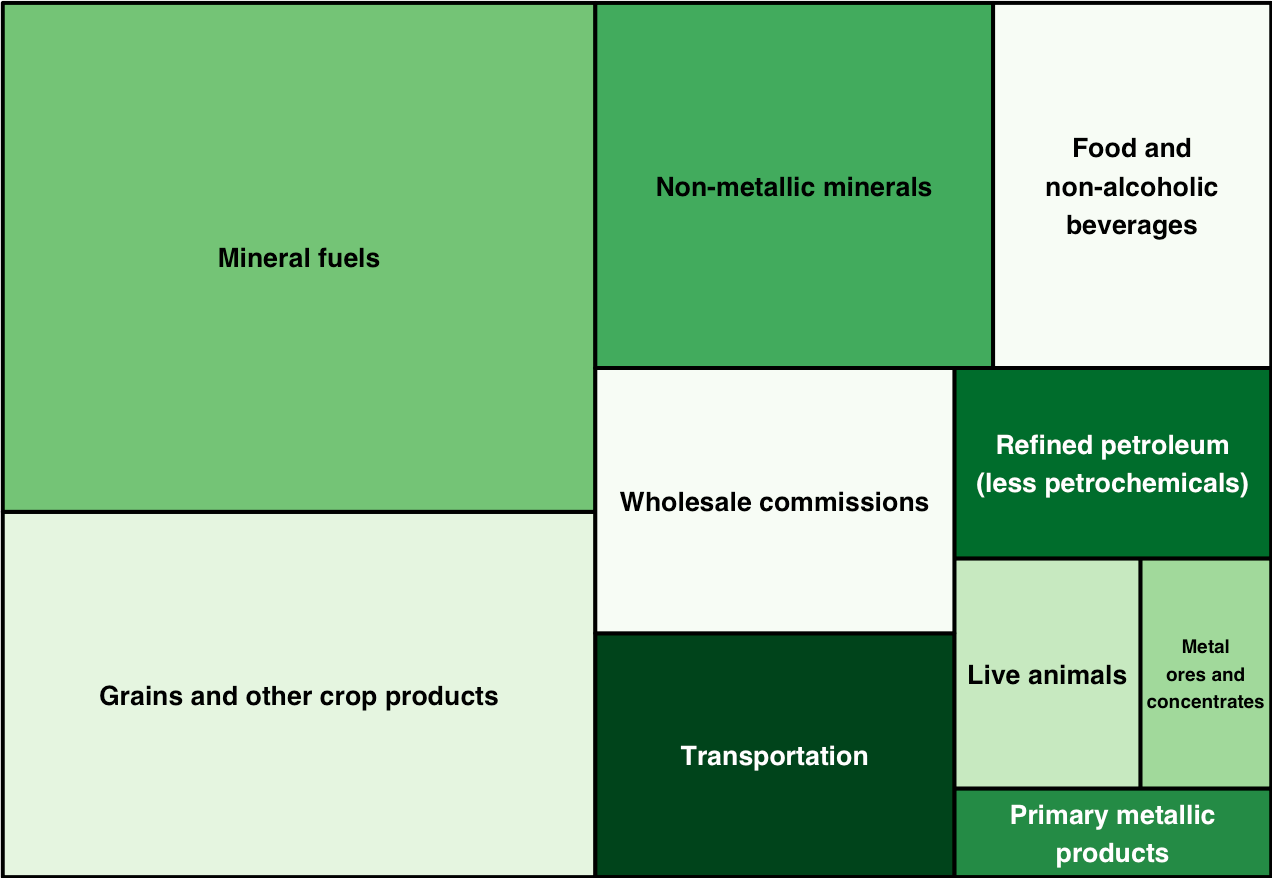
Prince Edward Island Top Exports



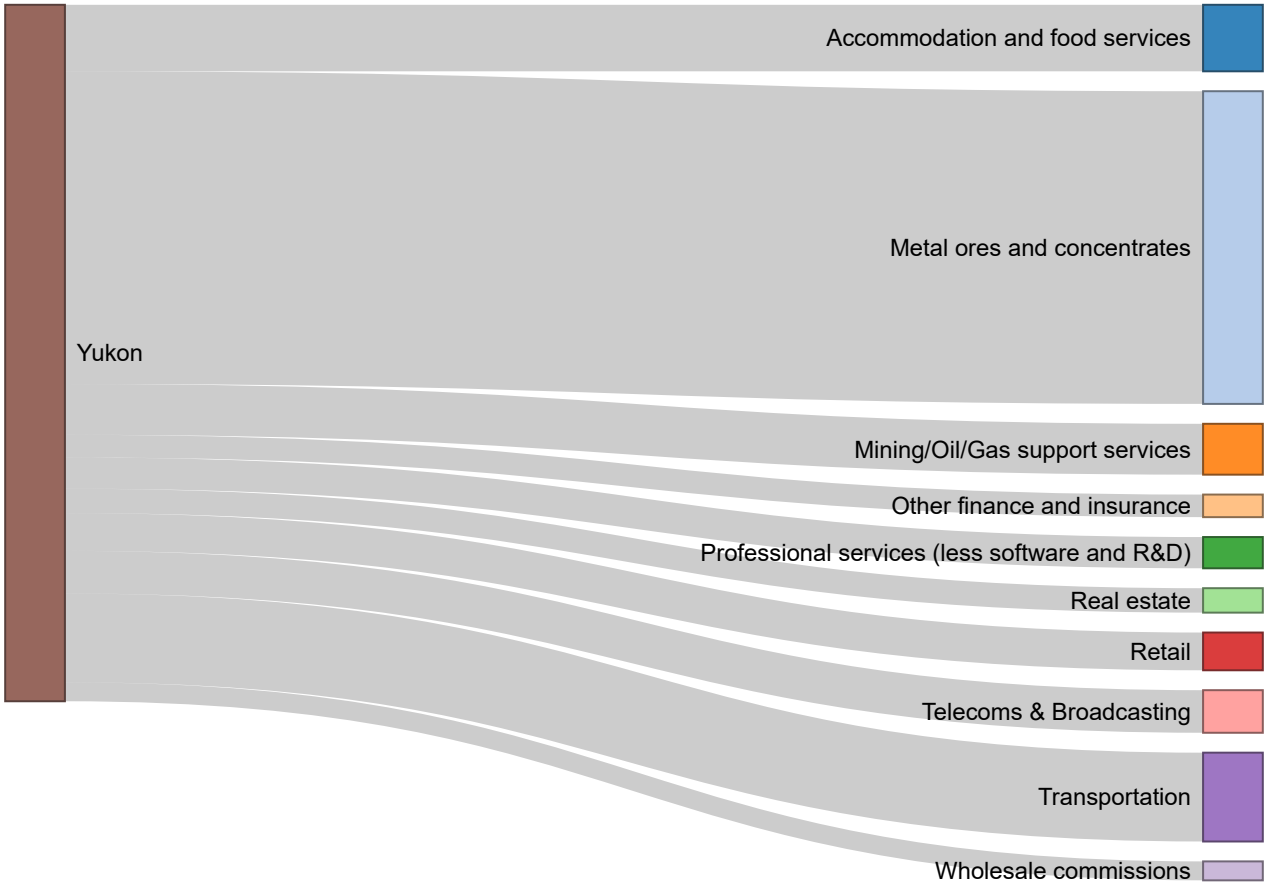
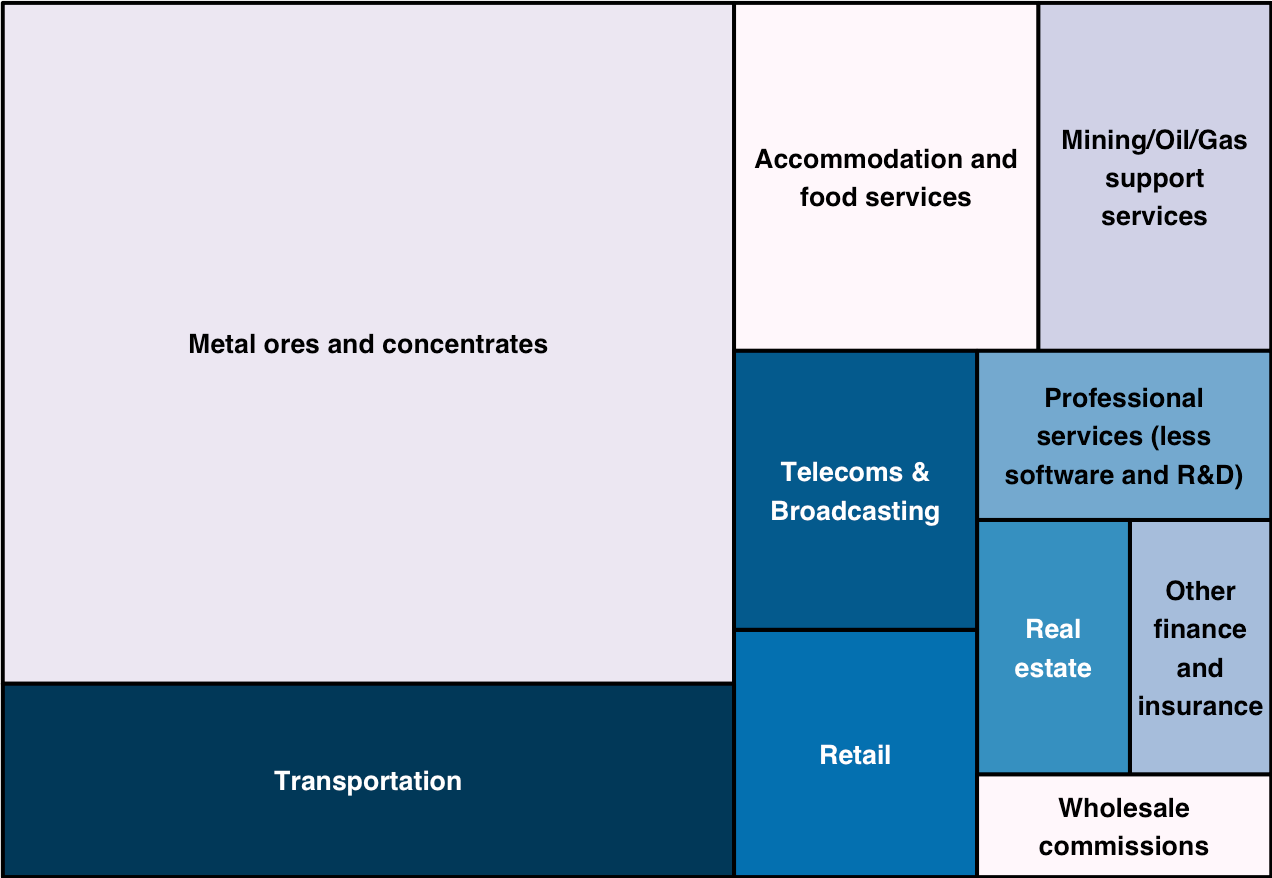
Quebec Top Exports



Saskatchewan Top Exports



Yukon Top Exports



Transportation

Transportation and its equipment are integral to Canadian supply chains, both as an input and as a product. Canada is the second-largest country in the world by land area, after Russia. It spans approximately 9.98 million square kilometers, and about 5,500 kilometers from its easternmost point in Newfoundland and Labrador to its westernmost point in British Columbia.

Modes of transportation

Canadian transportation, therefore, and its efficacy to connect Canada and the world, directly affects Canadian welfare and GDP. Transportation and warehousing made up 4.2% of Canada's total economy in 2023 (see figure GDP) and employed 5.1% of its workforce. Canadian modes of transport are encompassed broadly in four areas: air, marine, rail and road.³

Air network

Canadian airspace, managed by NAV CANADA, is an expanse of roughly 18 million square kilometers and six time zones. In 2022, The Canada Flight and Water Aerodrome Supplements listed 2024 registered sites and military landings:⁴ - 343 water aerodrome for float and ski planes; - 427 heliports for helicopters; - 1 254 land aerodromes for fixed-wing aircraft.

With 1444 air carriers operating in Canada, Canada's biggest airline Air Canada accounted for 51% of available seat kilometers in the domestic air market, operating an average of 959 flights a day on a fleet of 344 aircraft.⁵ Westjet, Porter Airlines, Air Transat and Sunwing Airlines are other Canadian airlines operating both domestically and internationally. Since the COVID-19 pandemic, air traffic has picked up to pre-COVID levels, showing a relatively full recovery.

Marine network

Canada maintains a historical actor in international shipping lanes, from its key supply line role in World War II until today. Canadian coastlines and ports allow domestic tonnage to flow but also act as connector points between international destinations. Marine networks also play key roles in supplying more isolated northern and coastal communities with little to no viable road networks, as well as developing offshore resources.

Canadian registered fleets carry around 99% of domestic tonnage, while also permitting foreign registered fleets to carry goods to and from international destinations through our hubs. Canadian ports also attract key supply chain routes into the US via our ports where they are then shipped by railway and trucking networks, creating Canadian value-added, revenue and job creation in international supply chains.

Canada boasts roughly 560 port facilities, 845 fishing harbors and 106 recreational harbors. The Canadian commercial fleet included over 200 cargo ships, dry bulk, and tankers, all with a required capacity of over 1000+ gross tonnage. Passenger fleets also play a key role in connecting communities and people. In 2022, 69 registered ferries and members of the Canadian Ferry Association, transported over 60 million passengers and more than 22 million vehicles.⁶

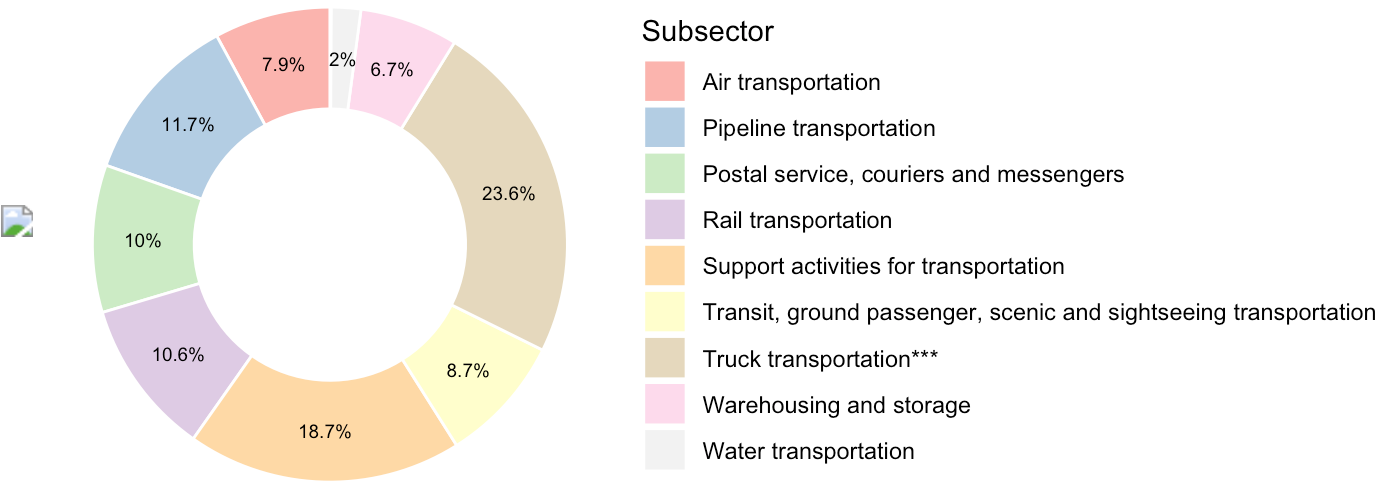
Rail Network

The Canadian railway network consists of about 44 000 km of track, with ~50% owned by Canadian National (CN), ~30% by Canadian Pacific (CP), and ~20% by other owners.

Commercially, as of 2021 there are over 51 000 freight cars that operate on mainline and shortline railways. Shortline railways are frequently used to connect shipping routes to longer and mainline railway networks, ports, and terminals, moving an average of 34\$ billion worth of freight a year.⁷

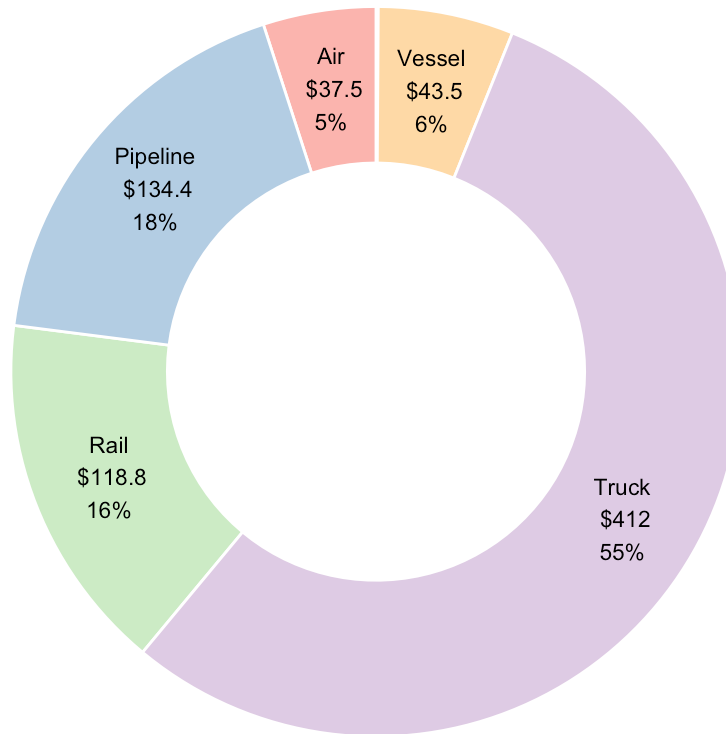
Passenger rail networks provide tourist, commute and intercity transportation. Passenger rail is mostly nationalized through VIA Rail, a Government of Canada crown corporation. Most services are concentrated along the Québec-Windsor Corridor, with additional longer routes from Vancouver to Toronto and Montréal to Halifax. In 2022, VIA Rail ran an average of 328 weekly train departures and plans to invest into The High Frequency Rail Project, to connect Toronto, Peterborough, Ottawa, Montréal, Trois-Rivières and Québec City. Such projects aim to reduce pollution and increase regional growth and efficiency allow for short commute times. Passenger railway potential is extremely underutilized and pales in comparison to rail networks in Europe and Asia. More projects like the High Frequency Rail Project that connect Canada in a quicker and greener way should be prioritized.

Distribution of Transportation and Warehousing sector (4.2% of Canada's total GDP), 2



Road transport is important for interprovincial trade, US-trade, and international trade from road to port and vice versa. The US remains Canada’s most important trade partner, and trucking the most favorable mode of transportation, with over 50% of Canada-US freight trade transported by truck. **Figure IV** Machinery and electrical equipment was the most traded commodity by truck at 17.4% of all exports to the US and Mexico, according to Transport Canada.⁸ Other manufactured and miscellaneous goods, automobiles and transport equipment, agricultural and food products, and chemicals/plastic/rubber products, all accounted for significant shares of over 10% of exports transported by truck. Imports by truck were dominated by machinery and electrical equipment with 30.2% of truck imports from the US and Mexico.⁹ Chemicals, automobiles, other manufactured goods and agriculture hold significant shares of over 10% in imports as well.

Canada-US Freight Trade by mode, 2022 (\$Millions)



Transportation and the supply chain

Since the COVID pandemic, there seems to be a permanent uptick in the demand for consumer goods over consumer services, when many services were unavailable. This has benefited all modes of transportation with higher good demand, but has also led to higher levels of congestion at West Coast ports, inland railyards, and warehouses.¹⁰ While demand has increased, the congestion and supply chain disruptions stay persistent.

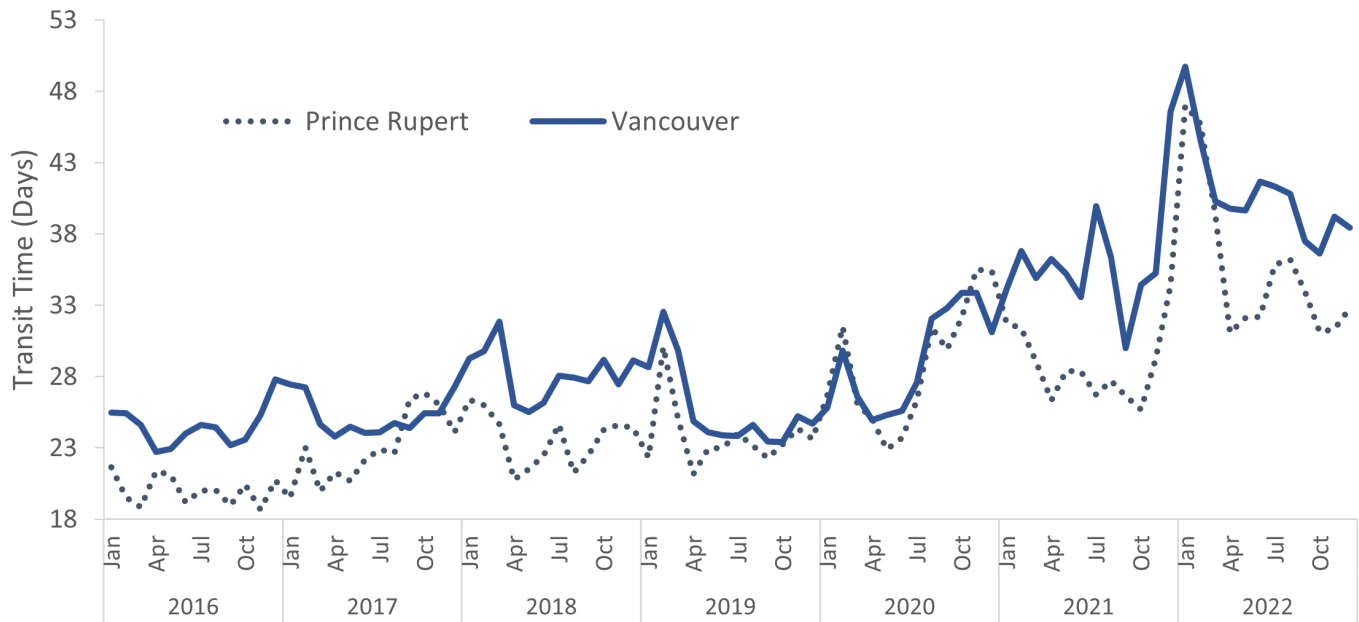
Container and grain transport times

Container and grain supply chains are two key areas of the Canadian economy, measuring their transport times give insight into the level of recovery in key economic areas.

The average end-to-end transit time to import a container from Shanghai to Toronto via West Coast ports was 39.9 days in 2022, above the 3-year average of 30.0 days.^[^11] Transit time peaked in January 2022, averaging 47.0 days when transiting via the Port of Vancouver and 49.7 days via the Port of Prince Rupert. **Figure V**

On Canada's East Coast, container end-to-end transit time from Antwerp to Toronto averaged 24.2 days in 2022, 5 days above the 3-year average of 19.6 days. This increase was largely a result of high demand, uncertainty, and significant congestion at intermodal yards in Central Canada hindering the ability to move containers off port terminals to transit inland. **Figure V**

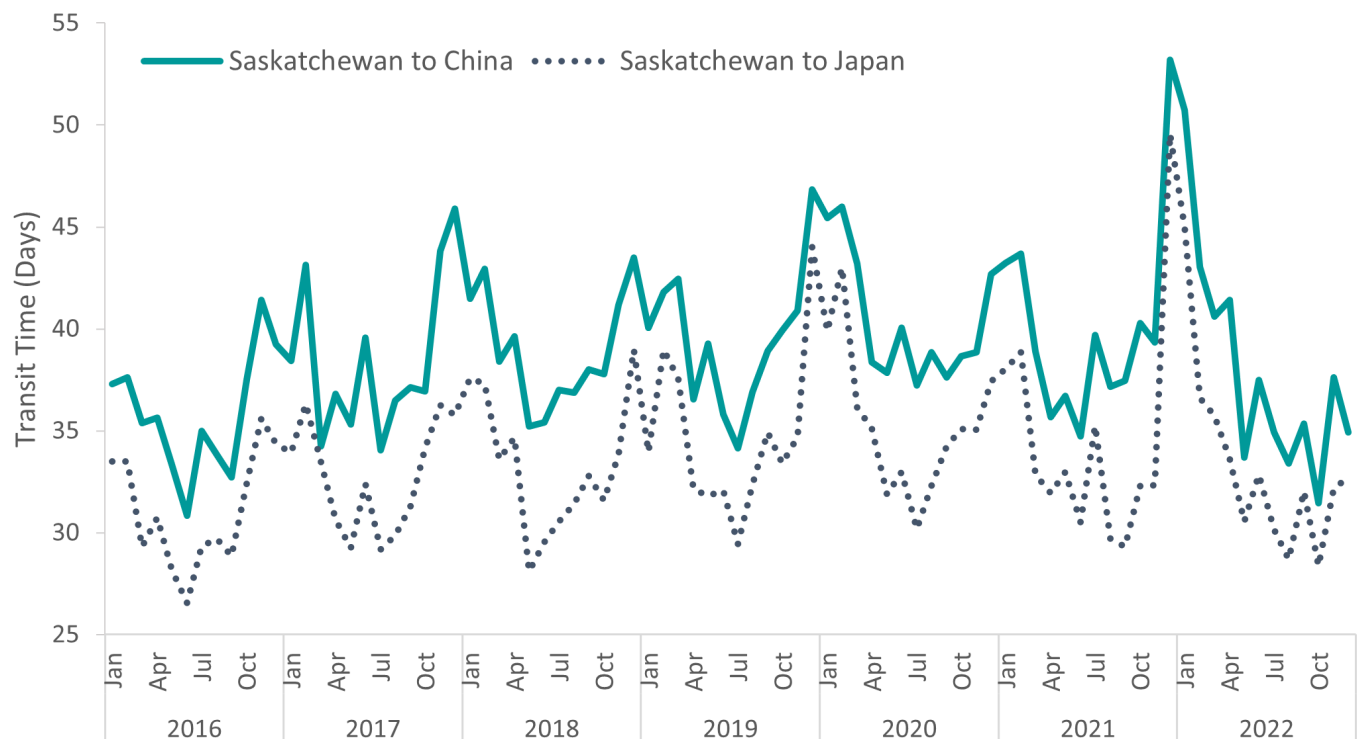
Container freight rates on the West Coast saw the largest decrease in 2022, hovering close to pre-pandemic levels at the end of 2022. Container freight rates on the East Coast have been decreasing throughout the year but remained up to three times higher than pre-COVID levels on some shipping lanes at the end of 2022, due to a higher demand for East Coast ports.



The Western Canada's grain harvest was 73.7 million tonnes for the 2022-23 crop year, 50% more than the previous year when drought and bad weather conditions led to a much smaller crop (49.2 million tonnes). Grain volumes transported in the system have also rebounded with rail shipments from the Prairies up 34.0% and exports from western ports up 51.0% for the 21 first weeks of the 2022-2023 crop year.

The performance of the Western grain supply chain measured using the end-to-end transit time to ship grain from Saskatchewan to Asia through the Port of Vancouver has stayed relatively stable over the last couple of years, with a 2021 year-end peak of ~53 days.**Figure VI**

End-to-end transit time for grain improved from Saskatchewan to Asia via the Port of Vancouver, averaging 37.9 days in 2022 for the grain going to China, below the 3-year average of 39.9 days. For the grain going to Japan, the 2022 end-to-end transit time averaged 33.2 days, slightly below the 3-year average of 34.8 days.**Figure VI**

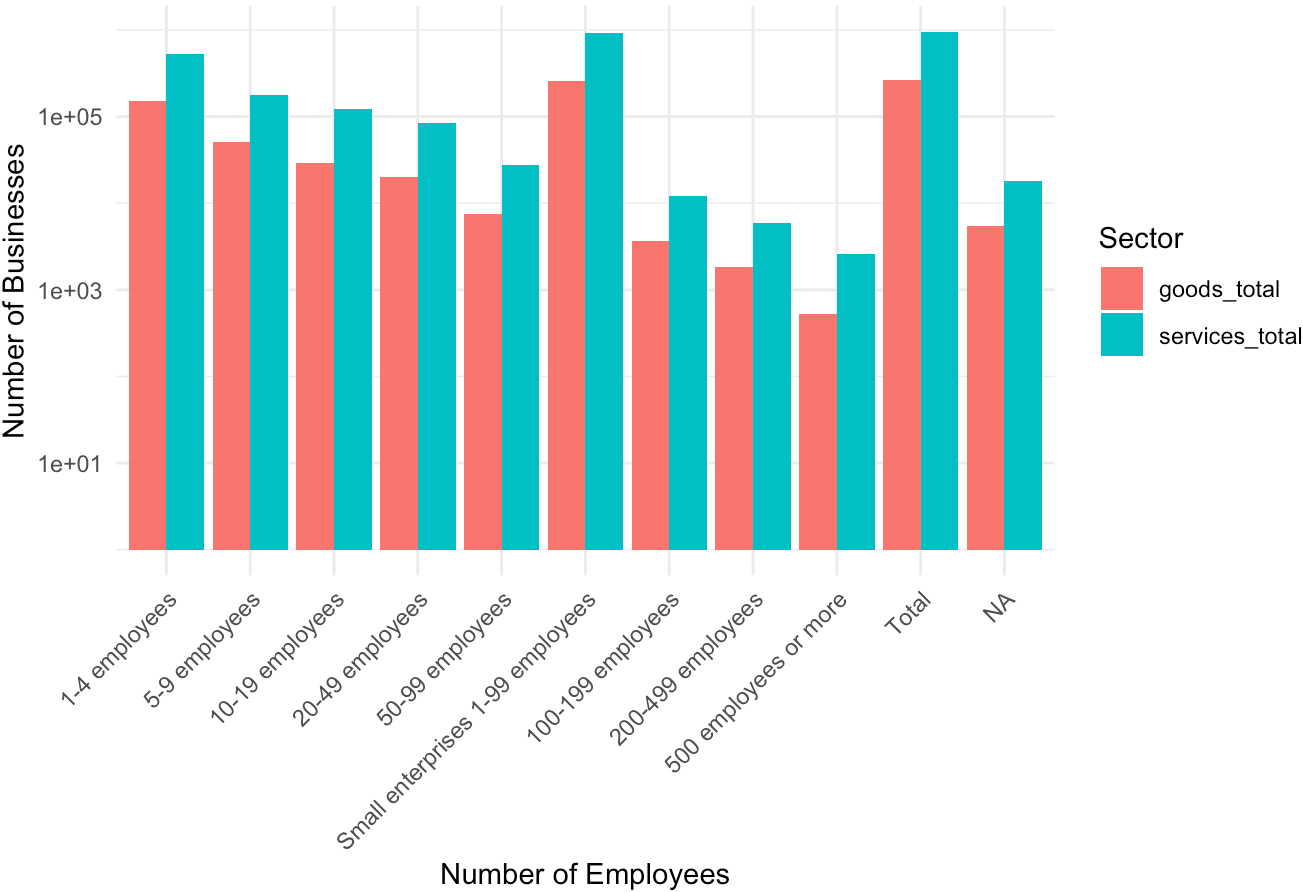


[^11]: Transport Canada. *Transportation in Canada 2020* ()

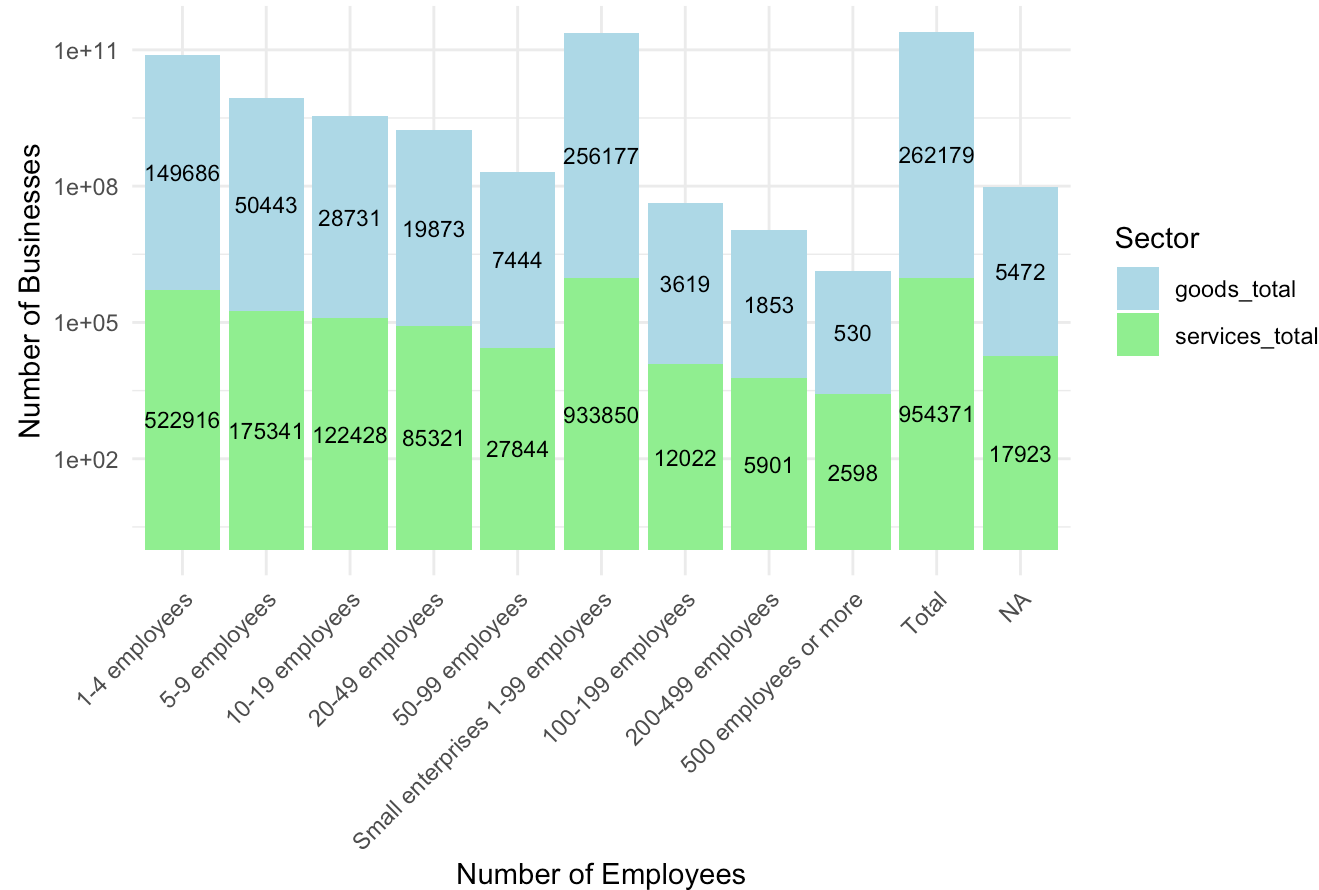
SME Statistics

Small and medium sized enterprises, or SMEs, make up a significant share of the Canadian economy. (See SME figure 1) SMEs consist of small enterprises ranging from 1-99 employees, and medium enterprises ranging from 100-499.

Businesses by Sector and Number of Employees, 2022



Businesses by Sector and Number of Employees, 2022



business_type	goods_total	services_total	total
1-4 employees	149686	522916	672602
5-9 employees	50443	175341	225784
10-19 employees	28731	122428	151159
20-49 employees	19873	85321	105194
50-99 employees	7444	27844	35288
Small enterprises 1-99 employees	256177	933850	1190027
100-199 employees	3619	12022	15641
200-499 employees	1853	5901	7754
500 employees or more	530	2598	3128
NA	5472	17923	23395

Total 262179 954371 1216550

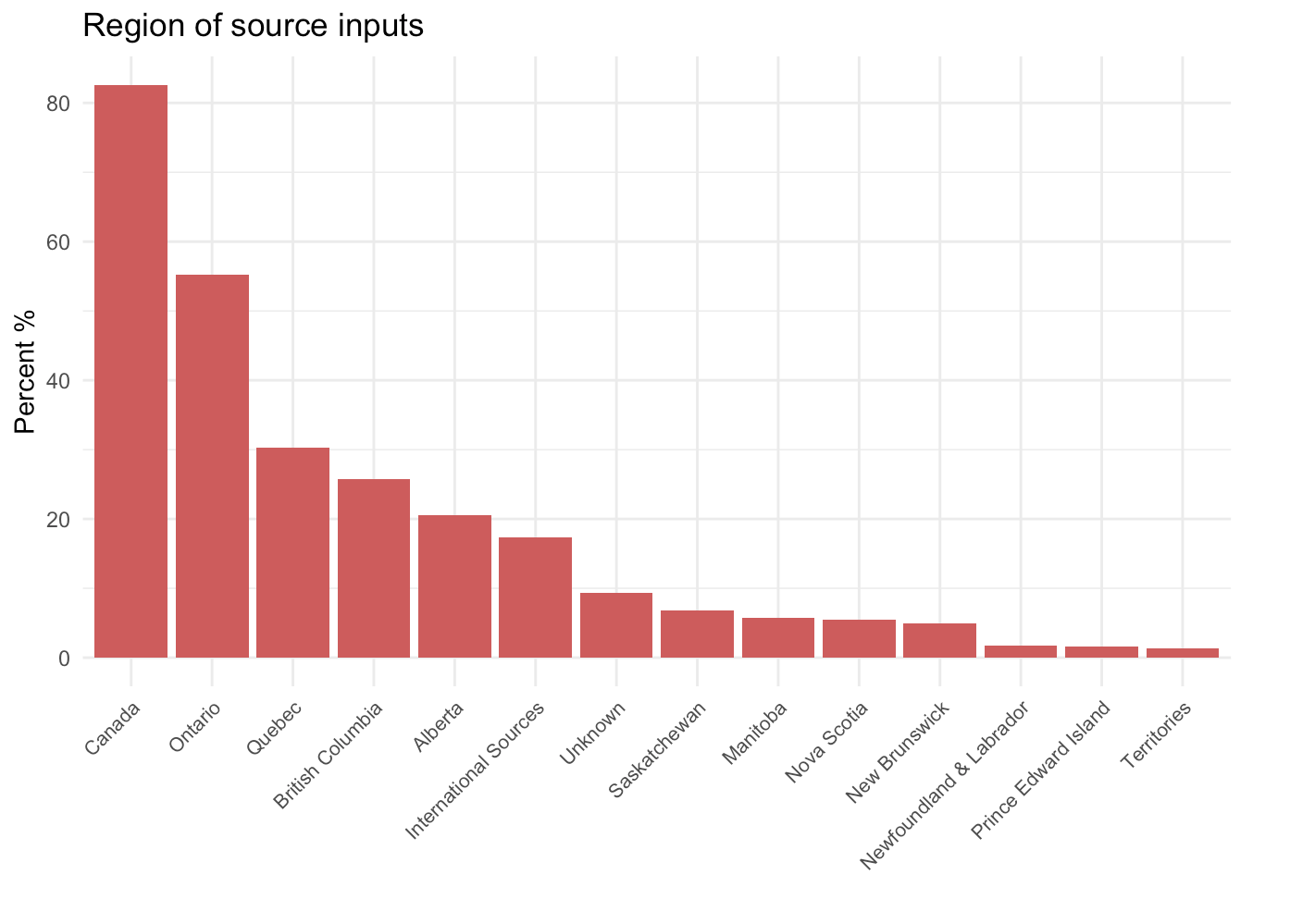
##				
##	-----			
##	Industry	Small	%	Medium
##		enterprises		enterprises
##		1-99		100-499
##		employees		employees
##	-----	-----	-----	-----
##	Goods-Producing Sector	256177	97.7	5472 2.1
##				
##	Agriculture	48630	99.3	335 0.7
##				
##	Mining/quarrying/oil/gas	6989	94.9	295 4
##	extraction			
##				
##	Utilities	1204	89.3	108 8
##				
##	Construction	151344	98.9	1520 1
##				
##	Manufacturing	48010	93.2	3214 6.2
##				
##	Services-Producing Sector	933850	97.8	17923 1.9
##				
##	Wholesale trade	52226	97.6	1208 2.3
##				
##	Retail trade	131515	97.4	3423 2.5
##				
##	Transportation and	71813	98.4	994 1.4
##	warehousing			
##				
##	Information and cultural	17014	96.9	455 2.6
##	industries			
##				
##	Finance and insurance	38912	97.9	700 1.8
##				
##	Real estate	58287	99.4	346 0.6
##				
##	Professional services	153879	98.9	1471 0.9
##				
##	Management of companies	5387	85.4	666 10.6
##	and enterprises			
##				
##	Administrative support,	50869	96.7	1484 2.8
##	waste management			
##	and remediation services			
##				
##	Educational services	13865	92.9	586 3.9
##				
##	Health care and social	128017	97.3	3089 2.3
##	assistance			

##				
## Arts, entertainment and recreation	17704	96.6	553	3
##				
## Accommodation and food services	80150	98.3	1371	1.7
##				
## Other services	107704	99.4	590	0.5
##				
## Public administration	6508	84	987	12.7
##				
## All Industries	1190027	97.8	23395	1.9
## -----				

Table: Table continues below

##	
##	
## -----	
## Large enterprises 500+ employees	%
## -----	
## 530	0.2
##	
## 14	0
##	
## 83	1.1
##	
## 37	2.7
##	
## 97	0.1
##	
## 299	0.6
##	
## 2598	0.3
##	
## 79	0.1
##	
## 113	0.1
##	
## 153	0.2
##	
## 85	0.5
##	
## 151	0.4
##	
## 23	0
##	
## 182	0.1
##	
## 256	4.1

##	
## 230	0.4
##	
## 472	3.2
##	
## 452	0.3
##	
## 73	0.4
##	
## 49	0.1
##	
## 26	0
##	
## 254	3.3
##	
## 3128	0.3
## -----	



1. Global Affairs Canada.Position and Length of Canadian Supply Chains
(<https://www.international.gc.ca/trade-commerce/economist-economiste/supply-chain-chainee-approvisionnement.aspx?lang=eng>).↵

2. Executive Office of the President. United States Trade Agreement between the United States of America, the United Mexican States, and Canada (<https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/agreement-between>)↵
3. Statistics Canada. Statistics Canada. Table 14-10-0023-01 Labour force characteristics by industry, annual (x 1,000) ()↵
4. Transport Canada. Transportation in Canada 2022 (<https://tc.canada.ca/en/corporate-services/transparency/corporate-management-reporting/transportation-canada-annual-reports/transportation-canada-2022>)↵
5. Transport Canada. *Transportation in Canada 2022* ()↵
6. Transport Canada. *Transportation in Canada 2022* ()↵
7. Transport Canada. *Transportation in Canada 2022* ()↵
8. Transport Canada. Table RO4: Canadian International Trade Value Shipped by Trucks, by Commodity Groups, 2019–2020 – Total Exports by trucks (https://tc.canada.ca/sites/default/files/2021-06/transportation_in_canada_statistical_addendum.pdf#page=105) p. 100.↵
9. Transport Canada. Table RO4: Canadian International Trade Value Shipped by Trucks, by Commodity Groups, 2019–2020 – Total Imports by trucks () p. 100.↵
10. Transport Canada. *Transportation in Canada 2020* ()↵