# Canada's Technology Triangle

## Manufacturing Industry Characteristics


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# A. MANUFACTURING EXPENDITURES

The scale and contribution of manufacturing to an economy is usually described in terms of number of jobs and associated wages. While these factors are significant, there are other measures that can be used to describe the scale and contribution of a region's manufacturing sector. This research provides additional statistics that describe Canada's Technology Triangles (CTT's) 3-digit North American Industrial Classification System (NAICS) manufacturing industries.

## MANUFACTURING PRINCIPAL STATISTICS

In 2003, CTT's manufacturing sector was comprised of 1,175 establishments, employing 48,092 production workers and 15,014 administrative employees. In total, $3.1 billion in salaries and wages were paid to these employees, while $9.4 billion was paid for material and supplies and $244 million for fuel and electricity. In the same year, shipments from the Region's manufacturing sector were worth $16.9 billion, with the valued added accounting for more than $7.2 billion.

From 2000 to 2003, production employment increased by 2.6 percent while administrative employment increased an outstanding 51.6 percent. Corresponding with employment growth, wages and salaries also increased 27.2 percent over the same time period. Other costs, including fuel and electricity and materials and supplies used in production, also rose, by 39.8 and 20.1 percent respectively. Lastly, the value of shipments increased 19.1 per cent and the value added rose 15.2 per cent between 2000 and 2003.

Details are presented in Table 1.

**Table 1**
**Principal Manufacturing Statistics**
**Canada's Technology Triangle**
**2000 and 2003**

| | 2000 | 2003 | Percent Growth/Decline |
|---|---|---|---|
| Number of Firms | 1,159 | 1,175 | 1.4 |
| Number of Production Employees | 46,894 | 48,092 | 2.6 |
| Number of Administrative Employees | 9,902 | 15,014 | 51.6 |
| Total Number of Manufacturing Employees | 56,796 | 63,106 | 11.1 |
| | | | |
| Total Salaries and Wages ($,000's) | $2,440,394 | $3,103,206 | 27.2 |
| Cost of Fuel and Electricity ($,000's) | $175,053 | $244,811 | 39.8 |
| Cost of Materials and Supplies ($,000's) | $7,843,083 | $9,422,831 | 20.1 |
| | | | |
| Value of Manufacturing Shipments ($,000's) | $14,271,108 | $16,998,482 | 19.1 |
| Manufacturing Value Added ($,000's) | $6,295,986 | $7,251,293 | 15.2 |

*Source: Statistics Canada*

**Administrative Employees include production management, design, engineers, knowledge workers, etc.*

## PRINCIPAL STATISTICS: BY 3-DIGIT INDUSTRY

### Number of Firms & Employment

At the 3-digit industry level of the North American Classification System (NAICS), the Transportation Equipment Industry is CTT's largest employer, accounting for 18.0 per cent of manufacturing employees although only 4.9 percent of manufacturing firms. The Fabricated Metal Product Industry is CTT's second largest manufacturing employer, accounting for 14.4 percent of manufacturing employment and the largest proportion of manufacturing firms at 22.2 percent. The Food Industry, the Machinery Industry and the Computer and Equipment Industry accounted for 12.1, 11.5 and 11.3 percent of manufacturing employment respectively. While all three of these industries are similar in terms of employment, the Machinery Industry accounts for 16.8 percent of manufacturing firms in CTT, compared to the Food and Computer Industries with a combined 10.4 percent of firms.

**Table 2**
**Total Number of Employees & Firms**
**by 3-Digit Industry**
**Canada's Technology Triangle**
**2003**

| | | Total Manufacturing Employment | | Firms | |
|---|---|---|---|---|---|
| **NAICS** | **Industry** | **#** | **%** | **#** | **%** |
| 336 | Transportation Equipment Mfg. | 11,329 | 18.0 | 58 | 4.9 |
| 332 | Fabricated Metal Product Mfg. | 9,117 | 14.4 | 261 | 22.2 |
| 311 | Food Mfg. | 7,642 | 12.1 | 67 | 5.7 |
| 333 | Machinery Mfg. | 7,247 | 11.5 | 197 | 16.8 |
| 334 | Computer & Electronic Product Mfg. | 7,136 | 11.3 | 55 | 4.7 |
| 326 | Plastics & Rubber Products Mfg. | 5,534 | 8.8 | 73 | 6.2 |
| 335 | Electric Equip./Appliance/Component | 2,544 | 4.0 | 35 | 3.0 |
| 337 | Furniture & Related Product Mfg. | 2,505 | 4.0 | 62 | 5.3 |
| 325 | Chemical Mfg. | 1,363 | 2.2 | 29 | 2.5 |
| 339 | Miscellaneous Mfg. | 1,116 | 1.8 | 71 | 6.0 |
| 321 | Wood Product Mfg. | 1,045 | 1.7 | 58 | 4.9 |
| 323 | Printing | 1,034 | 1.6 | 71 | 6.0 |
| 327 | Non-Metallic Mineral Product Mfg. | 1,024 | 1.6 | 38 | 3.2 |
| 315 | Clothing Mfg. | 986 | 1.6 | 19 | 1.6 |
| 314 | Textile Product Mills | 902 | 1.4 | 23 | 2.0 |
| 331 | Primary Metal Mfg. | 885 | 1.4 | 17 | 1.4 |
| 313 | Textile Mills | 706 | 1.1 | 13 | 1.1 |
| 322 | Paper Mfg. | 599 | 0.9 | 8 | 0.7 |
| 324 | Petroleum and Coal Products Man. | 180 | 0.3 | 6 | 0.5 |
| | **Total All Manufacturing Industries** | **63,106** | **100.00** | **1,175** | **100.0** |

*Source: Statistics Canada*

## Employment Growth (2000 to 2003)

While the total number of manufacturing workers increased by 11.1 percent between 2000 and 2003, this growth did not happen evenly across all manufacturing's 3-digit industries. Table 3 provides further details by examining employment growth or decline for CTT's 3-digit manufacturing industries.

Twelve industries experienced employment growth between 2000 and 2003. The Computer and Electronic Industry added the most jobs (4,029) for an outstanding 129.7 percent increase. Other industries contributing significantly to employment growth include the Fabricated Metal Industry, adding 1,526 jobs and the Food Industry contributing 1,386 additional jobs. While the Chemical Industry added a modest 322 new jobs over the time period examined, this represents a 30.9 percent increase in employment.

Seven 3-digit industries experienced an employment decline between 2000 and 2003, combined they accounted for a loss of 1,829 jobs. The Clothing Industry accounted for nearly half of these job losses.

**Table 3**
**Change in Manufacturing Employment**
**Canada's Technology Triangle**
**2000 to 2003**

| NAICS | Industry | Employment 2000 | Employment 2003 | Absolute Change | Percent Change |
|---|---|---|---|---|---|
| 334 | Computer & Electronic Product Mfg. | 3,107 | 7,136 | 4,029 | 129.7 |
| 332 | Fabricated Metal Product Mfg. | 7,591 | 9,117 | 1,526 | 20.1 |
| 311 | Food Mfg. | 6,256 | 7,642 | 1,386 | 22.2 |
| 336 | Transportation Equipment Mfg. | 10,466 | 11,329 | 863 | 8.2 |
| 325 | Chemical Mfg. | 1,041 | 1,363 | 322 | 30.9 |
| 339 | Miscellaneous Mfg. | 854 | 1,116 | 262 | 30.7 |
| 321 | Wood Product Mfg. | 873 | 1,045 | 172 | 19.7 |
| 322 | Paper Mfg. | 461 | 599 | 138 | 29.9 |
| 327 | Non-Metallic Mineral Product Mfg. | 901 | 1,024 | 123 | 13.7 |
| 335 | Electric Equip./Appliance/Component | 2,435 | 2,544 | 109 | 4.5 |
| 326 | Plastics & Rubber Products Mfg. | 5,439 | 5,534 | 95 | 1.7 |
| 331 | Primary Metal Mfg. | 875 | 885 | 10 | 1.1 |
| 314 | Textile Product Mills | 959 | 902 | (57) | (5.9) |
| 324 | Petroleum and Coal Products Man. | 239 | 180 | (59) | (24.7) |
| 323 | Printing | 1,113 | 1,034 | (79) | (7.1) |
| 333 | Machinery Mfg. | 7,383 | 7,247 | (136) | (1.8) |
| 313 | Textile Mills | 854 | 706 | (148) | (17.3) |
| 337 | Furniture & Related Product Mfg. | 3,023 | 2,505 | (518) | (17.1) |
| 315 | Clothing Mfg. | 1,818 | 986 | (832) | (45.8) |
| | **Total All Manufacturing Industries** | 56,796 | **63,106** | **6,310** | **11.1** |

*Source: Statistics Canada*

## Salaries and Wages

As expected, the proportion of total salaries and wages paid to employees is usually reflected in the number of employees in each industry. The Transportation Equipment industry, which employs the most people in the Region, not surprisingly accounts for the largest proportion of total salaries and wages paid: $738 million or 23.8 per cent of all manufacturing salaries and wages. The Fabricated Metal Industry, the Machinery Industry and the Computer and Electronic Product Industry ranked second, third and fourth, accounting for 14.8, 12.2 and 12.1 percent of total manufacturing salaries and wages respectively.

Even though the Food Industry employs more people than each of the Machinery Industry and Computing Industry, its proportion of salaries and wages is significantly lower than these other two industries.

Details are presented in Table 4.

**Table 4**
**Salaries and Wages**
**by 3-Digit Industry**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Salaries and Wages | Percent of all Manufacturing Salaries and Wages |
|---|---|---|---|
| | | $ (000's) | % |
| 336 | Transportation Equipment Mfg. | $738,433 | 23.8 |
| 332 | Fabricated Metal Product Mfg. | $460,556 | 14.8 |
| 333 | Machinery Mfg. | $378,994 | 12.2 |
| 334 | Computer & Electronic Product Mfg. | $374,674 | 12.1 |
| 311 | Food Mfg. | $264,015 | 8.5 |
| 326 | Plastics & Rubber Products Mfg. | $255,864 | 8.2 |
| 337 | Furniture & Related Product Mfg. | $102,492 | 3.3 |
| 335 | Electric Equip./Appliance/Component | $97,718 | 3.1 |
| 325 | Chemical Mfg. | $74,816 | 2.4 |
| 327 | Non-Metallic Mineral Product Mfg. | $52,834 | 1.7 |
| 331 | Primary Metal Mfg. | $46,806 | 1.5 |
| 339 | Miscellaneous Mfg. | $42,472 | 1.4 |
| 323 | Printing | $42,462 | 1.4 |
| 321 | Wood Product Mfg. | $37,328 | 1.2 |
| 314 | Textile Product Mills | $37,320 | 1.2 |
| 322 | Paper Mfg. | $27,729 | 0.9 |
| 315 | Clothing Mfg. | $26,982 | 0.9 |
| 313 | Textile Mills | $25,014 | 0.8 |
| 324 | Petroleum and Coal Products Man. | $10,770 | 0.3 |
| | **Total All Manufacturing Industries** | **$3,103,206** | **100.0** |

*Source: Statistics Canada*

## Cost of Materials and Supplies

Along with wages and salaries, a major manufacturing expenditure is the cost of the materials and supplies used in the manufacturing process. Of the industries examined, the Transportation Equipment Industry, which accounts for only 4.9 per cent of firms in the Region, consumes the most materials and supplies – over $4.4 billion in value. CTT's Food Industry and the Computer and Electronic Products Industry purchased over $1 billion and $793 million of materials and supplies respectively.

Although the Fabricated Metal Industry is CTT's second largest manufacturing employer, accounting for 14.4 per cent of manufacturing employment and 22.2 percent of manufacturing firms, it consumes relatively fewer materials and supplies, accounting for only 4.8 percent of materials and supplies used in production.

Unfortunately, the ability to decipher where materials and supplies originate is not possible, so it is not clear what is sourced locally and what is brought in from outside the Region.

Details are presented in Table 5.

**Table 5**
**Cost of Materials and Supplies Used in Production**
**by 3-Digit Industry**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Materials and Supplies $ (000's) | Percent of all Manufacturing M & S Costs % |
|---|---|---|---|
| 336 | Transportation Equipment Mfg. | $4,450,578 | 47.2 |
| 311 | Food Mfg. | $1,057,383 | 11.2 |
| 334 | Computer & Electronic Product Mfg. | $793,649 | 8.4 |
| 333 | Machinery Mfg. | $657,228 | 7.0 |
| 326 | Plastics & Rubber Products Mfg. | $584,879 | 6.2 |
| 332 | Fabricated Metal Product Mfg. | $451,389 | 4.8 |
| 325 | Chemical Mfg. | $238,268 | 2.5 |
| 335 | Electric Equip./Appliance/Component | $215,330 | 2.3 |
| 337 | Furniture & Related Product Mfg. | $153,193 | 1.6 |
| 331 | Primary Metal Mfg. | $143,350 | 1.5 |
| 327 | Non-Metallic Mineral Product Mfg. | $103,352 | 1.1 |
| 314 | Textile Product Mills | $100,770 | 1.1 |
| 321 | Wood Product Mfg. | $87,139 | 0.9 |
| 339 | Miscellaneous Mfg. | $76,642 | 0.8 |
| 313 | Textile Mills | $74,914 | 0.8 |
| 324 | Petroleum and Coal Products Man. | $65,268 | 0.7 |
| 322 | Paper Mfg. | $63,220 | 0.7 |
| 323 | Printing | $54,075 | 0.6 |
| 315 | Clothing Mfg. | $37,766 | 0.4 |
| | **Total All Manufacturing Industries** | **$9,422,831** | **100.0** |

*Source: Statistics Canada*

## Cost of Energy Used In Production

Energy, specifically the cost of fuel and electricity used in production, is another component of manufacturing firms' operating costs that can be measured. Within CTT, the Transportation and Equipment Industry is the largest user of energy, spending over $52 million on energy in 2003. Considering the Transportation Industry accounts for 39.8 percent of CTT's total manufacturing output (shipments), it is surprising that this industry accounts for only 21.4 percent of the area's manufacturing energy expenditures. Second and third in energy expenditures are the Food Industry and the Fabricated Metal Industry, spending over $39 million and over $34 million respectively.

**Table 6**
**Cost of Energy Used In Production**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Production Energy Cost | Percent of Total Manufacturing Energy Cost |
|---|---|---|---|
| | | $ (000's) | % |
| 336 | Transportation Equipment Mfg. | $52,364 | 21.4 |
| 311 | Food Mfg. | $39,280 | 16.0 |
| 332 | Fabricated Metal Product Mfg. | $34,322 | 14.0 |
| 326 | Plastics & Rubber Products Mfg. | $28,274 | 11.5 |
| 331 | Primary Metal Mfg. | $21,789 | 8.9 |
| 333 | Machinery Mfg. | $13,345 | 5.5 |
| 325 | Chemical Mfg. | $10,371 | 4.2 |
| 327 | Non-Metallic Mineral Product Mfg. | $7,712 | 3.2 |
| 334 | Computer & Electronic Product Mfg. | $5,991 | 2.4 |
| 314 | Textile Product Mills | $5,895 | 2.4 |
| 337 | Furniture & Related Product Mfg. | $4,671 | 1.9 |
| 335 | Electric Equip./Appliance/Component | $3,719 | 1.5 |
| 324 | Petroleum and Coal Products Man. | $2,870 | 1.2 |
| 339 | Miscellaneous Mfg. | $2,845 | 1.2 |
| 321 | Wood Product Mfg. | $2,833 | 1.2 |
| 313 | Textile Mills | $2,794 | 1.1 |
| 315 | Clothing Mfg. | $2,290 | 0.9 |
| 323 | Printing | $1,558 | 0.6 |
| 322 | Paper Mfg. | $1,034 | 0.4 |
| | **Total All Manufacturing Industries** | **$244,811** | **100.0** |

*Source: Statistics Canada*

## Energy as a Percentage of Adjusted Operating Cost

Considering the highly competitive environment in which CTT manufacturers operate, any increase to their operating costs can be cause for concern. Insight into how rising energy costs may affect CTT's manufacturing industries, therefore, is valuable. Table 7 shows production energy cost as a percentage of adjusted operating cost (where operating cost include production energy cost, the cost of materials and supplies used in production, and production wages).

Energy use within CTT's largest manufacturing industry, the Transportation Equipment Industry, accounts for only 1.0 percent of operating costs. The Computer and Electronic Product Industry is least effected by rising energy costs, with energy accounting for only 0.6 percent of this industry's operating costs.

The Primary Metal Industry is most negatively affected by rising energy costs, as energy expenditures accounted for 10.8 percent of its operating costs in 2003. Other CTT industries most vulnerable to rising energy costs include: Non-Metallic Mineral Products, Fabricated Metal Products and Textile Product Mills.

**Table 7**
**Energy Used in Production**
**as a Percentage of Adjusted Operating Cost**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Energy | Adjusted Operating Costs | Energy as a % of AOC |
|---|---|---|---|---|
| | | $(000's) | $(000's) | % |
| 311 | Food Mfg. | $39,280 | $1,268,907 | 3.1 |
| 313 | Textile Mills | $2,794 | $94,128 | 3.0 |
| 314 | Textile Product Mills | $5,895 | $128,259 | 4.6 |
| 315 | Clothing Mfg. | $2,290 | $59,875 | 3.8 |
| 321 | Wood Product Mfg. | $2,833 | $115,505 | 2.5 |
| 322 | Paper Mfg. | $1,034 | $83,763 | 1.2 |
| 323 | Printing | $1,558 | $79,180 | 2.0 |
| 324 | Petroleum and Coal Products Man. | $2,870 | $73,810 | 3.9 |
| 325 | Chemical Mfg. | $10,371 | $284,231 | 3.6 |
| 326 | Plastics & Rubber Products Mfg. | $28,274 | $810,213 | 3.5 |
| 327 | Non-Metallic Mineral Product Mfg. | $7,712 | $147,241 | 5.2 |
| 331 | Primary Metal Mfg. | $21,789 | $202,276 | 10.8 |
| 332 | Fabricated Metal Product Mfg. | $34,322 | $747,389 | 4.6 |
| 333 | Machinery Mfg. | $13,345 | $933,083 | 1.4 |
| 334 | Computer & Electronic Product Mfg. | $5,991 | $1,011,294 | 0.6 |
| 335 | Electric Equip./Appliance/Component | $3,719 | $273,653 | 1.4 |
| 336 | Transportation Equipment Mfg. | $52,364 | $5,153,412 | 1.0 |
| 337 | Furniture & Related Product Mfg. | $4,671 | $235,003 | 2.0 |
| 339 | Miscellaneous Mfg. | $2,845 | $104,975 | 2.7 |
| | **Total All Manufacturing Industries** | **$244,811** | **$11,824,260** | **2.1** |

*Source: Statistics Canada*

## Total Value of Manufacturing Shipments

The scale of manufacturing activity within CTT is best described by the value of shipments in a given year. In 2003, the Transportation Equipment Industry shipped over $6.7 billion worth of product – 39.8 percent of the Region's total shipments of manufactured goods. As noted elsewhere, attention should be given to the fact that this industry accounts for only 4.9 per cent of total manufacturing firms in CTT. A distant second in shipment value was the Food Industry, with shipments over $1.9 billion. Following the Food Industry is the Computer and Electronic Industry, the Fabricated Metal Product Industry, the Machinery Industry and the Plastics and Rubber Products Industry, with the value of their shipments ranging from $1.4 to $1.1 billion.

Details are presented in Table 6.

**Table 6**
**Value of Manufacturing Shipments**
**by 3-Digit Industry**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Manufacturing Shipments $ (000's) | Percent of Manufacturing Shipments % |
|---|---|---|---|
| 336 | Transportation Equipment Mfg. | $6,767,989 | 39.8 |
| 311 | Food Mfg. | $1,994,565 | 11.7 |
| 334 | Computer & Electronic Product Mfg. | $1,478,597 | 8.7 |
| 332 | Fabricated Metal Product Mfg. | $1,426,595 | 8.4 |
| 333 | Machinery Mfg. | $1,313,070 | 7.7 |
| 326 | Plastics & Rubber Products Mfg. | $1,162,273 | 6.8 |
| 335 | Electric Equip./Appliance/Component | $442,853 | 2.6 |
| 325 | Chemical Mfg. | $389,054 | 2.3 |
| 337 | Furniture & Related Product Mfg. | $387,217 | 2.3 |
| 331 | Primary Metal Mfg. | $291,582 | 1.7 |
| 327 | Non-Metallic Mineral Product Mfg. | $221,724 | 1.3 |
| 314 | Textile Product Mills | $193,292 | 1.1 |
| 321 | Wood Product Mfg. | $163,882 | 1.0 |
| 339 | Miscellaneous Mfg. | $149,823 | 0.9 |
| 323 | Printing | $144,720 | 0.9 |
| 313 | Textile Mills | $123,258 | 0.7 |
| 324 | Petroleum and Coal Products Man. | $118,859 | 0.7 |
| 322 | Paper Mfg. | $110,899 | 0.7 |
| 315 | Clothing Mfg. | $87,360 | 0.5 |
| | **Total All Manufacturing Industries** | **$16,998,482** | **100.0** |

*Source: Statistics Canada*

## Total Value Added

Since the value of shipments includes production costs, the value added in the manufacturing process is a more suitable measurement for capturing the economic benefit left in the Region. The higher the valued added, the greater the economic contribution to the regional economy. Value added is a measure of how much value workers generate using the land and capital/equipment employed in production. Essentially, value added includes the workers' wages and the return from capital/equipment utilized in production.

There are a number of factors that affect the level of value added, particularly the complexity of the manufacturing process. For example, buying an assembled product and painting it is a lower value added function than assembling and painting a product. Value added is also affected by the level of sophistication and skills required to produce a product. Putting fruit in a can would be of lower value added than designing and building custom automation equipment, where value added is increased through a higher level of expertise, knowledge and use of technology.

In 2003, the total value added by the Transportation Equipment industry was over $2.2 billion, followed by the Fabricated Metal Industry's $934 million and the Food Industry's $902 million. Of the 19 major manufacturing industries in CTT, the top six industries accounted for 81.6 per cent of total value added in the Region. These industries combined account for only 60.5 per cent of all manufacturing firms in the Region and 76.1 percent of employment.

Details are presented in Table 7.

**Table 7**
**Total Value Added by 3-Digit Industry**
**Canada's Technology Triangle**
**2003**

| NAICS | Industry | Total Value Added $ (000's) | Percent of Total Manufacturing Value Added % |
|---|---|---|---|
| 336 | Transportation Equipment Mfg. | $2,293,753 | 31.6 |
| 332 | Fabricated Metal Product Mfg. | $934,311 | 12.9 |
| 311 | Food Mfg. | $902,947 | 12.5 |
| 334 | Computer & Electronic Product Mfg. | $693,685 | 9.6 |
| 326 | Plastics & Rubber Products Mfg. | $549,185 | 7.6 |
| 333 | Machinery Mfg. | $533,073 | 7.4 |
| 337 | Furniture & Related Product Mfg. | $229,870 | 3.2 |
| 335 | Electric Equip./Appliance/Component | $221,133 | 3.0 |
| 325 | Chemical Mfg. | $138,993 | 1.9 |
| 331 | Primary Metal Mfg. | $117,757 | 1.6 |
| 327 | Non-Metallic Mineral Product Mfg. | $111,724 | 1.5 |
| 323 | Printing | $90,020 | 1.2 |
| 314 | Textile Product Mills | $85,096 | 1.2 |
| 321 | Wood Product Mfg. | $73,883 | 1.0 |
| 339 | Miscellaneous Mfg. | $69,449 | 1.0 |
| 324 | Petroleum and Coal Products Man. | $50,929 | 0.7 |
| 322 | Paper Mfg. | $48,046 | 0.7 |
| 315 | Clothing Mfg. | $46,177 | 0.6 |
| 313 | Textile Mills | $44,940 | 0.6 |
| | **Total All Manufacturing Industries** | **$7,251,293** | **100.0** |

*Source: Statistics Canada*