

Canadian Economic Observer

The evolution of the Canadian manufacturing sector

by John Baldwin and Ryan Macdonald



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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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Introduction

This paper examines the long-term performance of Canada's manufacturing sector over half a century. We find little evidence of a moribund manufacturing sector in decline; we do find that it has undergone significant change in response to the numerous challenges that it faced, even before the global recession hit in 2008. This paper also places developments in Canada in context by examining what has been happening in other Organization of Economic Co-operation and Development (OECD) nations, especially the US, Canada's largest trading partner.

Overview

In the debate over whether manufacturing is in secular decline, the most common evidence cited is the falling share of nominal GDP produced by manufacturing. It is clear, as we shall see, that manufacturing's share of current dollar GDP has declined over the past forty years (see for example: OECD 2006).

However, the share of nominal GDP is a poor measure for determining if the manufacturing sector is shrinking. Shares reflect the fact that the nominal value of GDP has both a volume and a price component, and falling relative prices for manufactured goods have dominated its declining share. As well, shares are affected by how other areas of the economy grow.

One of the most important factors affecting relative price changes is productivity growth. In Canada, manufacturing makes the highest contribution to productivity growth of any sector (Baldwin et al, 2001). Its processes are amenable to commoditization, allowing for greater specialization of labour and higher levels of mechanization. This leads to particularly high rates of productivity growth, as manufacturers exploit these features, and results in a decline in its prices relative to other goods and services.

The competitive process leads industries with higher productivity growth (such as manufacturing) to pass this on through lower price increases (Baldwin, Durand, and Hosein 2001). As a result, prices in these industries fall over time relative to goods and services produced in industries with lower productivity growth.

Competition and productivity growth have combined to hold back price increases in manufacturing relative to other industries. These relative price movements imply that changes in manufacturing's share of nominal GDP faced downward pressures irrespective of changes in relative volumes. Whether this occurred depends upon the price elasticity of manufacturing goods with respect to their own prices as well as the prices of

other goods, and the income elasticity of manufacturing goods: whether consumers, investors or governments buy relatively more manufactured goods over time as incomes increase or whether they choose to buy more services.

This shows that the share of manufacturing output in nominal GDP does not solely reflect what is happening to relative volumes.

Higher productivity growth in the manufacturing sector also suggests that an alternative measure of the health of manufacturing—its share of total employment—should also be used with caution. This is because employment does not directly track output if labour productivity, measured as output per hour worked, increases. Industries with higher labour productivity growth will have relatively lower labour input growth. If manufacturing output growth is as buoyant as that in the overall economy, its labour input growth would be less than overall employment growth because of its superior labour productivity performance. As a result, the share of manufacturing in total employment declines simply because of higher productivity.

In what follows, we investigate several of the simple metrics used to assess the health of the manufacturing sector. In doing so, we recognize that these share measures have both a volume and a price component, and we examine each in turn, focusing on what the trends reveal about the underlying relative performance of manufacturing.

Over long periods, the productivity performance of manufacturing is a major determinant of prices in this sector; but in the short-run, major shocks will also affect prices. Short-run economic shocks caused by recessions can be transmitted from one nation to another. Exchange rates move suddenly, altering the competitive pressure manufacturers face. The introduction of new trading regimes also affects demand for manufactured products by changing the size of markets some industries serve and by reducing product prices in industries where the exploitation of economies of scale reduces unit costs. Together, business cycles, exchange-rate shocks and tariff cuts lead to changes that alter the composition and size of a country's manufacturing industry.

The many factors affecting manufacturing at any point in time make it difficult to assess its health using a single metric or a short span of data. This paper, therefore, uses a number of metrics to examine the evolution of Canadian manufacturing industries between 1961 and 2005 (and excludes its recent cyclical decline in response to the global recession, as nominal GDP data by industry are not available after 2005). It starts by placing Canada in an international context, exploring the link between Canadian and US manufacturing. It then discusses major changes in the share of GDP accounted for by Canada's manufacturing industry between 1961 and 2005, and whether these changes were caused by changes in relative prices or by changes in relative volumes of manufacturing goods. It investigates the effect of exchange-rate shocks on Canadian manufacturing prices. Finally, it examines the impact of the 1990s trade liberalization on the structure of manufacturing in Canada.

The study draws on data from a range of sources. Since it provides the broadest coverage and price and volume movements, the OECD Structural Analysis (STAN) database is used to calculate the share of GDP originating in manufacturing across OECD nations. The STAN database contains estimates of nominal GDP, real GDP and price indices as far back as 1970 and as recently as 2005, and is used here to make comparisons with countries other than the US. While data for cross-country comparison are available from the OECD, users should be aware that output measures in these databases are not always measured consistently across countries with respect to market prices, basic prices or factor costs. Nevertheless, for the purpose of completeness, we use this data because we have compared Canada and US estimates using more comparable definitions and have found that while levels are affected, the growth rates reported here are not.

We also make use of data for the US from the National Income and Product Accounts, produced by the Bureau of Economic Analysis. Using the BEA data allows for comparisons of Canadian and US trends extending back to 1961.

Manufacturing's share of output

Over long periods of time, the share of the manufacturing industry's value added ¹ in nominal GDP declined across most OECD nations, regardless of whether they are relatively open or closed economies, or net resource importers or exporters. While the process is not smooth, and exhibits periods of both slow and rapid decline (and sometimes a temporary increase), the general trend is downward (Chart 3). This suggests that the evolutionary processes at work are remarkably similar across OECD nations.

There are some exceptions to this continuous downward trend: Australia, Italy, Canada and Norway show multi-year periods where manufacturing's share increased, but the respite was relatively short-lived for all except Canada, where during a 20-year period from 1980 to 2000 manufacturing's share actually rose slightly, despite two severe recessions. This is particularly noteworthy in view of the sharp drop in manufacturing activity in Canada in the current recession, which so far has been slightly less pronounced than the 17.4% contraction in 1981-82.

Despite this anomalous behaviour during the 1980s and 1990s, Canada's share of manufacturing in nominal GDP has fallen over the longer run: between 1961 and 2005, the share of Canadian manufacturing in total GDP declined by 8.7 percentage points, from 24.3% to 15.6%. In contrast, the share of manufacturing in US GDP fell between 1961 and 2005 by 12.6 percentage points, from 24.6% to 12.0%. Therefore the retreat in the US was almost half as large as in Canada. The difference is the result of the long hiatus during the 1980s and 1990s, when Canada's manufacturing share stopped its decline.

Between 1961 and 1980, manufacturing's share of GDP in Canada and the US experienced similar declines (Table 1), but the two economies diverged in the 1980s and 1990s. During the period spanning 1980 to 2000, Canada's share of manufacturing in GDP rose slightly, while the drop accelerated in the United States. After 2000, Canada experienced a resource boom, which helped reduce its manufacturing share of GDP more rapidly than other nations.

Relative prices and volumes

Relative price changes emerge as the primary source for the lower share of manufacturing in GDP in Canada and the US (Table 2).

For Canada, the volume of manufacturing output relative to the total economy between 1962 and 2005 was essentially unchanged. On the other hand, relative prices fell by 0.9% per annum, making them the primary force behind the decline in Canada's manufacturing share of nominal GDP. A similar pattern exists in the US, where relative volumes rose at an average annual rate of 0.2%, while relative prices declined by an average of 1.7%.

There are some shorter time periods during which relative manufacturing volumes did decline, but the drop in relative prices during these periods was usually considerably larger than the volume changes. There is little persuasive evidence that the volume of manufacturing output has been in a long-run decline.

This was not the case for countries outside North America: France, Norway and Japan experienced long-run declines in the volume of manufacturing relative to total economic output. With the exception of Norway, falling relative prices was still the most important determinant of the decrease in the share of manufacturing.

Relative prices and the dollar

While long-run trends in manufacturing prices are mostly influenced by technological change, there are other influences that may cause deviations. The exchange rate strongly affected the course of Canadian

manufacturing prices during the entire period and was large enough to offset some of the downward pressure exerted by productivity growth during the 1980s and 1990s. The hiatus in the decline in manufacturing's relative prices tempered the decrease in its share of GDP in Canada in these two decades, while in most other OECD countries it continued its downward trend.

The long-term depreciation in the Canadian dollar starting in the late 1970s was accompanied by a slowdown in the decline of manufacturing prices relative to other goods. The depreciating Canadian dollar lowered the relative cost of Canadian manufacturing compared to the US, providing room for domestic producers to adjust their prices, not so much because of international competition but because of cost conditions at home. It is during this period that the relative price of manufacturing products levelled off and even rose modestly (Chart 4) and Canada experienced a reversal from the secular decline in manufacturing's share of nominal GDP.

One way to see the advantage to the Canadian manufacturing sector of the long period of depreciation is to compare US and Canadian manufacturing prices over time, with Canadian prices adjusted for the exchange rate (Chart 5).

Canadian prices increased relative to US prices, after adjusting for exchange-rate movements from the early 1960s to the mid-1970s. With the depreciation of the Canadian dollar in the 1980s and 1990s, the relative price of Canadian manufacturing levelled off. After 2002, the appreciation of the Canadian dollar generated an unprecedented difference of Canadian manufacturing prices (expressed in US\$) from those of the US.

This emphasizes the general problem of interpreting movements in the industry share of nominal GDP. Prices are an important determinant of the share of output originating in the manufacturing sector because, in the long-run, their movement reflects movements in relative productivity. However, in the short-run, when there are shocks from the exchange rate or recessions, manufacturing prices can deviate from their long-term trajectory in a small, open economy like Canada's. During the 1980s and 1990s, Canadian manufacturing prices deviated from their long-term trend of tracking lower prices in the US, and this relative price increase helped to slow the decline in Canada's share of manufacturing in total GDP.

Trade liberalization, compositional shifts and productivity performance

Commodity price and exchange-rate cycles are not the only factors that have affected the long-run health of the manufacturing sector. Trade liberalization has been a major factor at work in this sector. The Auto Pact in 1965, The General Agreement on Tariff and Trade Kennedy Round (1964-1967) and Tokyo Round (1973-1979) of tariff cuts in the 1960s and 1970s were followed by the 1989 Free Trade Agreement (FTA) with the US and the North American Free Trade Agreement (NAFTA) between Canada, Mexico and the US in 1993.

During the 20 years before NAFTA, Canada's share of durables in manufacturing was lower than the share in the US, with the gap between the two fairly constant for 30 years. By the 1991 recession, the relative shares of durables and non-durables were at the same level as they had been in the early 1960s.

Following the implementation of NAFTA in 1994, a transformation of Canadian manufacturing began that resulted in Canada's shares in durables and non-durables matching those of the US ², ³ (Chart 6). Share changes were pervasive, increasing across most durables industries and decreasing in nearly every non-durable industry (Table 3). ⁴

In some cases, particularly in the case of durable goods, this growth was new. Non-metallic minerals, fabricated metals, computers, furniture and miscellaneous manufacturing all showed increases in industry shares after 1994 which had not occurred during the 1980s. For wood products and transportation equipment, the 1990s saw a continuation of the upward trend in their share that extended back to the late 1970s (and in the case of transportation equipment, to the establishment of the Auto Pact in 1965).

Durable goods industries differ from non-durables in a number of ways. First, durable goods have always exported more intensively than non-durables: export intensity of the average plant was at least 50% higher in durable than non-durable industries. Durables industries are concentrated in export markets and, following the trade agreements, benefited from additional access to North American markets. In addition, economies of scale were more important in the durable goods industries, where the ratio of the minimum efficient plant size was large relative to industry size. ⁵

Industries such as clothing and textiles saw steady declines in their share of manufacturing. Chemical products in Canada had a more rapid decrease in its share than had previously occurred, contrary to the US experience.

Following the ICT bust, the shares of durables and non-durables in Canada continued to match those of the US. NAFTA coincided with a shift in Canada's manufacturing industries that did not dissipate with the 2001 recession, or during the resource boom that followed.

Diminishing output shares do not necessarily imply lower output in absolute terms.

Between 1962 and 2005, volume growth in manufacturing and total GDP was about the same. More important, the actual volume of manufacturing output increased over the entire time period. Growth was positive in non-durables (the sector that saw its share diminished) as well as in durables, whose share was increasing.

Conclusion

Canada's relatively stronger performance of its share of GDP produced in manufacturing stems primarily from a different trend in the relative price of manufacturing goods. The downward trend in relative manufacturing prices in Canada tracked that of the US in the 1960s and early 1970s, but then underwent a reversal in the 1980s and 1990s. This period corresponds closely to events that led to a depreciation of the Canadian dollar against the US dollar, reducing competitive pressures on Canadian manufacturers. The stronger Canadian performance, using the nominal GDP share metric, was primarily the result of these unique movements in manufacturing relative prices compared to other countries, during a period of a depreciating exchange rate.

Canadian manufacturing output did not decline relative to the total economy as much as it did in many other countries. In relative terms, the volume of factory output held its own during the last half century.

This progress has been subject to substantial cyclical fluctuations. Canadian manufacturing has adapted, showing considerable resilience in the face of challenges, whether from demand shifts, relative price shifts or changes in tariff regimes. Over the past 28 years, manufacturers have dealt with several recessions in North America, trade liberalization (including the introduction of the FTA and NAFTA) and the largest resource boom since the end of the Second World War that precipitated a dramatic change in the relative prices of outputs and inputs. Through all of these events, and in the face of intense international competition and rising resource prices, manufacturers raised their productivity, and transformed the structure of manufacturing to match that of the US by shifting production to more durables and fewer non-durables.

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Notes

1. An industry's contribution to GDP is commonly referred to as value added—essentially the income earned by factors employed in an industry to transform materials and service inputs into outputs.
2. The minimum efficient size plant (MES) is calculated as the average size of the largest plants that account for the top 50% of shipments. See Baldwin (1995) for a discussion of this measure.
3. A similar change occurred in Mexico.
4. The one exception was a drop in computers and electronics after the ICT bust in 2001.
5. An industry's contribution to GDP is commonly referred to as value added—essentially the income earned by factors employed in an industry to transform materials and service inputs into outputs.



Chart 3.1 Manufacturing share of nominal GDP, 1961 to 2005

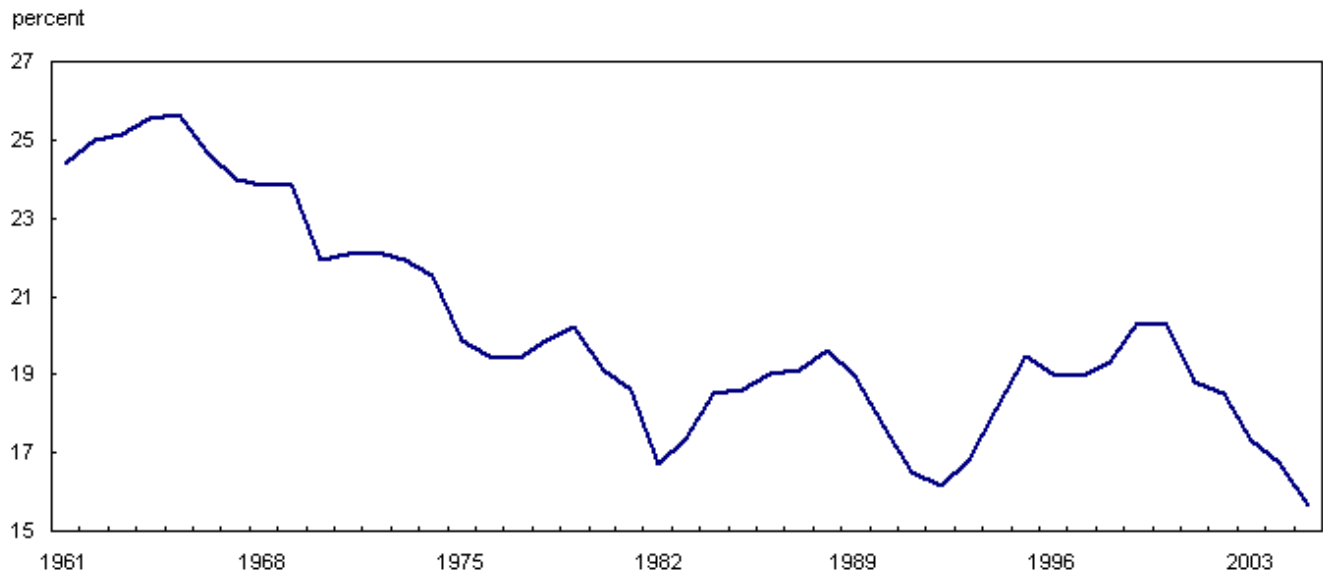




Chart 3.2 Manufacturing relative to GDP

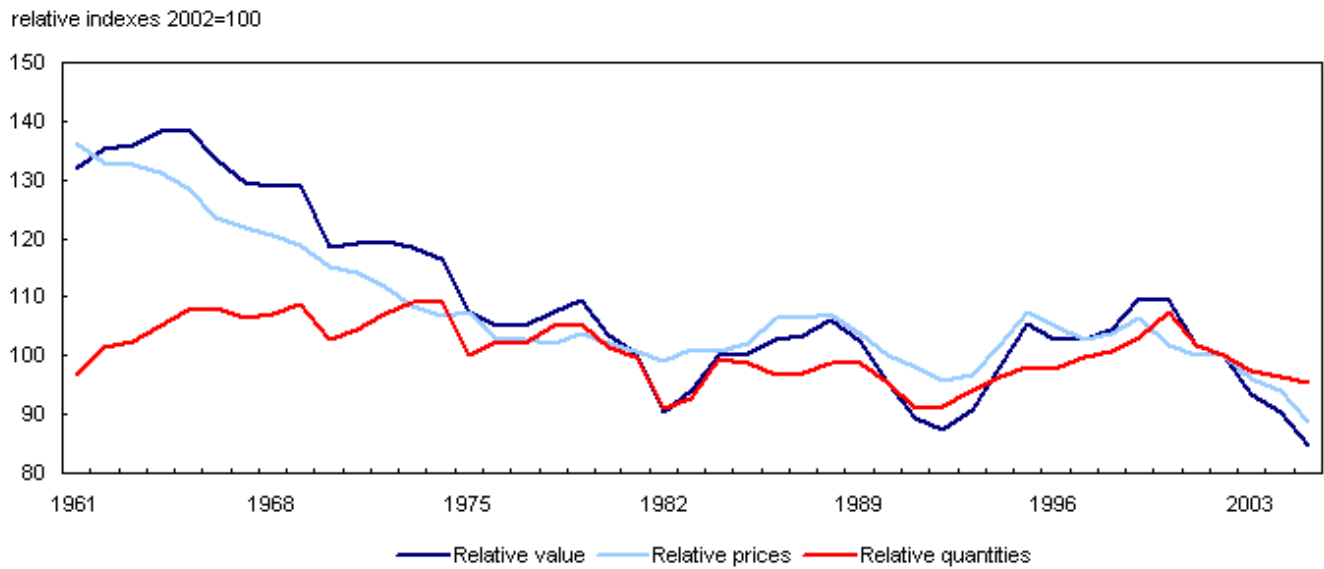




Chart 3.3 Manufacturing's share of nominal GDP

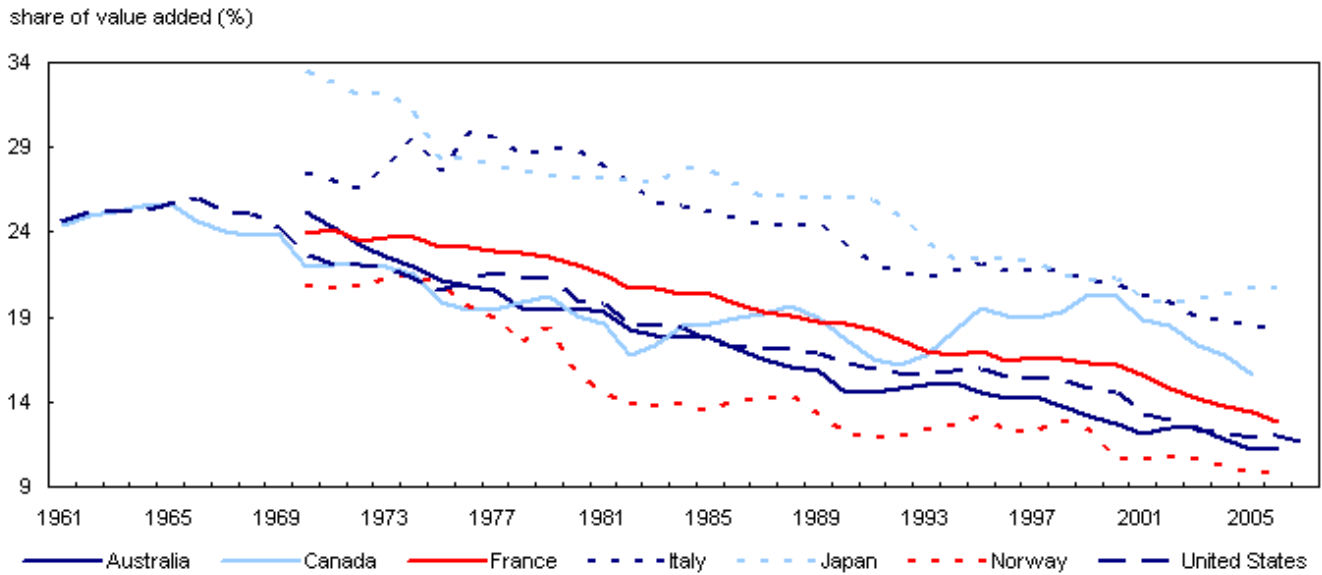


Chart 3.4

Canadian relative prices of manufactured goods and the Canada/US exchange rate

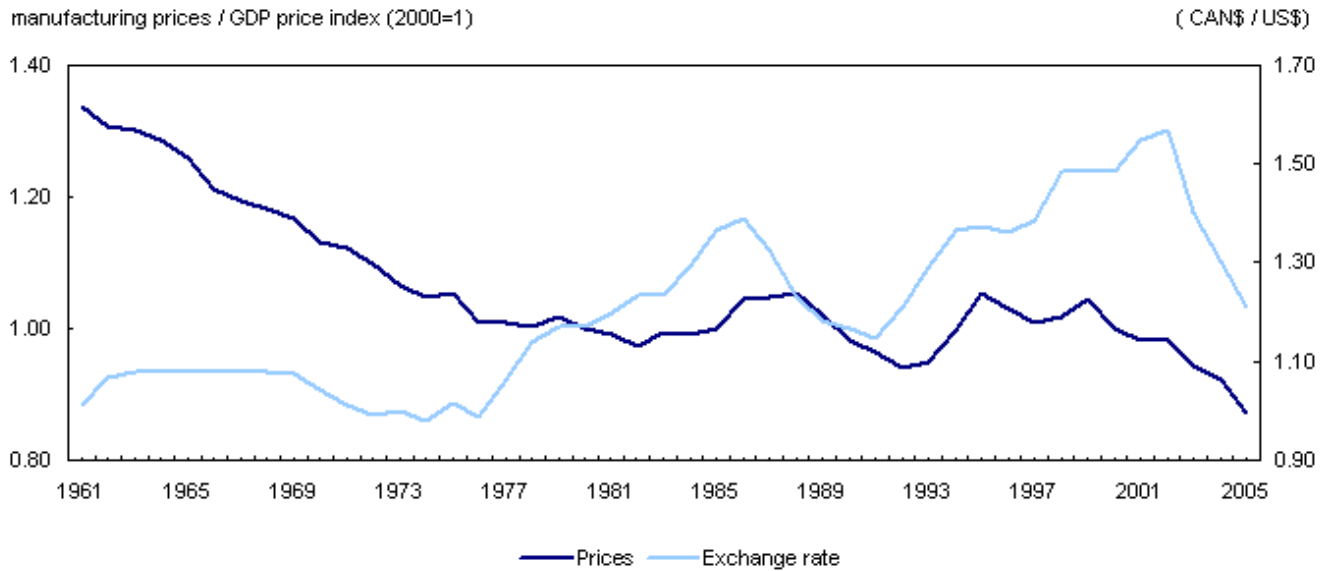


Chart 3.5 Canadian and US manufacturing prices

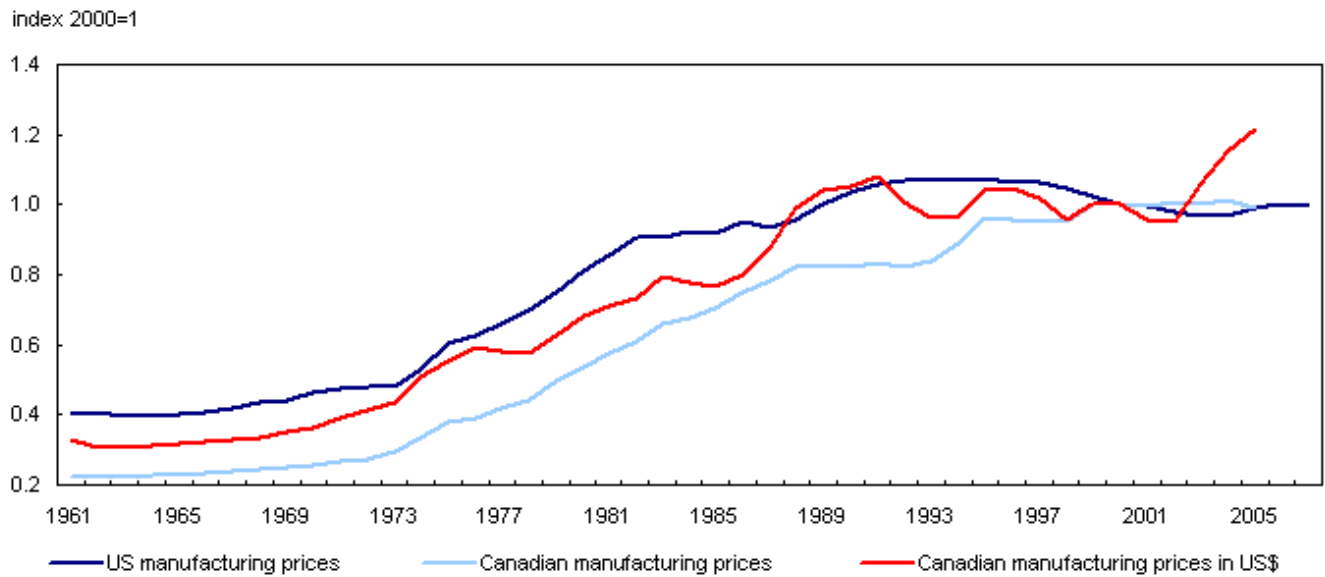
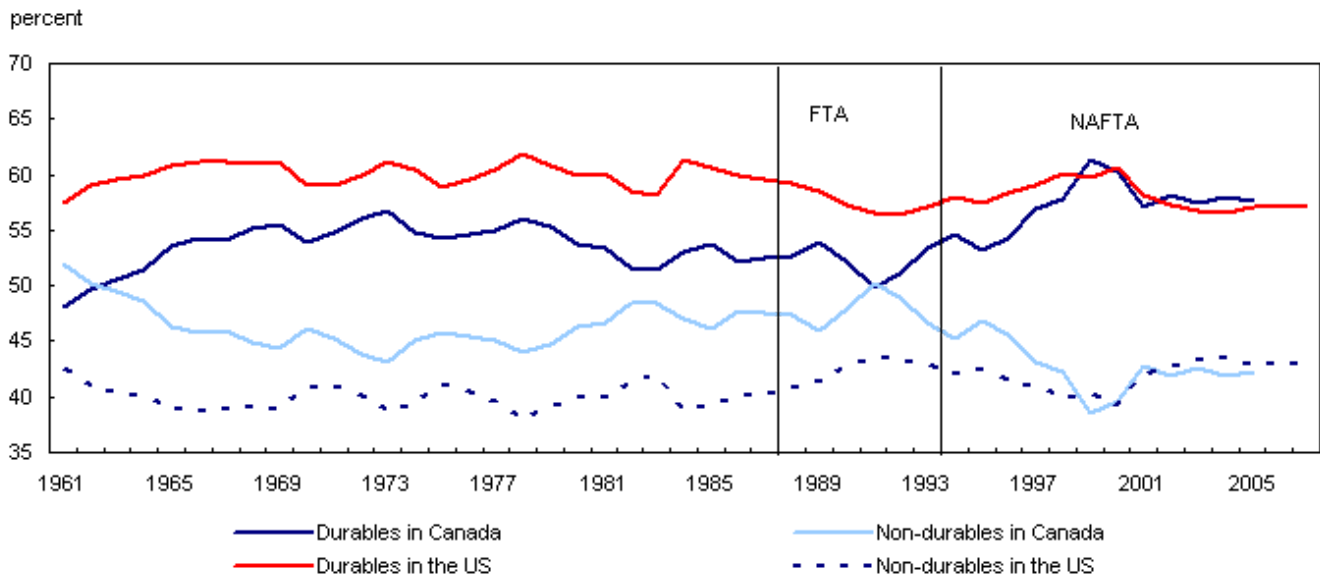


Chart 3.6
Durable and non-durable shares of manufacturing in Canada and US





Text table 3.1 Manufacturing share changes in nominal GDP

	1961 to 1980	1970 to 1980	1980 to 2000	2000 to 2005	
		percentage points			
Canada	-5.3	-2.8	1.2	-4.6	
United States	-4.6	-2.7	-5.4	-2.6	
France	--	-1.9	-5.8	-2.8	
Italy	--	1.4	-8.0	-2.5	
Japan	--	-6.4	-5.9	-0.7	
Norway	--	-5.3	-5.0	-0.8	
Australia	--	-5.6	-6.9	-1.5	



Text table 3.2

Average annual relative price and volume growth of manufacturing, Canada and US, by period

	1962 to 2005	1962 to 1970	1971 to 1980	1980 to 1990	1990 to 2000	2000 to 2005
	average annual percent change					
Canada - Relative price	-0.9	-1.8	-1.2	-0.3	-0.1	-3.0
Canada - Relative volume	0.0	0.7	-0.1	-1.0	0.8	-1.1
United States - Relative price	-1.7	-1.4	-1.1	-1.6	-2.2	-2.8
United States - Relative volume	0.2	0.5	-0.1	-0.7	0.8	-0.7

Text table 3.3

Industry shares in manufacturing GDP

	1961	1970	1980	1990	2000	2005
			percent			
Food	12.0	10.8	10.1	11.2	8.6	10.5
Beverage and tobacco	4.9	4.6	3.5	3.7	2.9	3.8
Textiles	2.5	2.3	2.0	1.9	1.5	1.3
Clothing	4.4	4.0	3.5	2.9	2.3	1.5
Leather	1.5	1.1	0.9	0.5	0.3	0.1
Paper	10.7	9.0	10.5	8.2	7.7	5.8
Printing	2.7	2.5	2.7	3.9	3.0	3.2
Petroleum	2.9	1.5	2.1	1.3	1.4	2.5
Chemical	8.2	7.6	7.9	10.3	7.2	7.9
Plastics and rubber	2.2	2.8	3.1	4.1	4.9	5.7
Wood	4.4	4.2	5.8	4.1	6.5	6.7
Non-metallic mineral	3.7	3.6	3.4	3.3	2.5	3.2
Primary metal	8.9	9.0	8.8	6.3	6.2	6.9
Fabricated metal	6.6	7.7	7.3	6.4	7.4	7.9
Machinery	4.3	5.4	7.1	5.9	6.6	7.1
Computer and electronic	4.5	5.3	4.7	5.0	6.2	3.9
Electrical equipment	4.2	4.3	4.0	3.4	2.4	2.0
Transportation equipment	7.9	10.6	9.2	13.3	17.7	14.3
Furniture	1.7	1.8	1.8	2.7	3.0	3.4
Miscellaneous	1.8	1.9	1.8	1.7	1.8	2.3
Non- Durables	51.9	46.2	46.2	47.9	39.7	42.3
Durables	48.1	53.8	53.8	52.1	60.3	57.7