Chemistry Industry Economic Profile 2016

CHEMISTRY INDUSTRY ASSOCIATION OF CANADA

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Contents

President's Message

I am pleased to present to you the Chemistry Industry Association of Canada's (CIAC) 2016 Chemistry Industry Economic Profile.

Canada's $53 billion chemical industry is a significant contributor to our country's economy. The sector is directly responsible for 87,500 jobs and pays over $6 billion in salary and wages. Primarily concentrated in Alberta, Ontario and Quebec, the industry supports more than 525,000 jobs in other manufacturing sectors across the country.

The value of "chemistry" to Canada's economy is not fully appreciated by many. The fact is that more than 95 per cent of all goods manufactured rely on chemistry. It's an integral part of our everyday life – from the homes we live in, to the cars we drive, the food we eat and the electronic devices we so heavily rely on.

While the industry has largely remained a robust engine of growth and investment, 2015 saw a 10% decline in shipments, compared to 2014, as a result of lower commodity prices. However, this has resulted in only a 2% decrease in revenue, which reflects the overall stability of the chemistry industry in Canada.

This annual review and the accompanying executive summary provides readers with an economic profile of the industry, and a quantitative insight into the industry's importance to Canada's economy and to all Canadians.

Yours sincerely,

Bob Masterson
President and CEO
Chemistry Industry Association of Canada

INDUSTRY ECONOMIC PROFILE

Introduction[1]

Using data from Statistics Canada (unless otherwise stated), CIAC's Annual Industry Economic Profile provides a statistical review of various key industry indicators including number on shipments, imports, exports, and employment. The report also includes a section on specialty chemicals, statistics for the key provinces of Quebec, Ontario and Alberta, and for the segments of the industry of primary interest to CIAC members.

This report is prepared by the Association's Business and Economics (B&E) team. The B&E team provides ongoing economic analysis of government policy initiatives, business trends and changing industry dynamics. The team also publishes national and provincial scorecards[2] that detail the state of policy initiatives and their effects on the industry and a Year-End Survey of Business Conditions,[3] an economic forecast based on CIAC members' sales trade and employment indicators.

The Chemistry Industry Association of Canada (CIAC) is the voice of Canada's $53 billion chemistry industry and represents more than 50 members and partners across the country. The industry employs 85,000 Canadians and supports another 425,000 jobs in Canada. Members of CIAC are signatories to Responsible Care® – the association's U.N.-recognized sustainability initiative.

Industrial classification

Industries in Canada are classified according to the 2012 North American Industrial Classification System (NAICS). This classification is maintained by Statistics Canada and its counterpart organizations in the United States and Mexico. The chemical manufacturing subsector is captured in NAICS 325 which comprises establishments primarily engaged in manufacturing chemicals and chemical products, from organic and inorganic raw materials.

NAICS 325 includes the following sub-industry groups:

- Basic chemicals (NAICS 3251)
- Synthetic resins, rubbers, and synthetic fibres (NAICS 3252)
- Pesticides and fertilizers (NAICS 3253)
- Pharmaceuticals (NAICS 3254)
- Paints, coatings and adhesives (NAICS 3255)

[1] This publication intends to provide the best information available. However, neither CIAC nor its employees make any warranty, expressed or implied, or assumes any liability or responsibility for any use, or the results of such use, of any information or data disclosed in this report.

[2] http://canadianchemistry.ca/index.php/en/fact-sheets-brochures

[3] http://canadianchemistry.ca/index.php/en/publications

- Soaps, cleaning compounds and toilet preparations (NAICS 3256)
- Other chemical products (NAICS 3259)

This report focuses on statistics for the overall chemical industry (NAICS 325), and for the combination of NAICS 3251 and 3252 which are collectively referred to as industrial chemicals.

- NAICS 3251 Basic chemicals - comprises establishments primarily engaged in manufacturing organic and inorganic chemicals, using basic processes such as thermal cracking, distillation, and chemical reaction.
- NAICS 3252 Synthetic resins, rubbers, and fibres - comprises establishments primarily engaged in manufacturing polymers such as polyethylene, butyl rubbers, polyamides, and fibres made from these resins. Polymerization of monomers into polymers, for example, ethylene into polyethylene, is the basic process.

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Chemical industry at a glance

Chemical industry[4] shipments in Canada in 2015 were $53 billion, exports were $38 billion and imports totaled $54 billion.

The industry employed 87,500 workers in 2015 which constituted 5.8% of all manufacturing jobs. In addition to the direct jobs, other jobs are supported by the purchasing activity of the chemical industry and by the subsequent expenditure-induced activity. CIAC has estimated that for every job in the chemical industry, another 5 indirect jobs are created in other parts of the economy, so in total the chemical industry supports almost 525,000 jobs in Canada.

Industrial chemicals[1] is a keystone industry within the Canadian economy. It converts and adds value to raw resources such as natural gas, crude oil, minerals, metals and biomass, creating intermediate products that are used as inputs by other parts of the chemical industry, and by almost all other manufacturing segments. Major consumer industries include: plastic and rubber products (NAICS 326), forest products (NAICS 321 and 322), transportation equipment (NAICS 336), oil and gas extraction (NAICS 211), clothing (NAICS 315), construction (NAICS 23), and pharmaceuticals (NAICS 3254). For industrial chemicals, shipments in 2015 were $27 billion, exports were $19 billion, imports were $20 billion, and employment was 15,000.

Table 1: Chemical industry statistics

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Shipments, $ billion	49.9	48.2	49.7	40.1	43.4	47.1	48.5	51.8	54.2	52.9
Employment, 000	80.0	78.1	80.9	78.4	81.4	79.8	83.6	81.7	80.9	87.5
Imports, $ billion	39.4	40.4	42.1	39.9	40.8	43.4	44.4	46.4	50.3	53.7
Exports, $ billion	28.9	32.3	32.0	26.5	27.8	31.3	29.6	32.0	35.5	38.0

Table 2: Industrial chemical statistics

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Shipments, $ billion	26.9	26.2	27.1	18.3	22.0	25.3	24.6	27.8	29.9	26.8
Employment, 000	18.7	17.8	18.1	16.1	17.2	17.2	17.2	16.6	15.1	15.0
Imports, $ billion	17.2	17.1	17.5	13.8	15.9	17.1	17.3	17.9	19.3	19.7
Exports, $ billion	17.9	19.7	18.4	13.2	15.7	18.6	17.0	18.7	19.8	19.2

[4] Chemical industry and industrial chemicals are defined on page 1.

Manufacturing shipments (revenue)

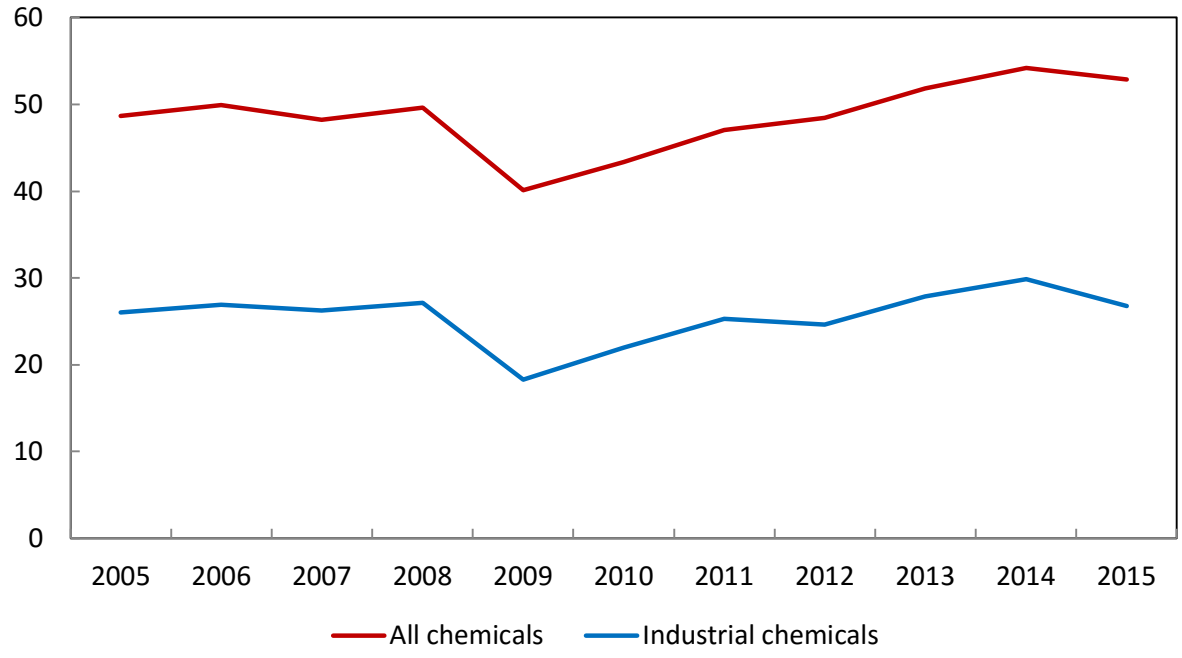
In 2015, the value of Canadian chemical industry manufacturing shipments was $53 billion, a decrease of 2% compared to 2014.

Shipments of industrial chemicals were $27 billion in 2015, representing a reduction of 10% compared to 2014 (Table 3, Figure 1). The decline in shipments value was largely due to lower commodity prices driven by the sustained global decline in oil prices. The price level for most petrochemical products is closely related to oil prices since oil-based production represents a large share of total production, and tends to be the marginal source of supply.

Table 3: Manufacturing shipments

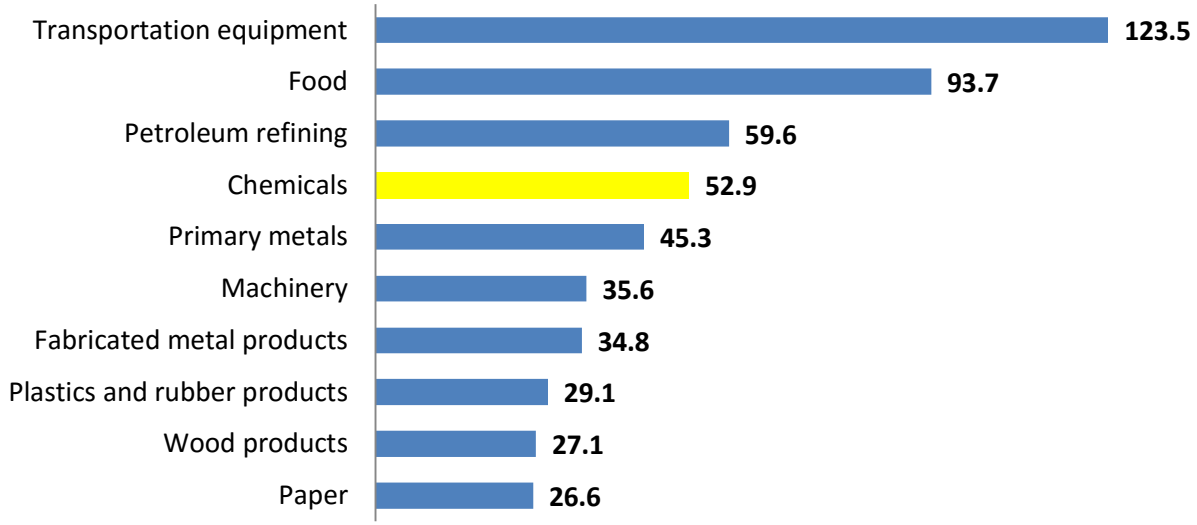
Manufacturing shipments, $ billion	2014	2015	Change 2014-15
All chemicals	54.2	52.9	-2.4%
Industrial chemicals	29.9	26.8	-10.3%

Figure 1: Chemical industry shipments, $ billion



Within the NAICS system, there are 21 manufacturing industries at the 3-digit level. Among these industries, chemicals (NAICS 325) ranks as the 4th largest on the basis of value of shipments (Figure 2).

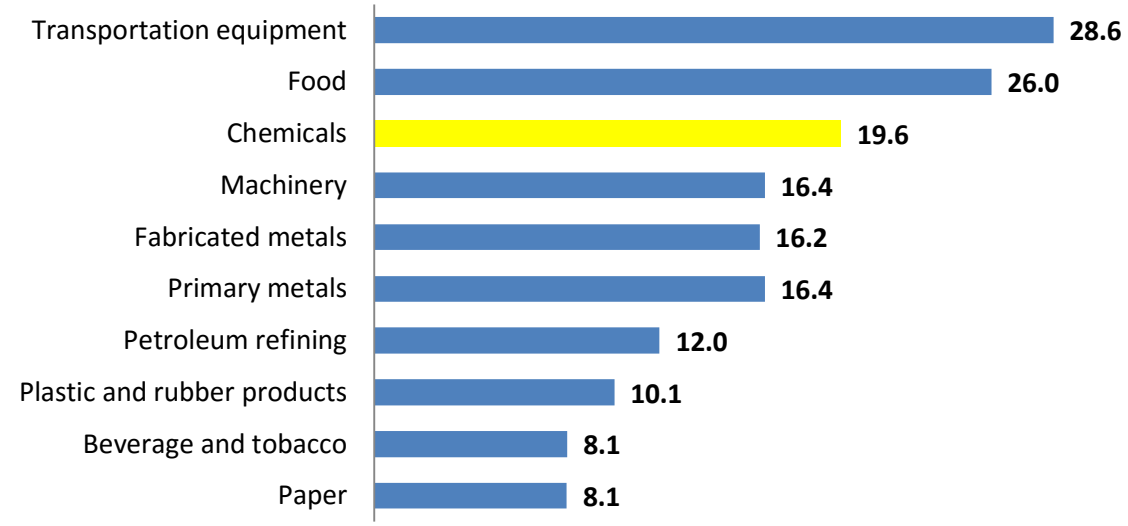
Figure 2: Top 10 manufacturing industries by value of shipments, $ billion



Value added

Value added measures the value of output of an industry less the value of intermediate inputs required in the production process. Many economists regard value add as a more accurate measure of contribution to an economy. Compared to all manufacturing industries, chemicals ranked 3rd on the basis of value added in 2012 (latest available, Figure 3).

Figure 3: Top 10 manufacturing industries by value added, $ billion



Employment

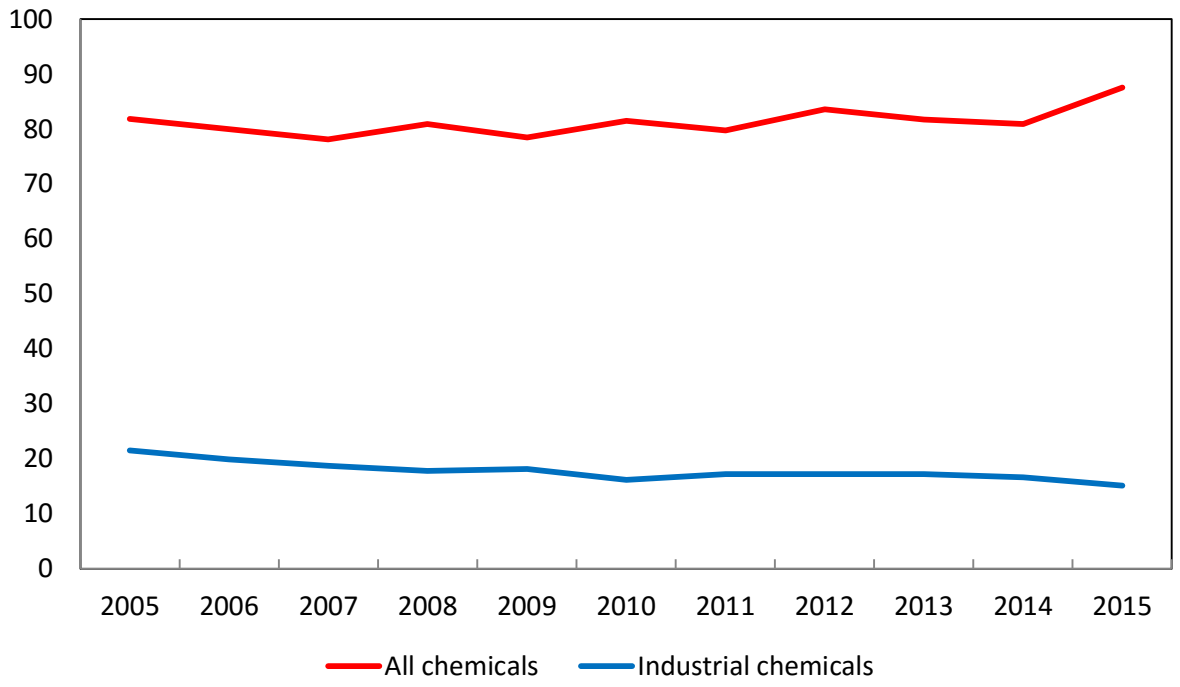
The chemical industry employed 87,500 workers in 2015. For industrial chemicals, the figure was 15,000. For both groupings, employment peaked in 2003 and has tended to decline since, although there was some bounce-back following the recession (Table 4 and Figure 4).

In addition to the direct jobs, additional jobs are supported by the purchasing activity of the chemical industry and by the subsequent expenditure-induced activity. For every job in the chemical industry, it is estimated that another 5 jobs in other sectors are indirectly linked to the industry. On this basis, the chemical industry supports about 525,000 jobs in the overall Canadian economy.

Table 4: Employment in the Canadian chemical industry

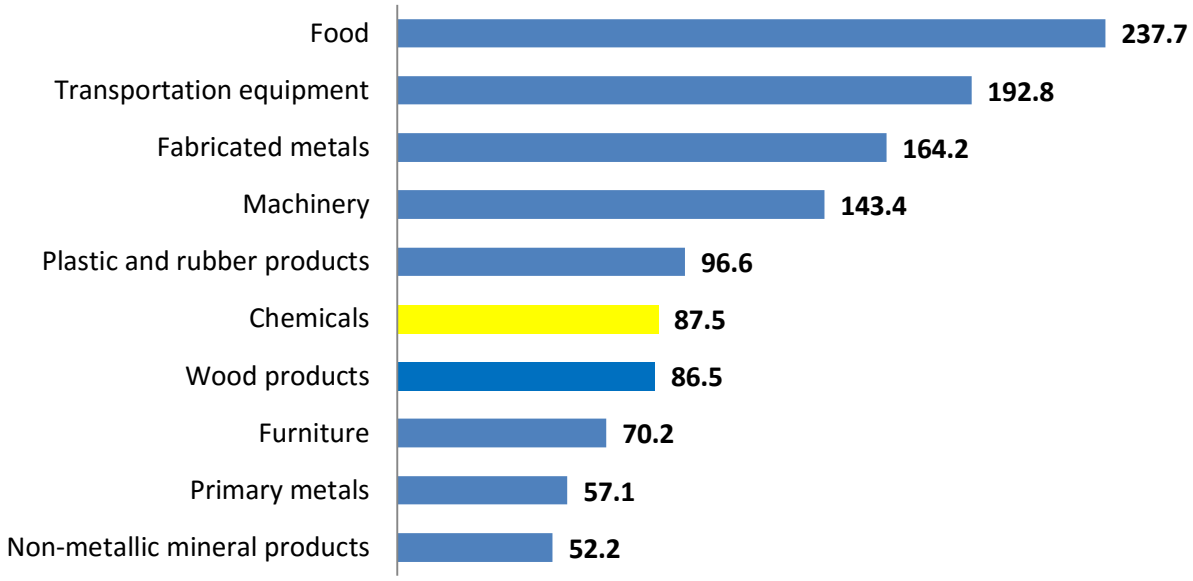
Total employment, 000	2014	2015	Change 2014-15
All chemicals	80.9	87.5	8.2%
Industrial chemicals	15.1	15.0	-0.3%

Figure 4: Chemical industry employment (thousands)



On the basis of employment, chemicals ranks 6th among all manufacturing industries (Figure 5).

Figure 5: Top 10 manufacturing industries by employment, thousands



Salaries and wages

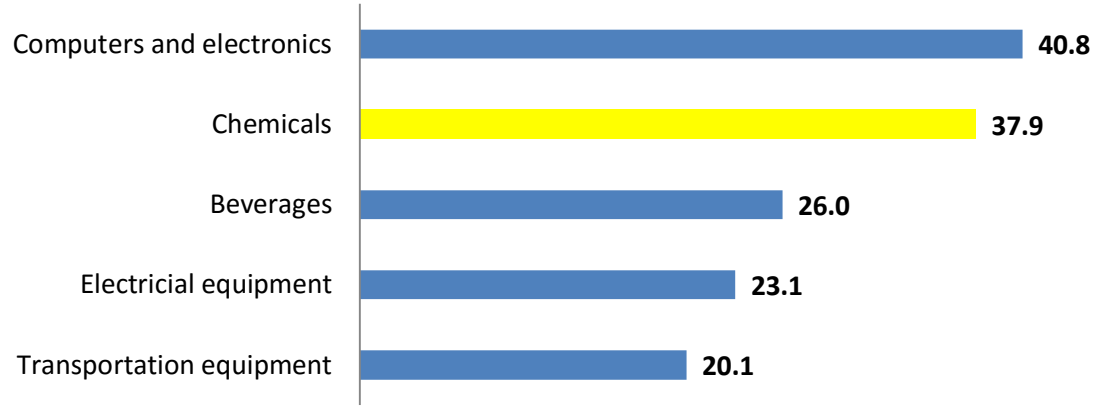
Total salaries and wages paid to employees in the chemical industry in 2015 were $6.3 billion, with $1.4 billion paid within the industrial chemical segment (Table 5).

Table 5: Total salary and wages paid by the chemical industry

Total salaries and wages, $ billion	2014	2015	Change 2014-15
All chemicals	5.4	6.3	16.9%
Industrial chemicals	1.3	1.4	13.9%

Chemical companies operate a variety of types of complex equipment and processes using sophisticated computer control technologies. Employees require specialized education and training in order to operate these processes safely and efficiently. As a result, the chemical industry's proportion of employees with a university degree (38%) is second only to the computer and electronic products industry (Figure 6), and chemicals has the highest proportion of employees with post-graduate degrees.

Figure 6: Top 5 manufacturing industry by proportion of employees with university degree, %



Due to this highly-skilled workforce, chemicals is a well-paid industry, ranking 3rd among all manufacturing industries (Figure 7). For overall manufacturing, the average salary in 2015 was $54,400. For chemicals this was $72,000 and higher still for industrial chemicals at $96,400 (Table 6).

Figure 7: Top 10 manufacturing industries based on average earnings per employee, $000

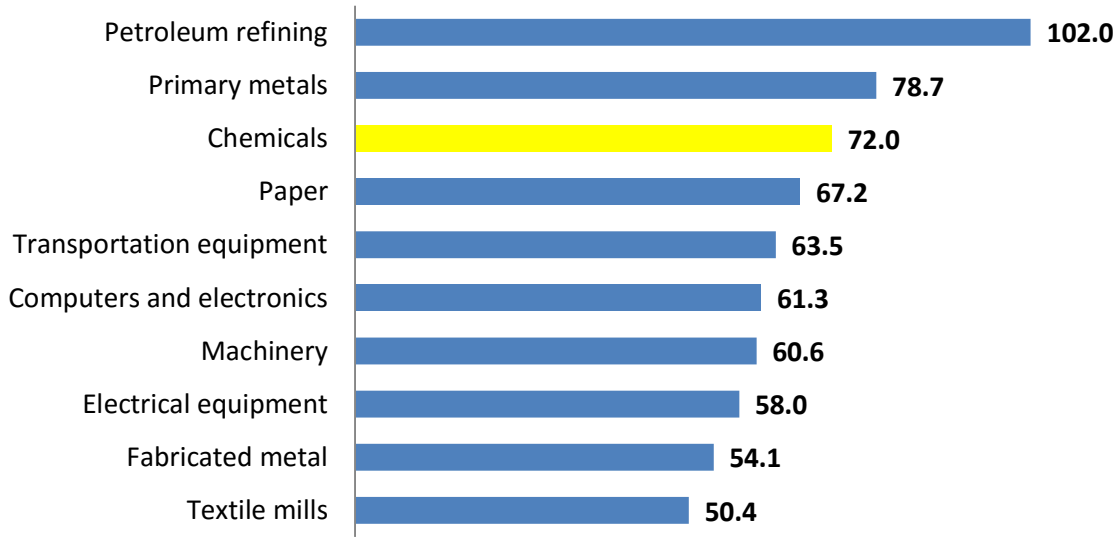


Table 6: Average salary and wages paid by the chemical industry

Average salaries and wages, $000	2014	2015	Change 2014-15
All chemicals	66.7	72.0	8%
Industrial chemicals	84.4	96.4	14.3%

International trade

Canada exported $38 billion worth of chemicals and chemical products to the world in 2015, an increase of 7% from 2014. Canadian imports also increased by 7% to $54 billion (Table 7 and Figure 8). The United States represents the dominant export market and the dominant source of imports. In 2015, 77% of exports went to the United States and 62% of imports originated there. The next largest export markets were: China (4%), and followed by Mexico, the United Kingdom, and Belgium (2% each). The next largest sources of imports were: Switzerland (5%), Germany (5%), China (3%) and France (3%).

For industrial chemicals, Canadian exports in 2015 were $19 billion, a decrease of 3% from 2014. Imports were $20 billion, growing 2% (Table 7 and Figure 9). Again the United States is the primary trading partner, receiving 77% of exports and responsible for 68% of imports. The next largest export markets were: China (7%), Mexico (3%), United Kingdom (2%) and Netherlands (2%). The next largest sources of imports were: China (5%), Germany (3%), Switzerland (2%) and France (2%).

Table 7: Trade in the chemical industry

Value of trade, $ billion	2014	2015	Change 2014-15
All chemicals			
- Imports	50.3	53.7	6.6%
- Exports	35.5	38.0	7.1%
Industrial chemicals			
- Imports	19.3	19.7	2.1%
- Exports	19.8	19.2	-2.9%

Figure 8: Trade by the total chemical industry, $ billion

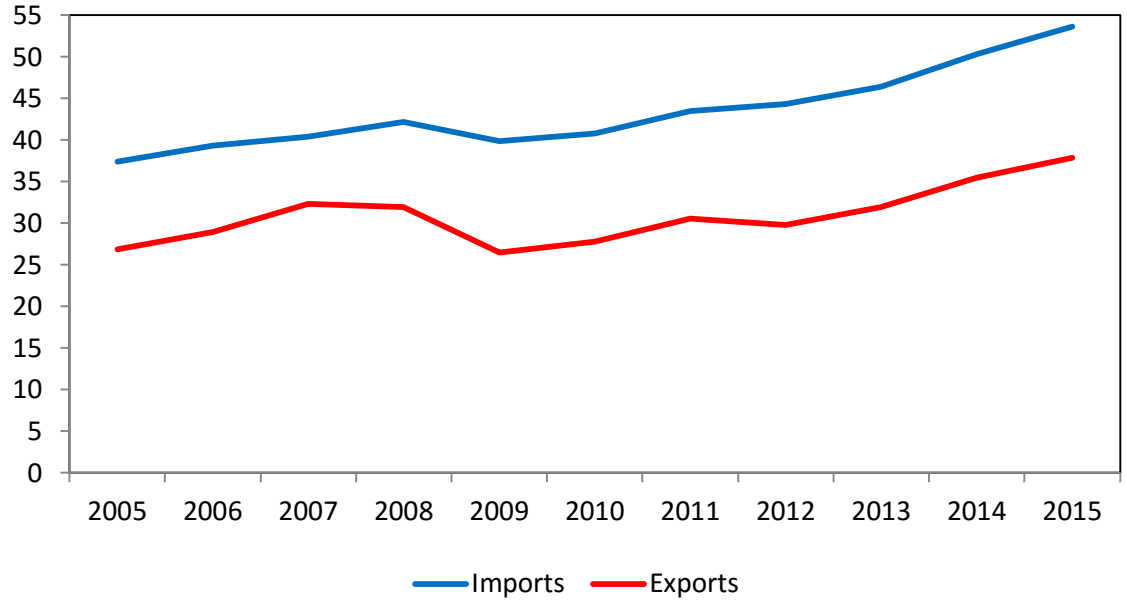
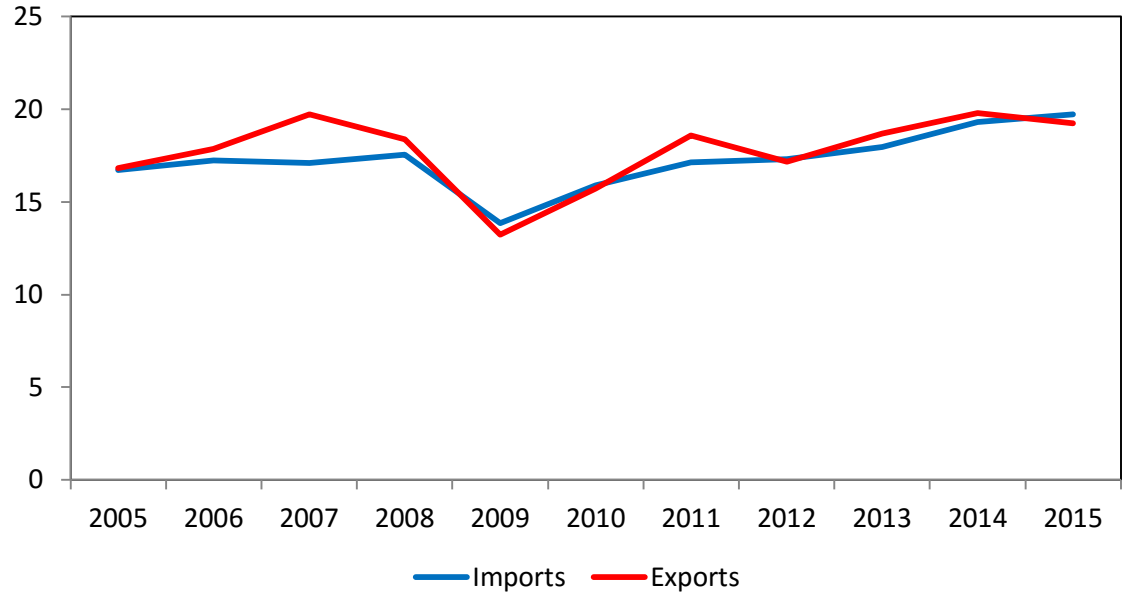
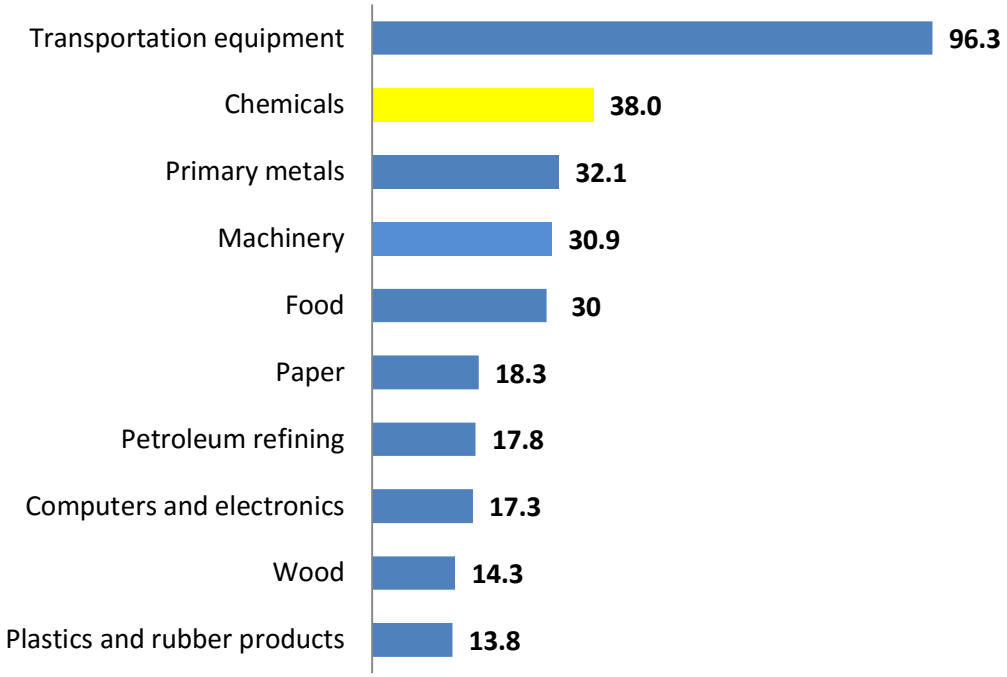


Figure 9: Trade in industrial chemicals, $ billion



Chemicals is the 2nd largest exporter among all manufacturing industries (Figure 10)

Figure 10: Top 10 manufacturing industries by exports, $ billion



Profits

Profits for the chemical sector depend on factors such as capacity utilization, energy and raw material costs, supply-demand balance and competition with foreign producers. Operating profits for the total chemical industry were $8.4 billion in 2015, the best year ever, and $4.2 billion for industrial chemicals, also setting a new record (Table 8).

Table 8: Operating profits in the chemical industry,

Operating profit, $ billion	2014	2015	Change 2014-15
Total chemicals	8.3	8.4	2.2%
Industrial chemicals	4.1	4.2	2.3%

Productivity

One measure of manufacturing productivity is the value of revenue per employee. For all chemicals, output per employee has only shown small growth over the past decade, from $594,000 in 2005 to $603,000 in 2015 (Table 9). Output per employee is much higher for industrial chemicals reflecting the capital intensive nature of this industry compare to chemicals overall. For industrial chemicals, output per employee increased from $1.3 million in 2005 to $1.8 million in 2015.

Table 9: Productivity

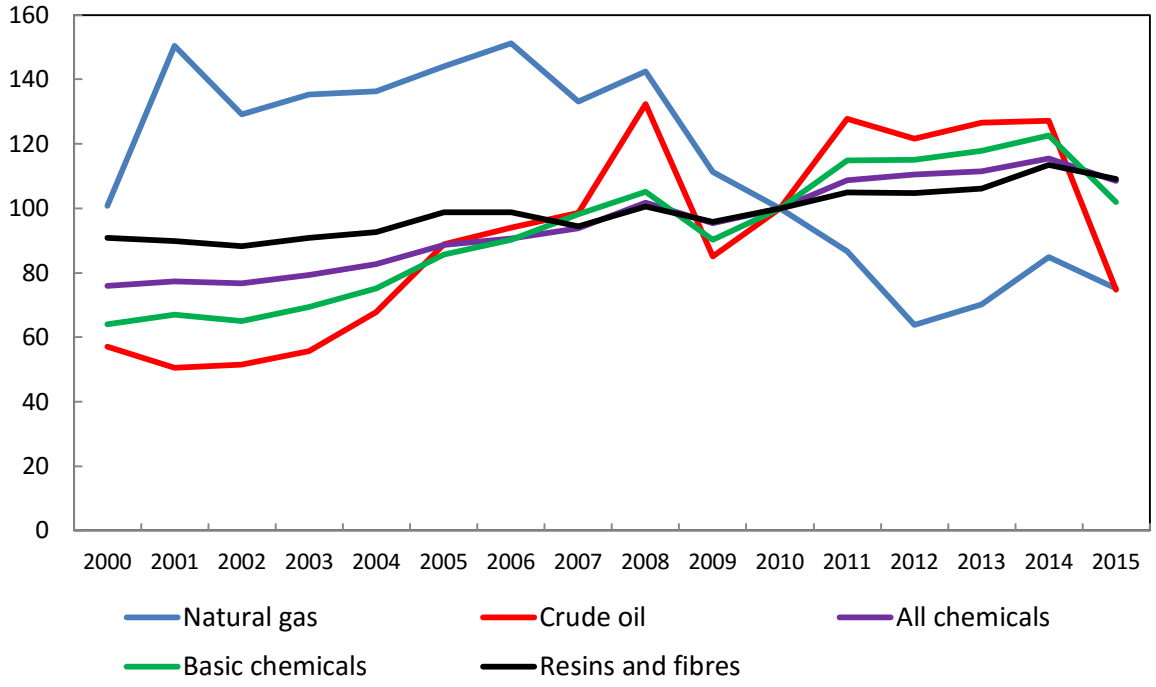
Output per employee, $000	2005	2015
All chemicals	594	603
Industrial chemicals	1313	1783

Price Index

The Industrial Product Price Index (IPPI) reflects the prices that producers in Canada receive as the goods leave the plant gate. It does not reflect what the consumer pays. Unlike the Consumer Price Index (CPI), the IPPI excludes indirect taxes and all the costs that occur between the time a good leaves the plant and the time the final user takes possession of it, including the transportation, wholesale, and retail costs.

Natural gas and crude oil are two important sources of feedstocks for the chemical industry. Natural gas and crude oil have shown very different price behaviour in recent years. Natural gas prices rose steadily until 2008, and have trended downward since then. The decline in gas prices has been driven primarily by the huge increases in North American supply coming from shale gas formations. By contrast, the crude oil price index trended upward until 2008, then declined in 2009 due to the global recession, but climbed steeply again in 2010 and 2011, leveled off in 2012 and 2013, and then fell sharply in 2014 and 2015 (Figure 11). All of the chemical indices also showed declines in 2015.

Figure 11: Price index, 2010=100

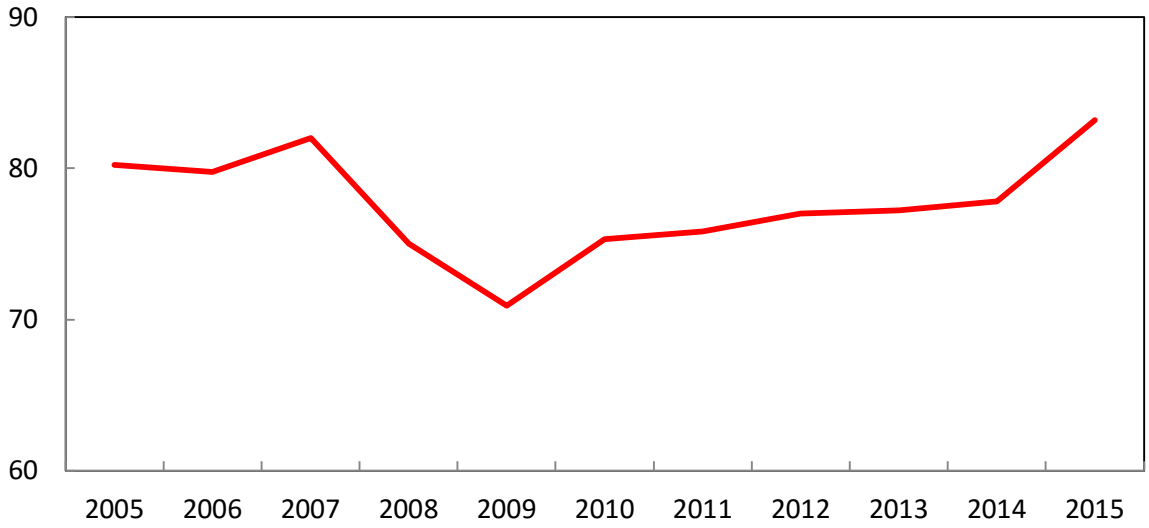


Capacity utilization

Capacity utilization refers to the extent to which an industry uses its installed productive capacity (Figure 12). Thus, it compares actual output with the maximum potential output that could be achieved if all capacity was fully used.

Since 2000, capacity utilization for the chemical industry has averaged 79%. In 2009, capacity utilization reached its lowest level since the statistic has been measured, falling under 70%. In 2015, average capacity utilization for the year was 83%, the highest number since 1996. While separate data is not available for industrial chemicals, it would be expected to have utilization rates higher than the industry average since continuous production processes are employed, whereas the segment of the industry producing formulated products relies on batch processes.

Figure 12: Capacity utilization in the overall chemical industry, %



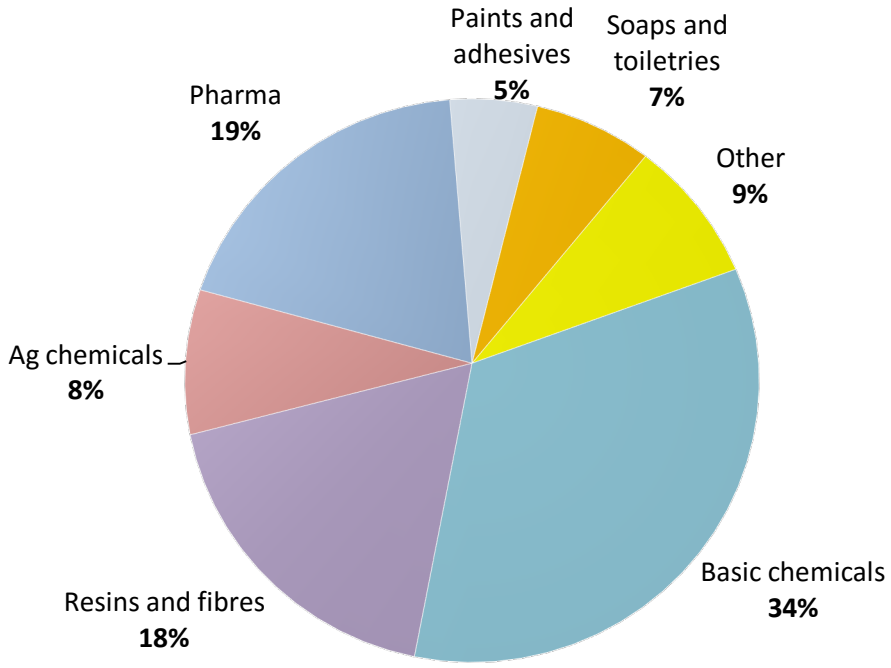
Other chemical manufacturing subsectors

As mentioned previously, the Canadian chemical industry is comprised of the following sub-industries:

- Basic chemicals (NAICS 3251)
- Synthetic resins and fibres (NAICS 3252)
- Pesticide, fertilizer and other agricultural chemicals (NAICS 3253)
- Pharmaceuticals (NAICS 3254)
- Paints, coatings and adhesives (NAICS 3255)
- Soaps, cleaning compounds and toilet preparations (NAICS 3256)
- Other chemical products (NAICS 3259).

Figure 13 shows the relative size of these industries by shipment value in 2015. Industrial chemicals accounts for over half of the total industry.

Figure 13: Distribution by chemical sub-industries based on shipments



While NAICS 3251 and 3252 are the focus of this report, the following tables provide some data on the other sub-industries.

Table 10: Principal statistics for pesticides, fertilizers and other agricultural chemicals (NAICS 3253)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2006	3,747	3,807	1,544	1,564
2007	4,235	4,067	1,745	1,678
2008	5,234	4,433	2,405	2,401
2009	4,328	4,486	2,054	1,645
2010	3,869	4,161	1,974	1,594
2011	4,530	4,645	2,405	2,015
2012	4,811	5,235	2,700	2,141
2013	4,925	4,863	3,101	1,951
2014	4,681	5,170	3,358	1,715
2015	4,578	6,275	3,578	2,057

Table 11: Principal statistics for pharmaceuticals (NAICS 3254)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2006	9,492	28,016	11,369	5,442
2007	8,047	27,465	12,334	6,802
2008	7,807	28,869	12,661	6,768
2009	8,143	30,012	14,539	7,569
2010	8,062	31,749	13,331	6,158
2011	7,742	30,249	13,597	5,895
2012	8,613	31,802	13,517	5,549
2013	8,560	31,808	13,706	6,054
2014	8,891	30,570	15,387	8,301
2015	10,112	32,180	16,820	10,486

Table 12: Principal statistics for paints, coatings and adhesives (NAICS 3255)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2006	2,609	7,940	1,494	705
2007	2,799	8,020	1,512	691
2008	2,664	8,729	1,485	604
2009	2,601	7,371	1,473	423
2010	2,399	6,742	1,586	409
2011	2,145	6,111	1,633	474
2012	2,750	7,391	1,825	535
2013	2,648	7,782	1,902	528
2014	2,808	8,375	2,055	596
2015	2,712	9,070	2,321	723

Table 13: Principal statistics for soaps, cleaning compounds and toilet preparations (NAICS 3256)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2006	2,984	11,147	3,619	2,037
2007	2,942	10,883	3,712	2,043
2008	2,954	10,791	4,060	2,143
2009	2,933	10,666	4,330	2,125
2010	2,788	10,724	4,303	2,183
2011	2,859	10,803	4,274	2,334
2012	2,978	11,236	4,566	2,447
2013	3,269	10,927	4,934	2,665
2014	3,376	11,295	5,312	2,907
2015	3,668	14,065	6,073	3,281

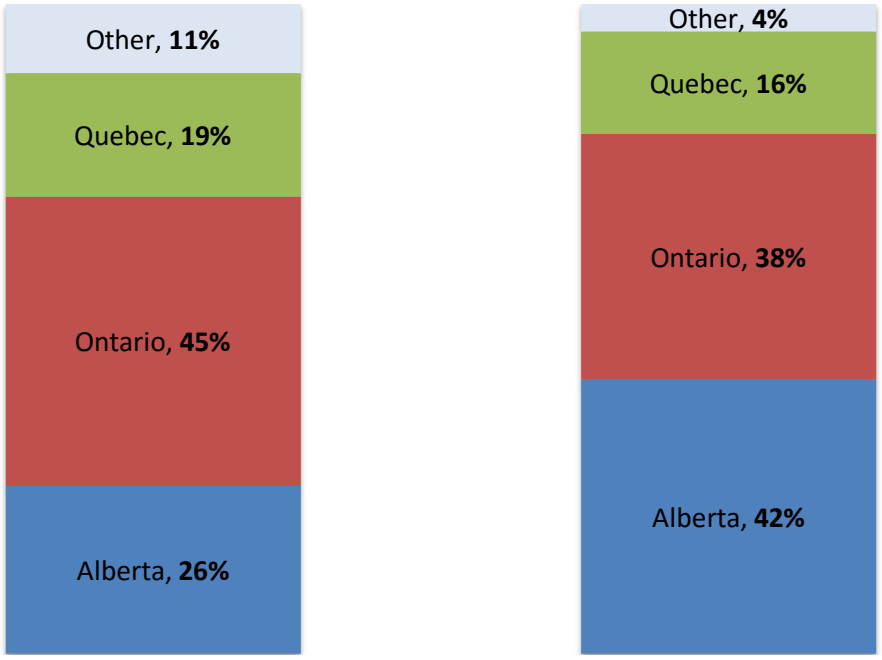
Table 14: Principal statistics for other chemical products (NAICS 3259)

	Shipments, $ million	Employment	Imports, $ million	Exports, $ million
2006	4,176	10,341	4,095	1,321
2007	3,955	9,829	4,028	1,388
2008	3,870	9,987	3,970	1,687
2009	3,808	9,743	3,675	1,499
2010	4,269	10,908	3,732	1,723
2011	4,521	10,759	4,363	1,913
2012	4,694	10,749	4,460	1,966
2013	4,843	10,168	4,798	2,055
2014	4,882	10,875	4,889	2,179
2015	4,427	11,160	5,150	2,254

Provincial statistics

Both the overall chemical industry and the industrial chemicals segment are concentrated in the provinces of Ontario, Alberta and Quebec (Figure 14).

Figure 14: Provincial distribution of the chemical industry, by value of shipments

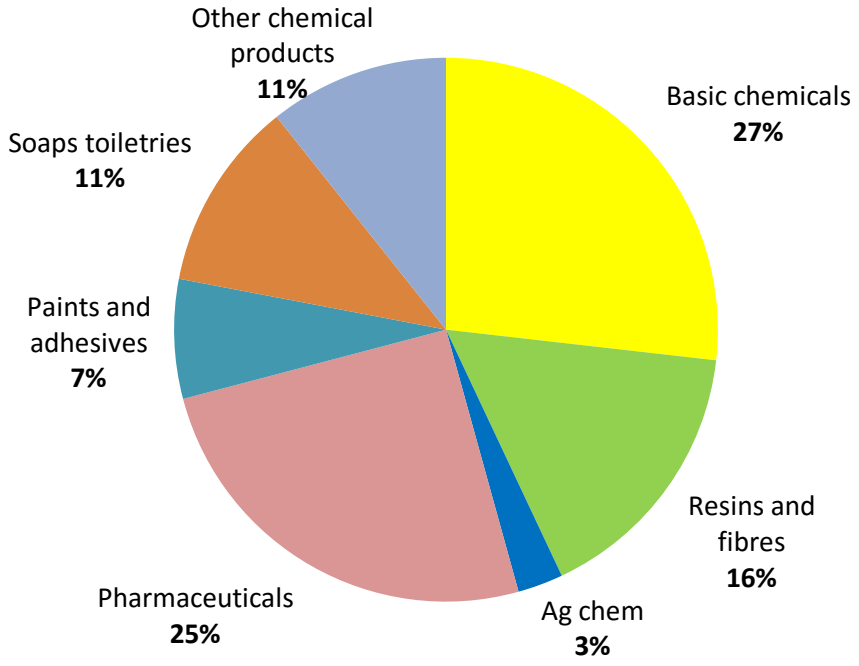


Further information about these three main provinces is contained in the following portions of the analysis.

a. Ontario

In 2015, Ontario's chemical industry had shipments of $24 billion and over 40% of this was comprised of industrial chemicals (Figure 15).

Figure 15: Composition of the Ontario chemical industry



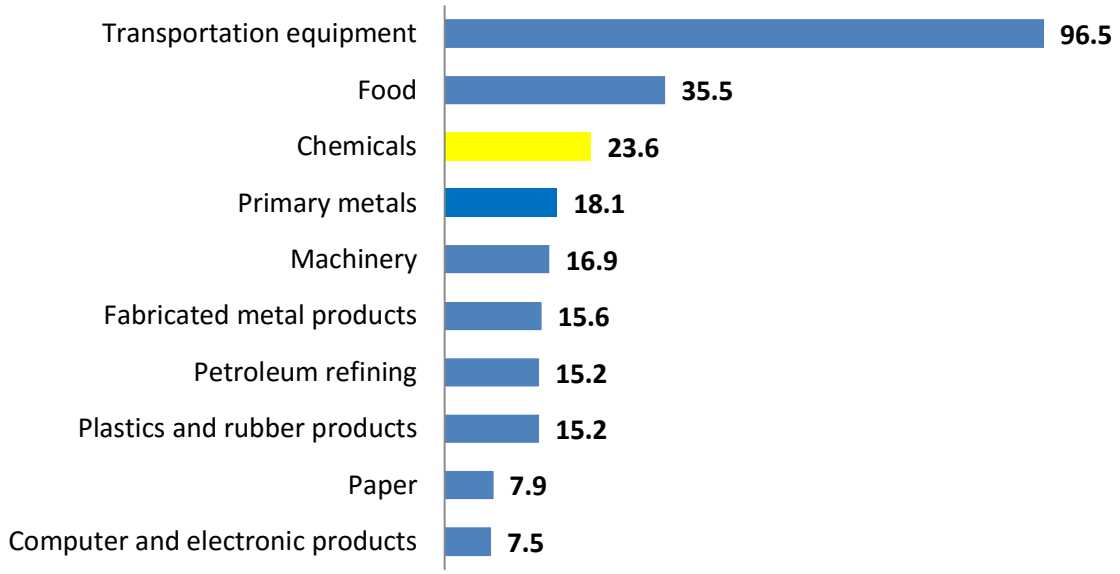
The value of industrial chemical shipments dropped substantially in 2015 to $10 billion (Table 15). This decline was due primarily to lower commodity selling prices rather than due to reduced production volumes. The largest cluster for the industrial chemical industry is located in the Sarnia region, with the next largest concentrations in the Golden Horseshoe and along the St. Lawrence Seaway.

Table 15: Ontario chemical industry shipments

Shipments, $billion	2014	2015	Change 2014-15
All chemicals	24.7	23.6	-4.6%
Industrial chemicals	12.3	10.1	-17.4

Chemicals was the 3rd largest of all manufacturing industries in the province in 2015, on the basis of shipments (Figure 16).

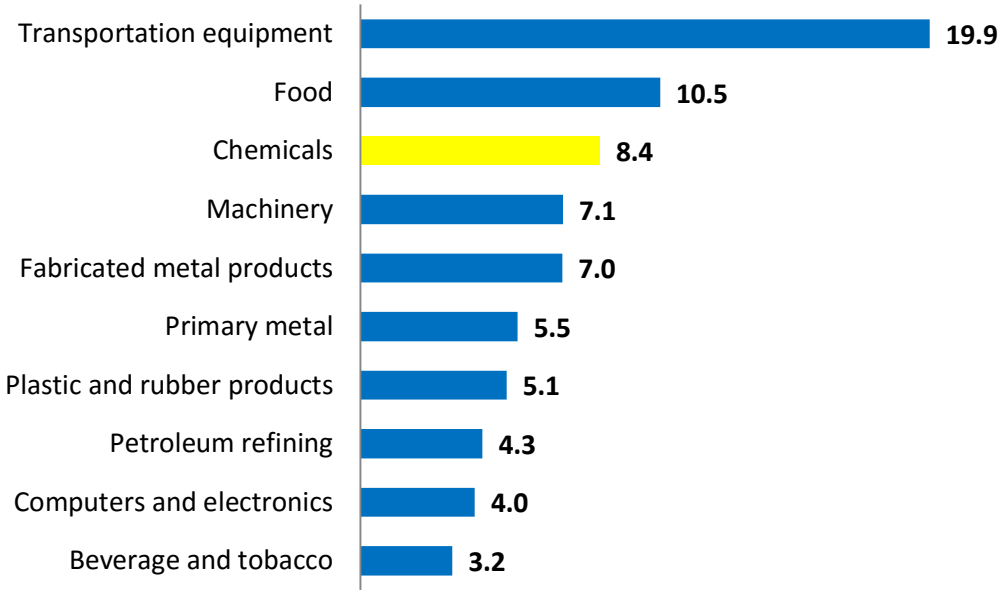
Figure 16: Top 10 manufacturing industries in Ontario by value of shipments ($billion)



- **Value added**

On the basis of value added, chemicals also ranked 3rd among all manufacturing industries in 2012 (latest data available) (Figure 17).

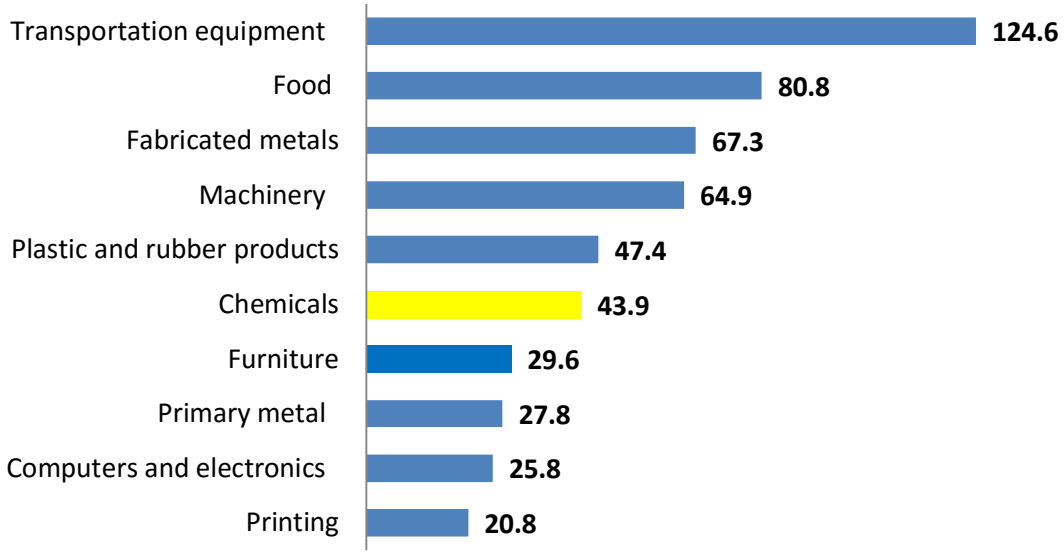
Figure 17: Top 10 manufacturing industries by value added in Ontario ($ billion)



Employment ranking

The chemical industry directly employed 43,900 people in Ontario in 2015, up 8% from 2014. When indirect employment is included, it is estimated that the chemical industry supports over 260,000 jobs in the province. The number of employees working in industrial chemicals was 6,180, down 4% from 2014, and representing 41% of the national total. When compared to other manufacturing industries, chemicals ranked 6th on the basis of employment (Figure 18).

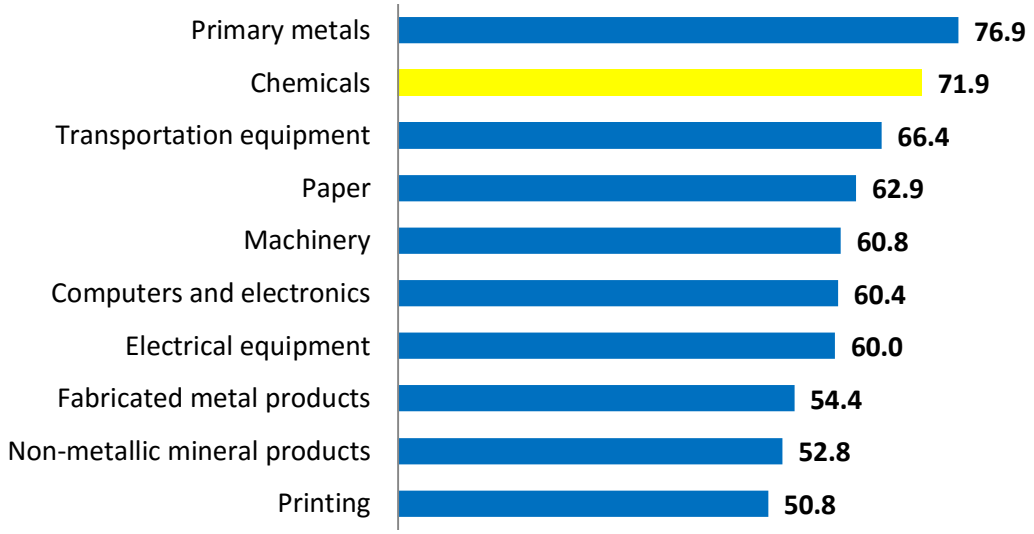
Figure 18: Top 10 manufacturing industries by employment in Ontario (thousands)



Salaries and wages

The chemical industry paid a total of $2.9 billion in salaries and wages in the province in 2015. With an average annual salary of $71,900, the industry ranked 2nd among all manufacturing industries in Ontario (Figure 19). The average salary within industrial chemicals was much higher at $89,500. The average salary across all manufacturing industries in Ontario was $58,100.

Figure 19: Top 10 manufacturing industries by average salary in Ontario ($000)



• Trade

The value of exports by the chemical industry from Ontario in 2015 was $20 billion, while imports were $36 billion (Table 16). The United States was the destination for 76% of exports, followed by Italy (3%) and the United Kingdom (3%). The United States was also the source for most of the imports (62%), followed by Switzerland (7%), Germany (4%) and France (3%).

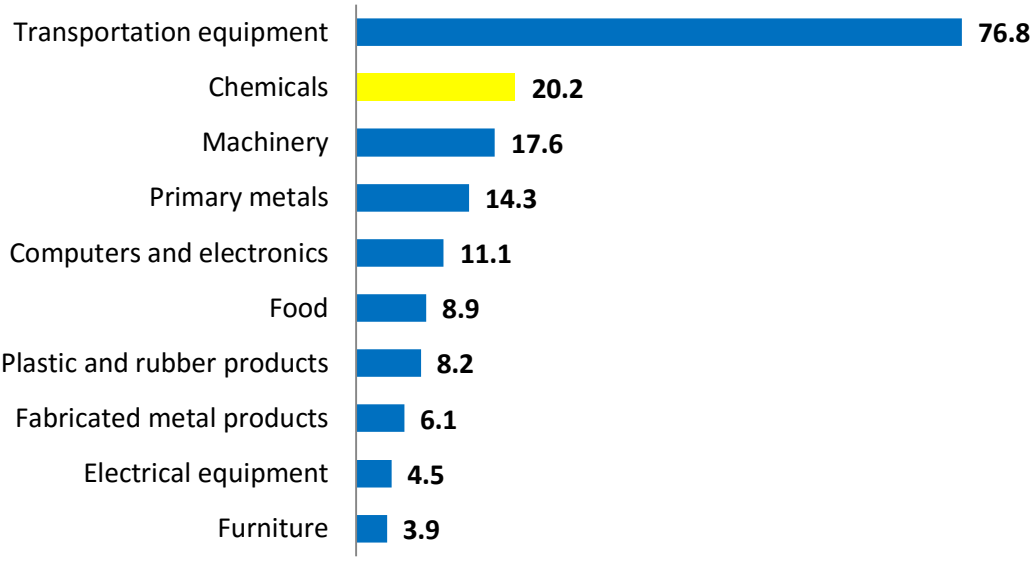
For industrial chemicals, exports from the province in 2015 were $8 billion, while imports were $12 billion. The United States was the destination for 78% of exports, followed by the United Kingdom (5%), and China and Netherlands (3% each). The United States was also the source of most of the imports (70%), followed by China (4%), and Switzerland and France (3% each).

Table 16: Trade by the chemical industry in Ontario

Value of trade, $ billion	2014	2015	Change 2014-15
All chemicals			
- Imports	32.6	35.9	10.0%
- Exports	18.8	20.2	7.4%
Industrial chemicals			
- Imports	10.9	11.6	6.5%
- Exports	8.0	7.8	-3.0%

Chemicals is the 2nd largest exporter among all manufacturing industries (Figure 20).

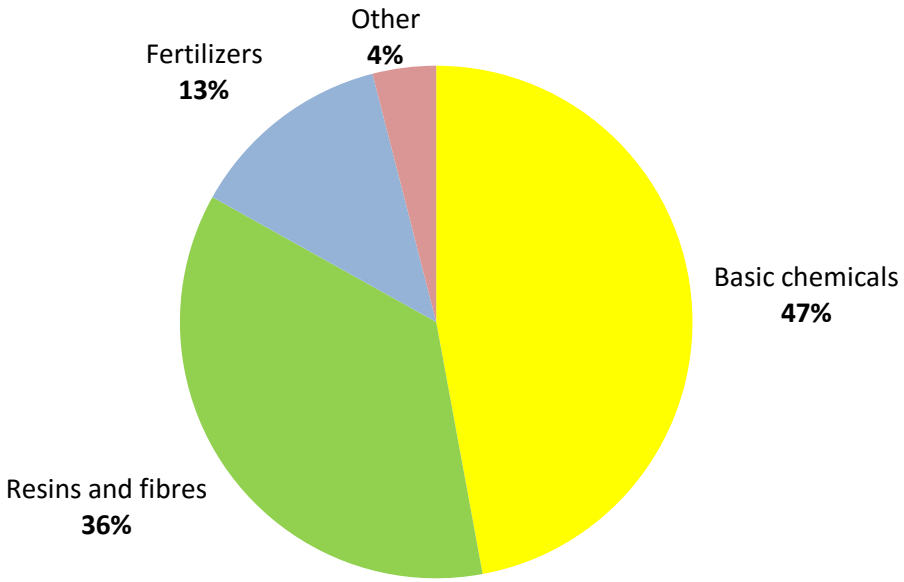
Figure 20: Top 10 manufacturing industries by value of exports from Ontario ($ billion)



b. Alberta

In 2015, Alberta's chemical industry had shipments of $14 billion (Table 17). Over three-quarters of the total was comprised of industrial chemicals. (Figure 21).

Figure 21: Composition of the Alberta chemical industry



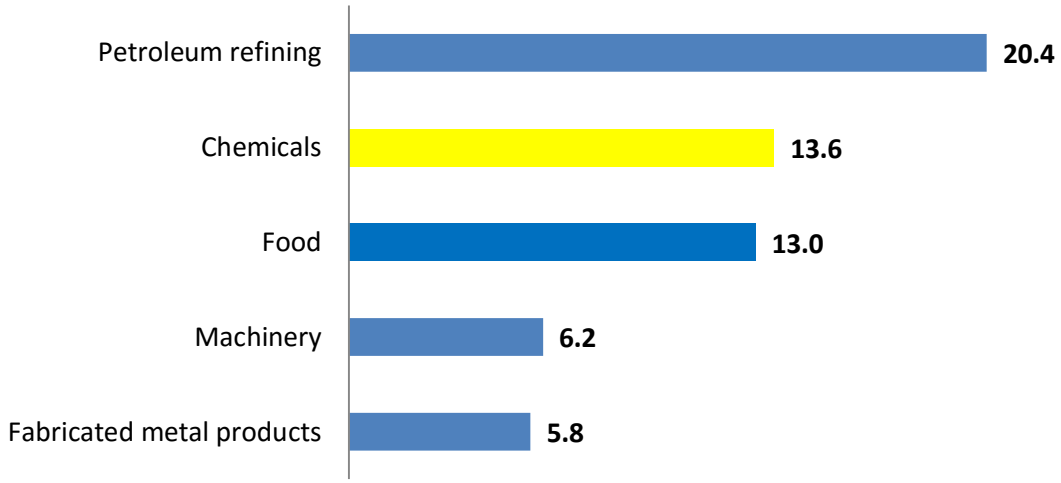
The value of industrial chemical shipments in 2015 were $11.3 billion. There are two main clusters for the industrial chemical industry in Alberta. One is the region to the northeast of Edmonton, and the second is situated in central Alberta, near Red Deer.

Table 17: Alberta chemical industry shipments

Shipments, $billion	2014	2015	Change 2014-15
All chemicals	14.2	13.6	-4.2%
Industrial chemicals	11.9	11.3	-4.9%

Chemicals was the 2nd largest manufacturing industry in the province in 2015, on the basis of shipments (Figure 22).

Figure 22: Top 5 manufacturing industries in Alberta by value of shipments, $billion[5]

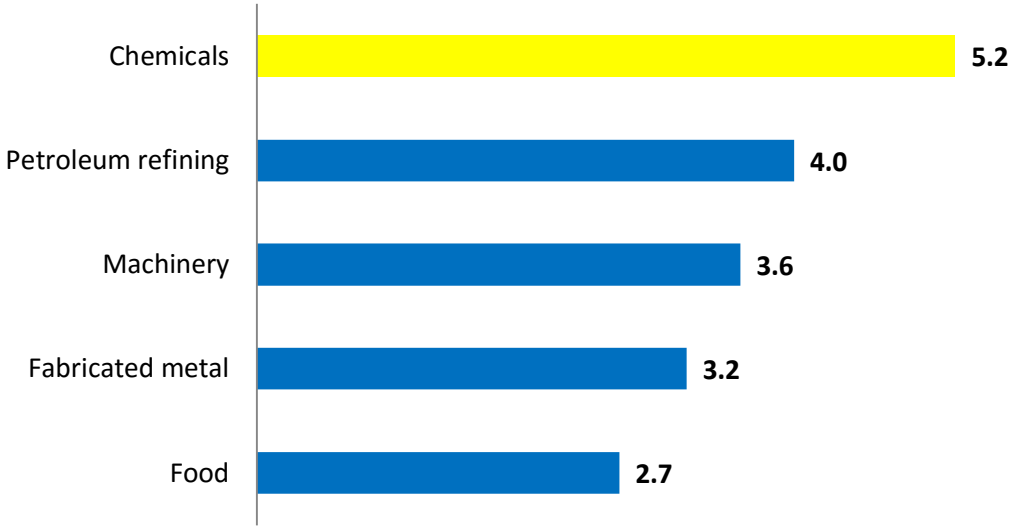


• Value added

On the basis of value added, chemicals ranked 1st among all manufacturing industries in Alberta (Figure 23) based on 2012 data (latest available). The higher ranking compared to shipments reflects the fact that the chemical industry is a high-value adding manufacturing activity.

[5] The top 10 industries cannot be ranked because too many industries have been suppressed by Statistics Canada after the top 5.

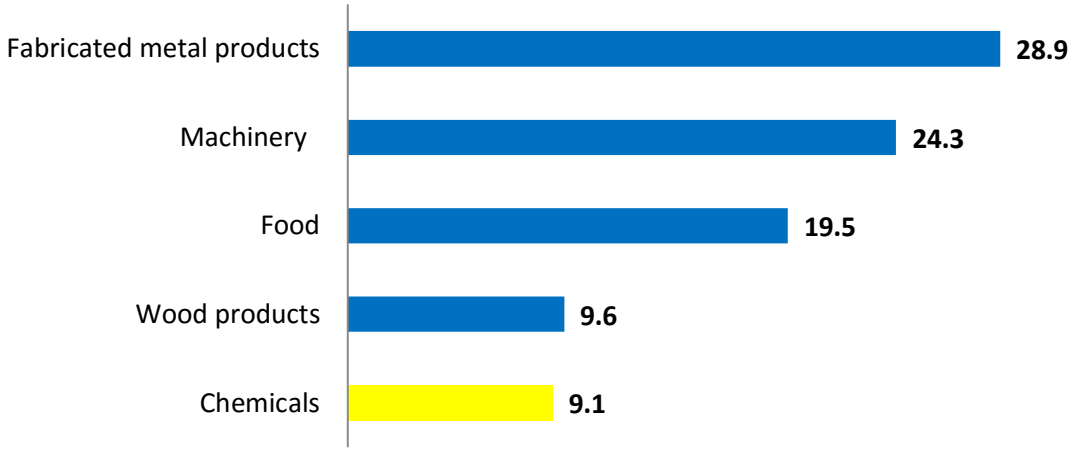
Figure 23: Top 5 manufacturing industries by value added in Alberta ($ billion)



• Employment ranking

The chemical industry employed 9,070 people in Alberta in 2015, up 16% compared to 2014. When indirect employment is included, it is estimated that the chemical industry supports about 54,000 jobs in the province. The number of employees working in industrial chemicals in 2015 was 4,580. When compared to other manufacturing industries in the province, chemicals ranked 5th (Figure 24).

Figure 24: Top 5 manufacturing industries by employment in Alberta (thousands)



• Salaries and wages

The chemical industry paid a total of $1 billion in salaries and wages in the province in 2015. The average salary paid to employees in the chemical industry was $109,900, which ranked 1st among all manufacturing industries (Figure 25). (NB: Petroleum refining would be in the top 5 but its data has been suppressed). The average salary for industrial chemicals was higher still at $122,800. For all manufacturing the average salary in the province was $65,100.

Figure 25: Top 5 manufacturing industries by average salary in Alberta ($000)

• Trade

The value of exports by the chemical industry from Alberta in 2015 was $8.5 billion, while imports were $2.7 billion (Table 18). The United States was the destination for 82% of exports, followed by China (10%) and Mexico (3%). The United States was also the source of most imports (80%), followed by China (4%) and Germany (3%).

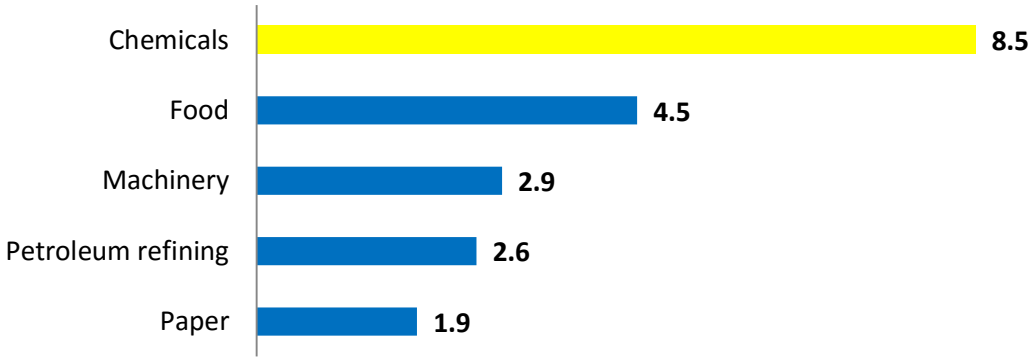
For industrial chemicals, exports from the province in 2015 were $7.0 billion, while imports were $1.3 billion. The United States was the destination for 79% of exports, followed by China (12%), and Mexico (4%). The United States was the source of most imports (78%), followed by China (7%), and Germany (4%).

Table 18: Trade by the chemical industry in Alberta

Value of trade, $ billion	2014	2015	Change 2014-15
All chemicals			
- Imports	2.9	2.7	-5.9%
- Exports	8.7	8.5	-1.6%
Industrial chemicals			
- Imports	1.5	1.3	-10.8%
- Exports	7.5	7.0	-6.0%

Chemicals ranks 1st among manufacturing industries in terms of exports from Alberta (Figure 26). For all commodities, chemicals ranked 2nd behind crude oil and ahead of natural gas in 2015.

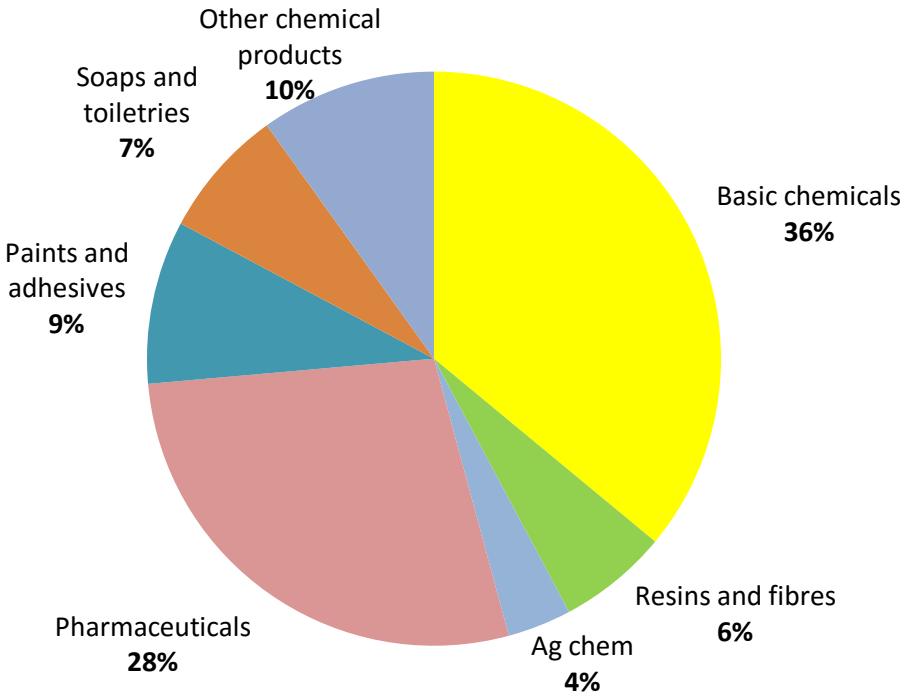
Figure 26: Top 10 manufacturing industries by value of exports from Alberta ($ billion)



c. Quebec

In 2015, Quebec's chemical industry had shipments of $10 billion and over 40% was comprised of industrial chemicals (Figure 27).

Figure 27: Composition of the Quebec chemical industry



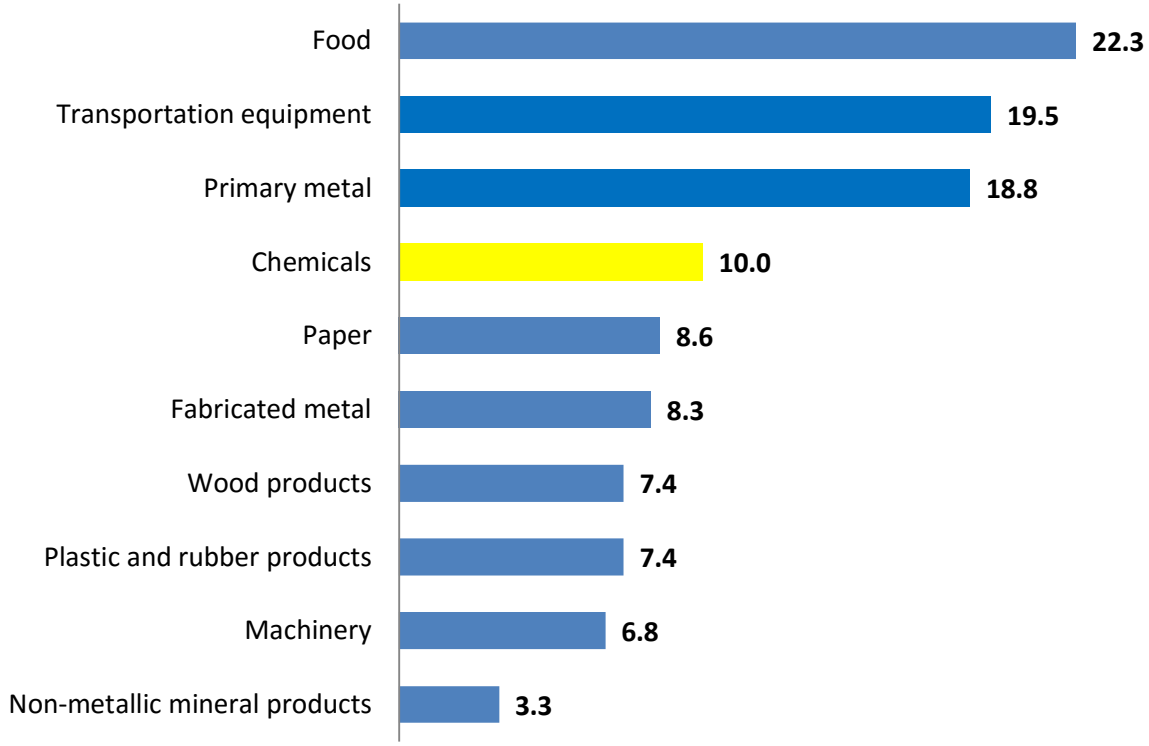
Shipments of industrial chemicals $4.2 billion (Table 19). The industrial chemical industry in Quebec is concentrated in the eastern end of Montreal and along the south shore of the St. Lawrence.

Table 19: Quebec chemical industry shipments

Shipments, $billion	2014	2015	Change 2014-15
All chemicals	9.9	10.0	1.6%
Industrial chemicals	4.2	4.2	1.1%

Chemicals was the 4th largest manufacturing industry on the basis of shipments (Figure 28).

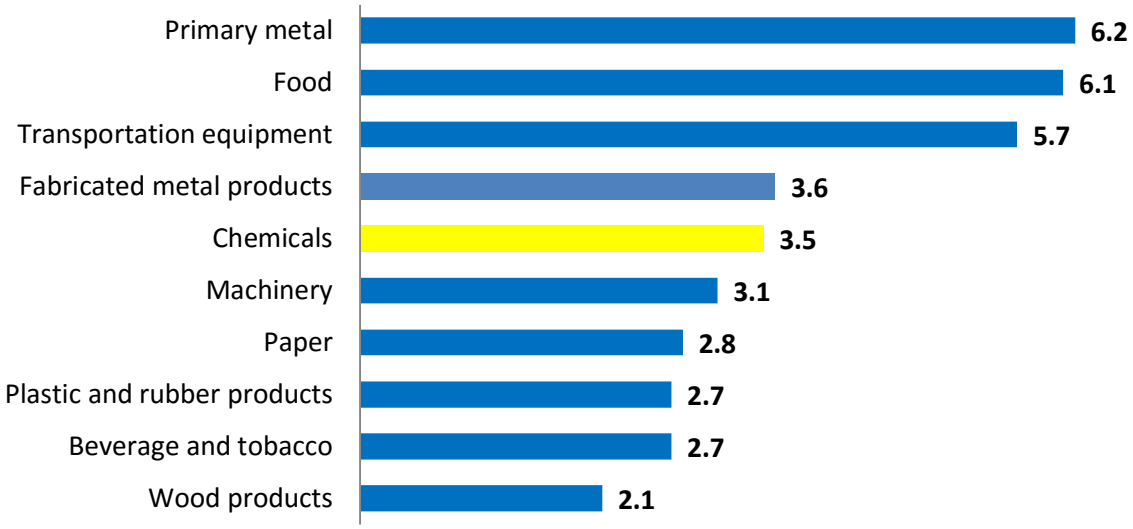
Figure 28: Top 10 manufacturing industries in Quebec by value of shipments ($billion)



• Value added

On the basis of value added, chemicals ranked 5th among all manufacturing industries in Quebec (Figure 29).

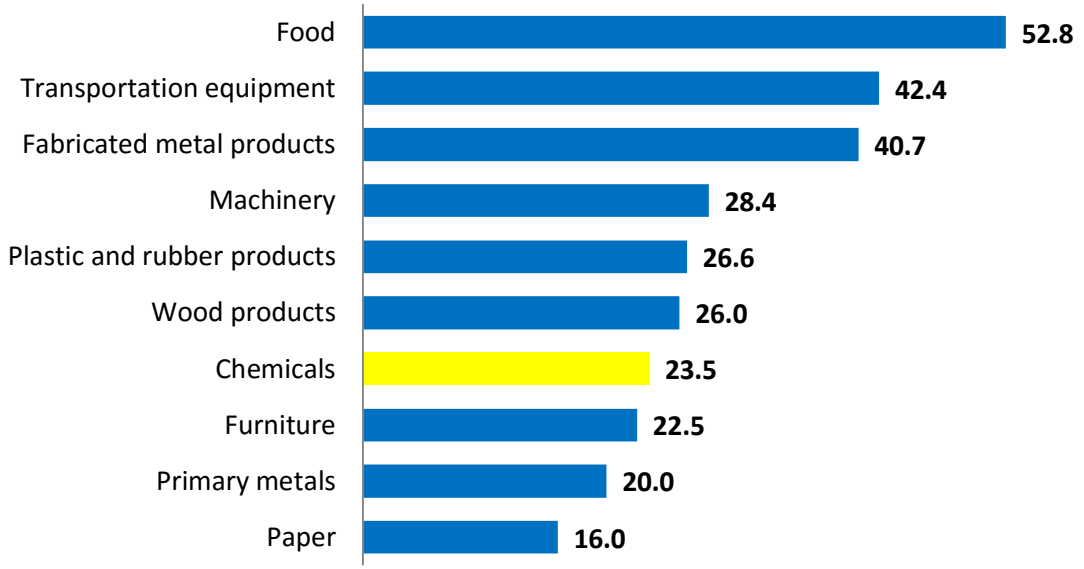
Figure 29: Top 10 manufacturing industries by value added in Quebec ($ billion)



• Employment ranking

The chemical industry employed 23,500 people in Quebec in 2015. When indirect employment is included, it is estimated that the chemical industry supports 140,000 jobs in the province. The industrial chemical industry employs 2,955 in the province. When compared to all manufacturing industries in the province, chemicals ranked 7th (Figure 30).

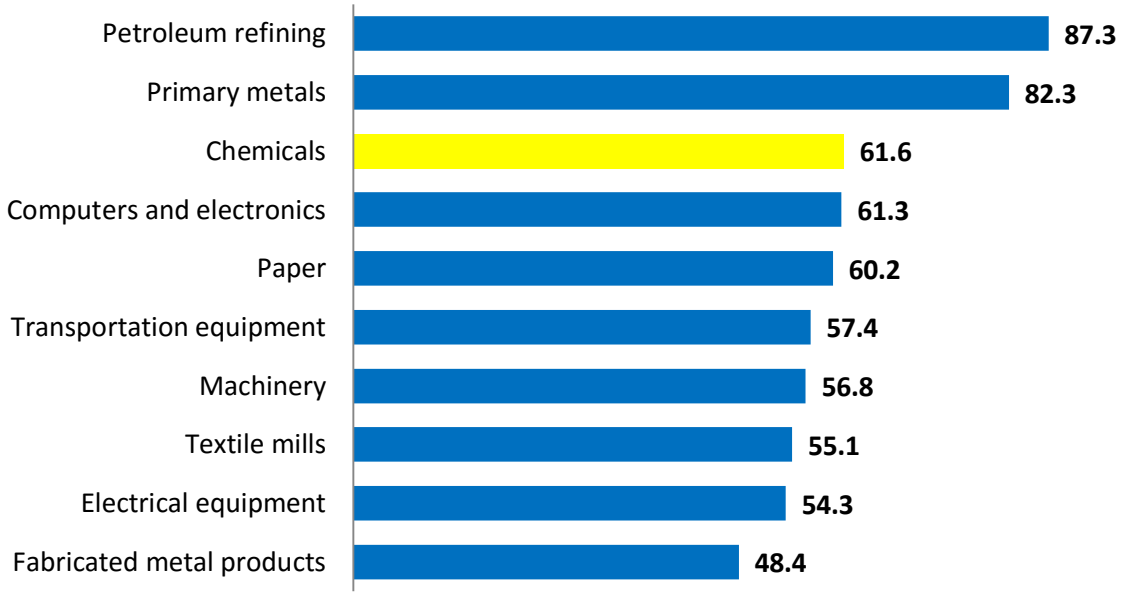
Figure 30: Top 10 manufacturing industries by employment in Quebec (thousands



Salaries and wages

The chemical industry paid a total of $1.4 billion in salaries and wages in the province in 2015, corresponding to an average annual salary of $61, 600, which placed the industry 3rd in Quebec (Figure 31). The average salary for industrial chemicals was $82,600. For all manufacturing, the average salary in the province was $51,200.

Figure 31: Top 10 manufacturing industries by average salary in Quebec ($000)



Trade

The value of exports by the chemical industry from Quebec in 2015 was $5.6 billion and imports were $8.0 billion (Table 20). The United States was the destination for 78% of exports, followed by Mexico (3%), and Belgium (2%). Quebec is different from the other provinces in that a much lower proportion of its imports come from the United States (43%), followed by Germany (11%), France (6%) and Ireland (5%).

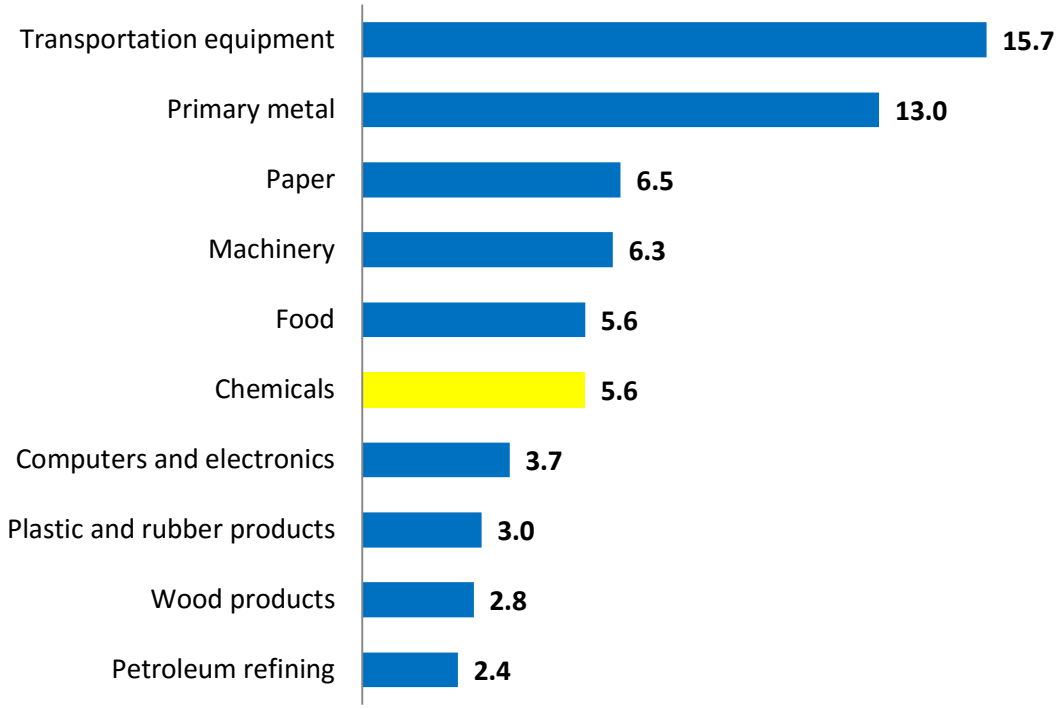
For industrial chemicals, exports from the province in 2015 were $2.5 billion, while imports were $3.9 billion. The United States was the destination for 85% of exports, followed by Mexico (4%). The United States was the source of 56% of imports, followed by China (5%), and Germany, Kazakhstan, Belgium and Namibia (3% each).

Table 20: Trade by the chemical industry in Quebec

Value of trade, $ billion	2014	2015	Change 2014-15
All chemicals			
- Imports	8.0	8.0	-0.8%
- Exports	5.2	5.6	7.2%
Industrial chemicals			
- Imports	4.0	3.9	-2.6%
- Exports	2.6	2.5	-6.1%

Compared to all other manufacturing industries, chemicals was the 6th largest export industry (Figure 32).

Figure 32: Top 10 manufacturing industries by value of exports from Quebec ($ billion)



Industry profiles

The segments of the chemical industry of primary interest to CIAC members are profiled according to the following categories:

- Petrochemicals and other organic chemicals
- Inorganic chemicals
- Synthetic resins, rubbers and fibres
- Specialty chemicals

a. Petrochemicals and other organic chemicals

Statistics Canada reports data on organic chemicals in two industry groups:

- NAICS 32511 – Petrochemicals
- NAICS 32519 – Other organic chemicals.

The petrochemicals industry only includes hydrocarbons. The main petrochemicals produced by CIAC members in Canada are ethylene, propylene, butylenes, butadiene, higher olefins, alkanes, benzene, toluene, xylenes, and styrene. Ethylene is the largest-volume petrochemical; it is always consumed very close to the point of production so almost none is traded.

Organic chemicals that contain atoms other than hydrogen and carbon are captured in the other organic chemicals industry. CIAC members are producers of all of the largest-volume chemicals in this category in Canada: methanol, isopropyl alcohol, and ethylene glycol.

Principal statistics for these industries are shown in Table 1.

Table 1: Principal statistics for petrochemicals and other organic chemicals

	2011	2012	2013	2014	2015
Establishments					
Petrochemicals	19	20	25	26	27
Other organic chemicals	135	135	135	135	140
Shipments $M					
Petrochemicals	7,529	7,151	8,713	8,852	6,216
Other organic chemicals	4,318	3,960	4,848	4,826	4,780
Employment					
Petrochemicals	1,316	1,186	1,162	1,130	1,165
Other organic chemicals	2,292	2,297	2,251	2,190	2,260
Exports $M					
Petrochemicals	2,634	2,301	2,597	2,874	1,839
Other organic chemicals	3,608	3,402	3,777	4,231	3,962
Imports $M					
Petrochemicals	859	907	1,067	1,155	985
Other organic chemicals	5,634	5,601	6,035	6,510	6,748

• Commodity data

Statistics Canada reports production data for a limited number of organic chemicals as shown in Table 2.

Table 2: Canadian production of specific organic chemicals, kilotonnes

	2010	2011	2012	2013	2014
Benzene	639	589	569	529	670
Toluene	269	241	236	258	229
Xylenes	222	241	273	293	381
Butadiene	213	215	209	234	216
Butylenes	162	202	176	155	177
Propylene	660	601	624	616	550
Formaldehyde	158	159	161	154	165

More data exists for imports and exports than for domestic production. Table 3 shows the exports for a select range of organic chemicals, in both tonnage and dollar value terms.

Table 3: Canadian exports of select organic chemicals

	Value, $M	Quantity, kt	Top markets
Benzene	98	106	USA 86% Spain 6% Netherlands 6%
Butadiene	149	78	USA 100%
Ethylene glycol	1,319	1,410	USA 53% China 47%
Higher olefins	205	154	USA 98% Italy 1%
Isopropyl alcohol	109	85	USA 98% Mexico 1%
Methanol	105	237	USA 100%
Propylene	345	268	USA 100%
Styrene	616	518	USA 100%

• CIAC members producing petrochemicals and organic chemicals in Canada

- Akzo Nobel Chemicals Ltd.
- ARLANXEO
- BASF Canada
- BioAmber Inc.

- Chemtura Canada Co./Cie
- Dow Chemical Canada ULC
- Evonik Oil Additives Canada Inc.
- H.L. Blachford Ltd.
- Imperial
- INEOS Canada Partnership
- Jungbunzlauer Canada Inc.
- MEGlobal Canada ULC
- Methanex Corporation
- NOVA Chemicals Corporation
- PCAS Canada Inc.
- Shell Chemicals Canada
- Stepan Canada Inc.

b. Inorganic chemicals

Statistics Canada reports data on inorganic chemicals as part of basic chemicals within NAICS 32518. Under this category there are two sub-industry classifications:

- NAICS 325811 – Alkali and chlorine
- NAICS 325819 – Other inorganic chemicals.

Since 2010, shipment and employment data have been suppressed at the 6-digit NAICS level and only reported at the 5-digit level.

The main inorganic chemicals produced by CIAC members in Canada are: chlorine, sodium hydroxide, hydrochloric acid, hydrogen peroxide, sodium chlorate, sodium silicates, sulphuric acid, and titanium dioxide.

Principal statistics for these industries are shown in Table 1.

Table 1: Principal statistics for inorganic chemicals

	2011	2012	2013	2014	2015
Establishments					
Chlor-alkali	7	7	8	9	6
Other inorganic chemicals	117	117	130	133	129
Shipments $M	3,549	3,683	4,485	4,844	4,923
Employment, 000	4,356	4,475	4,385	4,265	4,395
Exports $M[6]					
Chlor-alkali	153	134	153	101	90
Other inorganic chemicals	4,599	3,875	4,047	3,606	4,086
Imports $M					
Chlor-alkali	308	327	325	328	374
Other inorganic chemicals	2,369	2,312	2,309	2,075	2,112

[6] Exports sometimes exceed shipments due to different databases used to collect the two sets of data.

Commodity data

Statistics Canada reports production data for a limited number of inorganic chemicals as shown in Table 2.

Table 2: Canadian production of specific inorganic chemicals, kilotonnes

	2010	2011	2012	2013	2014
Carbon black	228	233	224	221	241
Chlorine	466	567	550	600	510
Hydrogen peroxide	217	225	217	225	240

More data exists for imports and exports than for domestic production. Table 3 shows the exports for a select range of inorganic chemicals, in both tonnage and dollar value terms.

Table 3: Canadian exports of select inorganic chemicals

	Value, $M	Quantity, kt	Top markets
Chlorine	37	161	USA 100%
Hydrochloric acid	40	279	USA 99%
Hydrogen peroxide	57	101	USA 99%
Sodium chlorate	457	614	USA 79% Japan 7% Chile 5% South Africa 2%
Sodium hydroxide	50	47	USA 100%
Sodium silicate	12	20	USA 96% Italy 2%
Sulphuric acid	169	2,069	USA 100%
Titanium dioxide	9	4	Belgium 79% USA 9% India 4%

CIAC members producing inorganic chemicals in Canada

- Akzo Nobel Chemicals Ltd.
- Arkema Canada Inc.
- Axiall Canada Inc.
- CCC
- Canexus Corporation
- Chemtrade
- ERCO Worldwide
- Evonik Canada Inc.
- KRONOS Canada Inc.
- National Silicates
- NorFalco Sales Inc. (A GLENCORE Company)
- Olin Canada ULC
- PeroxyChem Canada
- Solvay Canada Inc.

c. Synthetic resins, rubbers and fibres

There are two industry sub-groups within this classification:

- NAICS 32521 – Synthetic resins and rubbers
- NAICS 32522 – Synthetic fibres.

Since 2013, shipment and employment data have been suppressed at the 5-digit NAICS level and only reported at the 4-digit level.

The main synthetic resins and rubbers produced in Canada are polyethylene, ethylene vinyl acetate, polystyrene, PVC, polyacrylamides, PET, nylons, urea and phenol formaldehydes, latex emulsions, unsaturated polyesters, silicones, and butyl and halobutyl rubbers. Synthetic fibres are produced in Canada using a variety of domestically-produced and imported resins.

Principal statistics for these industries are shown in Table 1.

Table 1: Principal statistics for synthetic resins rubbers and fibres

	2011	2012	2013	2014	2015
Establishments					
Synthetic resins and rubbers	141	144	133	127	121
Synthetic fibres	25	27	25	33	30
Shipments $M	8,413	8,315	8,723	9,524	9,329
Employment, 000	6,691	6,613	6,174	4,980	4,620
Exports $M					
Synthetic resins and rubbers	6,476	6,333	7,073	7,945	8,142
Synthetic fibres	472	436	400	367	391
Imports $M					
Synthetic resins and rubbers	6,709	6,857	6,950	7,880	8,045
Synthetic fibres	554	555	536	564	607

• Commodity data

Within these industries, Statistics Canada reports production data only for polyethylene as shown in Table 2.

Table 2: Canadian production of synthetic resins, kilotonnes

	2010	2011	2012	2013	2014
Polyethylene	3,182	3,226	3,186	3,503	3,407

Table 3 shows the exports for a select synthetic resins and rubbers, in both tonnage and dollar value terms.

Table 3: Canadian exports of select synthetic resins and rubbers

	Value, $M	Quantity, kt	Top markets
Butyl and halobutyl rubbers	279	73	USA 48% China 16% South Korea 10% Mexico 9% Japan 7%
Polyethylene	5,431	3,183	USA 87% Mexico 5% China 3%

- **CIAC members producing synthetic resins, rubbers and fibres in Canada**

  - ARLANXEO
  - BASF Canada
  - Dow Chemical Canada ULC
  - Imperial
  - NOVA Chemicals Corporation

d. Specialty chemicals

This profile is different from the others in the series. There is no Statistics Canada aggregation that provides data for an industry called specialty chemicals. Therefore, a number of assumptions have been made to derive an approximation for the size of this industry grouping.

Examples of the types of specialty chemicals produced by CIAC members include: fatty acids, maleic anhydride, plasticizers, citric acid, photochemicals, and additives for fuels, lubricants, plastics and rubber.

- Assumption #1: Specialty chemicals are a subset of NAICS 32519 – Other organic chemicals. Very little, if any, specialty chemicals fall within the petrochemical industry as it is comprised primarily of commodity products. For this analysis it is assumed that inorganic chemicals and synthetic resins and rubbers can also be excluded.

- Assumption #2: The ratio of specialty chemical to commodity chemical exports can be used to estimate the value of shipments and employment attributable to specialty chemicals. This assumption allows the use of relatively-detailed trade data to gain a measure of the level of specialty chemical production in Canada. However, deciding which products are commodity versus which are specialty remains subjective.

There are about 15 facilities in Canada producing ethanol that are captured within the other organic chemical industry. Since ethanol is primarily used for fuel, these facilities are not considered part of specialty chemicals.

Estimated statistics for the total other organic chemicals industry and the specialty component are shown in Table 1. The data for the other organic chemicals industry includes both commodity and specialty chemicals, and is repeated from the Petrochemicals profile. It is presented again to provide an indication of the relative size of the commodity versus specialty element of the industry.

Table 1: Estimated principal statistics for specialty chemicals

	2011	2012	2013	2014	2015
Establishments					
Other organic chemicals	135	135	135	135	140
Specialty chemicals	115	115	115	115	120
Shipments $M					
Other organic chemicals	4,318	3,960	4,848	4,826	4,780
Specialty chemicals	1,935	1,975	2,130	2,030	2,005
Employment, 000					
Other organic chemicals	2,292	2,297	2,251	2,190	2,260
Specialty chemicals	1,049	1,190	995	905	950
Exports $M					
Other organic chemicals	3,594	3,402	3,777	4,231	3,962
Specialty chemicals	1,696	1,590	1,670	1,745	1,664
Imports $M					
Other organic chemicals	5,634	5,601	6,035	6,510	6,748
Specialty chemicals	2,650	2,590	2,650	2,685	2,824

Commodity data

Table 2 shows the exports for a select range of specialty chemicals, in both tonnage and dollar value terms in 2014.

Table 2: Canadian exports of select specialty chemicals

	Value, $M	Quantity, kt	Top markets
Palmitates and stearates	8.1	4.4	USA 87% China 4% Israel 4%
Dinonyl or didecyl orthophthalates	5.1	1.7	USA 100%
Azo compounds	2.9	0.05	USA 78% Japan 13% Netherlands 6%
Cyanine dyes	45.1	2.8	USA 100%
Azo dyes	6.4	0.3	USA 91% South Korea 3% Spain 3% China 2%
Other fatty acids	14.1	11.4	USA 99%

CIAC members producing specialty chemicals in Canada

- Akzo Nobel Chemicals Ltd.
- BASF Canada
- Chemtura Canada Co./Cie
- Evonik Oil Additives Canada Inc.
- H.L. Blachford Ltd.
- Imperial
- Jungbunzlauer Canada Inc.
- PCAS Canada Inc.
- Stepan Canada Inc.