Catalogue no. 11-626-X — No. 074
ISSN 1927-503X
ISBN 978-0-660-08600-2

Economic Insights

Real Growth of Canadian Manufacturing Since 2000

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Analytical Studies Branch and Economic Analysis Division

Release date: June 27, 2017

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. not available for any reference period
.. not available for a specific reference period
... not applicable
0 true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

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Real Growth of Canadian Manufacturing Since 2000

by Sean Clarke and Lydia Couture, Analytical Studies Branch and Economic Analysis Division

This *Economic Insights* article reports on changes in the Canadian manufacturing sector since 2000. Using data from the Canadian System of National Accounts and the U.S. Bureau of Economic Analysis, it provides an analysis of recent trends in Canadian manufacturing sector output, as well as a decomposition of the contribution of manufacturing industries to the evolution of the sector and a comparison with the United States.

Overview

Over much of the post-1961 period, real gross domestic product (GDP) in the Canadian manufacturing sector grew at essentially the same rate as real GDP in the business sector (Baldwin and Macdonald 2009). This article finds that this changed during the post-2000 period: manufacturing experienced markedly slower growth and declined in real terms relative to the overall business sector.

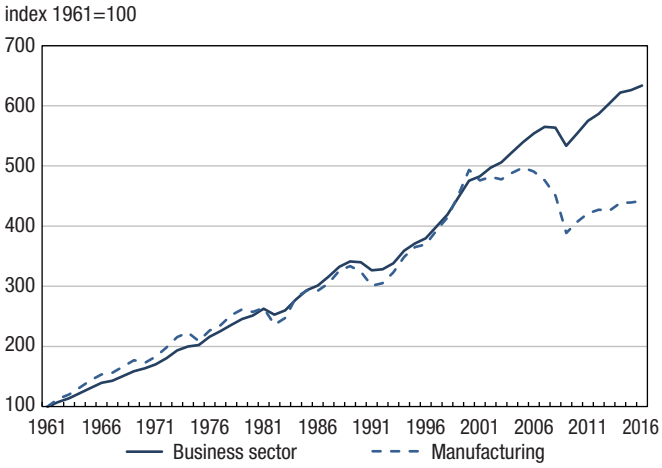
In Canada, as in many other advanced economies, the share of manufacturing in current dollar GDP has declined over the last 30 years. A number of explanations for the decline have been proposed, including increased global competition, outsourcing of manufacturing activities to emerging economies, the rapid rise of the service economy (Nickell, Redding and Swaffield 2008) and slower price growth in manufacturing than in the overall business sector (Baldwin and Macdonald 2009). The latter paper showed that the nominal share of manufacturing in the Canadian economy declined as relatively stronger productivity growth in manufacturing led to relatively weaker price growth. This was the result of competition and innovation, both of which the authors took to be signs of a healthy manufacturing sector. While the decline was present only in nominal terms in their study, more recent data suggest that real manufacturing growth did not keep pace with real business sector growth (Chart 1).

Canadian manufacturing sector after 2000

During the 1990s, the Canadian manufacturing sector experienced generally strong growth, owing to trade liberalization, the depreciation of the Canadian dollar, and innovations related to the adoption of information and communications technologies. Economic conditions changed after 2000, and, for the first time since 1961, real manufacturing growth in Canada stalled for over half a decade while the business sector continued to expand.

A number of factors likely contributed to weakening the demand for Canadian manufactured goods over this period: the bursting of the tech bubble in 2001; the global commodity boom; the appreciation of the Canadian dollar vis-à-vis its U.S. counterpart; and stronger competition from abroad, all of which provided a new and more challenging environment for Canadian manufacturers. Research indicates that the commodity boom and factors related to the dollar's appreciation played a role in the post-2000 performance of the Canadian manufacturing sector, but that the manufacturing sector was also affected by lagging productivity growth and cyclical changes in demand.[1]

Chart 1
Real gross domestic product, business sector and manufacturing, chained Fisher quantity index of GDP at basic prices, 1961 to 2016



Sources: Statistics Canada, CANSIM tables 383-0021 and 379-0031, and authors' calculations.

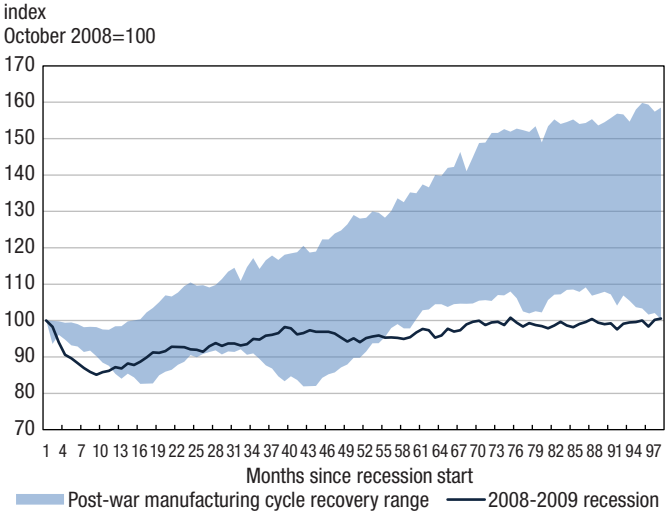
1. See Shakerim, Gray and Leonard Is (2012); İşcan (2014); Beine, Bos and Coulombe (2012).

Slowest recovery in the manufacturing sector since the Second World War

The 2008-2009 recession exacerbated the challenges faced by the Canadian manufacturing sector. While it affected virtually all business sector industries, the effects of the recession were particularly strong for manufacturing. GDP volumes in the manufacturing sector declined at an annual average rate of around 9% in 2008 and 2009, compared with an average annual contraction of less than 2% in the business sector.

In terms of real GDP, the manufacturing sector has generally experienced greater declines than the business sector during economic downturns.[2] However, the 2008-2009 recession differed from earlier recessions in that manufacturing took much longer to regain its pre-recession levels (Chart 2). And while the business sector returned to pre-recession levels in less than two years, it took about six years for GDP volumes in manufacturing to return to pre-recession levels. This post-recession recovery period for manufacturing has been the slowest since the Second World War.

Chart 2
Post-recession manufacturing output (months from peak in real gross domestic product)

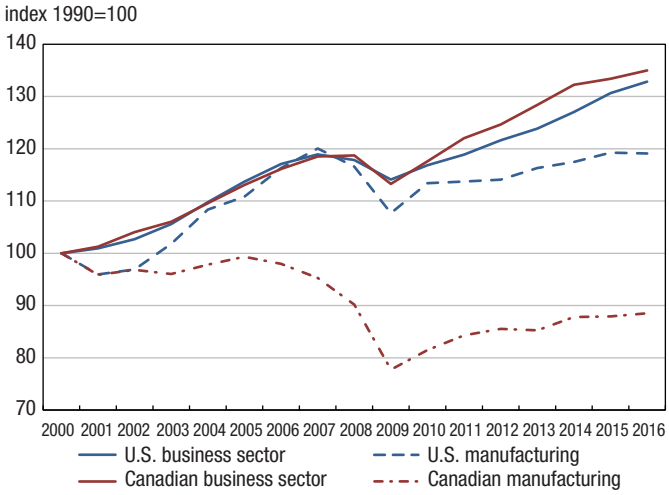


Source: Statistics Canada, authors' calculations.

Different trend observed in the United States

In addition to being different relative to previous downturns, movements in the real growth of Canadian manufacturing output after 2000 have also been different from those in the United States. Following the entry into force of the Canada–U.S. Free Trade Agreement in 1989 and of the North American Free Trade Agreement in 1994, the Canadian and U.S. economies became increasingly integrated. Both countries faced some common economic shocks throughout the 2000s, and the relative performance of the business sectors in the two countries was remarkably similar. However, unlike the manufacturing sector in Canada, U.S. real manufacturing GDP growth did not diverge significantly from that of the business sector[3] in the post-2000 period (Chart 3). Thus a closer comparison of the Canadian and U.S. manufacturing sectors may inform the investigation into what is behind the divergence between the business sector and the manufacturing sector in Canada.

Chart 3
Canadian and U.S. real value added, 2000 to 2016



Sources: Statistics Canada; CANSIM table 379-0031; U.S. Bureau of Economic Analysis; and authors' calculations.

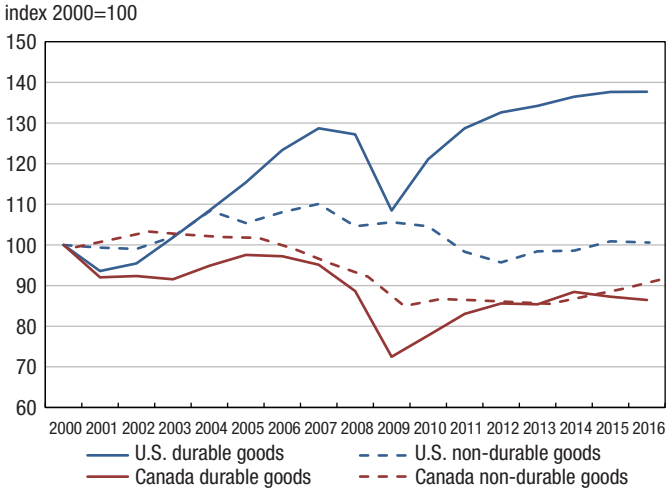
2. See Baldwin and Macdonald (2009).
3. U.S. business sector, or private industries, excludes general government, private households, and non-profit institutions (https://www.bls.gov/mfp/outputnote.pdf). The Canadian business sector is based on the Input-Output industry codes and includes BS11A0 to BS810 (http://www23.statcan.gc.ca/imdb-bmdi/document/1301_D2_T9_V1-eng.htm).

The ability of the U.S. manufacturing sector to keep pace with the U.S. business sector in terms of real GDP growth can be traced to the performance of its durable goods sector[4] (Chart 4). While affected by the U.S. recessions both in the early 2000s and from 2007 to 2009, the U.S. durable goods sector managed to grow an average of 2.5% per year over the period from 2000 to 2016, compared with 0.0% for the U.S. non-durable goods sector, -0.2% for the Canadian durable goods sector, and 0.0% for the Canadian non-durable goods sector.

The U.S. durable goods sector grew faster than the Canadian durable goods sector up to 2007, was less affected by the last recession, and then grew slightly faster afterwards. While the differences in the non-durable goods sectors were not as stark, the U.S. non-durable goods sector performed better than its Canadian counterpart in the years leading up to the last recession and also experienced a milder contraction.

A more detailed analysis of the growth and contributions of key industries in the manufacturing sectors across all three time periods in both Canada and the United States is presented in the following sections.

Chart 4
Manufacturing real gross domestic product, durable and non-durable goods sectors, 2000 to 2016

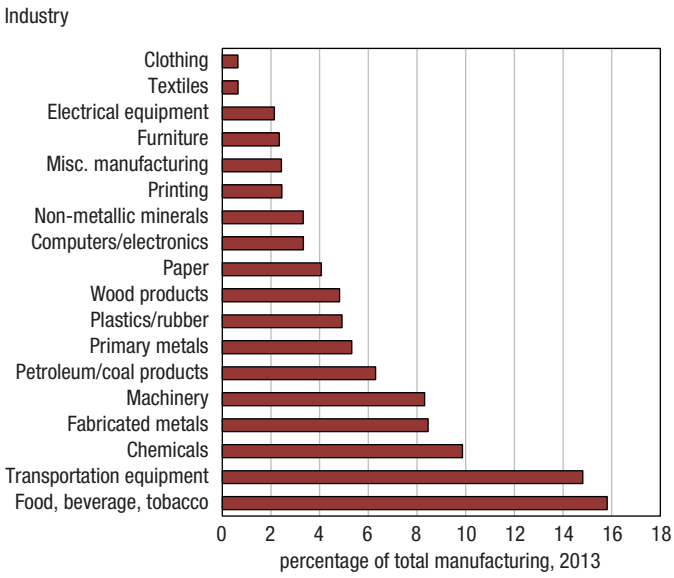


Sources: Statistics Canada, CANSIM table 379-0031; U.S. Bureau of Economic Analysis; and authors' calculations.

Real gross domestic product growth in key manufacturing industries

Trends in the Canadian manufacturing sector are largely influenced by two key industries: food, beverage and tobacco (roughly 16% of total manufacturing and 32% of non-durable goods manufacturing); and transportation equipment (15% of total manufacturing and 29% of durable goods manufacturing). The bulk of the transportation equipment industry comprises motor vehicles, motor vehicle parts, and aerospace production, all with roughly equal shares. A third industry, chemical manufacturing, makes up another 10% of manufacturing output (20% of non-durable goods manufacturing) (Chart 5).[5]

Chart 5
Canadian manufacturing nominal gross domestic product by industry



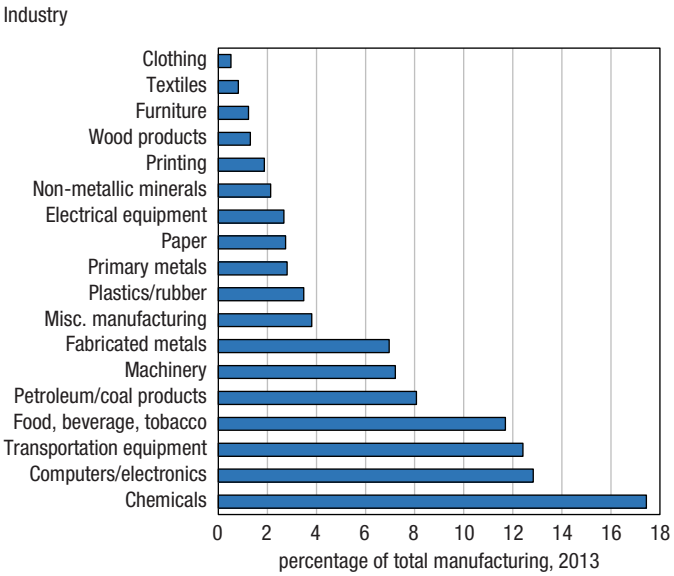
Source: Statistics Canada, CANSIM table 383-0032.

4. The distinction between durable and non-durable goods is based on whether the goods can be used only once for production or consumption purposes or whether they can be used repeatedly or continuously. A durable good is therefore defined as one that may be used repeatedly or continuously over a period of more than one year, assuming a normal or average rate of physical usage (see NAICS 2007).
5. The percentages in this paragraph are for the year 2013, the most recent year for which nominal shares are available.

In the United States, a little more than one-half of the total manufacturing sector is made up of four key industries: chemicals (17%); computers and electronics (13%); transportation equipment (12%); and food, beverage and tobacco (12%) (Chart 6). Computers and electronics and transportation equipment each compose about 24% of the U.S. durable goods sector, while chemicals and food, beverage and tobacco compose 37% and 25%, respectively, of the U.S. non-durable goods sector.

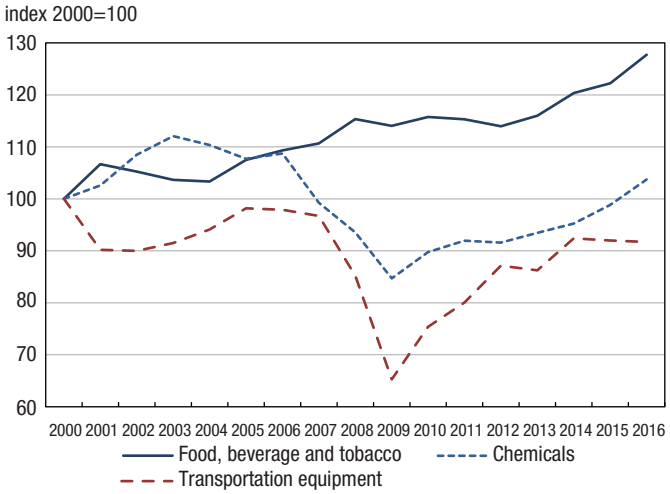
The pattern of growth in the Canadian transportation equipment industry over the 2000-to-2016 period (Chart 7) resembles the pattern of growth in the Canadian durable goods sector (Chart 4). While declines were broad based across nearly all durable goods industries during the recession, the transportation equipment industry experienced the largest contraction by far, declining by more than 32% during the downturn. This was largely due to significant contractions in both the motor vehicle industry (-46%) and the motor vehicle parts industry (-42%) (Chart 8). In addition, while these two sectors have grown since the last recession, they have yet to return to pre-recession levels, let alone levels seen in 2000. The aerospace industry, in contrast, performed considerably better as of the mid-2000s and throughout the recession. Despite this, the level of real GDP in aerospace in 2016 was slightly lower than its level in 2000, and its relatively stronger performance was not sufficient to offset the overall decline of the motor vehicle and motor vehicle parts industries.

Chart 6
U.S. manufacturing nominal gross domestic product by industry



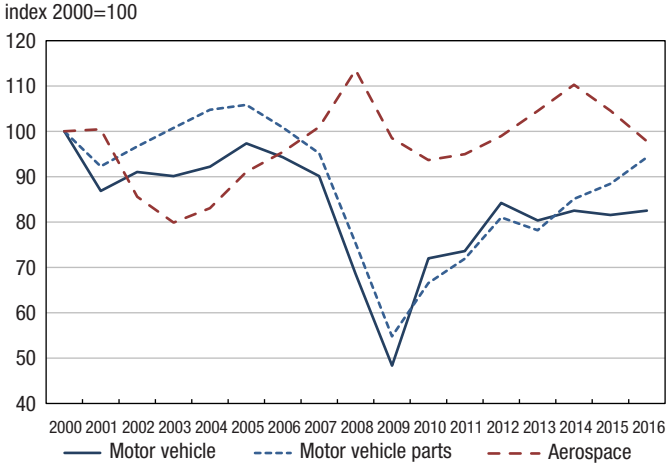
Source: U.S. Bureau of Economic Analysis.

Chart 7
Canadian manufacturing real gross domestic product, select industries, 2000 to 2016



Note: Weighted average for both the food industry and the beverage and tobacco industry.
Source: Statistics Canada, CANSIM table 379-0031.

Chart 8
Canadian transportation equipment real gross domestic product, 2000 to 2016

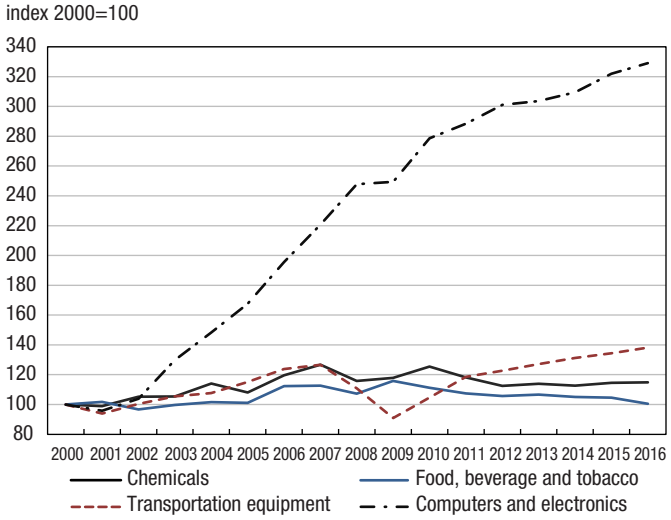


Source: Statistics Canada, CANSIM table 379-0031.

In contrast to the Canadian transportation equipment industry, the U.S. transportation equipment industry experienced significant positive overall growth from 2000 to 2016 (Chart 9). This industry was also heavily affected by the last recession, contracting 28% during the downturn. However, it rebounded rapidly, led by an increase of more than 100% in output in the motor vehicle and parts industries in 2010 alone, and by 2013 the transportation equipment industry had returned to 2008 levels.

While the performance of the U.S. transportation equipment industry from 2000 onward helps partially explain why U.S. output of durable goods outperformed Canadian output of durable goods, the U.S. computer and electronics industry played a much larger role in driving manufacturing output (Chart 9). Real GDP in this industry rose more than 120% between 2000 and 2007, and, following a brief period of limited growth during the recession, expanded a further 32% between 2010 and 2016. Overall, real GDP rose more than 200% in this industry between 2000 and 2016. No industry in the Canadian manufacturing sector exhibited growth of this magnitude.

Chart 9
U.S. manufacturing real gross domestic product, select industries, 2000 to 2016



Note: Weighted average of motor vehicles, bodies, parts, trailers and other transportation equipment.
Source: U.S. Bureau of Economic Analysis.

Less is learned by comparing the key industries in the non-durable goods sectors. The Canadian and U.S. chemical industries grew at roughly the same rate up to 2005; however, during the recession, the Canadian chemical industry contracted more than twice as much as the U.S. chemical industry. Output in Canada's chemical industry outperformed output in its U.S. counterpart after the recession. However, neither the Canadian chemical industry nor the U.S. chemical industries have returned to their respective pre-recession peaks as of 2016.

The food, beverage and tobacco industry performed somewhat differently. While both countries experienced similar growth up to 2007, the U.S. industry contracted 4.7% in 2008, and, following a brief rebound in 2009, output has steadily declined ever since. In contrast, the Canadian food, beverage and tobacco industry experienced a much smaller contraction (about 1% in 2009), and output has essentially expanded ever since. While the Canadian food, beverage and tobacco industry was well above pre-recession levels in 2016, output in the U.S. industry continued to decline.

Contributions to real manufacturing gross domestic product growth

The relative size of Canada's transportation equipment industry and its pattern of growth over time suggest that it could be at least partly responsible for the relatively weak growth and slow recovery of the Canadian manufacturing sector over the post-2000 period. The previous section also showed that the strong growth in the U.S. computer and electronics industry contributed to the stronger performance of the U.S. durable goods sector relative to that of Canada's, allowing the U.S. manufacturing sector to keep pace with growth in the U.S. business sector. For simplicity and flexibility, a Törnqvist index[6] is used to calculate the contributions to real GDP growth from each three-digit NAICS manufacturing industry for both Canada and the United States to examine to what extent the weakness in Canada's overall manufacturing growth came from the transportation equipment industry. The index is also used to examine the contribution to manufacturing growth from the U.S. computer and electronics industry. Finally, the index is used to determine which other industries contributed to the difference in the performance of the manufacturing sectors in Canada and the United States.

6. The contribution of industry to real GDP growth is equal to

$$\frac{1}{2}\left[\left(\frac{V_{i,t}}{\Sigma_{i=1}^{n} V_{i,t}}\right)+\left(\frac{V_{i,t-1}}{\Sigma_{i=1}^{n} V_{i,t-1}}\right)\right] \bullet \ln\left[\frac{Q_{i,t}}{Q_{i,t-1}}\right],$$

where n represents the number of industries i, t the time period, and V_i and Q_i the current and constant dollar value of output of industry i, respectively.

Between 2000 and 2007, the difference in the average growth of manufacturing GDP between Canada and the United States (-2.4 percentage points) was primarily accounted for by the difference in the contributions of the computer and electronics industries (-2.2 percentage points). The difference in the contributions of the transportation equipment industries (-0.5 percentage points) and the chemical industries (-0.3 percentage points) were of secondary importance (Table 1). Even if the contribution of the Canadian transportation equipment industry had been the same as in the United States over this time period, growth in the Canadian manufacturing sector and the Canadian durable goods sector would still have been less than half of that in the United States. It therefore would have been insufficient to raise the growth of the Canadian manufacturing industry enough to match the growth exhibited in the business sector. Over the 2000-to-2007 period, it was the much larger contribution of the U.S. computer and electronics industry that made it possible for the U.S. manufacturing sector to match the growth of the business sector.

During the last recession, the difference in the contributions of the computer and electronics industries (-1.1 percentage points) continued to play an important role in accounting for the Canada–U.S. difference in the average growth of manufacturing output (-4.3 percentage points). Although the Canadian transportation equipment industry made the single largest negative contribution to Canadian manufacturing growth during the recession (-2.6 percentage points of the overall -9.6 percentage points for all of manufacturing), neither it nor the chemical industry accounted for why the manufacturing industry contracted more during the recession in Canada than in the United States. Instead, a number of other industries, such as primary metals, wood products, miscellaneous manufacturing, paper, and plastics and rubber, together accounted for a large part (-2.9 percentage points) of the Canada–U.S. difference in the average growth of manufacturing output over that period.

After the recession, the computer and electronics industry continued to account for a large portion of the Canada–U.S. difference in growth in the durable goods sector (-0.6 percentage points of the -0.6 percentage point difference). The Canadian transportation equipment industry continued to contribute less than its U.S. counterpart, but its relative contribution again played a minor role in accounting for the overall Canada–U.S difference. The non-durable goods sector in Canada outperformed that in the United States in the post-2008-2009-recession period, in large part due to contributions by the Canadian food, beverage and tobacco industry and the Canadian chemical industry.

Table 1
Average contribution to manufacturing growth

	2000 to 2007			2008 to 2009			2010 to 2016		
	Canada	U.S.	Difference	Canada	U.S.	Difference	Canada	U.S.	Difference
	percentage points								
Total manufacturing (growth)	**0.7**	**3.1**	**-2.4**	**-9.6**	**-5.3**	**-4.3**	**1.9**	**1.5**	**0.4**
Durable goods	0.4	2.6	-2.2	-7.2	-4.3	-2.9	1.3	1.9	-0.6
Wood products	0.2	0.0	0.2	-0.6	-0.2	-0.4	0.3	0.0	0.3
Non-metallic minerals	0.1	0.0	0.1	-0.3	-0.4	0.1	0.0	0.0	0.0
Primary metals	0.1	-0.1	0.2	-1.2	0.0	-1.2	0.2	0.2	0.0
Fabricated metals	0.2	0.1	0.1	-0.9	-1.1	0.2	0.1	0.2	-0.1
Machinery	0.1	0.1	0.0	-0.7	-0.7	0.0	0.1	0.1	0.0
Computers and electronics	-0.2	2.0	-2.2	-0.3	0.8	-1.1	-0.1	0.5	-0.6
Electrical equipment	-0.1	0.0	-0.1	-0.1	-0.2	0.1	0.0	0.0	0.0
Transportation equipment	-0.1	0.4	-0.5	-2.6	-2.4	-0.2	0.7	0.9	-0.2
Furniture	0.0	0.0	0.0	-0.4	-0.3	-0.1	0.0	0.0	0.0
Miscellaneous manufacturing	0.0	0.1	-0.1	-0.2	0.2	-0.4	0.0	0.0	0.0
Non-durable goods	0.3	0.5	-0.2	-2.3	-0.9	-1.4	0.6	-0.5	1.1
Food and beverage	0.1	0.2	-0.1	0.0	0.2	-0.2	0.3	-0.3	0.6
Textiles	-0.1	-0.1	0.0	-0.2	-0.1	-0.1	0.0	0.0	0.0
Clothing	0.0	-0.1	0.1	-0.1	-0.1	0.0	-0.1	0.0	-0.1
Paper	0.0	-0.1	0.1	-0.6	-0.1	-0.5	0.0	-0.1	0.1
Printing	0.0	0.1	-0.1	-0.2	-0.2	0.0	-0.1	0.0	-0.1
Petroleum	0.0	0.1	-0.1	0.0	0.2	-0.2	-0.1	0.0	-0.1
Chemicals	0.1	0.4	-0.3	-0.6	-0.5	-0.1	0.3	-0.1	0.4
Plastics and rubber	0.1	0.0	0.1	-0.6	-0.2	-0.4	0.2	0.0	0.2

Notes: Components may not sum to totals due to rounding. Constant dollar data used to provide growth rates in the Tornqvist transformation are available up to 2016. Current dollar data used to provide the weights of the industrial sectors in the total manufacturing sector is available up to 2013. The most recent weights available, 2013, are thus used to calculate the contributions to growth for the years 2014 to 2016.
Sources: Statistics Canada, CANSIM tables 383-0032 and 379-0031; U.S. Bureau of Economic Analysis; and authors' calculations.

Conclusion

Between 1961 and 2000, real GDP in the Canadian manufacturing sector grew at essentially the same rate as that in the business sector. After a decade of strong growth during the 1990s, partly attributable to trade liberalization and a weaker dollar, the Canadian manufacturing sector adjusted to significant changes in the economic environment during the 2000s. Real GDP growth in the manufacturing sector slowed markedly, diverging from the overall business sector for the first time. The 2008-2009 recession exacerbated the challenges faced by the manufacturing sector, and, subsequently, as of 2016, the recovery was the slowest since the Second World War. In the United States, there has been no corresponding divergence between GDP growth in the manufacturing sector and the business sector over this period.

A major portion of the post-2000 slowdown in Canada's manufacturing sector stems from the weak performance of the durable goods sector. Negative growth in the transportation equipment industry was a factor, but even if the percentage point contribution of the Canadian transportation equipment industry to growth in the durable goods sector had been the same as in the United States, growth in the Canadian durable goods sector would still have been much weaker than in the United States. Instead, outside of the last recession, the contribution of the computer and electronics industry in the United States has largely accounted for the relatively weaker performance of the Canadian durable goods sector. No manufacturing industry in Canada has matched the performance of the U.S. computer industry over the post-2000 period.

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