A Comparative Analysis of Productivity and Competitiveness in Agri-food Processing in Canada and the United States

Prepared By
Larry Martin
Kate Stiefelmeyer

January 2001

A Comparative Analysis of Productivity and Competitiveness in Agri-food Processing in Canada and the United States

Larry Martin and Kate Stiefelmeyer[1]

Executive Summary

This study starts with three objectives:

a. to revisit and revise, if necessary, the definition of competitiveness and characterize the factors that affect relative competitiveness.
b. To apply the definition of competitiveness empirically by measuring labour productivity, as well as value-added for industries in the agri-food sector in Canada and the US.
c. To assess and describe changes in agri-food sector competitiveness over time

Conclusions about each of the objectives are presented below.

Definition of Competitiveness

This was also an objective of the first study in this series. Our conclusion is that the definitions put forward by the Agri-Food Competitiveness Task Force in 1990 is very similar in meaning to others. They all focus on relative productivity and market share. While any could be used, we maintain the one by the Task Force:

Competitiveness is the sustained ability to profitably gain or maintain market share.

Applying the Definition

This definition implies that to measure the competitiveness of an industry, one needs to obtain data on its productivity relative to its competitors, and its market share. Our approach here is first, to measure output by the industry's value added. Then productivity is measured through three alternative ratios of value added - per employee, per dollar of wages and salaries, or per dollar of sales. The relationship of these measures to profitability was noted in section 2.0.

Market share is measured by the net export orientation ratio. This is the difference between the value exports and imports of an industry's products expressed as a ratio of the value of an industry's production.

[1]The authors are CEO and Research Assistant in the George Morris Centre.

These ratios are applied to nine food processing industries in sections 3.0 and 4.0 of the report. In section 5.0, a brief analysis is presented of investment flows in agri-food between Canada and the US. This is consistent with the results of the comparative analysis.

Assessment of Competitiveness

Table 6.1 contains a summary of the results of the analysis in sections 3.0 and 4.0. In developing the entries for the table, we assessed the relative performance on the variable since 1989, the beginning of CUSTA. If the Canadian industry outperformed the US industry, it was assigned a +. If the US outperformed, then a - was assigned. If there appeared to be no difference, we assigned a ~.

The table presents a rather clear overall picture. The number of negatives significantly exceeds the number of positives.

Summary of Canadian Relative Performance

Industry	NEOR	VA/Person	VA/$ Wages	VA/$ Sales
Veg Oil	+	+	+	+
Frozen Fruit & Veg	+	~	+	~
Red Meat	+	-	-	~
Fluid Milk	~	~	+	+
Grain Based	~	-	-	~
Dry Pasta	-	-	-	~
Processed Fruit & Veg	-	-	-	~
Manuf. Dairy	~	-	-	-
Poultry	-	-	-	-

The fundamental conclusion of this analysis is that only one food processing industry can be said to have clearly enhanced its competitiveness since the beginning of the Canada US Trade Agreement. Three others have likely not lost much ground, although they, in many cases, simply maintained their lag behind their US counterparts.

The remaining industries have clearly lost ground against their US rivals.

Implications

It is ironic that post CUSTA, the net flow of investment capital in the agri-food sector switched from being in Canada's favour, to being very much of a deficit. This, however, is consistent with the fact that only one of nine food processing industries unequivocally gained in competitiveness, while most of the remainder fell further behind in labour productivity or failed to make any gains.

The irony arises because of the fact that CUSTA gave Canada more access to a market of 250 million, while the US got access to only 25million. One would have expected a relatively larger investment in Canada in order to gain the economies of size required in the US market. But this has, apparently, happened mainly in the vegetable oil industry and, more recently, red meat processing.

Why the reluctance to take advantage of the opportunity, especially when it is enhanced by a currency that is worth only 2/3 of the US currency? While we did not set out to answer this question explicitly, conversations with many people in the industries suggests at least two potential reasons for this. One is a much higher tax level for both businesses and individuals. Capital budgets often make Canadian investments look much worse after tax than before tax. And individuals often prefer to pay government less for the services it provides.

The second reason that is often mentioned is that the regulatory burden in Canada is much more onerous than in the US. The data reported here would seem to support that perception.

If Canadian policy makers see this growing lack of competitiveness as an issue worth resolving, then it would be sensible to understand the reasons for the decline, and to offer some alternatives for changing the situation.

A Comparative Analysis of Productivity and Competitiveness in Agri-food Processing in Canada and the United States

Larry Martin and Kate Stiefelmeyer[2]

1.0 INTRODUCTION

Growth in the Canadian agri-food sector is dependent on the sector's competitiveness relative to other sectors in the economy and relative to the agri-food sectors in other countries. The international competitiveness of key segments of the Canadian agri-food sector has received previous research attention. For example, the Agri-Food Competitiveness Council's work in the early 1990's spawned research on the competitiveness of Canadian food processing industries (Martin *et al*, 1992). More recently, Martin *et al* (1999) analysed the international competitiveness of the Canadian hog-pork supply chain.

The sector has undergone considerable structural and technological change in the past decade as a result of the Canada-US Trade Agreement (CUSTA), NAFTA, the 1995 WTO agreement. Much of that structural change was intended to enhance the profitability and competitiveness of the sector relative to other sectors in Canada and the competing industries in other countries, especially the US. But whether the intention has been achieved has not been analysed.

At the same time, Handy *et al* have shown that the net flow of investment capital for the food processing and distribution industries has been negative for Canada relative to the US, and has been becoming increasingly negative over time. In other words, since the beginning of CUSTA, Canadian investment in the US food industry has been far greater than US investment in Canada. This implies that, despite structural adjustment in Canada, it is possible that US competitiveness has increased relative to Canadian because there has been even more structural adjustment there. No analysis has been undertaken to show how the food industries have changed in terms of relative competitiveness and profitability during the decade.

It is important to understand relative competitiveness and profitability. To successfully compete with other sectors for labour and capital, agri-food must be relatively profitable. In turn, to be relatively profitable, the sector's labour and capital productivity needs to be comparable. This is the second of two reports that address this issue. The first reported on an analysis of the productivity and competitiveness of Canada's agri-food processing sector relative to other manufacturing industries in Canada. In this report, Canada's agri-food sector is dis-aggregated into its four digit component parts and compared to their counterparts in the US.

---

[2]The authors are CEO and Research Assistant in the George Morris Centre.

1.2 PROJECT OBJECTIVES

The objectives of this study are:

1. to revisit and revise, if necessary, the definition of competitiveness and characterize the factors that affect relative competitiveness.
2. To apply the definition of competitiveness empirically by measuring labour productivity, as well as value-added for industries in the agri-food sector in Canada and the US.
3. To assess and describe changes in agri-food sector competitiveness over time

The first objective above was also an objective for the first report in the series. Section 2.0 of that report addresses that objective and is repeated below so that readers who do not have it can follow the logic.

Section 3.0 contains an analysis of productivity in the food processing industries in Canada and the US. In section 4.0 we present information on market shares for each of the industries. In section 5.0, we present a brief discussion of investment flows between the food industries of the two countries. Section 6.0 contains conclusions.

2.0 MEASURING COMPETITIVENESS, AND ITS RELATIONSHIP TO PROFITABILITY

Competitiveness is one of those words that has meant different things to different people and is, therefore, often not particularly meaningful. Often it is a substitute for cost - ie some people believe the lowest cost producer has the most competitiveness. However, this implies that the only strategy for competing is a low cost strategy, a point of view that totally ignores differentiation and niche strategies. Others regard it as descriptive of one's behaviour, or attitude, thereby confounding it with "being competitive".

The word came into the Canadian vocabulary with the signing of the Canada US Trade Agreement (CUSTA), because there was great concern about whether Canada could compete against the US in a freer trade environment. Then in 1990/91, the publication of Michael Porter's book and its Harvard Business Review precis, The Competitive Advantage of Nations, brought the conversation to a new level. Subsequent work by Hamel and Prahalad (Competing For the Future) raised the quality of the concept even higher because they, much more so than Porter, focus on non-cost competition.

2.1 DEFINING COMPETITIVENESS

Unfortunately, Porter chose not to define competitiveness. He quite correctly notes that it is complex, and difficult to capture in a few words. While this may be true, not defining contributes to a lack of specificity in discussing it, and has likely reduced its usefulness as a concept in guiding either public policy or business strategy.

In 1990, Canada's Agri-Food Competitiveness Task Force did define the word, and suggested the definition could be applied to an individual company, an industry, an industrial sector or a national economy. They said,

Competitiveness is the sustained ability to profitably gain or maintain market share.

In expanding on the definition, the Task Force indicated that the following considerations should be associated with it:

- it has three measurable aspects - profits, market share and (sustained) time. So, competitiveness is attained if one is profitable with steady or increasing market share over time.
- the word "profitably" is meant to imply only that profitability is attained from the market place, not from unfair competition, public policy that confers unfair advantage, or subsidies.
- the fact that profitability is used instead of cost explicitly recognizes that there are alternative competitive strategies **and** recognizes that various stages in the supply chain must be profitable.
- underlying the definition is the expectation that, as a result of its actions in the market, a company, industry, sector, or national economy that has maximum competitiveness will be able to attract resources of production - ie labour, capital and new ideas.
- the term focuses on results (profitability, market share), not on behaviour. So, the distinction between one who is competitive and one who has a high degree of competitiveness is that the first displays competitive behaviour, while the second shows results. The two are not necessarily the same. The second person's competitiveness may have resulted from her or his ability to cooperate.

The last distinction is important in that it implies that an analysis of competitiveness begins with the end - ie has this industry shown a high degree of profitability and an ability to gain market share? If so, or if not, we know something about it's degree of competitiveness. We don't know why. This creates the next step - why does it have what ever degree of competitiveness it has? This is the diagnostic step that can allow one to make prescriptions about changes in private business strategy or its application, and/or about public policy as it affects the industry. This definition and approach implies that without knowing how well the industry is doing, it is not useful to know why and provides no basis to figure out how to help it improve or maintain its competitiveness.

Other definitions are similar when all of their underlying concepts are understood. One that has been widely used as a definition of national competitiveness is by the former US Office of Technology Assessment (1991):

> "*… the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real incomes of its citizens" (OTA, 1991)*.

The two definitions are very similar. The only way real incomes of a populace can expand over time is if their employers are profitable. Private sector incomes arise from only two sources; wages and profits. Profits translate into income through dividends or increased share values. In the long term, share values reflect profits. So real incomes can only increase if returns before and after wages are rising. When that becomes clear, the definitions are the same.

Others simply say that competitiveness is about nothing more than continuously improving productivity relative to the productivity of others (either others in your product market or others against whom you are competing for resources). We have no issue with that concept. In the final analysis, profitability or expanding real incomes can only occur if productivity increases and can only continue if productivity continues to rise. So all three definitions are part of the same thing.

2.2 COMPETITIVENESS, PROFITABILITY AND PRODUCTIVITY

So, if these definitions are essentially the same, how does one go about measuring them? How do "profitability" and "productivity" converge at a practical level? Let's address profitability first, and see whether it leads to productivity.

Profitability is a deceptively simple, yet complex concept. At its simplest, it is the excess left after paying costs out of revenue. The problems with profitability start when one tries to measure it:

- The most obvious issue is that there are several and arbitrary ways to account for long term capital assets.
- Second, publically reported profits are calculated to optimize tax treatment.
- Third, despite the idea of "generally accepted accounting principles", the truth is that there are often many ways to do the same thing. So, no two accounting statements are calculated in precisely the same way.
- Fourth, in attempting to make inter-industry comparisons (as we must do in this study), the vast majority of firms are not publically traded, and do not provide financial statements.
- Fifth, even where they are publically traded, many firms operate in more than one industry but generally report on a consolidated basis.

Considering all these issues, it would appear impossible to obtain a reliable measure of an industry's profitability from profit data.

This led researchers at the George Morris Centre, several years ago (Martin *et al*, 1992), to consider using value added as a proxy for profits. By definition, value added is the difference between an industry's total revenue (value of shipments, as reported by Statistics Canada and the US Commerce Department) and its cost of raw materials. So, for food manufacturing industries, value added is the difference between their selling prices (ie "wholesale' prices) multiplied by the units sold, less the cost of raw materials from farms, packaging and energy. If there were no labour or capital cost, value added would be profits. So, they approach being the same. An attractive aspect of value added as a proxy is that it provides information on the progress of industries that are attempting to move away from a low cost orientation toward differentiation: if differentiation is successful, then margins increase and this will be clear by expressing value added as a percentage of sales.

In fact, since Canada and the US also report the cost of labour and management, they can also be deducted. However, we believe it is more revealing to use these data as denominators, for two reasons. First, to do meaningful inter-industry comparisons, one needs to scale the data to something comparable. Reporting value added or value added less payments for labour and management for two industries is meaningless by itself because of differences in the scales of the industries. Reporting value added per dollar of expenditure on wages and salaries, or per employee gives a similar basis for comparison. Moreover, using

value added as the first proxy for profits, and then showing it relative to expenditure on wages and salaries gives a second proxy: if value added per dollar of wages and salaries is rising, then the industry is generating more dollars after its payment for raw materials and labour to pay for capital, equipment and knowledge.

The second reason for using employment or labour payments as denominators is that the resulting ratios are a representation, at an industry level, of true labour productivity. Macro measures of labour productivity use GNP or GDP - ie total out put per worker. If GDP per worker is rising, then we assert that labour productivity is rising. At a macro level, this is acceptable because GDP nets out the contributions at various levels of each industry. But for an individual manufacturing industry or sector, use of an overall measure of output (such as sales - ie, value of shipments) to measure labour productivity can be misleading. Industry sales per worker may be rising or falling simply because raw material prices may be rising or falling. By expressing value added per worker, the raw material markets are removed from the equation The result is the true measure of the manufacturing industry's contribution, and then the contribution of workers to it.

This leaves one final vexing issue about the measures. It is that, while the foregoing explains the standard concept of labour productivity, it nevertheless says more about capital productivity than labour productivity. If an accounting firm provided each employee with an abacus to do their calculations, then the number of numbers processed in a day would be small. Labour productivity would be low. If the same firm replaced the abacus with a pentium3 computer, the number of numbers processed in a day would be hugely increased. Labour productivity would be far higher.

But what does this say about the quality or true underlying productivity of the worker? Other than in the second case the worker would need to learn computer skills, it says nothing. The difference in labour productivity in the two cases is almost totally a function of the capital base with which the worker has to work. <u>All measures of labour productivity say much more about capital productivity than about workers</u>.

2.3 METHODS

Following from the foregoing discussion, this study uses value added as a first approximation for profitability of processing industries because it represents the revenue that is excess to that required to pay for raw materials. To undertake inter-industry comparisons with other industries in Canada, or the same industries in the US, three sets of ratios are developed for each:

- Value added per dollar of sales. This indicates the gross margin of the subject industry relative to the comparators. An increase in the ratio indicates that margins are rising and, in industries with a competitive structure, suggest that the industry's product mix is changing toward being less of a commodity. A decline in the ratio may indicate that the industry's products are being commoditized, that non-raw material costs are declining, and/or that competitive pressure from others in the supply chain are increasing.
- Value added per dollar of expenditure on wages and salaries. This is the second approximation for profitability. If this ratio is rising, the industry is generating additional revenue after paying for labour, management and raw materials to pay for capital and knowledge.
- Value added per worker. This is "labour productivity". If it rises, it means the industry is generating more output per worker. It should be correlated with the previous ratio over

time, but will be affected by differences in wage and salary levels in the industry and its comparators. It likely says more about "capital productivity" because investment in plant, equipment, and technology have a material effect on the ability of workers to perform either because of the quality of equipment and technology, or because of economies of size. Especially in some of the food processing industries where unit manufacturing costs are highly correlated with scale of operation, failure to invest in world scale plants means that labour productivity is limited.

Productivity ratios are measured for Canadian industries relative to their US counterparts. This study uses four digit classifications to define the industries. Detailed definitions are included in Appendix 1. The industries are also characterized in Section 3.0

The ratios span the period from 1981 to 1997. Statistical providers have not yet released the 1998 data. Our fundamental hypothesis is that structural adjustments caused by or exacerbated by the Canada US Trade Agreement, and subsequent economic pressures have altered the competitiveness of Canadian processing industries. Hence the main comparison is between the pre-and post free trade situations. As will become obvious, the tardiness of their release causes one to want to see more. There are good reasons to expect changes in the two missing years that may be positive for the Canadian sector or negative to it. The data are from Statistics Canada and the US Commerce Department.

The market share component of the analysis is explained in section 4.0

3.0 Canadian Agri-Food Industry Versus the United States Agri-Food Industry

3.1 Introduction

The industries included in the analysis are profiled in section 3.2 and the comparisons of productivity are then provided in subsequent sections. The table in appendix 1 contains a detailed list of the SIC categories included for each industry and each country. This includes the sub-industries involved and their corresponding standard industrial classification codes (SIC) for both countries.

3.2 Canadian and United States Industry Profiles

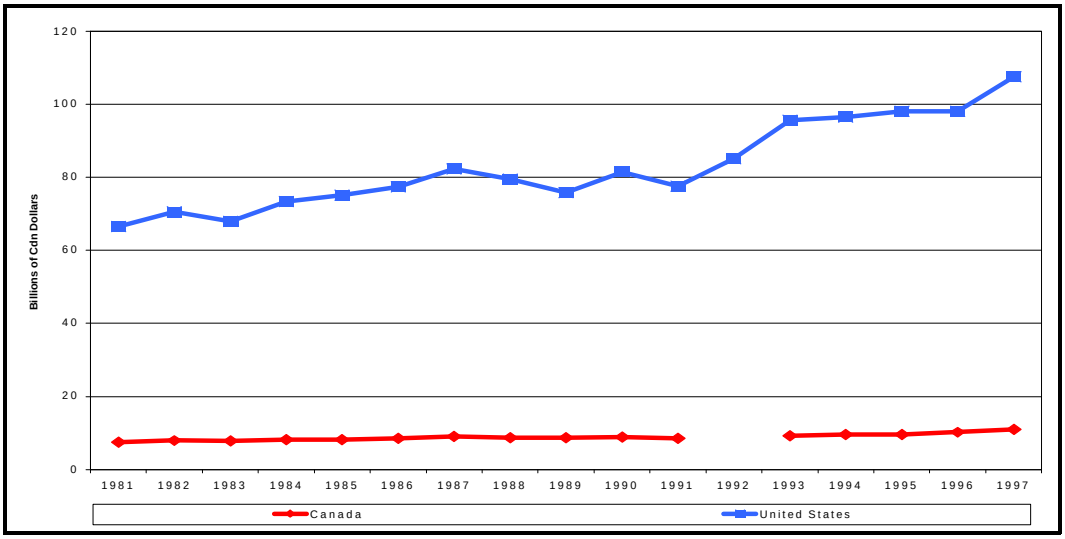
A graphical representation of the characteristics of the two countries' agri-food sectors best depicts the growth trends that have occurred over the past couple of decades. The graphs are constructed using data from 1981 to 1997[3]. This section is divided among the various industries analysed, starting with the graphs of the three general descriptors of the sectors; sales, employment and wages & salaries. These general descriptors are followed by three performance indicators; value added per dollars of sales, value added per dollar spent on wages & salaries, and value added per employee.

[3]All graphs in this Section are constructed from data received from the Canadian Annual Survey of Manufactures and the U.S. Department of Commerce Annual Survey of Manufactures.

3.2.1 Red Meat Industry

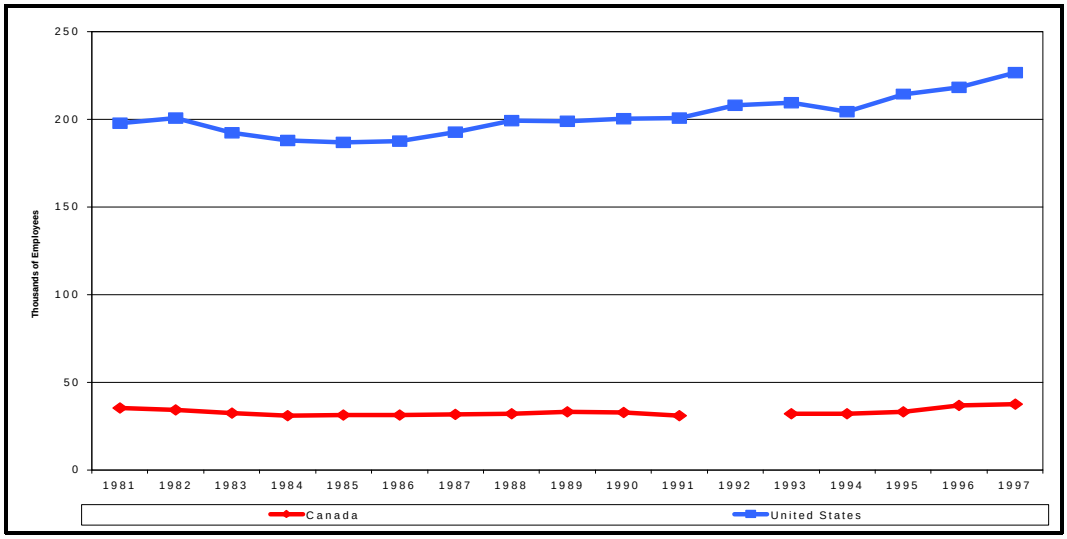
Sales in the red meat industry in the United States are just under 10 times greater than sales in Canada (Figure 3.1). Sales for the United States grew at a rate of 3% per year compared to 2.1 % in Canada.

Figure 3.1: Sales



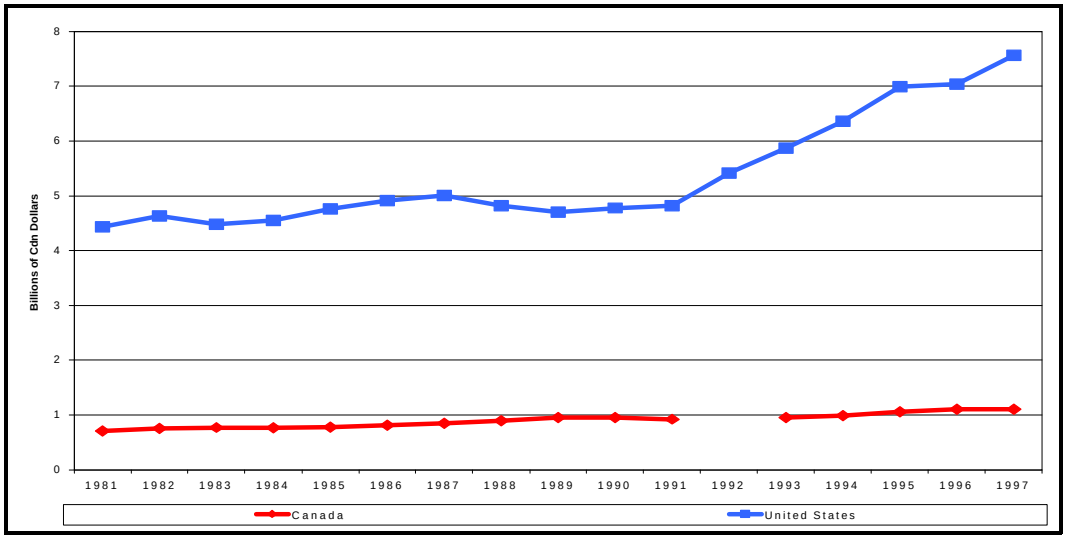
Employment in Canada remained very stable throughout the years, averaging 33,000 employees and growing at less than 1% per year. Employment in the US averages just over 200,000 employees and grew at the same rate as in Canada.

Figure 3.2 Employment



Due to the great difference in number of employees, there is a great difference in total expenditure on wages and salaries. Canada's expenditure grew steadily at a rate of 3% per year. The United States expenditure remained even during the 1980's and took a major turn upward starting in 1992.

Figure 3.3 Wages



Canada surpassed the United States, on average, in value added per dollar of sales, with an average of 20 cents compared to 17 cents in the US. And both industries grew at a rate of 2.9% per year. Note that the US gained relative to Canada in the latter years of the data.

Figure 3.4 Value Added per $ of Sales

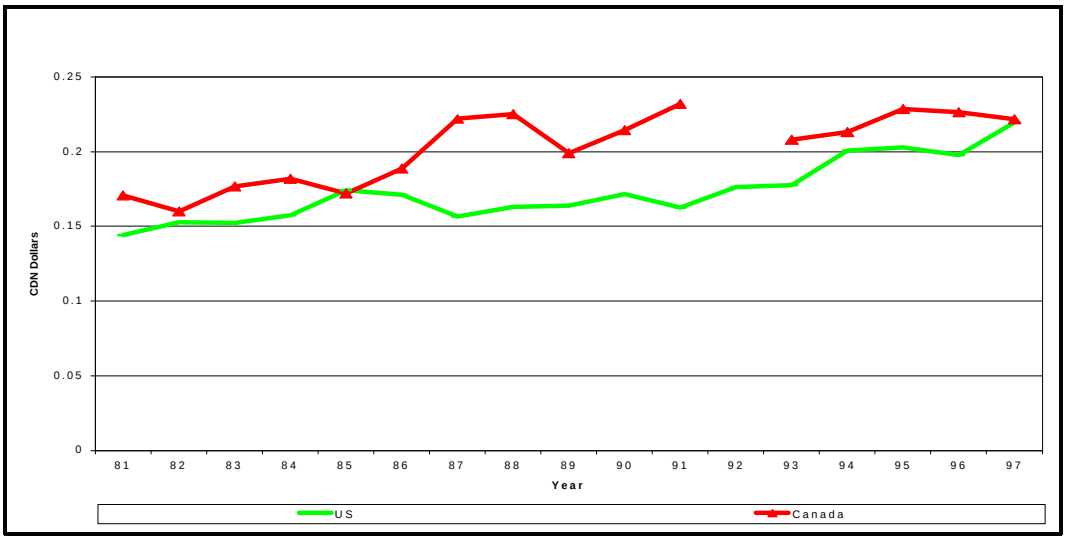


Figure 3.5 Value Added per $ Spent on Wages and Salaries

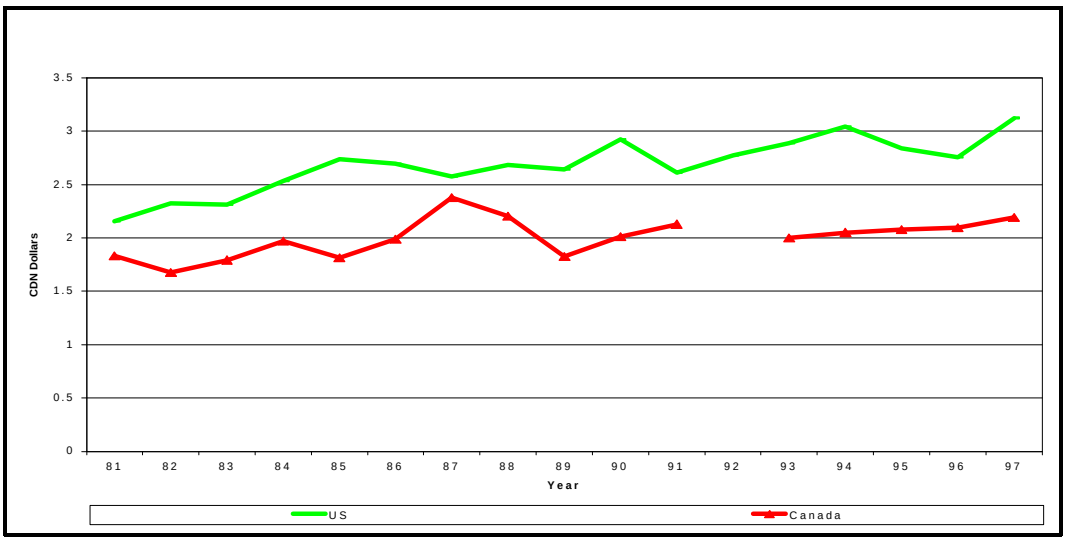
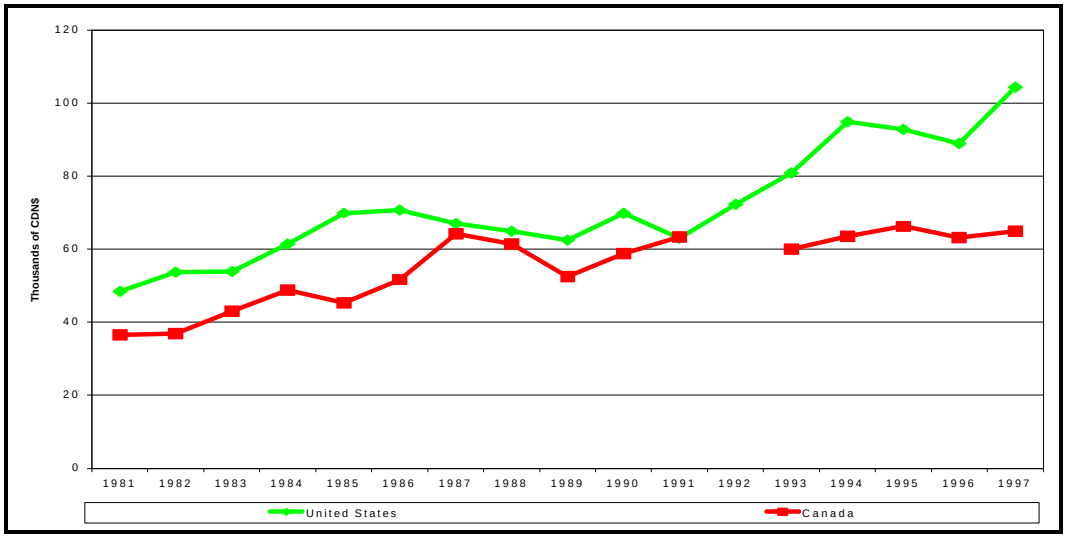


Figure 3.6 Value Added per Employee



Both industries grew at the same rate in value added per dollar spent on wages and salaries as well, (Figure 3.5), at a rate of 2.2%. The United States averages $2.68, 34% greater than Canada. Value added per unit of labour in both countries shows a strong upward trend. The United States grew slightly quicker at 5.3% per year compared to 5.1% in Canada. What is interesting in these data is the relative change after 1991. In the earlier period, US and Canadian productivity per worker was relatively equivalent, but Canada lagged the US in productivity per dollar of wages. The difference reflects relatively higher wage rates in the US. In the later period, the US industry gains markedly in terms of productivity per worker, and increases its advantage in productivity per dollar of wages. This coincides with a major restructuring of the pork processing industry in the US that brought with it substantial investment in plant and equipment with economies of size. This, in turn, would have been expected to result in improved labour productivity, which it clearly did. Also recall that the ratio of value added to sales increased for the US in later years of the series. This

suggests that the US changed its product mix in the later years so that it contained a higher value added component. This too would add to the US labour productivity ratio.

Probably more than any other industry, the fact that the data reported by Statistics Canada and the US Commerce Department have not been updated past 1997 is a problem here. A number of major investments have been made in meat processing since 1996 in Canada, which changed the structure of the industry. A three year lag in reporting causes one to wonder how the data have changed. On the other hand, a major investment in Canadian beef processing was completed in 1996/97, and most of the pork investments were subsequent to that. With the inevitable lags that occur in getting new processing lines up and running efficiently, updated data may simply make us wonder what the future will hold!

3.2.2. Poultry Industry

Sales by the Canadian poultry processing industry (Figure 3.7) grew at a rate of 7.1% per year and have nearly doubled since 1981. Sales by US poultry processors grew by 8.3% per year and have more than tripled in value, growing from $12.5 billion in 1981 to $43.8 billion in 1997.

Figure 3.7 Sales

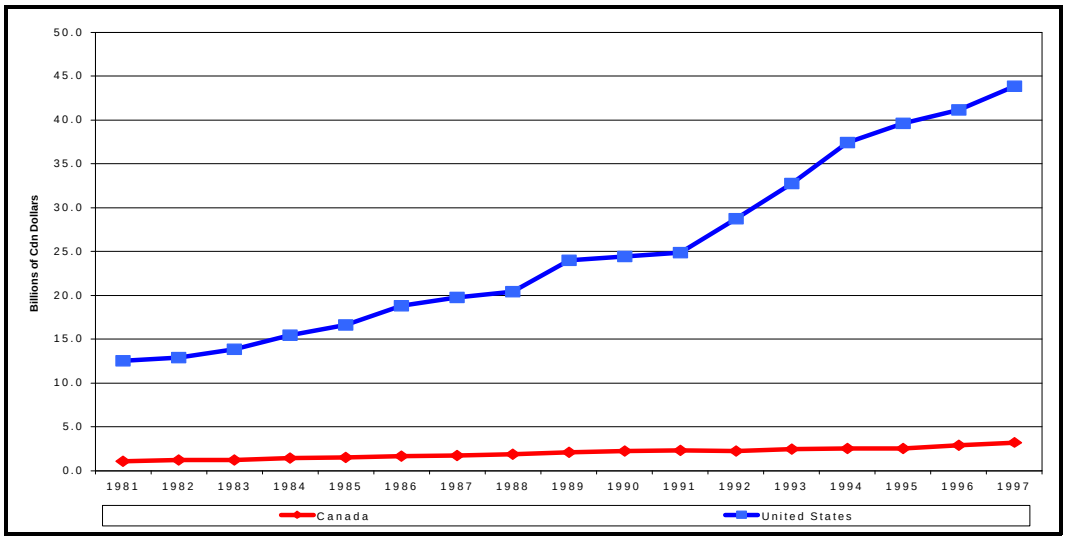
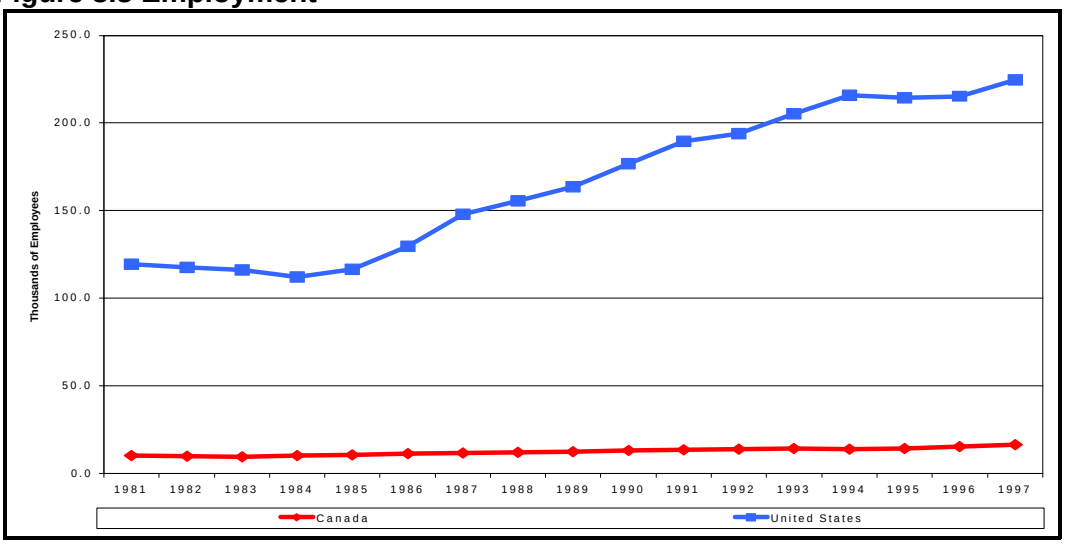
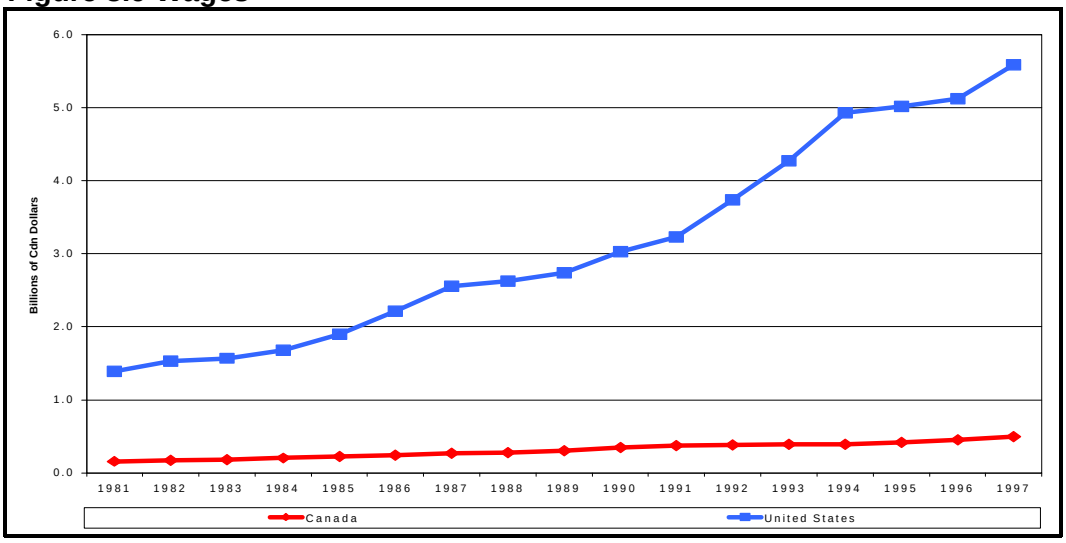


Figure 3.8 Employment



Employment in the US poultry industry grew at an average annual rate of 4.12% compared to 3.2% in Canada. The US poultry industry averaged 166,000 employees over the past 2 decades, whereas Canada employs 12,600 employees on average. Total expenditure on wages and salaries (Fig. 3.9), parallels Figure 3.8 because of relatively stable wage rates. Canada boasts the higher hourly rate of $11.20 compared to $8.50 per hour in the US.

Figure 3.9 Wages



Canada and the United States are similar in value added per dollar of sales (Fig 3.10), although the US improved in the latter years. Both countries averaged $0.30 of value added per dollar of sales in these years. The US ratio grew by 4% per year, while Canada grew on average by 1.2% per year.

Again in value added per dollar spent on wages and salaries, the United States grew faster, at 3.5% compared to1% in Canada. On average, and the ratio is $0.50 higher in the United States than in Canada. The major reason for this is revealed in Fig 3.12: labour productivity in

the US industry grew at more than double the rate in Canada, ie 8.6% compared to 4.1%, and this higher percentage growth was on a base that was double for the US relative to Canada. While value added per employee almost doubled in Canada, it more than tripled in the US.

Figure 3.10 Value Added per $ of Sales

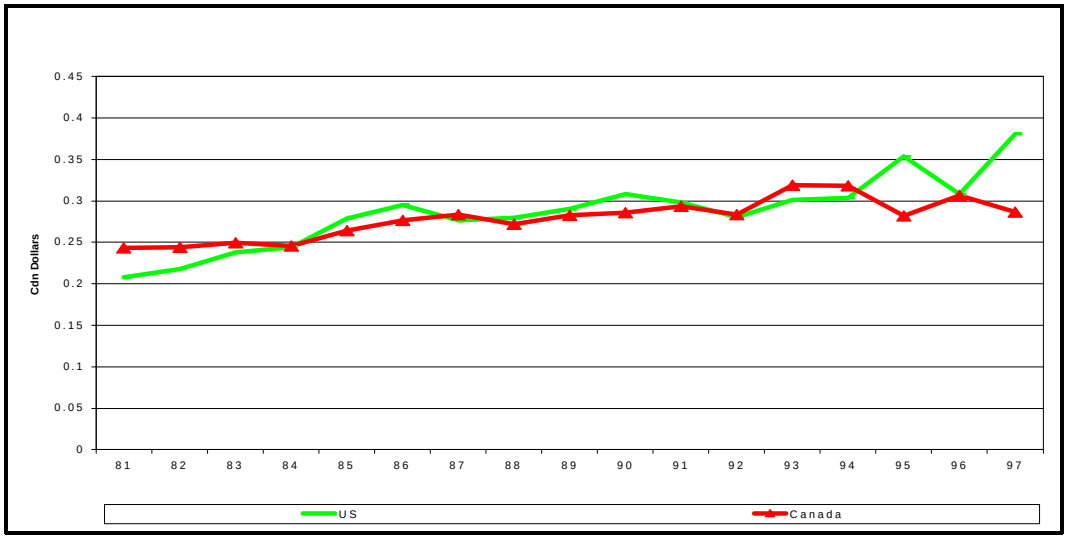


Figure 3.11 Value Added per $ Spent on Wages and Salaries

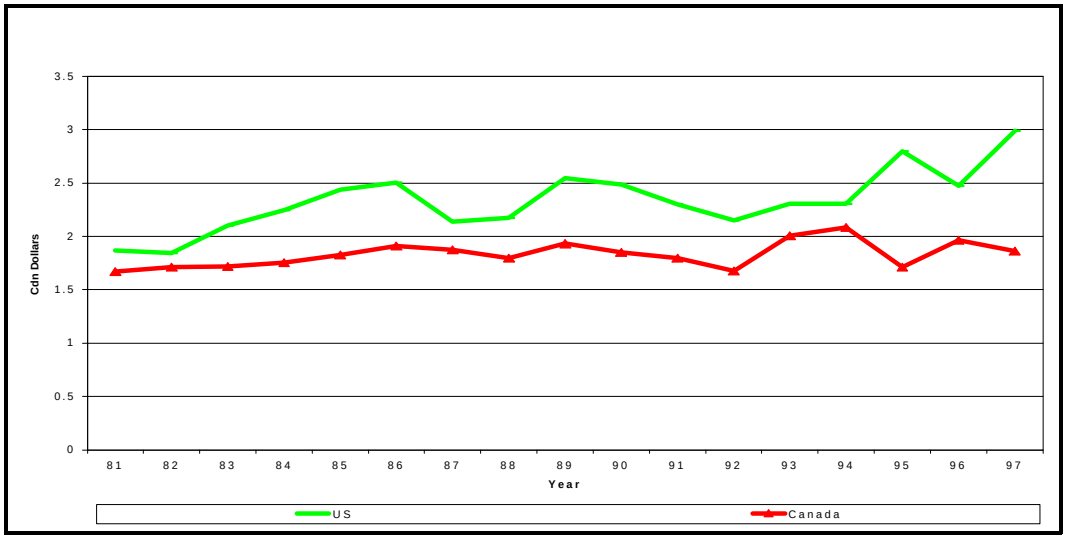
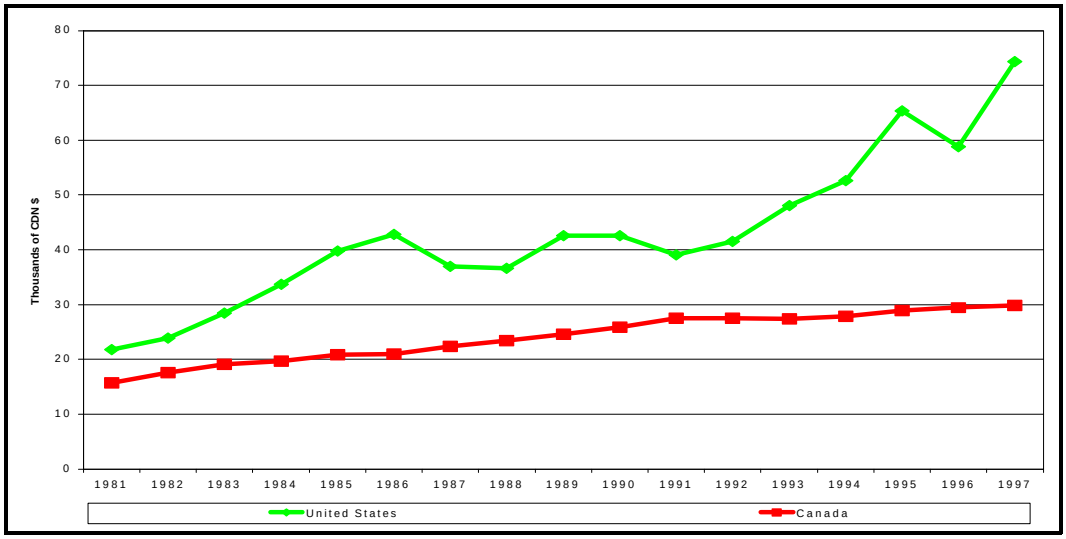


Figure 3.12 Value Added per Employee

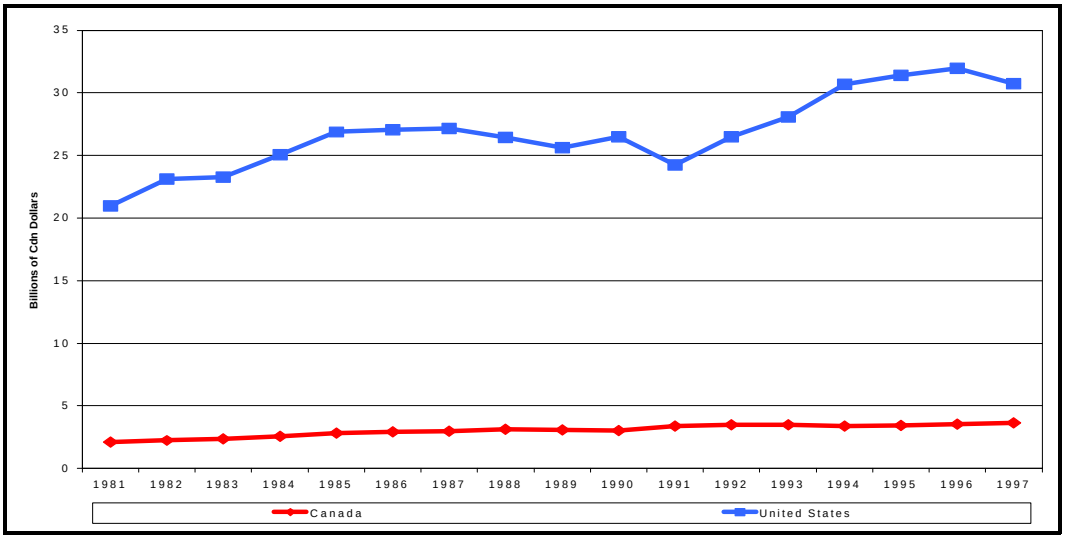


3.2.3 Fluid Milk Industry

The milk processing industry has two distinct components, fluid and manufacturing. The former produces milk and fluid creams. The latter produces cheese, yogurt and the like. In this section we address only the fluid industry and treat the manufacturing component separately below.

Sales of fluid milk in Canada (Fig 3.13) averaged $3 billion, while The United States averaged $26 billion per year. Canadian sales trended at a growth rate of 3.5% per year, while the US trend was 2.5% per year.

Figure 3.13 Sales



In the United States this industry experienced a strong decline in number of employees, with a -2% growth rate, employment has fallen from 81,300 in 1981 to 58,000 employees in 1997. Canada has been trending downward in total number of employees as well, and is growing at a

slightly faster negative rate than the fluid milk sector in the United States at -2.3%. The trend in number of employees follows the trend in number of establishments, which has decreased by 40% since 1981 in Canada.

Both Canada and the United States experienced upward trends in total wages and salaries. Canada averaged an annual growth rate of 2.1% compared to the US rate of 3%. The United States' hourly wage rate increased from $9.60 in 1981 to $19.90 in 1997, a growth rate of 4.7% per year. Canada also increased it's hourly rate substantially, growing from $9.70 in 1981 to $19.00 in 1997, an annual growth rate of 4.5

Figure 3.14 Employment

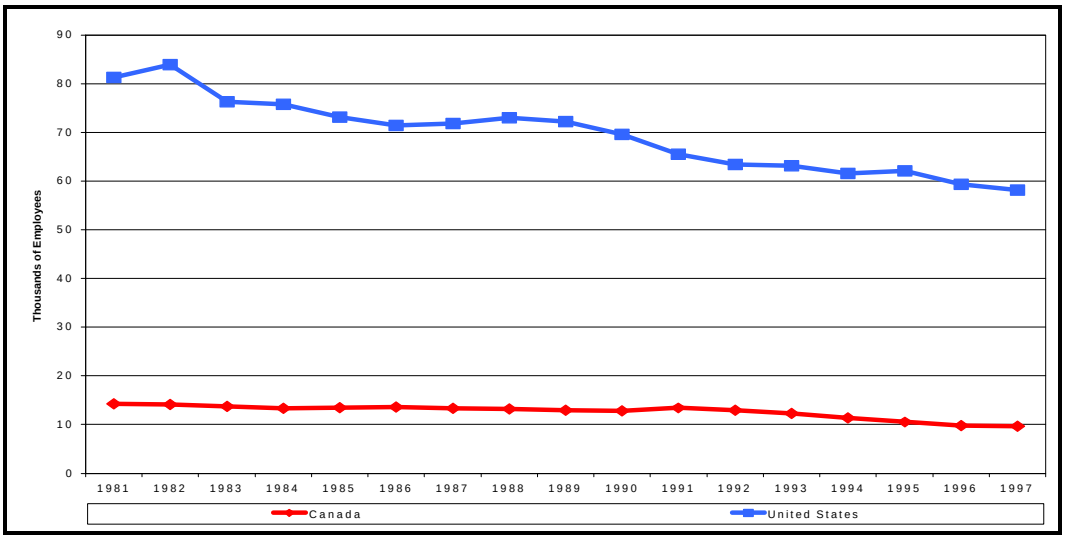


Figure 3.15 Wages

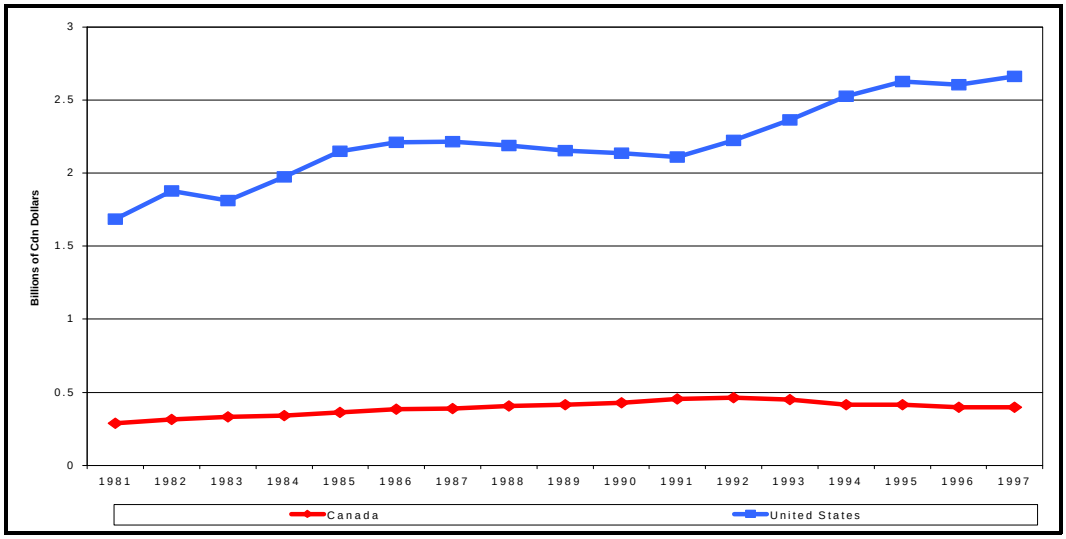


Figure 3.16 Value Added per $ of Sales

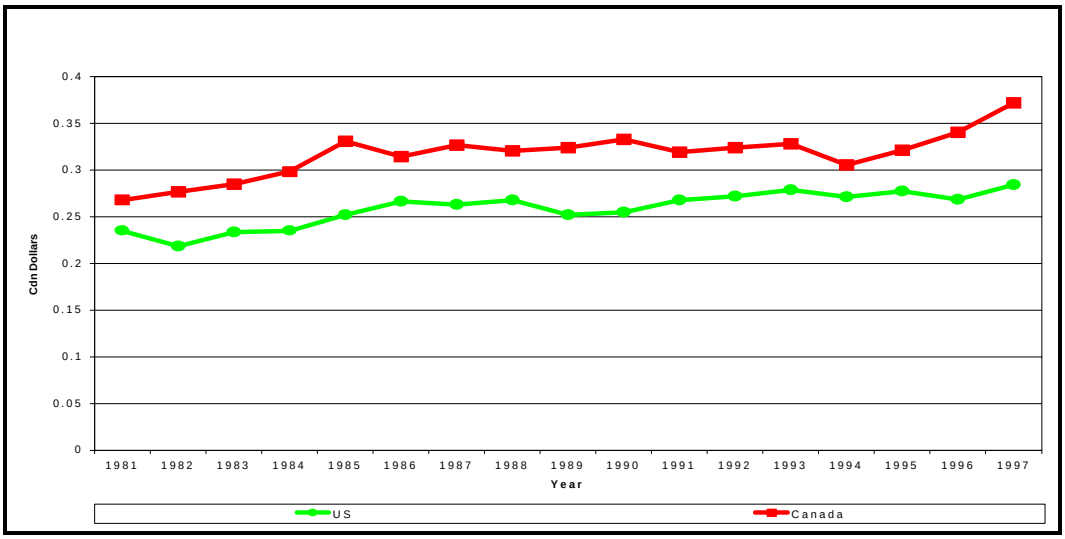


Figure 3.17 Value Added per $ Spent on Wages and Salaries

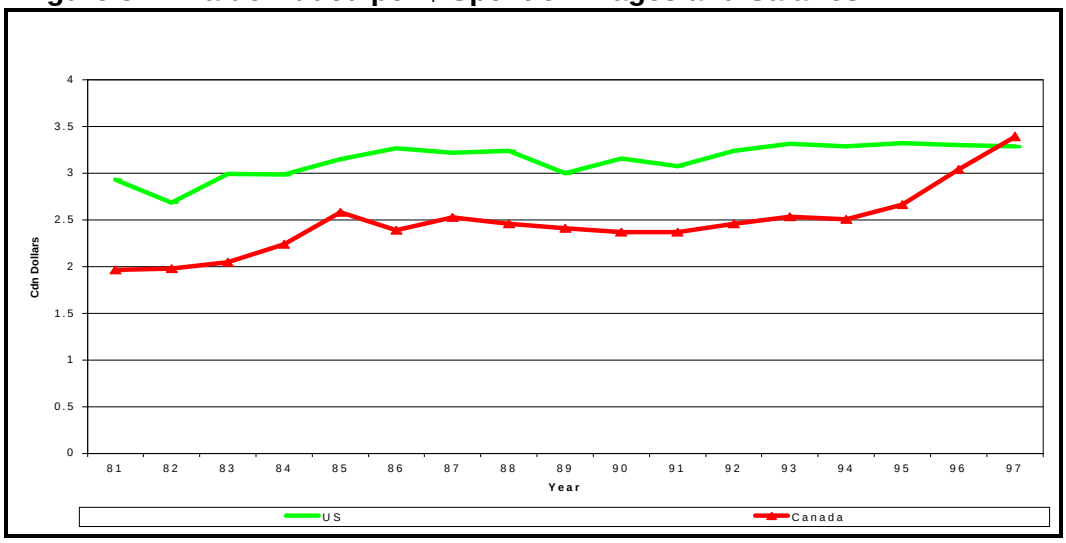
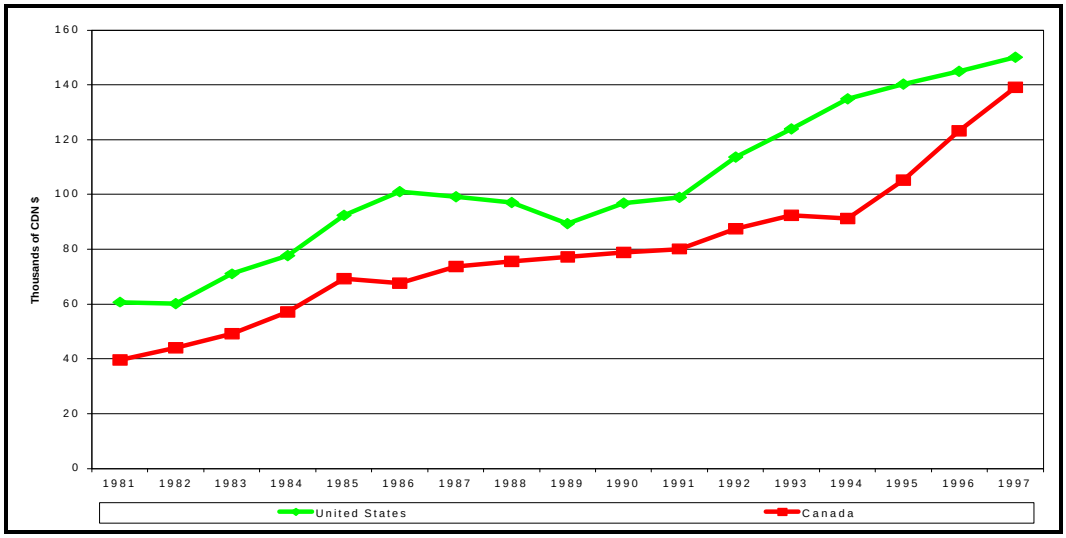


Figure 3.18 Value Added per Employee



Canada remained above the US in value added per dollar of sales and took a sharp upward trend in 1995 to increase the gap (Figure 3.16). Canada averaged $0.06 higher than the United States in value added per dollar of sales and is grew at almost double the rate, 2.18% compared to 1.28%.

Value added per dollar of wages and salaries in Canada showed a strong upward trend and began to surpass the US in 1997. Value added per dollar of wages remained stable in the United States during the 1990's, leaving it growing at only 0.8% per year, whereas Canada's value added grew strongly at an average rate of 3.7% per year.

Value added per employee in both countries showed a strong upward trend (Figure 3.18). The calculated average growth rates of productivity in Canada are 8.4% and 6.07% in the United States. Since the mid 1990's the fluid milk sector in Canada narrowed the gap in value added per employee.

3.2.4 Processed Fruit and Vegetable Industry

This industry includes companies that produce canned and dried fruit and vegetable products. Sales by Canada's industry increased steadily at an average annual rate of 4.6%. Not surprisingly given climatic differences, Canada's sales are 6% of the United States on average.

Employment showed a slight downward trend in this industry in both countries. Employment in the United States decreased at an average rate of 1 .4% per year, whereas Canada's employment fell by 0.1% per year. Canada employed roughly 10% as many people as the US (Figure 3.20). Wages and salaries on the other hand grew in both countries at an average annual rate of 4%.

Figure 3.19 Sales

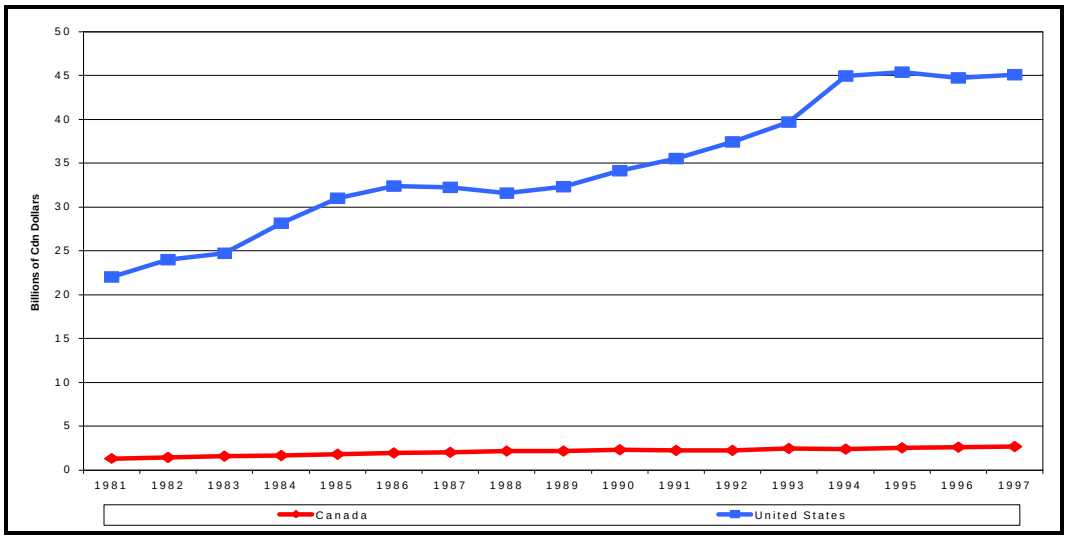


Figure 3.20 Employment

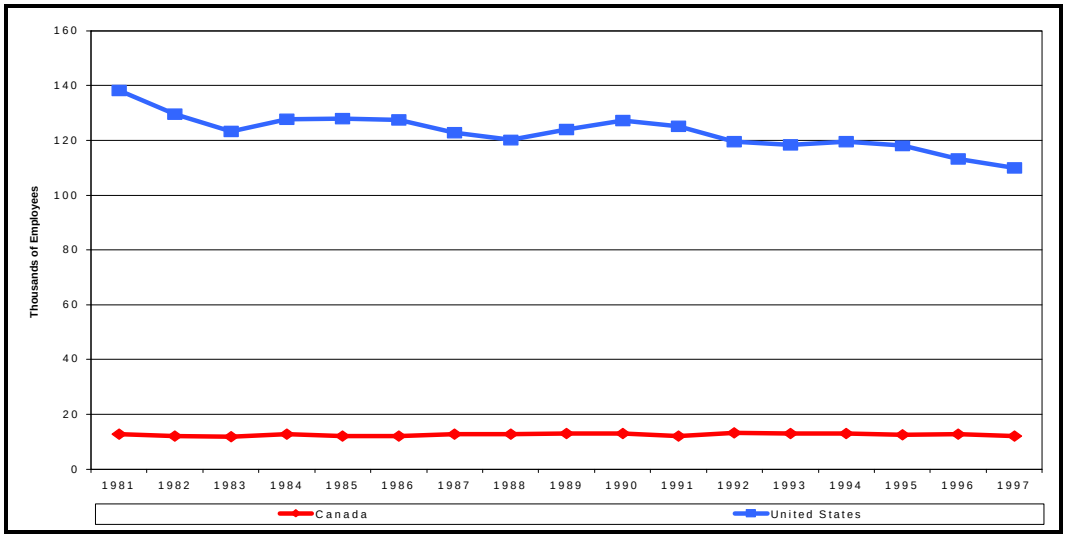
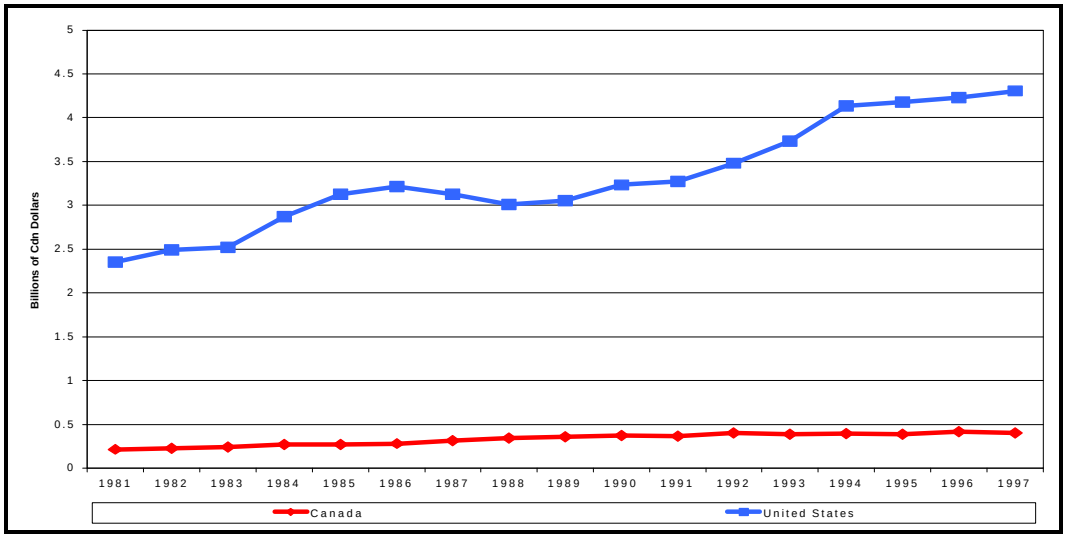


Figure 3.21 Wages



Value added per dollar of sales has showed an upward trend in both countries, Canada's value added grew at an annual average rate of 2.4% while the US growth rate was 1.8%. Canada averaged $0.52 per dollar compared to $0.46 in the United States.

Figure 3.22 Value Added per $ of Sales

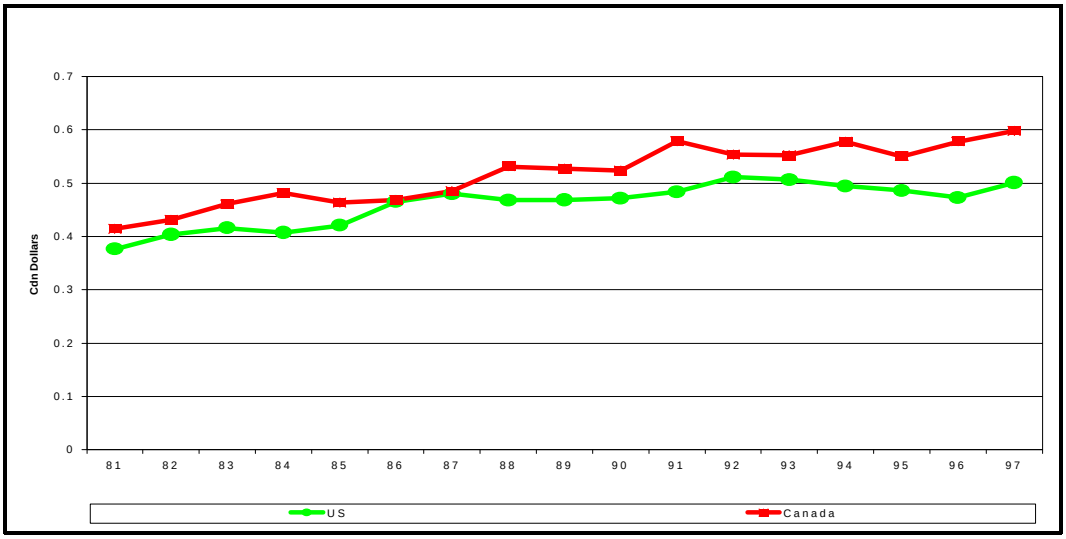


Figure 3.23 Value Added per Dollar of Wages and Salaries

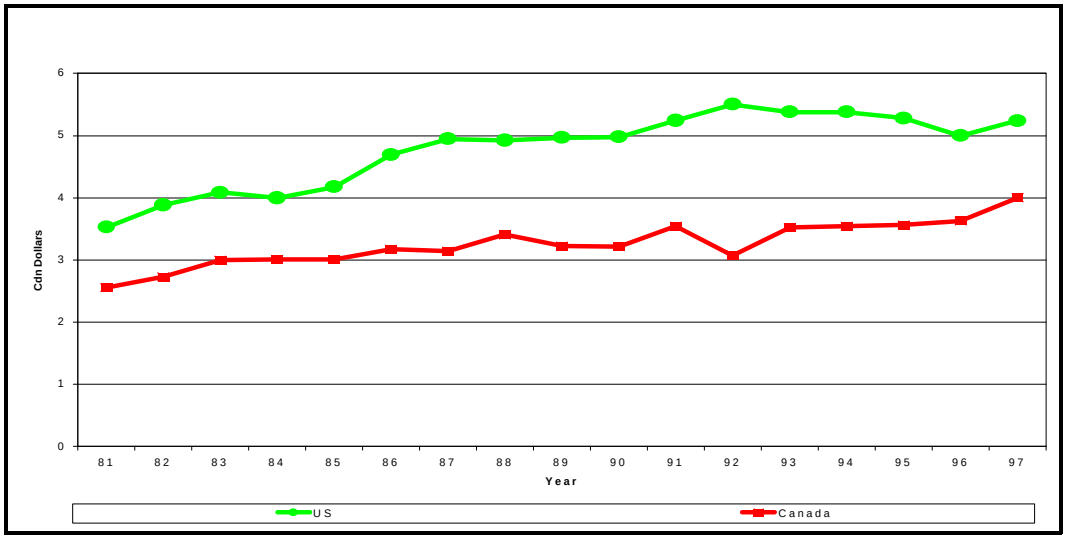
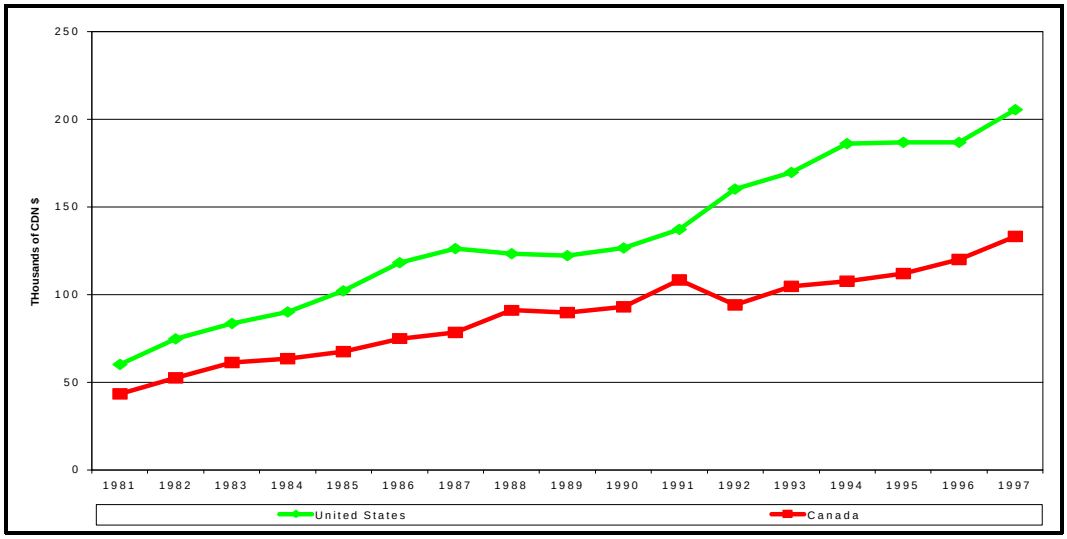


Figure 3.24 Value Added per Employee



Value added per dollar of wages and salaries grew in both countries. Although the US values are 35% larger than Canada's, the US had a lower annual growth rate of 2.6% compared to 3% in Canada.

Labour productivity in the processed fruit and vegetable industry showed a consistent upward trend. The average annual growth rate in the United States was 8.2% compared to Canada's 7.6%. Canada's growth rate remained positive but weakened in the 1990's compared to the stronger trend upward in the 1980's.

3.2.5 Frozen Fruits and Vegetables

Sales by frozen fruits and vegetable processors trended upward in both the United States and Canada. Canada's sales grew on average by 7.7% per year, while the US experienced a 5.6% growth rate. Of the average sales of $9 billion in the US, 43% were value added. In Canada, 47% of the $876 million in sales are value added.

Figure 3.25 Sales

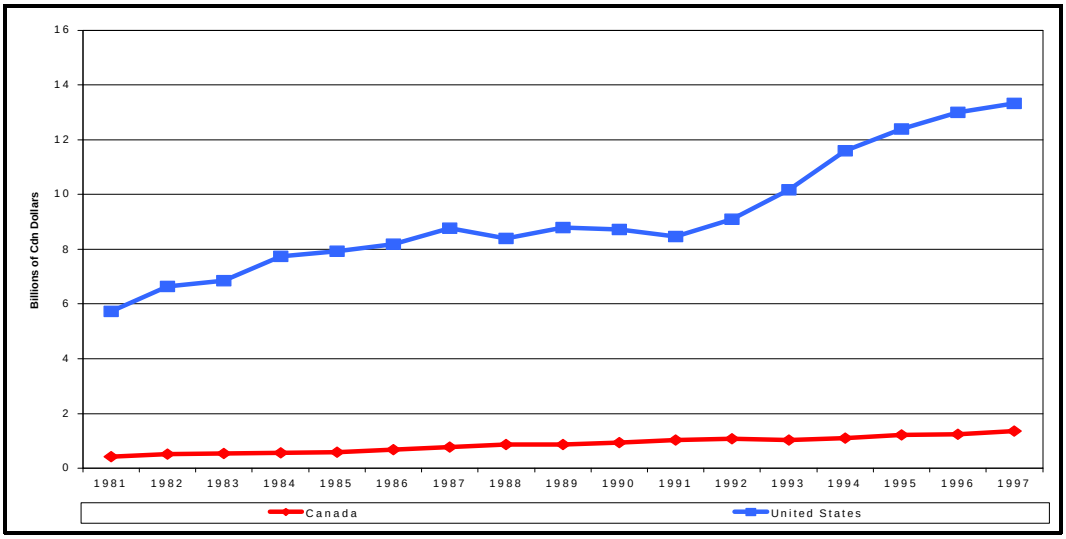


Figure 3.26 Employment

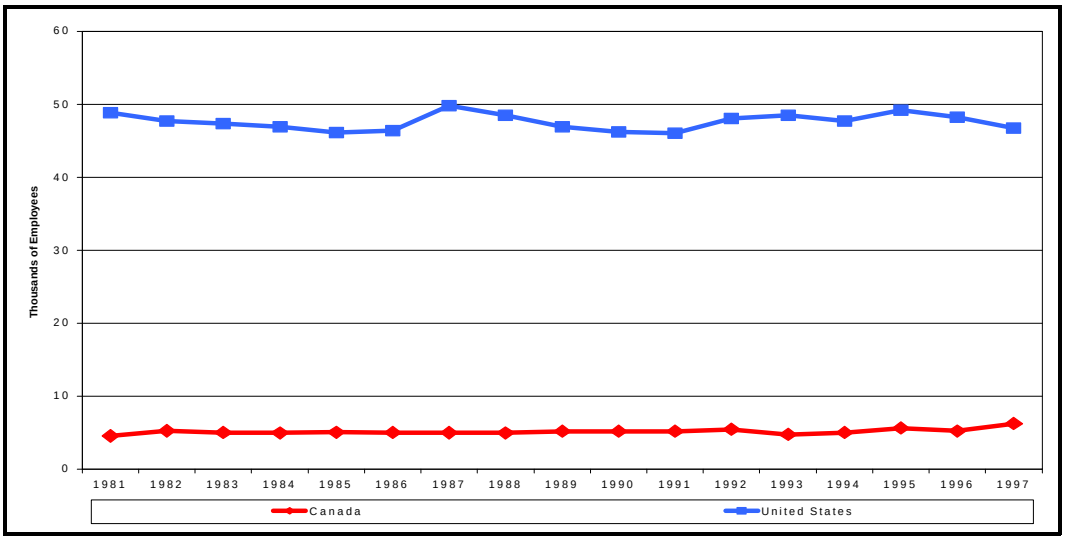
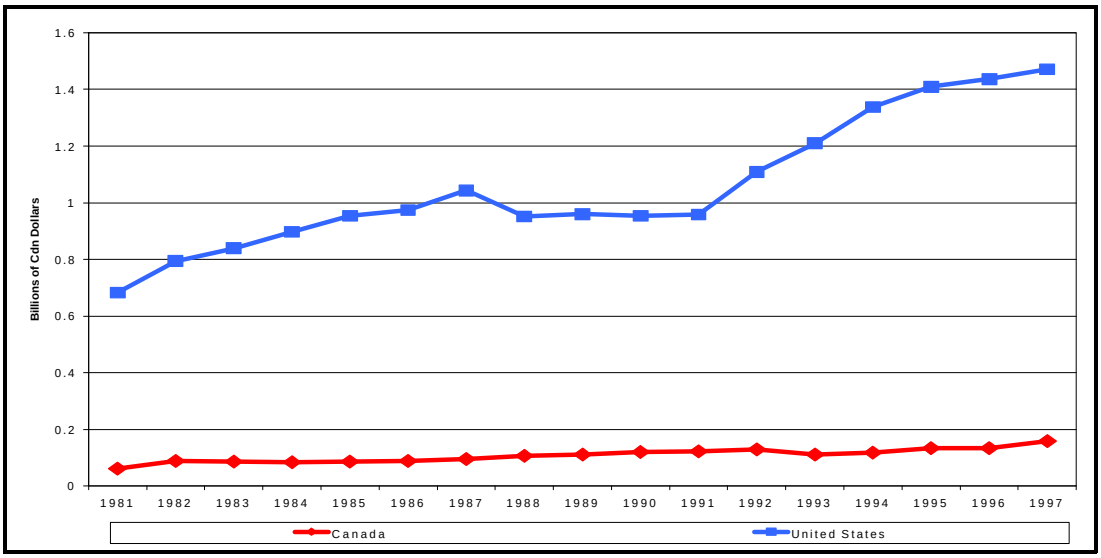


Figure 3.27 Wages



In both Canada and the United States, employment in this industry remained relatively flat. The US employs an average of 4,600 production and administrative workers, while Canada employs on average 5,200.

Total wages and salaries in the US industry showed an upward trend but began to grow stronger since the early 1990's, with an annual average growth rate of 5.1%. Canada's growth has been more steady than the US at a rate of 6.5% yearly. Consequently, because employment remained relatively constant and total wages and salaries rose, production workers' hourly rates also rose in the industry.

Figure 3.28 Value Added per $ of Sales

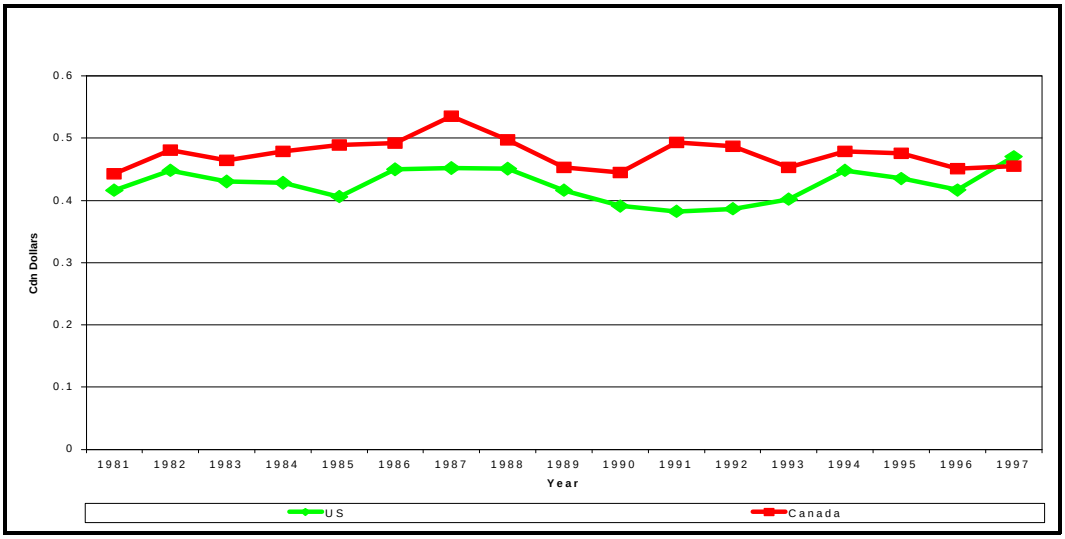


Figure 3.29 Value Added per Dollar of Wages and Salaries

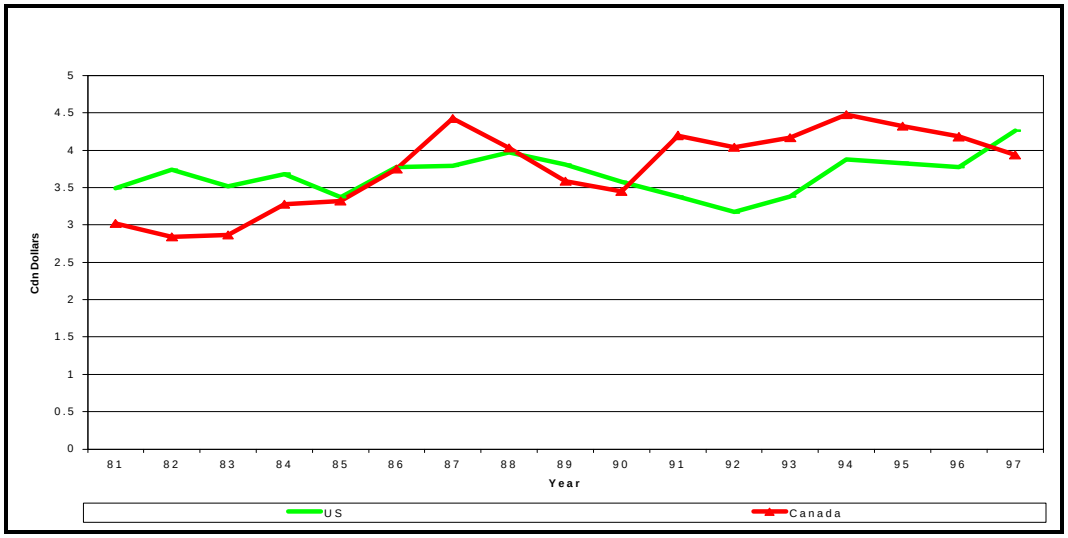
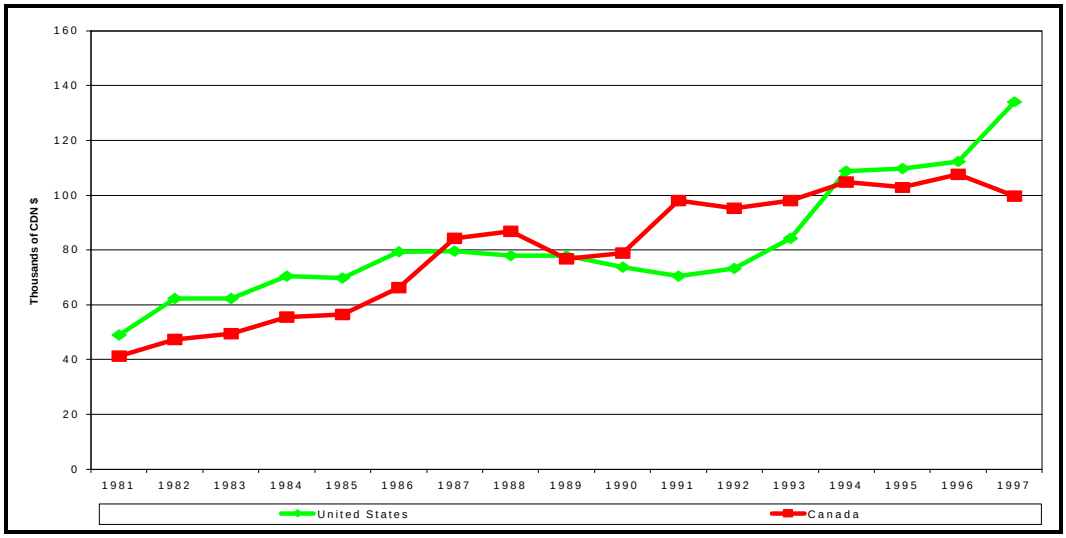


Figure 3.30 Value Added per Employee



Canada's value added per dollar of sales by the frozen fruit and vegetable industry sector was, on average, $0.05 above the US. Both countries experienced average annual growth rates in value added per dollar of sales of less than 1%.

The Canadian industry had an upward trend in value added per dollar of wages and salaries, although there is some cycle in the data. Canada's average value added per dollar of wages and salaries was slightly greater than the US at $3.76 compared to $3.67.

Value added per employee showed a strong upward trend in both countries. Since the 1990's US has grown slightly stronger than Canada. The United States averages $82,000 of value added per employee compared to $79,000 in Canada.

3.2.7. Dairy Manufacturing (excluding Fluid Milk)

Sales by the US dairy manufacturing industry (Figure 3.31) showed a consistent upward trend and an especially strong growth rate since 1990. Its annual average growth rate was 5%. Sales in Canada also grew but at a rate of 3.34%.

Figure 3.31 Sales

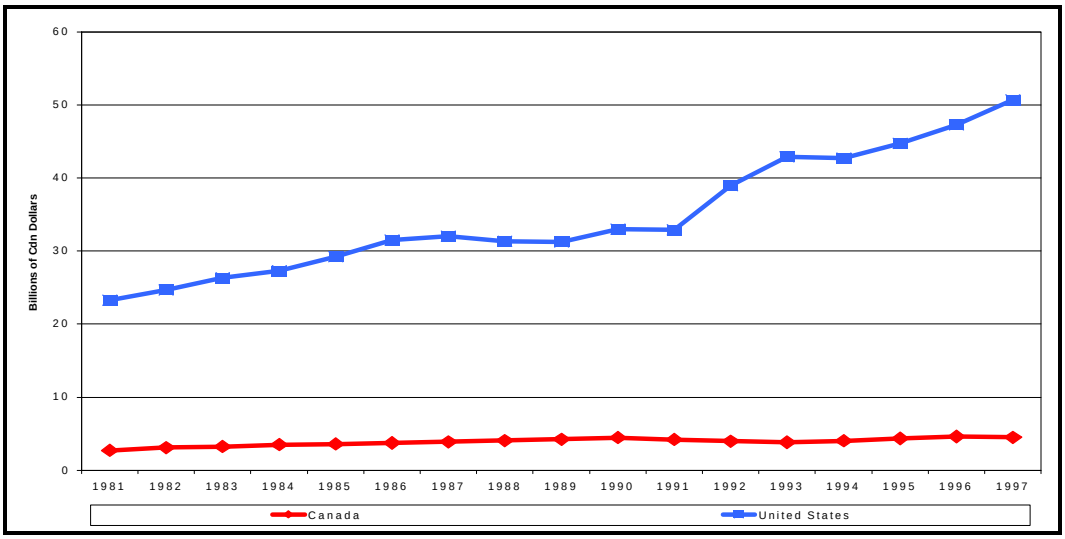


Figure 3.32 Employment

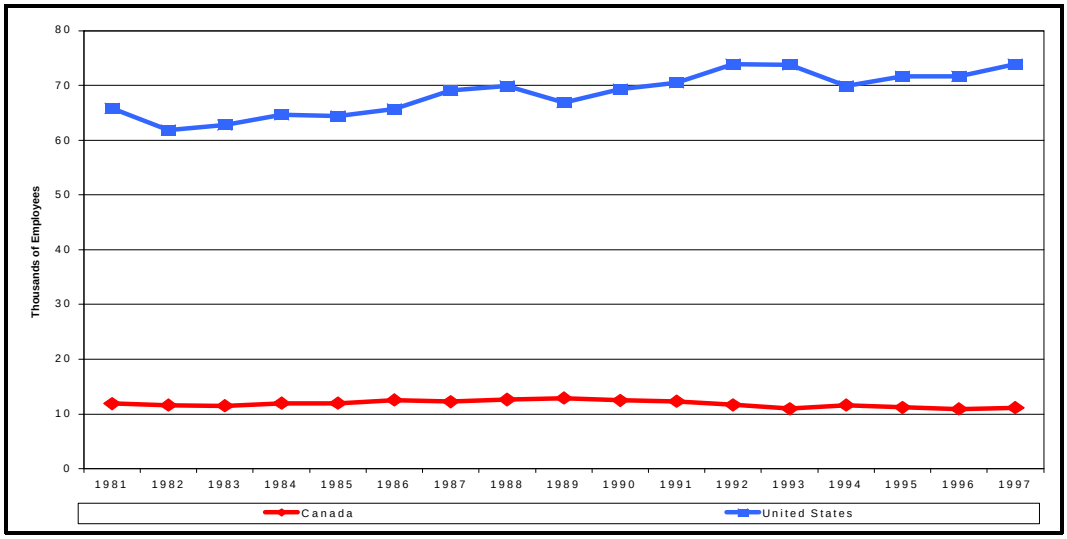
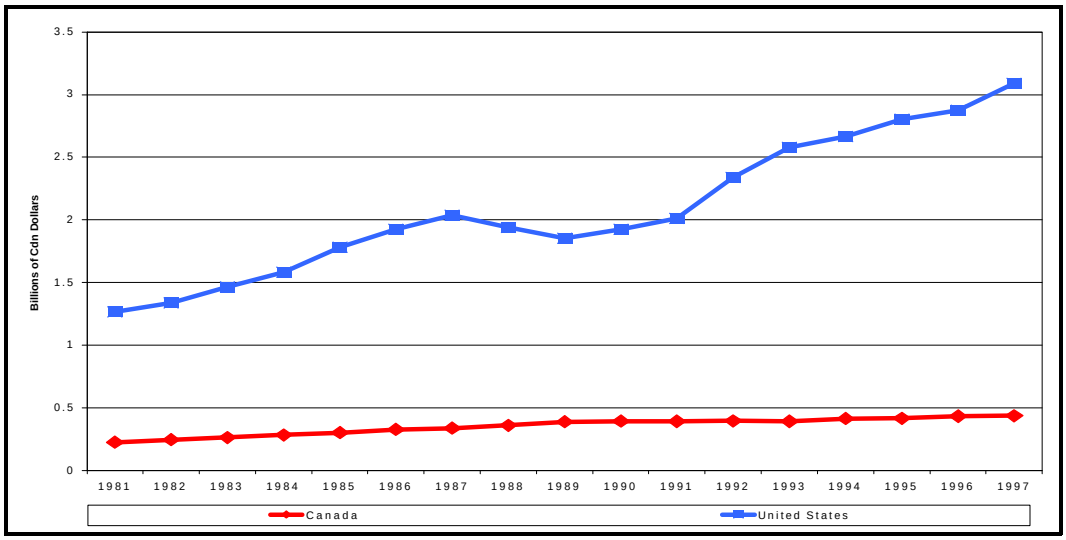


Figure 3.33 Wages



Employment in both countries' industries remained relatively stable, averaging 68,500 employees in the US and 11,800 employees in Canada. Strong growth occurred in both countries' total wages and salaries. US wages grew on average by 5.8% per year while growth in Canada was 4.3% yearly. Growth in the US hourly wage rate in the dairy sector swamps its growth in total wages and salaries, growing on average at 8.8%. The hourly wage rate in the United States increased from $7.00 in 1981 to $18.00 in 1997. Canada's hourly wage rate grew by only 4% yearly, and increased from $8.85 in 1981 to $16.80 in 1997.

Figure 3.34 Value Added per $ of Sales

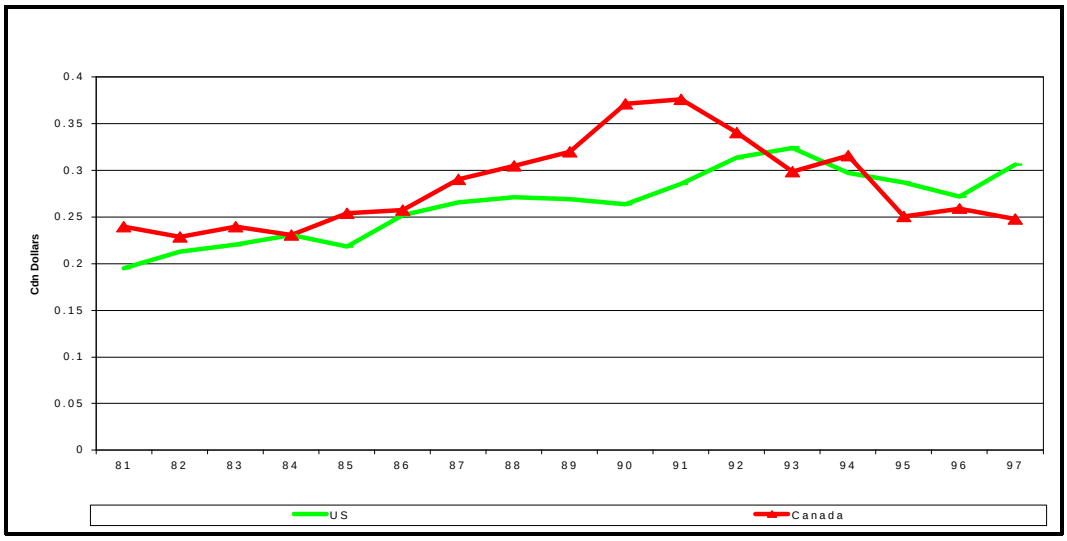


Figure 3.35 Value Added per $ Spent on Wages and Salaries

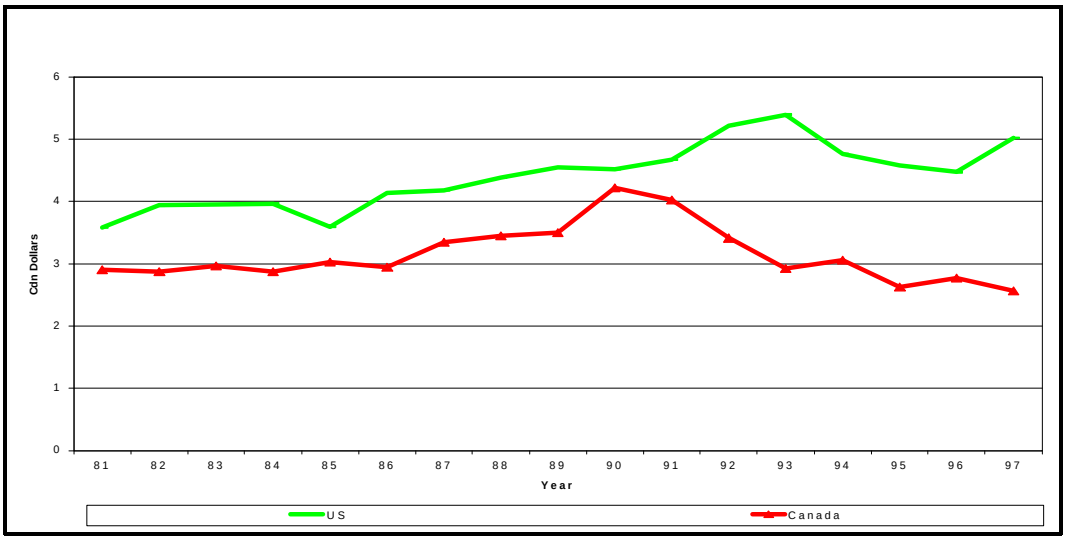
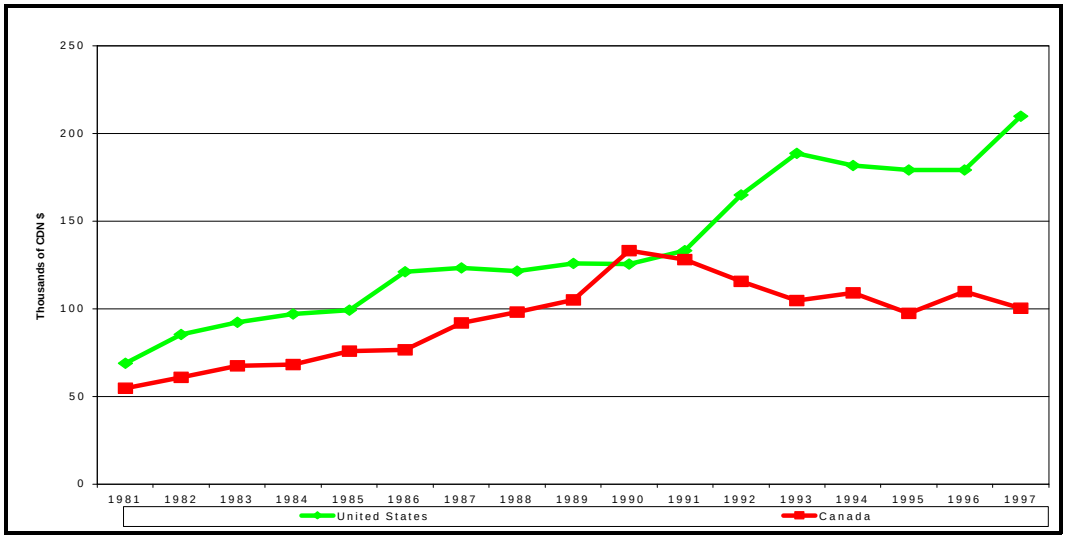


Figure 3.36 Value Added per Employee



The productivity ratios for this industry are quite interesting. Canada showed a very strong upward trend in value added per dollar of sales from 1981 to 1990, but since then it has trended back down to the level of 1991. Clearly, the industry has faced considerable pressure on its margins. While a little of the same pattern is also in the US data, it is not as pronounced, and the US pulled ahead of Canada's. Average growth for the US was 3% yearly compared to Canada at 0.8%.

Again, Canada took a downward turn around 1990 in value added per dollar of wages and salaries. The US did the same but began to recover in 1996. The average value added per dollar of wages and salaries in the US was $4.40, compared to $3.15 for Canada.

Labour productivity in the US dairy manufacturing industry grew steadily, averaging 7.6% per year, and a value of $135,000 per employee (Fig 3.36). Canada's labour productivity in the dairy manufacturing industry showed growth until 1989 and then decreased in parallel with the earlier

decline in value added per dollar of sales. Canada's annual average growth rate was half the US rate, at 4% and averaged $94,000 per employee.

3.2.8 Dry Pasta Products Industry

Sales by the dry pasta products industry in the US grew faster than in Canada. US sales grew at an annual average rate of 6.2% compared to 4.2% in Canada. Canada's average sales of $190 million are 11% of the larger US sector values. Of that $190 million, $133 million are value added, 70% of the total. The US compares with 56% of its $1.67 billion in value added.

Figure 3.37 Sales

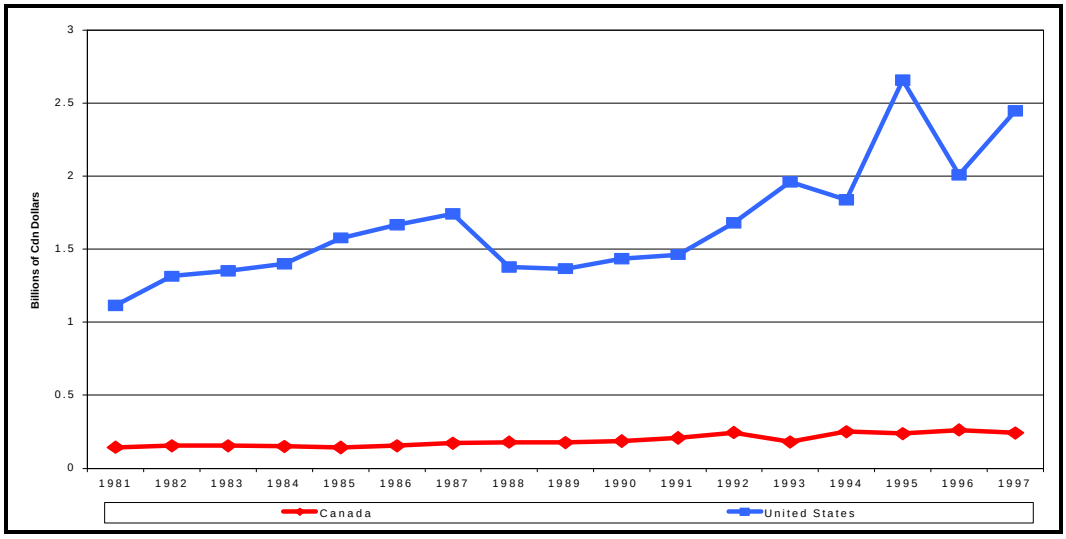


Figure 3.38 Employment

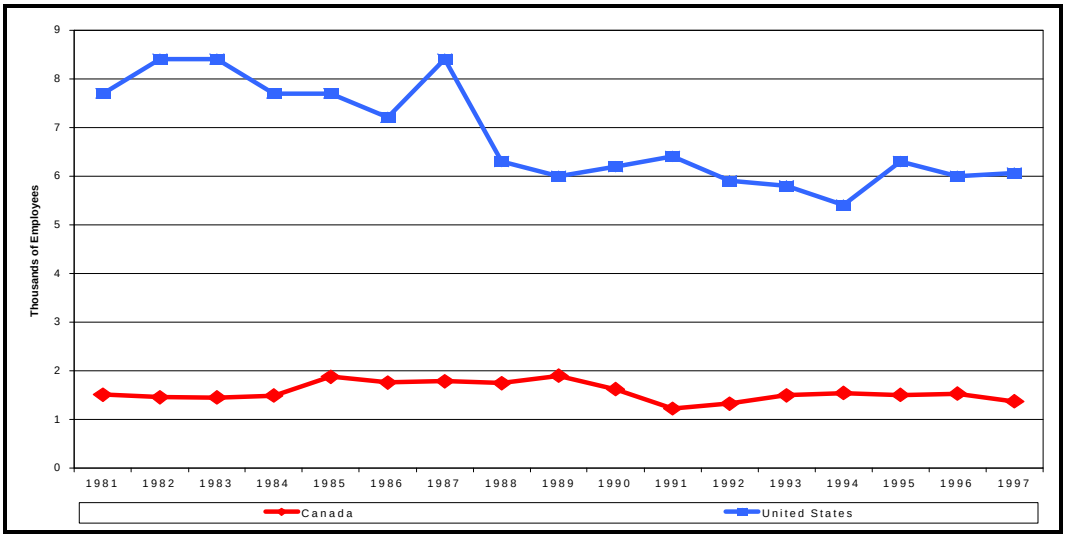
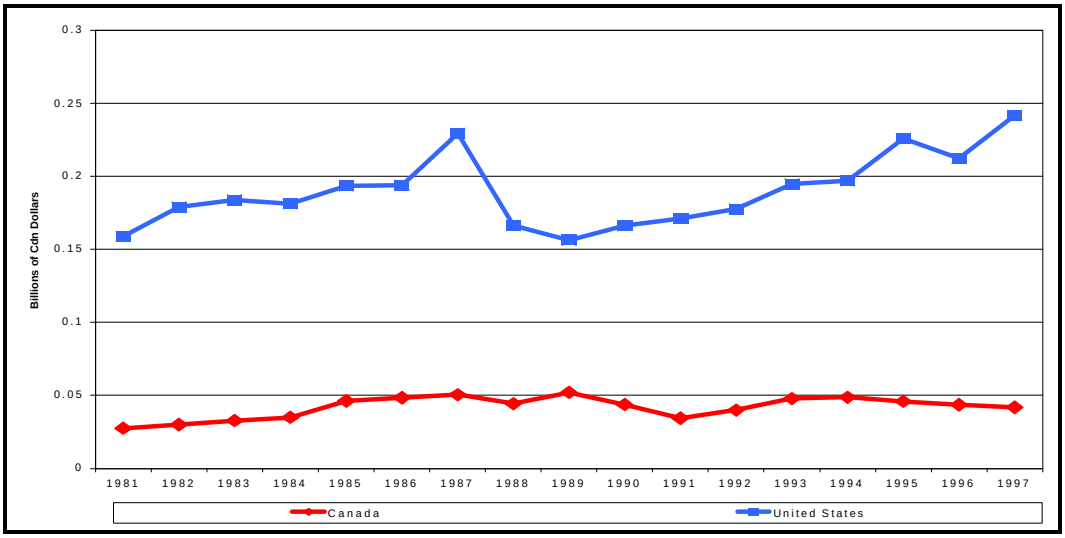


Figure 3.39 Wages



Employment in the US shows an overall downward trend since 1981, averaging an annual growth rate of -1.1%, whereas Canada's employment remains relatively stable and grew at 0.02% yearly.

Total wages and salaries increased in both countries by 3.5% yearly. Although the US swamps Canada, averaging a total expenditure of $190 million compared to Canada's $42 million. The hourly wage rate in the pasta increased 4.6% yearly for the US 3.9% for Canada.

Figure 3.40 Value Added per $ of Sales

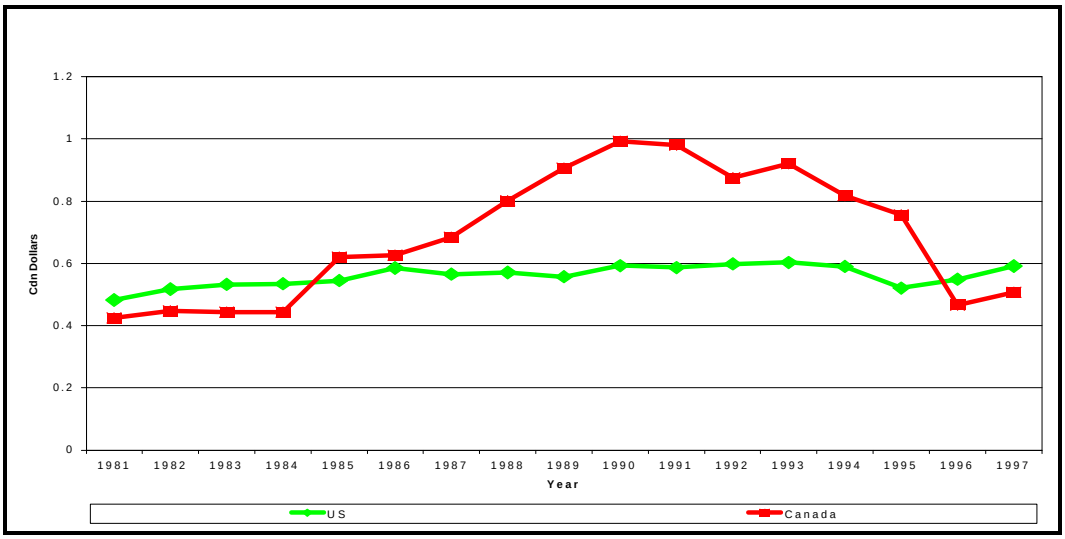


Figure 3.41 Value Added per Dollar of Wages and Salaries

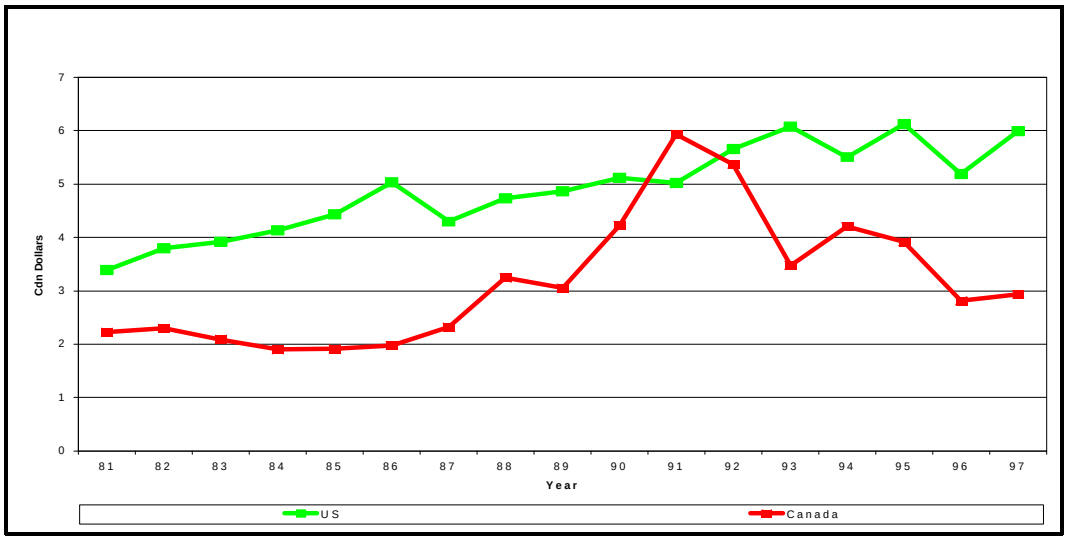
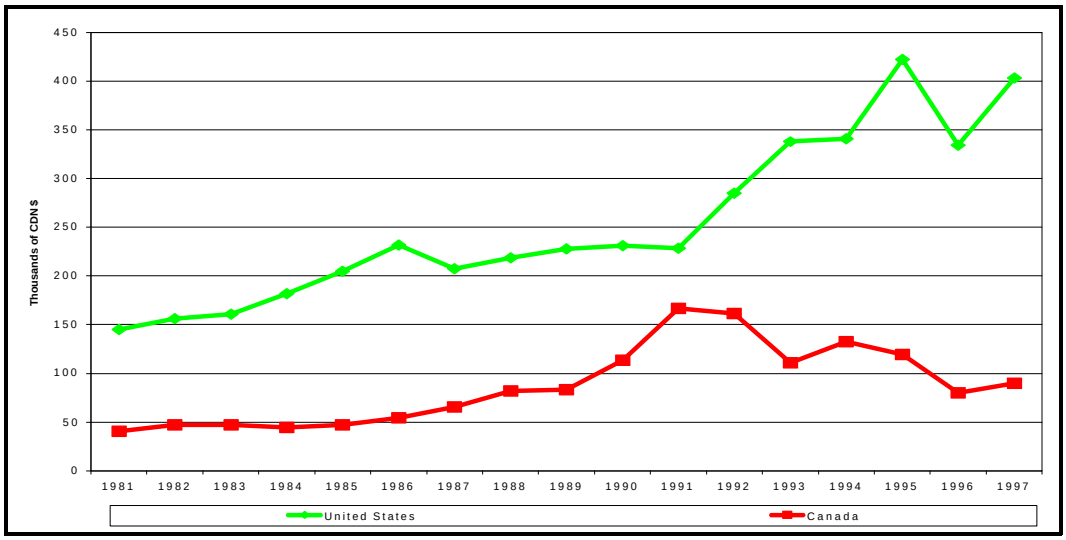


Figure 3.42 Value Added per Employee



As seen in Figure 3.40, until 1990 the Canadian industry showed a strong upward trend in value added per dollar of sales, but that trend took a downward turn and only began to recover in 1997. Value added per dollar of sales by the US grew at a slower but steadier pace, averaging $0.56 compared to $0.69 in Canada.

Although the annual average growth rates of value added per dollar of wages is the same in both Canada and the United States at 4%, the US swamps Canada in real value. The average value in the US is $4.90 compared to $3.17 in Canada (Fig 3.41). Again, Canada's pasta industry showed growth until 1990 and has since declined. Labour productivity tells the same story. It grew at the same annual average rate of 7.3% in both countries, but Canada's average is much lower than the US. Productivity in the US pasta industry averages $253,000 per employee compared to $87,000 per employee in Canada sector. Here again, Canada showed an upward trend until 1990 and has since declined.

3.2.9 Vegetable Oil Industry

This industry predominantly produces canola and soybean oil and meal in North America. As can be seen in Figure 3.43, sales by the vegetable oil industries show an upward trend, specifically since 1991 in both countries. Although Canada is swamped by the US in real values, it grew at an annual average rate of 7.8%, almost double that of the US growth rate in sales of 4.4%. The Canadian vegetable oil industry had average sales of $1.1 billion. Of that, $181 million are value added. In the US, average sales values in the vegetable oil industry equal $15.7 billion, of which $1.9 billion are value added.

Figure 3.43 Sales

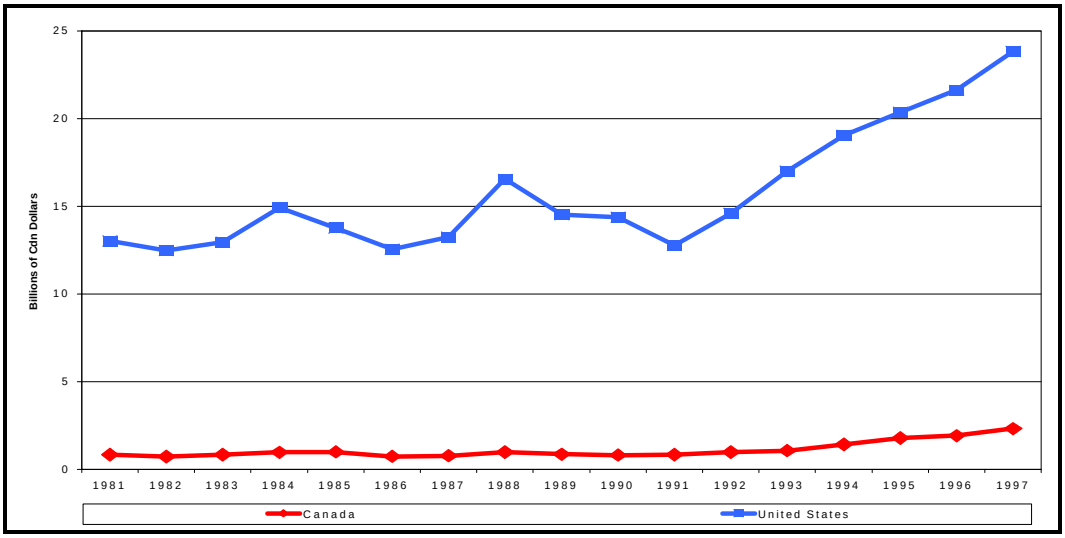


Figure 3.44 Employment

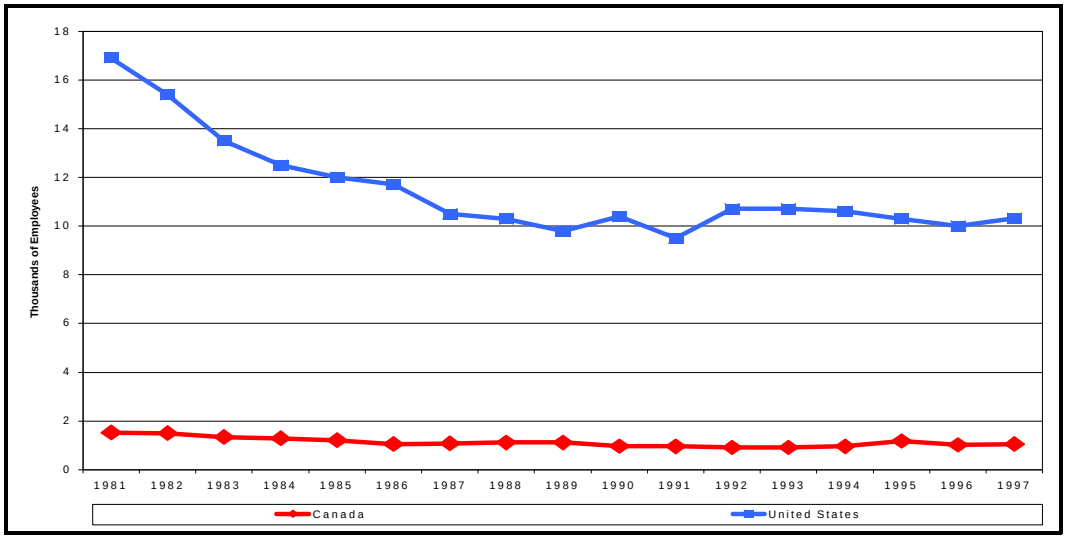
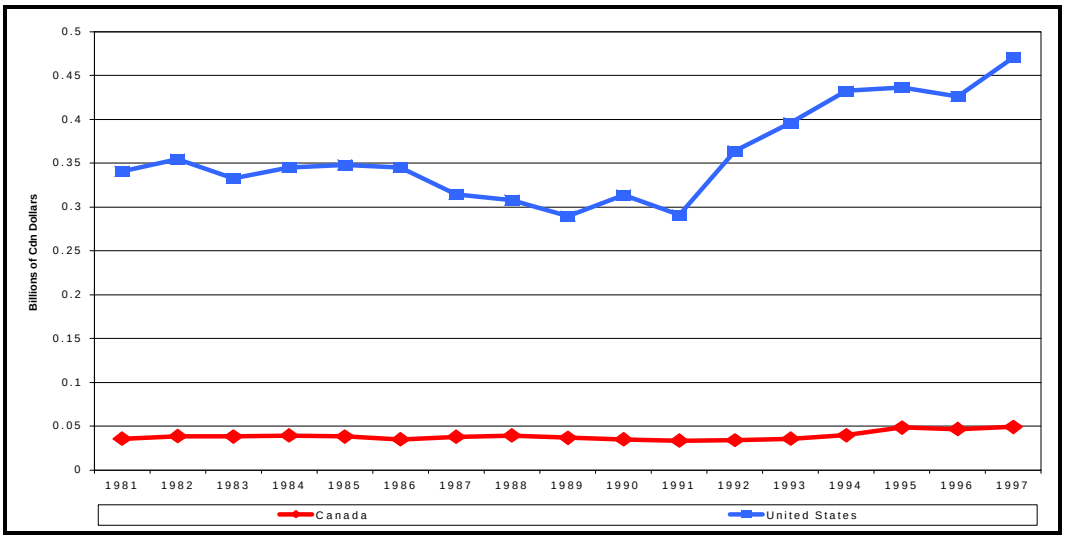


Figure 3.45 Wages



Employment in the US took a sharp downward turn in the 1980's but has since remained steady around 100,000 employees. Total employment in the vegetable oil industry in Canada averaged 1130 employees over the past two decades.

Total wages and salaries took a strong upward turn in 1990 in both Canada and the United States, and have grown at roughly the same annual average of 2.3%.

Figure 3.46 Value Added per $ of Sales

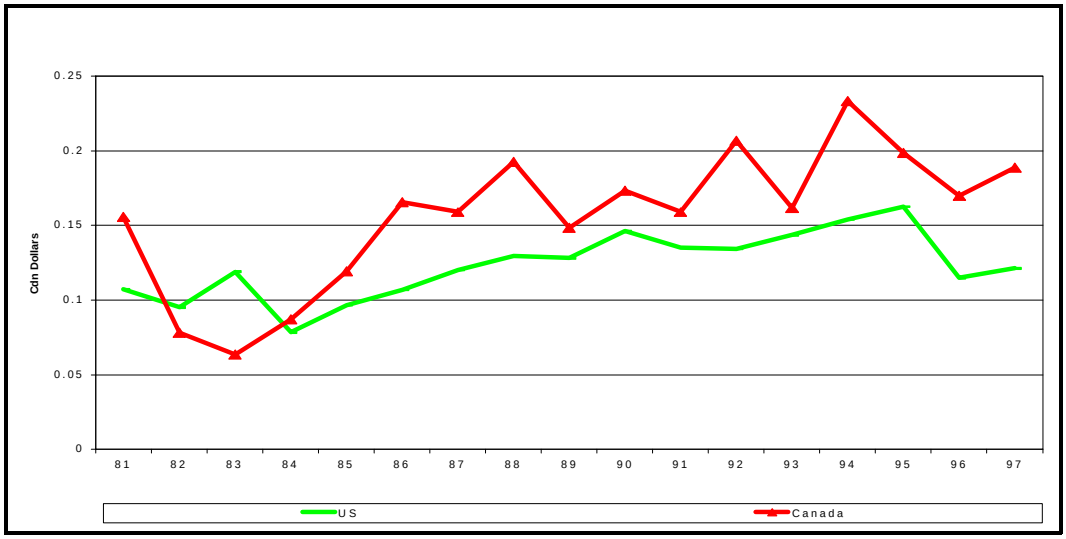


Figure 3.47 Value Added per Dollar of Wages and Salaries

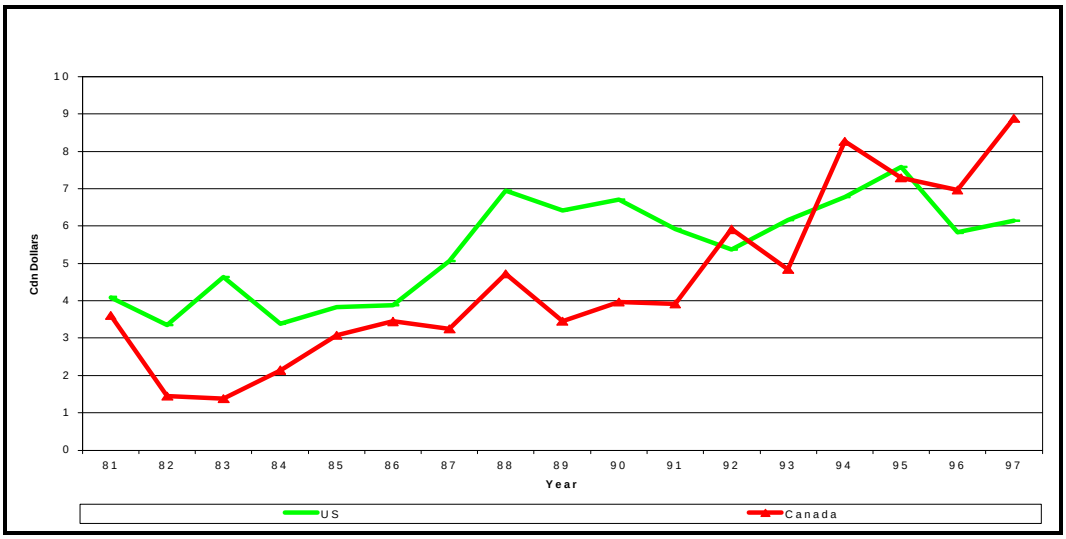
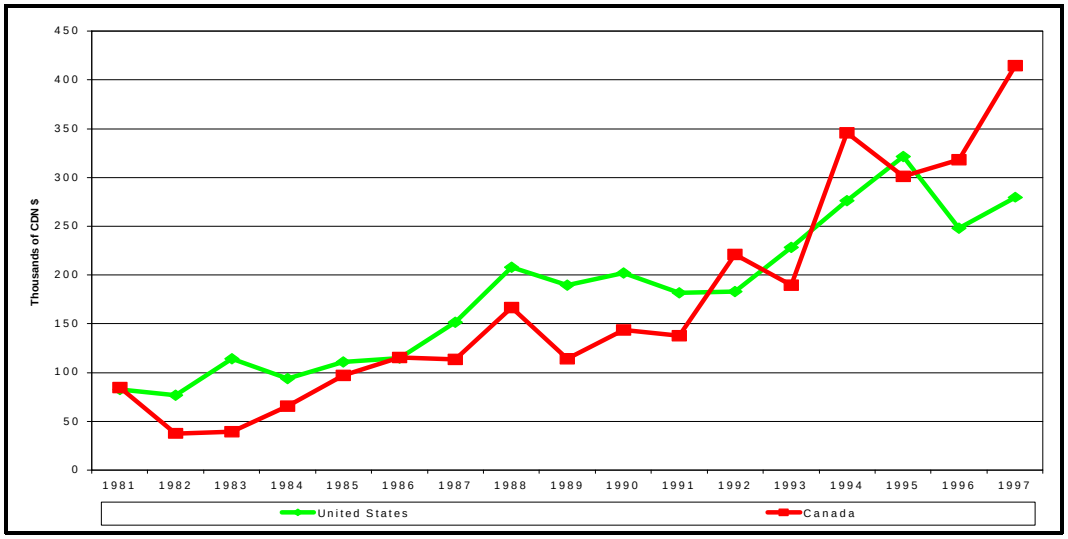


Figure 3.48 Value Added per Employee



Value added per dollar of sales in Canada look very erratic in Figure 3.46, but overall show an upward trend throughout the years. The Canadian industry averaged an annual growth rate in value added per dollar of sales of 5%, whereas the US sector increased at an annual average rate of 2.2%.

Figure 3.47 shows the same erratic movements in value added per dollar spent on wages and salaries in both countries, but overall there is a definite upward trend. The Canadian industry grew at an average annual rate of 11.7% compared to 4.4% in the US.

Value added per worker in the vegetable oil industry has shown a very strong upward trend in both countries. Labour productivity in the Canadian industry grew by 17% yearly, while productivity in the US has grown by 9.7%. These growth rates in productivity are the highest of

any of the industries analysed.

3.2.10 Grain Based Products Industry

This set of industries produces various kinds of grain products for human consumption, ie bread, bakery products, and breakfast cereals. As can be seen in Figure 3.49, sales by the grain based industry in the US shows a definite upward trend, one that became stronger beginning in 1990. The Canadian industry's sales also showed an upward trend, but much less so than the US. The Canadian industry averaged growth of 7% compared to 5.6% by the US. Of the average of $3.7 billion in sales in Canada , $2.2 billion are value added. In the US, value added comprises 58% on average sales of $53.7 billion.

Figure 3.49 Sales

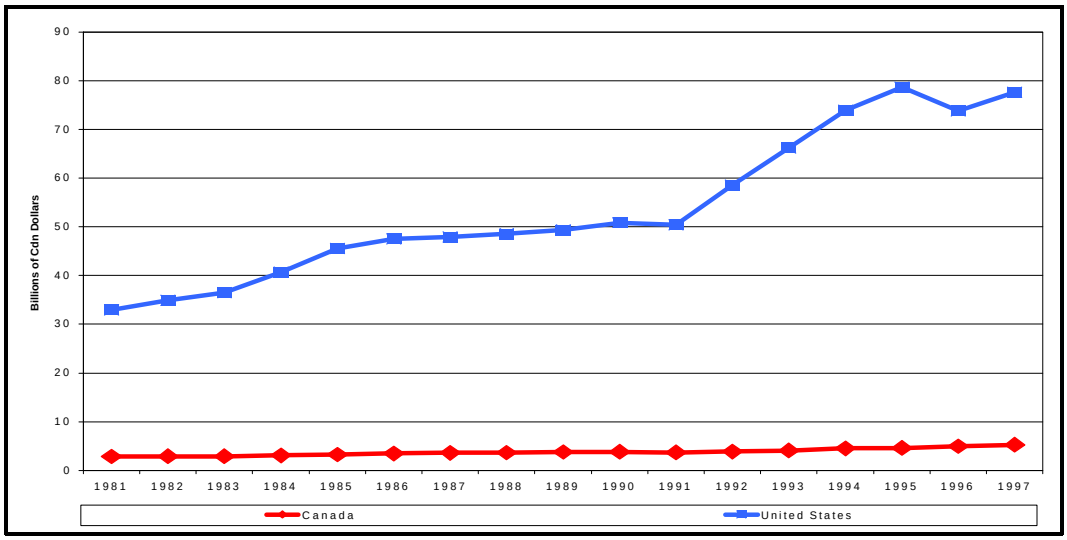


Figure 3.50 Employment

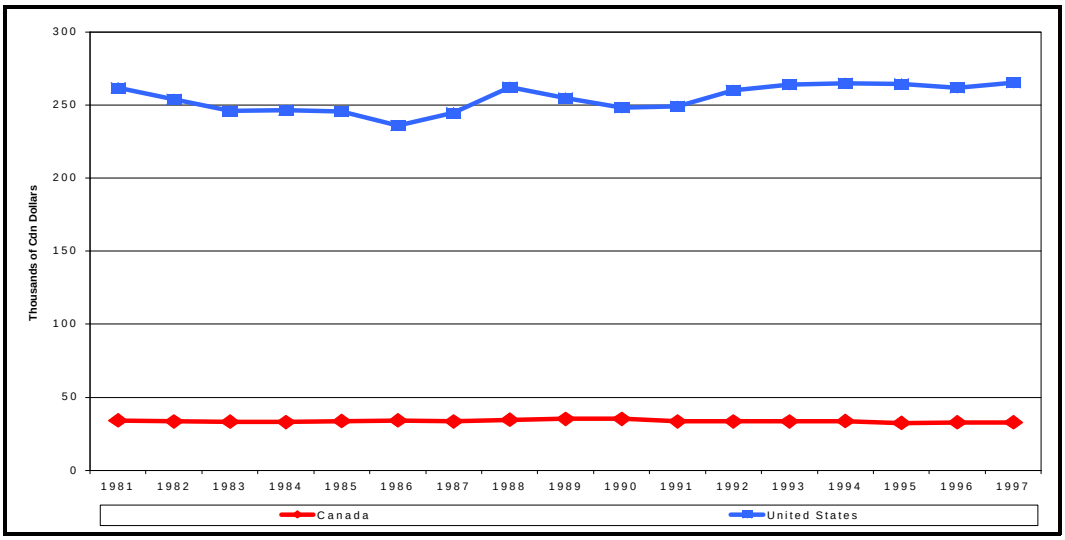
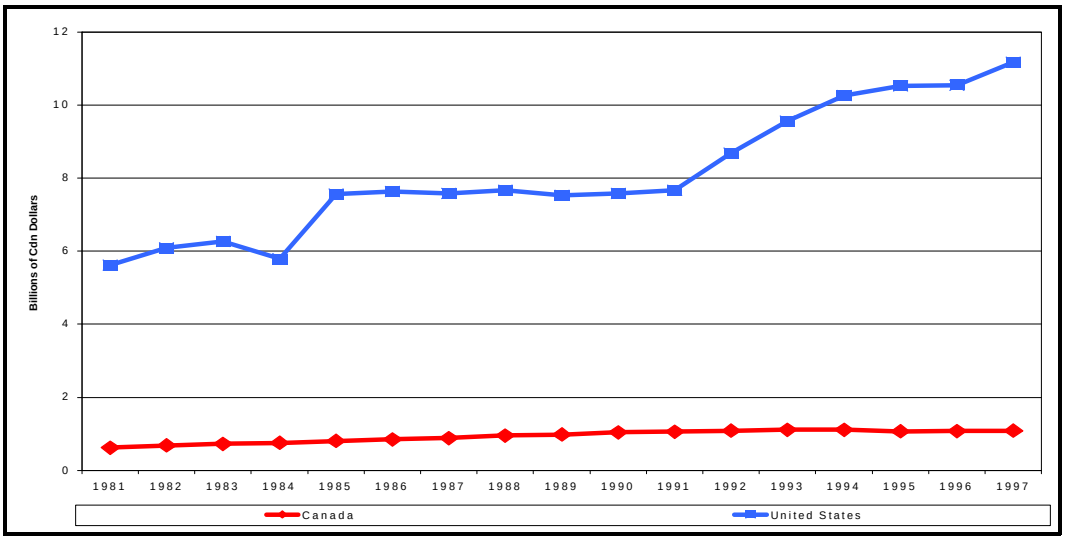


Figure 3.51 Wages



Employment in both countries was relatively stable. The US grains based industry employed an average of 255,000 employees yearly compared to 32,500 in Canada.

Total wages and salaries trended upward in the US, especially after 1990, the average annual growth rate in the US grains based sector is 4.7%, whereas the annual growth rate in Canada averages almost double that at 9.1%. Consequently, the hourly wage rate of production workers has grown in both countries during the past two decades. The average annual growth rate in hourly wages in the US sector is 4.6%, with an average value of $14.70 per hour. In Canada, the average hourly wage rate was $12.20 per hour with an annual average rate of 3.6%.

Figure 3.52 Value Added per Dollar of Sales

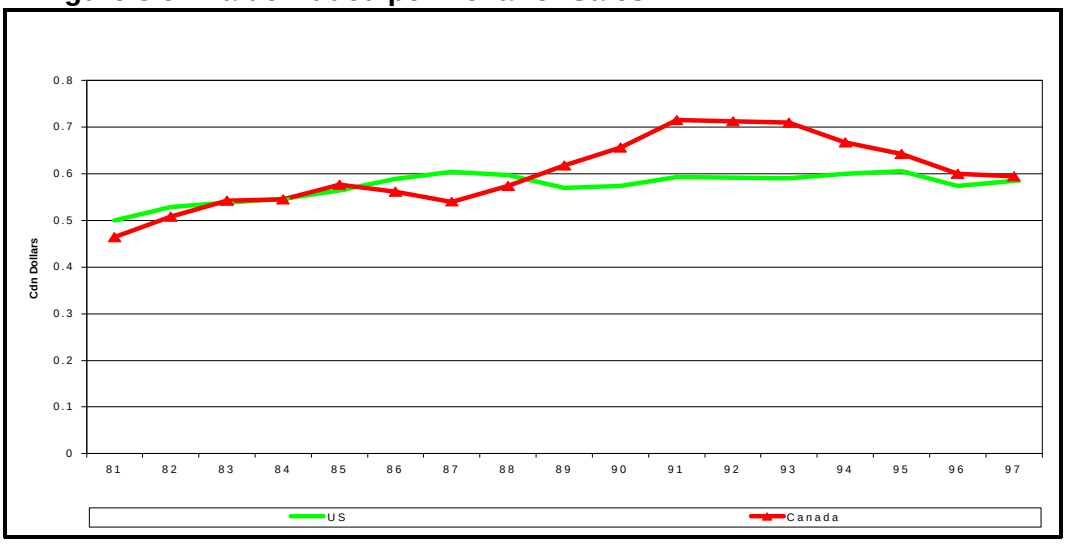


Figure 3.53 Value Added per Dollar of Wages and Salaries

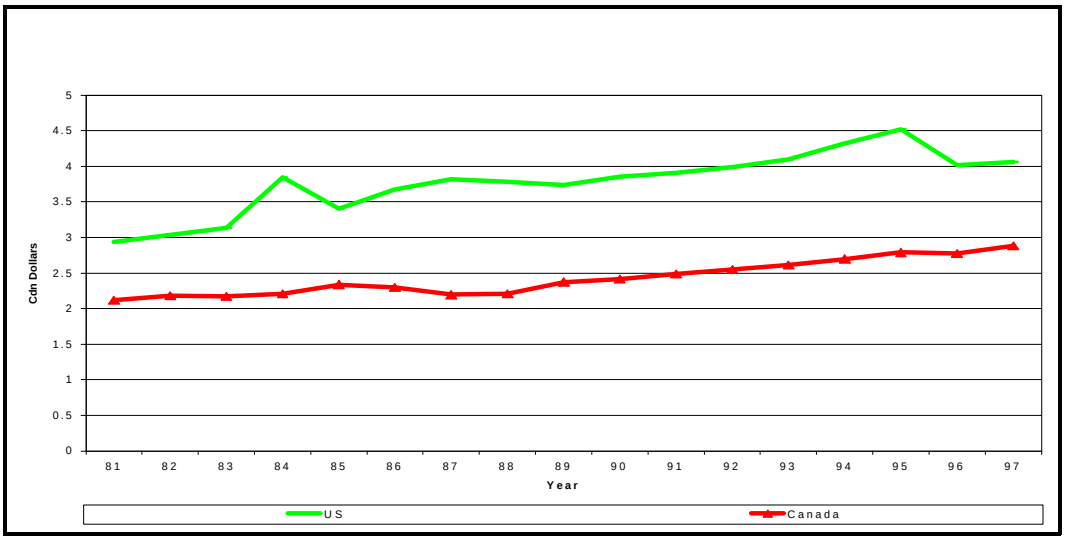
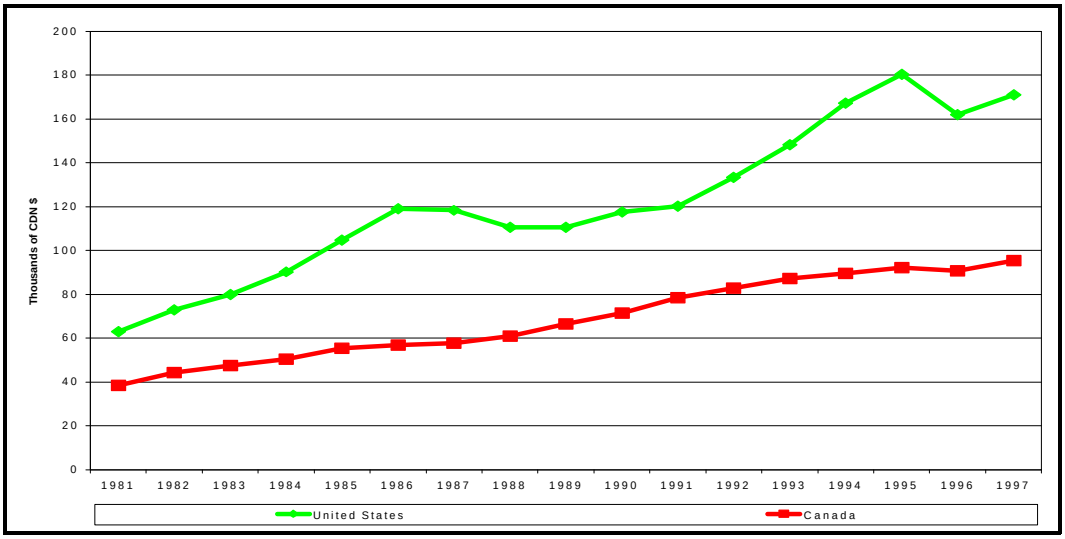


Figure 3.54 Value Added per Employee



As seen in Figure 3.52, value added per dollar of sales in Canada showed an upward trend until 1991 and then declined, with an average annual growth rate of 1.7%. Value added per dollar of sales in the US remained steady around $0.57 with average growth of 1% yearly.

Figure 3.53 shows a steady upward trend in both countries for value added per dollar of wages and salaries. Both countries' industries grew at the same average annual rate of 2.3%, although the US averages $1.20 more than Canada.

Labour productivity in this sector showed a strong upward trend throughout the past two decades (Figure 3.54) and both countries are grew at the exact same average annual rate of 6.7%. Again, the US swamped Canadian figures; the US averages $122,000 per employee and Canada averages $70,600 per employee.

4.0 Net Export Orientation Ratios

The definition of competitiveness presented in section 2.0 used in this discussion also conveys that firms must be able to achieve growth in their respective markets. Given this definition, competitiveness can be partly measured through some representation of market share. Market position, or sales in relation to competition, is a very meaningful bench mark (Martin, 1972).

There are various variables one can use to analyse market share. The most obvious are one's market share of its domestic market or its percentage of production sold internationally. The export orientation ratio measures the industry's exports as a percentage of its total production, and the import penetration ratio expresses imports from other countries as a percentage of domestic consumption. Both of these variables indicate a level of growth in the domestic industry. In this discussion we have chosen a variant of these two indicators, the net export orientation ratio. This indicator is the difference between exports and imports as a ratio of value of sales in a particular industry. Therefore, if there is a positive net export orientation ratio (NEOR), it shows that the particular industry exports a larger percentage of its product than is imported into its country. And the opposite is true for a negative NEOR, it shows that a larger percentage of its product is imported from other countries than it is exporting.

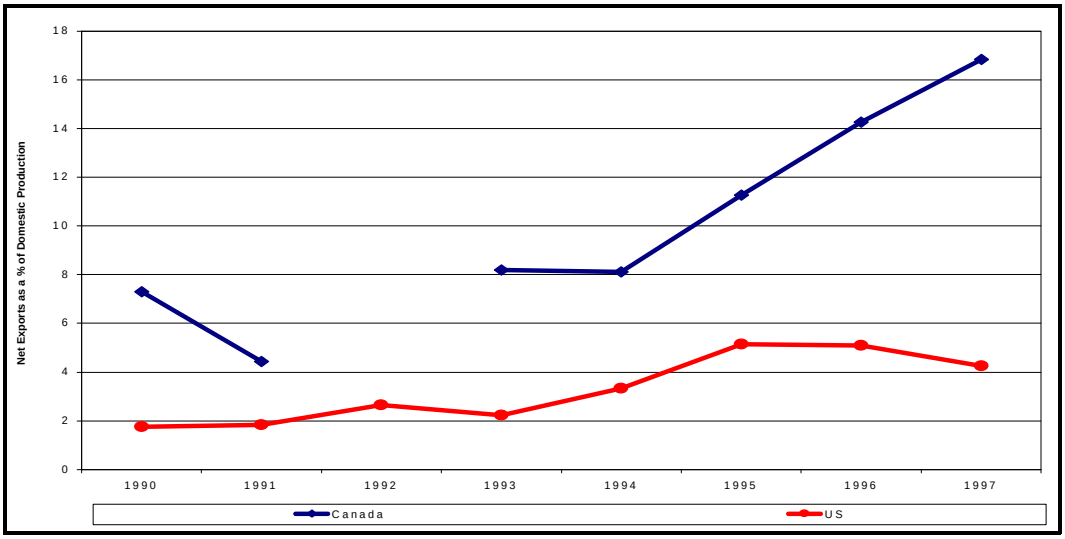
The following section compares the NEOR's of a variety of Canadian and US industries.

4.1 Canadian and US Net Export Orientation Ratio Comparison

Red Meat Processing

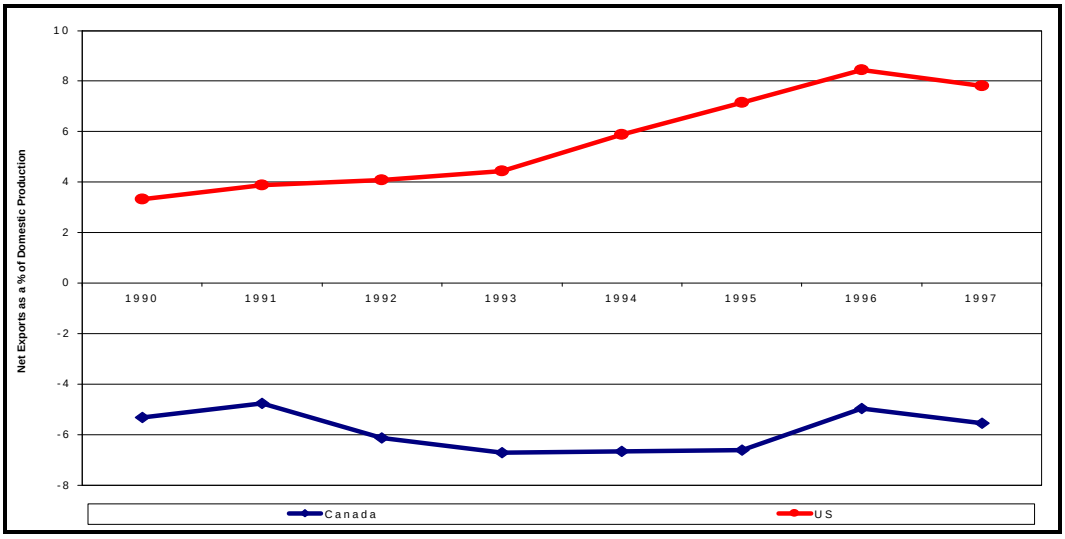
Exports by the Canadian red meat industry have consistently been much larger than imports. Therefore Canada has always shown a positive NEOR in the red meat industry. Since the mid-1990's, it has shown very strong growth compared to the US which is still growing but at a much slower pace. Since 1990, Canada's NEOR averaged10%, while the US lags with a NEOR of 3%. Canadian net exports are of both beef and pork. They represent exports to the US, as well as Asia and Latin American nations. The US is a growing net exporter of beef to Asia and Latin America. It became a net exporter of pork in the late 1990's.

Figure 4.1 NEOR's Red Meat Industry



Poultry Processing Industry

Figure 4.2 NEOR's - Poultry Industry



The NEOR's in the poultry industry look much different for Canada than the red meat industry. Canada's ratios are below zero, averaging -5% since 1990, and trending downward slightly.

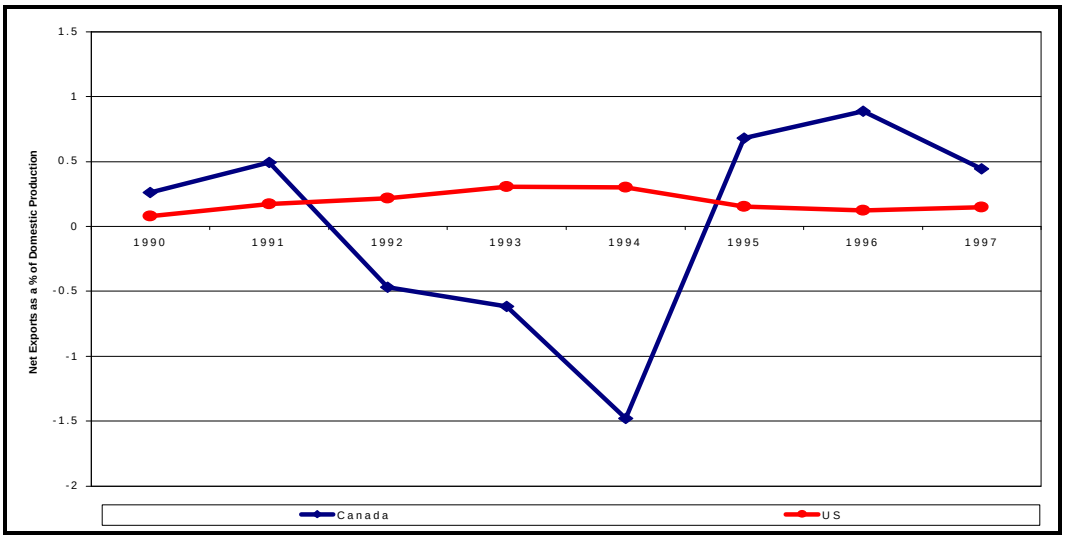
The US average NEOR is 5.6% since 1990, continually growing until 1997 when it dropped slightly. The positive net exports of 5% in poultry go mainly to Canada and Asia. Roughly 95% of Canada's poultry imports come from the United States. Although Canada has begun to supply more poultry to Asia, it is very small relative to its imports.

Fluid Milk Industry

Fluid milk is essentially a non-traded commodity. The US has remained quite steady in its trade

of milk and the constant NEOR averages just 0.2%. Although the Canadian NEOR looks quite erratic, it is actually not when the scale of the graph is considered. Both of these NEOR's are so small because there is no real trading market for fluid milk in Canada and the US due to the protection that is given to this commodity in both countries. This is also abetted by the fact that the commodity is highly bulky and mainly water.

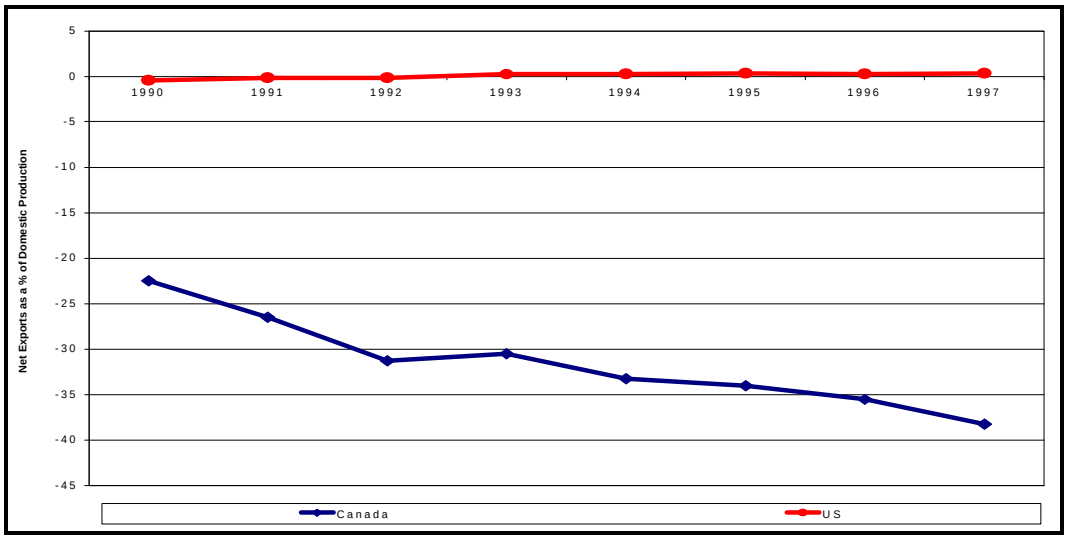
Figure 4.3 NEOR's - Fluid Milk



Processed Fruit and Vegetable Industry

Canada is an increasing net importer of canned and dried fruits and vegetables, with a negatively trending NEOR. The US is essentially self-sufficient. Canada's processed imports originate mainly in Mexico.

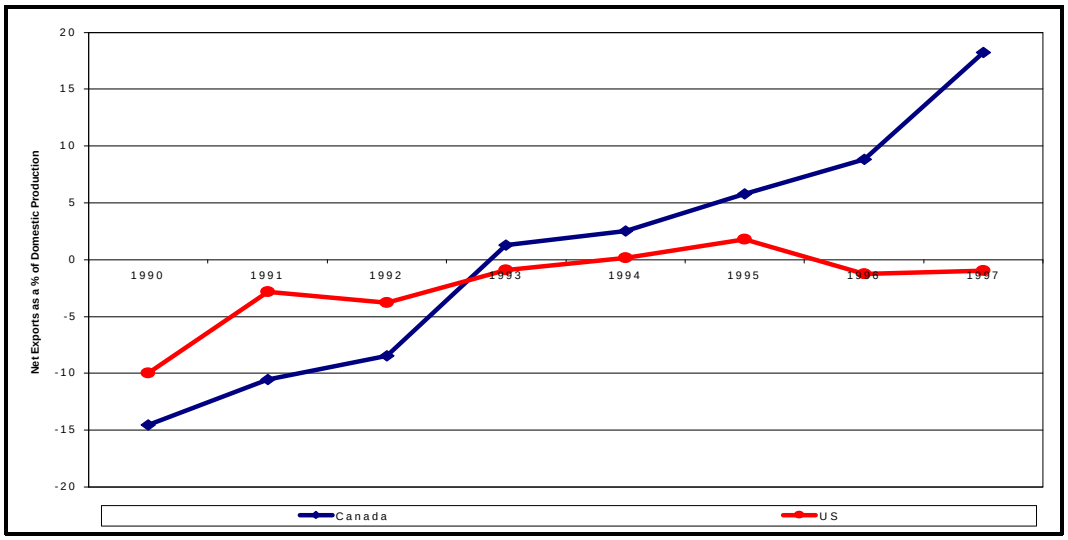
Figure 4.4 NEOR's - Processed Fruits and Vegetables



Frozen Fruit and Vegetable Industry

Canada's NEOR for frozen fruits and vegetables has grown dramatically since 1990 due to the hefty growth in exports and only a slight growth in imports while sales in the industry remained steady. The US NEOR peaks at 1% and stays rather flat due to the parallel growth in net exports and sales.

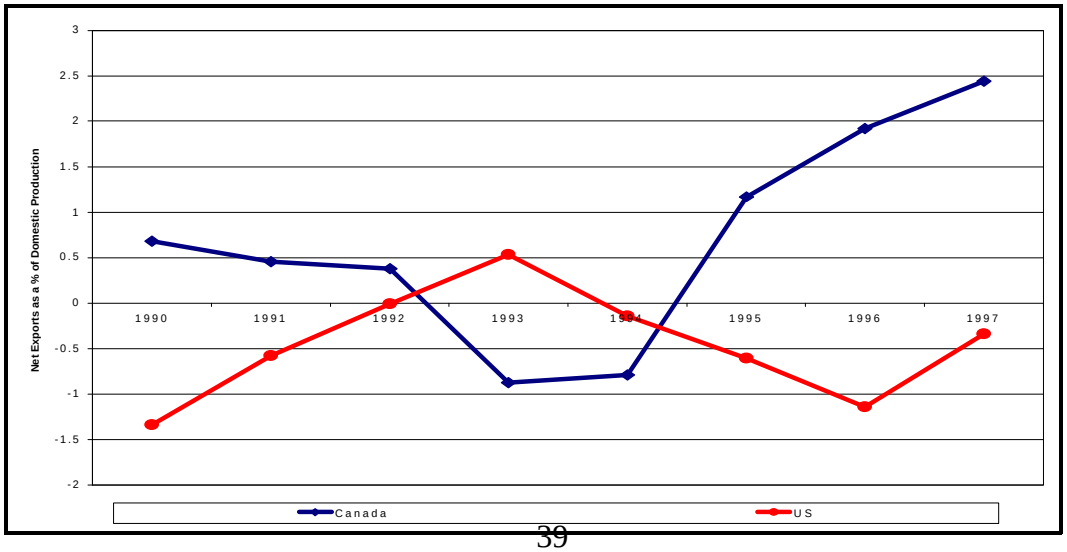
Figure 4.5 NEOR's - Frozen Fruits and Vegetables



Manufactured Dairy Products

Again we can see (Fig 4.6) that dairy products, not unlike fluid milk, are mostly non-traded products, although not as dramatically as fluid milk. In this case, the lack of trade is not attributable to the bulkiness of the product, since many processed dairy products are highly concentrated and high in value/volume ratios. Both countries' NEORs are erratic and show no common pattern of trade because trade occurs mainly when needed to remove short term surpluses , although Canada has begun to show a pattern of increased net exports in dairy products.

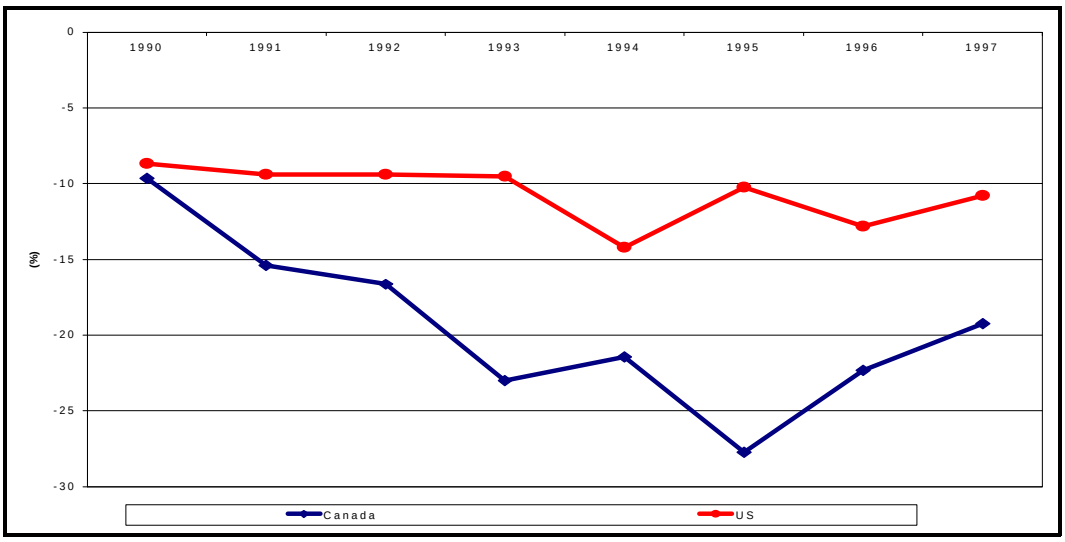
Figure 4.6 NEOR's - Manufactured Dairy Products



Dry Pasta Products

This NEOR graph clearly shows that both Canada and the United States import dry pasta products. Canada's ratio averages nearly -20%. This result is particularly ironic for Canada, which is a major net exporter of durum wheat to high cost countries which, in turn, process it and export pasta back to Canada.

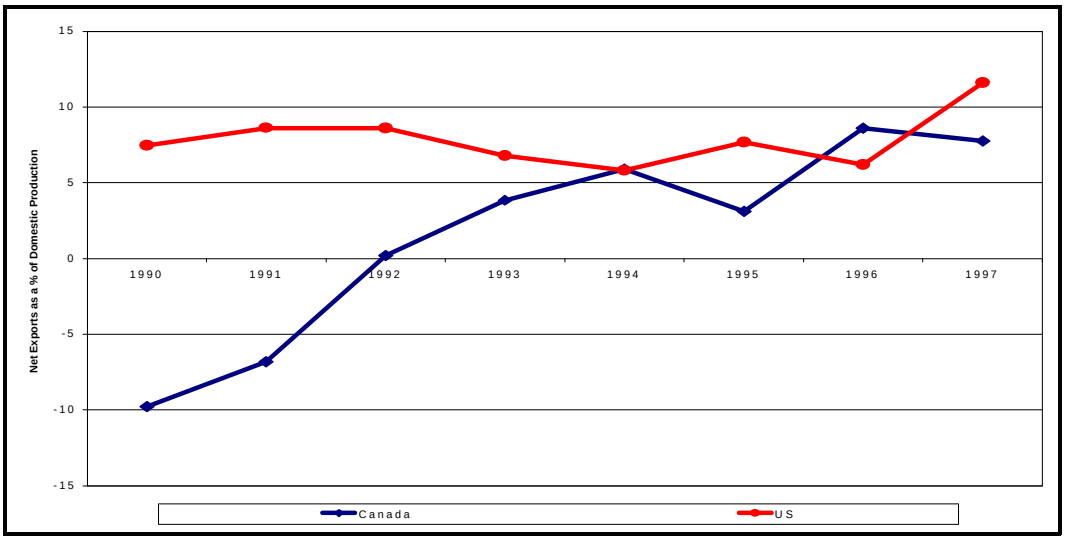
Figure 4.7 NEOR's - Dry Pasta Products



Vegetable Oil Industry

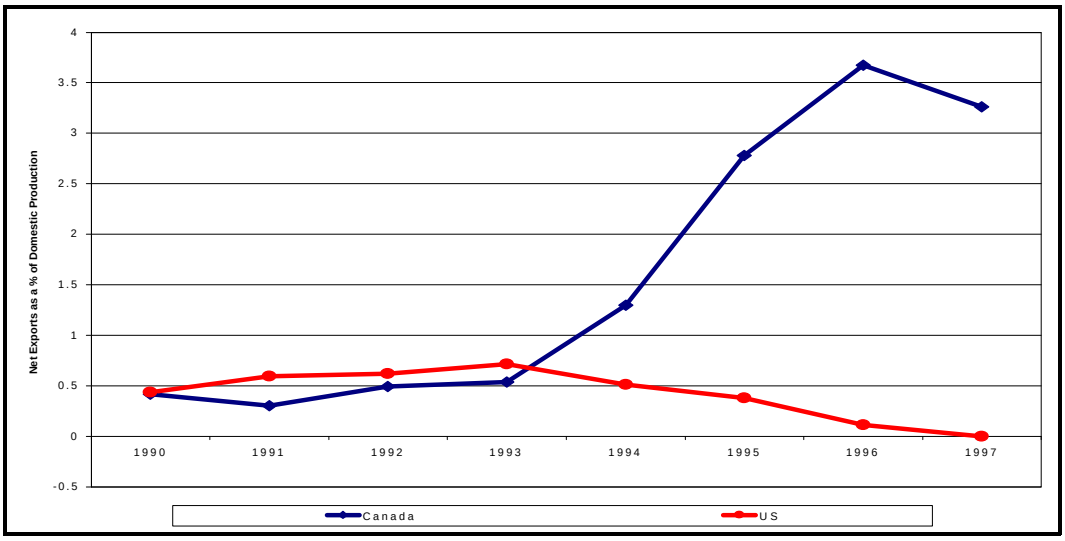
Canada's NEOR in the oilseed processing industry has continuously improved since 1990. Exports have increased five-fold and have surpassed imports substantially, while sales also tripled since 1990. Again the US remains fairly steady with an average of 7.8% net exports of sales.

Figure 4.8 NEOR's - Vegetable Oils



Grain-Based Products Industry
Until 1993 grains-based product NEOR's in both Canada and the United States remained fairly stable around only 0.5%. Since then, Canada's ratio improved, but only to just over 3%.

Figure 4.9 NEOR's Grain-Based Products



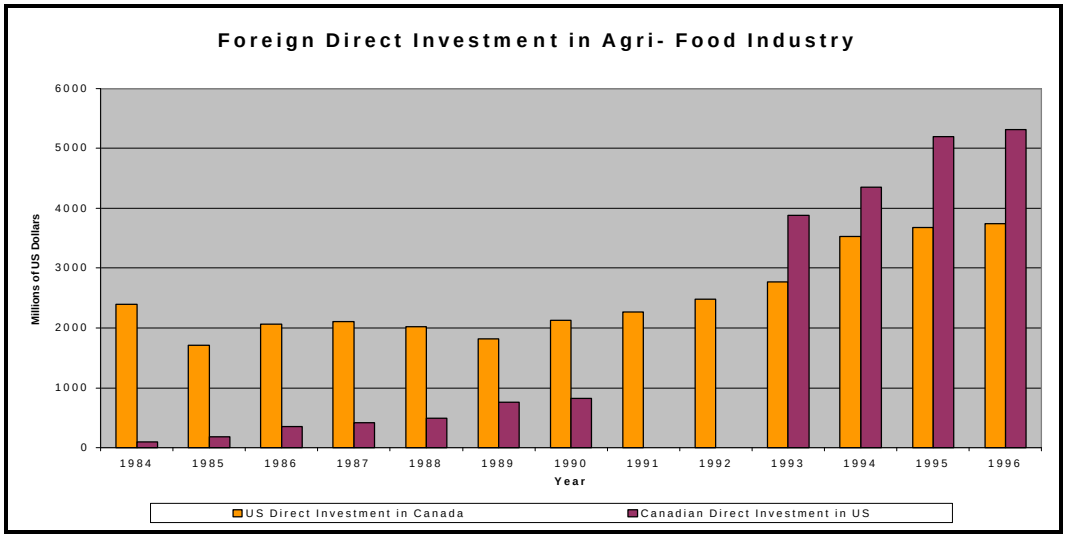
5.0 INVESTMENT IN THE AGRI-FOOD INDUSTRY

The relationship between competitiveness and investment is a complex one. It has dimensions of two way causality: ie an industry with a high degree of competitiveness attracts investment, but investment causes an increase in productivity and a high degree of competitiveness.

One way to at once validate and test the underlying assumptions and assertions of this study is by tracking net investment flows. The foregoing results show that, with the exception of the oilseed crushing industry, all of the industries in Canada have lagged their US counterparts in the area of productivity, whether it is measured per dollar of wages or per employee. The implication, if the underlying assertion is right, is that the Canadian sector is lagging because it does not invest more, or that it can't attract enough capital to make its productivity grow.

So, what is the situation with respect to investment in agri-food processing? There are various ways to address this question, but none can address it precisely by industry. The way we *have* addressed it is to cite a detailed analysis of direct investment by Canada in the US agri-food sector, and by the US in the Canadian sector (Fig 5.1).

Figure 5.1



While there are two years of data missing, it is interesting that the data show:

- Investment by both countries in the other grew substantially after the introduction of CUSTA
- Before the introduction of CUSTA, the US invested more in Canadian sector than *vice versa*
- After CUSTA, Canadian investment in the US grew enormously and surpassed US investment in Canada.
- The magnitude of this relative change in investment is quite extraordinary: in 1988, the last year before CUSTA, US investment in Canada was $2 bil, while Canadians only invested about $500 mil in the US. By 1996, Canadian investment in the US had surged to $5.3 bil, while the US sent only $3.8 bil to Canada.

The investment flows shown above are quite consistent with the findings of the competitiveness analysis. Canadian food processing industries lag their US competitors in productivity. Canadians seem to be more interested in investing in the US industry.

6.0 Conclusions

This study starts with three objectives:

1. to revisit and revise, if necessary, the definition of competitiveness and characterize the factors that affect relative competitiveness.
2. To apply the definition of competitiveness empirically by measuring labour productivity, as well as value-added for industries in the agri-food sector in Canada and the US.
3. To assess and describe changes in agri-food sector competitiveness over time

Conclusions about each of the objectives are presented below.

6.1 Definition of Competitiveness

This was also an objective of the first study in this series. Our conclusion is that the definitions put forward by the Agri-Food Competitiveness Task Force in 1990 is very similar in meaning to others. They all focus on relative productivity and market share. While any could be used, we maintain the one by the Task Force:

Competitiveness is the sustained ability to profitably gain or maintain market share.

6.2 Applying the Definition

This definition implies that to measure the competitiveness of an industry, one needs to obtain data on its productivity relative to its competitors, and its market share. Our approach here is first, to measure output by the industry's value added. Then productivity is measured through three alternative ratios of value added - per employee, per dollar of wages and salaries, or per dollar of sales. The relationship of these measures to profitability was noted in section 2.0.

Market share is measured by the net export orientation ratio. This is the difference between the value exports and imports of an industry's products expressed as a ratio of the value of an industry's production.

These ratios are applied to nine food processing industries in sections 3.0 and 4.0 of the report. In section 5.0, a brief analysis is presented of investment flows in agri-food between Canada and the US. This is consistent with the results of the comparative analysis.

6.3 Assessment of Competitiveness

Table 6.1 contains a summary of the results of the analysis in sections 3.0 and 4.0. In developing the entries for the table, we assessed the relative performance on the variable since 1989, the beginning of CUSTA. If the Canadian industry outperformed the US industry, it was assigned a +. If the US outperformed, then a - was assigned. If there appeared to be no difference, we assigned a ~.

The table presents a rather clear overall picture. The number of negatives significantly exceeds the number of positives.

Table 6.1 Summary of Canadian Relative Performance

Industry	NEOR	VA/Person	VA/$ Wages	VA/$ Sales
Veg Oil	+	+	+	+
Frozen Fruit & Veg	+	~	+	~
Red Meat	+	-	-	~
Fluid Milk	~	~	+	+
Grain Based	~	-	-	~
Dry Pasta	-	-	-	~
Processed Fruit & Veg	-	-	-	~
Manuf. Dairy	~	-	-	-
Poultry	-	-	-	-

Only the vegetable oil industry shows positives in every cell. Interestingly, this industry has clearly had immense investment. Several new crushing plants have been built in Canada since the beginning of CUSTA. This was mainly in response to perceived opportunities in the development of canola oil markets. From this has come a major gain in Canadian productivity. The positive with respect to value added per dollar of sales also indicates that the industry has been able to enhance its product mix and its margins relative to the US industry. This is part of the source of productivity gains.

The next two highest ranking industries are red meat processing and the frozen vegetable industries. Again, both increased their market share and the frozen vegetable industry had a relative gain on one measure of productivity, and held its own on the other two ratios. Both of these industries have seen considerable new investment although, as indicated in section 3.0, much of it occurred after the end of the data available. This is reflected in the fact that the Canadian red meat productivity ratios did not gain as much as did the US.

The fluid milk industry is an interesting case, and quite in contrast to the manufacturing industry. Because of its relative bulk, fluid milk processing serves relatively small areas with relatively low margin products. The industry does not ship product very far and the similarities between the two countries' industries suggest similar technology and scales of plant are used in both countries.

Among the remaining industries, a few had a small amount of exports. We did not treat

them as significant unless the net export orientation ratios were at least 5%. All of them showed substantially declining labour productivity relative to the US, whether one measures it per worker or per dollar of wages and salaries. What also stands out is that the industries that are lagging the most, with one exception, are those that are highly regulated in the domestic market. The exception is largely so because much of the product in this industry is based on semi-tropical fruits and vegetables.

The fundamental conclusion of this analysis is that only one food processing industry can be said to have clearly enhanced its competitiveness since the beginning of the Canada US Trade Agreement. Three others have likely not lost much ground, although they, in many cases, simply maintained their lag behind their US counterparts.

The remaining industries have clearly lost ground against their US rivals.

6.4 Implications

It is ironic that post CUSTA, the net flow of investment capital in the agri-food sector switched from being in Canada's favour, to being very much of a deficit. This, however, is consistent with the fact that only one of nine food processing industries unequivocally gained in competitiveness, while most of the remainder fell further behind in labour productivity or failed to make any gains.

The irony arises because of the fact that CUSTA gave Canada more access to a market of 250 million, while the US got access to only 25million. One would have expected a relatively larger investment in Canada in order to gain the economies of size required in the US market. But this has, apparently, happened mainly in the vegetable oil industry and, more recently, red meat processing.

Why the reluctance to take advantage of the opportunity, especially when it is enhanced by a currency that is worth only 2/3 of the US currency? While we did not set out to answer this question explicitly, conversations with many people in the industries suggests at least two potential reasons for this. One is a much higher tax level for both businesses and individuals. Capital budgets often make Canadian investments look much worse after tax than before tax. And individuals often prefer to pay government less for the services it provides.

The second reason that is often mentioned is that the regulatory burden in Canada is much more onerous than in the US. The data reported here would seem to support that perception.

If Canadian policy makers see this growing lack of competitiveness as an issue worth resolving, then it would be sensible to understand the reasons for the decline, and to offer some alternatives for changing the situation.

Appendix 1: Canadian and United States Corresponding Manufacturing Food Sectors Based on their Standard Industrial Classification Codes.

	United States		Canada	
SECTOR	**SIC CODE**	**SUB-SECTOR**	**SIC CODE**	**SUB-SECTOR**
Red Meat	2011	Meat Packing Plants	1011	Meat and Meat Products Excl. Poultry
	2013	Sausages and Other Prepared Meats		
Poultry	2015	Poultry Slaughtering and Processing	1012	Poultry Products
Fluid Milk	2026	Fluid Milk	1041	Fluid Milk
Feed	2047	Dog and Cat Food	1053	Feed
	2048	Prepared Feeds		
Processed Fruits & Vegetables	2032	Canned Specialties	1031	Canned and Preserved Fruits and Vegetables
	2033	Canned Fruits and Vegetables		
	2034	Dehydrated Fruits, Vegetables, Soups		
	2035	Pickles, Sauces, and Salad Dressings		
Frozen Fruits & Vegetables	2037	Frozen Fruits and Vegetables	1032	Frozen Fruits and Vegetables

Other Dairy Products	2021	Creamery Butter	1049	Other Dairy Products
	2022	Cheese, Natural and Processed		
	2023	Dry, Condensed, Evaporated Products		
	2024	Ice Cream and Frozen Desserts		
Dry Pasta Products	2098	Macaroni and Spaghetti	1092	Dry Pasta Products
Vegetable Oils	2074	Cottonseed Oil Mills	1061	Vegetable Oil Mills
	2075	Soybean Oil Mills		
	2076	Vegetable Oil Mills		
Grain Based Products	2041	Flour and Other Grain Mill Products	1051	Cereal Grain Flour
	2043	Cereal Breakfast Foods	1052	Prepared Flour Mixes and Cereal Foods
	2045	Prepared Flour Mixes and Doughs	1071	Biscuits
	2051	Bread, Cake, and Related Products	1072	Bread and Other Bakery Products
	2052	Cookies and Crackers		
	2053	Frozen Bakery Products, Excl. Bread		

References

Cansim.

Handy, Charles, Steve Neff, and Christine Bolling. *U.S. Foreign Direct Investment in the Western Hemisphere Food Industry.* United States Department of Agriculture, Economic Research Service. Agricultural Economic Report No.760.

Martin, Larry, Erna van Duren, Randy Westgren, Marc Le Maguer, Marc Banik, Fabrice Richarc, Clea Coronel, Arlie McFaul and Samuel Bonti. *Competitiveness of Food Processing in Canada: A Study for Industry, Science and Technology Canda.* The George Morris Centre. January, 1992.

Martin, Larry, Zana Kruja, and John Alexiou. *Prospects for Hog Production and Processing in Canada.* The George Morris Centre. March, 1999

Martin, L. Bell. *Marketing: Concepts and Strategy*, 2nd ed., Houghton Mifflin Company, Boston.1972

Office of Technology Assessment. *Competing Economies: America, Europe, and the Pacific Rim.* U.S. Congress, Report OTA-ITE-498. Washington, DC: U.S. Government Printing Office. 1991.

Prahalad, C. K. and Gary Hamel. Competing in the Future. Harvard Business School Press. 1996.

Porter, Michael. The Competitive Advantage of Nations. Macmillan. 1990.

Statistics Canada. Annual Survey of Manufactures.

Task Force on Competitiveness in the Agrifood Industry. *Growing Together.* Report to the Minister of Agriculture. June, 1990.

U.S. Department of Commerce. Annual Survey of Manufactures.