Improving Productivity
in Canada’s Food Processing Sector
through Greater Scale

February 2012
Executive Summary

The purpose of this study was to provide an economic analysis of the relationship between scale and productivity in Canada’s food processing and its significance for Canadian public policy and management purposes. With the changing global agri-food environment and future demand opportunities, scale in food processing is one factor that allows participating Canadian firms to compete successfully in this environment. Large scale processing drives large scale demand for agricultural products, leads to growth of markets along the whole value chain and allows firms to satisfy both the domestic and export markets.

In this analysis, elements of the economic literature relevant to economies of scale and productivity were reviewed, with an emphasis on Canadian food processing. Industry data from Canada and the United States were collected and analyzed, and interviews were completed with Canadian food processors. Based on the above, hypotheses regarding scale and productivity in Canadian food processing were formulated and assessed. This analysis formed the basis for our conclusions.

The results showed the following:

- **Canadian food processors are significantly smaller in scale than their US counterparts.** On average, Canadian food processing facilities have half the number of employees and less than half the sales revenue of US facilities. Major scale differences are found in all sectors of the food processing industry.

- **Larger facilities are more productive – value added per employee for establishments at the 75th percentile is twice the level for the median establishment.** To the extent Canadian establishments have not achieved scale, this hurts the industry’s overall productivity.

- **Investment in machinery and equipment in Canadian food processing facilities trails the US; for every dollar invested per worker in the US, Canadian facilities invest only 62 cents.**

- **Canadian food processing firms noted the following regarding scale and productivity:**
  - Operating plants at a competitive/efficient scale is fundamental, especially in specialized facilities
  - Firm scale allows for the overhead of enhanced marketing, human resource, and research and development functions
  - The more dependent firms are on the raw farm product as a share of product value, the greater the extent to which competition drives scale
  - In other cases, the perishable nature of the product and transportation cost relative to the size/concentration of the local market limits plant scale.
  - A number of marketing regulations and firms that experience downtime in multiproduct plants were also found to limit scale of Canadian firms.

- **Even within free trade agreements, border effects are perceived as significant.** This has the effect of broadly limiting the future scale of Canadian firms, particularly in competing in global markets.

- **The scale of food retailing in Canada is a significant factor for many food processors.** Given that food retailing is more concentrated in Canada than in the US, this suggests the potential for increased scale in food processing in the future.
• Marketing regulations that impact the available supply of farm product, flexibility of procurement arrangements, ability to export and the ability to for firms to compete with rivals in raw product procurement are a limit to scale. In effect, some of these regulations create sub-national markets which limit scale by their very nature.

Thus, firm scale is an important part of the productivity challenge. The analysis here finds that manufacturing productivity increases with scale, as does capacity utilization. Although scale is not the only challenge to improving productivity, it is a factor that has helped to maintain or improve productivity in the US sector while Canada’s lags. As new labour-saving technologies emerge, the gap in scale will only be exacerbated.

To the extent that policy creates barriers to firm scale and/or could better promote scale as a means of narrowing the productivity gap, this should be engaged. Policy by governments has tended to contain scale biases- either implicitly favoring scale or opposing scale. The current emphasis on “local” appears to fall toward the latter. Instead, policy should be even-handed regarding scale, and transparent that policy initiatives are scale-neutral.

On the domestic side, any policy that constrains national markets (e.g. provincial waste and packaging standards) can have an effect on scale efficiencies of a firm servicing the entire country.

This leads to the following recommendations:

• Governments (AAFC, Industry Canada, provinces) should continue and intensify efforts to minimize border friction. This ranges from increased trade advocacy activity, to ongoing diplomatic engagement regarding border interruptions and costs. The results of these efforts should be communicated to industry, so that more transparent assessment can be made of export market prospects, with the goal of greater certainty in market access.

• The system of farm product allocation among processing plants in supply management should be reformed. Administratively-derived allocation is inflexible and creates unproductive entitlements to supply. It is unclear that these contribute anything to the market power protection of farmers. Administrative allocation mechanisms should be reformed to a more freely competitive system of allocation among plants.

• Regulated marketing is largely fragmented at the provincial level. This creates unnecessary friction among provinces and additional costs in the system. Acknowledging that some of this orientation has a statutory basis, especially in supply management, the system should be reformed to be national in structure. Dairy marketing agencies have attempted to move in this direction; this should be supported and continue for all provincial marketing boards in supply management with the goal of having a single national marketing agency for the national allocation of each of the supply managed commodities.

• Regulated marketing, including the Canadian Wheat Board (the most recent federal legislative proposal on the CWB would accomplish this) and supply management should be reformed to better meet the needs of differentiated markets and facilitate cooperation between processors and their suppliers where there is a willingness on behalf of both
parties to do so. This would allow improved access to specified farm products on behalf of processors, and allow farmers an alternative to imposed product standards.

- The objectives and instruments of regulated marketing should be reviewed to determine whether overreach is occurring.
- When Government assesses new policies (waste, packaging), it should consider the effect a provincial policy vs. federal policy will have on the ability of firms to scale up and service the country.
- New technology will be a driver for food processing scale. Currently, government announcements focus on the number of jobs that grants and investments will bring to a community. As new labour and energy saving technologies are adopted, fewer jobs may be created but the focus should be on the fact that higher skilled jobs will be created as a result.
- An opportunity exists to create awareness regarding productivity and the role of scale in educational activities. Public resources or incentives should be provided to firms to examine and upgrade processes and technology related to scale that can improve competitiveness.
- The data associated with scale and productivity are imperfect. If competitiveness in food processing is important to the Canadian economy (as we believe it is) then the nature of the data should be reviewed and formatted appropriately for more precise comparisons, and government should be “minding the store” and regularly monitoring the situation.

It must be made clear that this report and its conclusions are not based on a ‘big versus small’ argument. There is room for all sizes of food processing targeting various markets in Canada. However, if Canada wants to compete effectively against foreign food processors, both in the domestic market and export markets, then more focus is required on improved scale and productivity in those firms that do want to compete in this arena. Innovation, technology and effective management will be the key to moving the sector forward and using resources efficiently. There is an opportunity for good public policy to play an important role in creating a business climate that will facilitate this growth and investment for the betterment of the entire agri-food value chain.

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The analysis and recommendations are those of the authors.
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1. Introduction

“To remain competitive and profitable, Canadian food processors will increasingly need to identify growth markets that will allow them to leverage their production capacity and increase their scale.” Stephen Rannekliev, Vice-President, Food and Agribusiness Research and Advisory Services, Rabobank, April 2008.

Bank of Canada research indicates that “a smaller average size is one of the most distinctive structural features of Canadian firms relative to those in the United States, which in the past has registered a systematically higher productivity level than Canada” and Intel founder Andy Grove argues that “losing the ability to scale will ultimately damage our capacity to innovate”.

The productivity gap in Canada has been well documented as a competitive challenge to the economy in many sectors including in food processing (Hodgson and Triplett, 2007; Conference Board of Canada, 2010). This research project intends to examine scale as a factor that could be affecting the gap.

1.1 Purpose and Objectives

The purpose of this study was to evaluate and assess the relationship between scale and productivity in Canada’s food processing sector, and to put it in context.

The specific objectives of this study were to:

- Determine the impact of scale in Canada’s food processing sector overall and its important sub-sectors
- Identify the key contributors to Canada’s sub-scale challenges where they exist
- Develop public policy recommendations to deal with opportunities for improvement

1.2 Report Outline

Section 2 begins by putting scale and productivity into context. Section 3 describes the effects of scale on productivity based on a comprehensive literature review. Section 4 describes the food processing sector in Canada, compares it to the United States and shows the effects of scale on productivity. Section 5 assesses a set of hypotheses formulated based on potential contributors to Canada’s sub-scale challenges. Lastly, Section 6 provides recommendations to improve scale challenges in Canada’s food processing sector.
2. **Defining Productivity and Scale, and their Relationship**

2.1 **Defining Productivity and Scale**

“Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker”.


‘Over long periods of time, small differences in rates of productivity growth compound, like interest in a bank account, and can make an enormous difference to a society's prosperity. Nothing contributes more to reduction of poverty, to increases in leisure, and to the country's ability to finance education, public health, environment and the arts.’


The purpose of this section is to provide background and understand what is known about the relationship between the size of firms and firm productivity, with particular application to food processing. Specifically, the section seeks to determine the following:

- What are the economies associated with larger firms?
- What has been observed regarding the relationship between firm size/scale and productivity, particularly in reference to Canada’s food processing sector?
- What measures are employed to relate size/scale and productivity?
- What is the significance of size/scale in food processing?

**Productivity**

Most commonly, and basically, *productivity* is defined as a ratio of output volume over volume of inputs (OECD). This ratio measures the efficiency at which inputs are used to produce a given level of output (OECD). Therefore, depending on the type of competing entity, productivity can be distinguished with respect to products, industries or nations as a whole. And depending on the space where entities operate, productivity can be compared on a regional, national or international basis. It is also possible the extend this definition outside of a commodity orientation by measuring the value of inputs and outputs in transformation - this allows for differentiated products in which, compared with a commodity variant of the product, the value of inputs is high but with a concomitantly high value of output.

**Economies of Size and Scale**

Firm costs and returns vary as a function of its level of inputs and outputs; this is the basis for the related concepts of economies of size and scale. *Economies of size* relates unit cost to level of output; if unit costs decrease as output is increased, economies of size exist - conversely, if unit costs increase as output is increased, diseconomies of size are observed (Beattie and Taylor, Debertin). *Economies of scale* is a concept that focuses on the scaling of inputs relative to corresponding output observed (Beattie and Taylor, Debertin). For example, when all inputs are increased by the same proportion (say double), if the value of output more than doubles we
observe increasing returns to scale; if output less than doubles we have decreasing returns to scale. In fact, economies of scale formally involve technical qualification around all inputs being increased proportionally; as a consequence, economies to scale tends to be more of academic significance, even if it is a much more commonly used term (Beattie and Taylor).

Besanko, Dranove, and Shanley provide a discussion of how economies relating to firm size arise. The first factor identified is indivisibilities in fixed costs. If some inputs are fixed in size, then unit costs can be decreased until the capacity of these fixed inputs are fully utilized. For example, a train runs on rails regardless of the load being transported; the longer and more fully loaded the train, the lower the unit cost. Secondly, there are economies related to size arising from inventory. Firms operating at a larger size can maintain lower ratios of inventory to sales than smaller ones, based on observations from operations theory. Conversely, larger firms may be able to secure volume discounts in purchasing inputs that smaller firms cannot. Finally, the costs of firm capacity itself induce economies relating to size- the incremental cost of increasing capacity is decreasing. Tirole also refers to economies of “massed reserves”. These arise because a plant with a larger number of machines can sustain a flow of output proportionally higher than one with a smaller number; this is true because the random effect of a single machine breaking down is much smaller in a larger plant.

Leung et al summarized recent research relating productivity and the size of firms in the Canadian economy. The results showed the following. First, labour productivity (measured as sales/employee) is higher for larger firms than smaller ones, due to improved use of technology and training, the fixed costs of which can be amortized over a larger sales volume and thus lower on a unit cost basis. Secondly, larger firms are more capital intensive due lower costs of capital and greater specialization. The authors cite empirical evidence that for the period 1984-1997, Canadian firms with greater than 100 employees had sales/employee levels 27% higher than firms with fewer than 100 employees. Over the same period, Canadian firms had sales/employee levels 82% that of the US. The authors note that this productivity gap is almost entirely explained by productivity lags in small firms (<20 employees) and large firms (>500 employees); for firms between 20 and 500 employees, Canadian firms had similar or better sales/employee (productivity) compared with the US.

There can also be diseconomies associated with firm size. One is that there are decreasing returns to management. This is described in the transactions cost literature by Williamson- the boundaries of a firm, including its size, are limited by the opportunity costs associated with internal management. A related concept discussed by Liebenstein is that of “X-efficiency” in firms- the difference between theoretical allocative efficiency and actual efficiency. The gap represented by X-efficiency was observed as relating to problems in motivating workers, and waste resulting from not fully understanding or implementing technology.

Empirical Research

There have been a range of empirical studies of food processing that relate to economies of size/scale. McPhee and Peterson lay out three types of empirical approaches used to study economies of size; (1) average costs estimated from accounting data on existing plants/firms, (2) engineering cost estimates, where the technology and costs of alternative sized plants are
explicitly modeled and average costs observed, and (3) the “survivor firm” approach, in which firms are sorted into size categories, and the share of industry output of each size category tracked. Based on changes in size category shares over time, efficient firm sizes are inferred.

For example, Chang-Kang et al (1999) looked at productivity growth in food manufacturing in Canada and the US over the period 1962-1993 and found that Canadian food manufacturers had operated below capacity to a much greater extent than in the US, and that this affected productivity. Canadian food processors were found to have lower productivity growth and lower returns to research and development. The study concluded that the observed differences were explained by Canadian firms’ unwillingness to engage in mergers and cost-cutting measures, and due to extensive regulation in Canada. Gervais et al (2008) studied productivity in the Canadian meat, bakery, and dairy segments based on 1990-1999 data from the Annual Survey of Manufacturers (Statistics Canada). The results showed increasing returns to scale in the meat segment, a range of increasing and decreasing returns by province in bakeries— with increasing returns in small provinces and decreasing returns in large provinces, and essentially constant returns to scale in dairy processing, with some provincial variation— similar to that observed in bakeries.

In the US, Buccola et al (2000) analyzed productivity growth in the US baking and grain milling industries for the period 1958-1994 and found that productivity growth was positively related to capacity utilization and the capital stock. Xia and Buccola (2002) considered the relationship among firm size, unit cost, and productivity in US meat processing from 1973-1994 and found rates of productivity growth to be declining, and that technical change and economies of size have a type of synergistic effect in enhancing productivity. MacDonald and Ollinger investigated the nature and extent of scale economies in the US hog slaughter segment for 1963, 1967, 1972, 1977, 1982, 1987, and 1992. The results showed modest economies of scale in primary hog processing, and that technology improvements had increased the effective scale of plants over time.

In Europe, Wijnands et al conducted an in-depth study of food processing competitiveness in the EU. As part of the analysis, the following measures were estimated— growth in gross value-added, growth in the Balassa index (revealed comparative advantage), world market share growth, and growth in gross value-added per worker; these were benchmarked against competing nations. The results showed that the EU food industry is relatively weak in labour productivity and economies of scale. Cultural diversity across member countries was observed as allowing some economies of scope and specialization of small and medium-sized firms. Key threats to competitiveness were seen as limitations on farm production practices, restrictive regulatory approval policy for new products, and food retailer concentration.

A range of other empirical studies test for increasing returns to scale in industries, and infer from this the potential for market power. For example, Bhuyan and Lopez studied market power and elasticities of scale in 40 food and tobacco processing industries in the US. They found that for 20 of the industries, increasing returns to scale were observed, and that 37 of the 40 industries exercised market power in output price setting. Morrison Paul (2001) investigated monopoly and monopsony power in US meat packing and the role of scale economies in industry.
concentration and found substantial economies of scale in US meat packing, as well as significant market power, particularly in output markets.

Cohen and Paul (2005) considered the spatial concentration of food processing in several regions within the US based on the period 1986-1996. Their results showed significant economies relating scale and localization effects associated with farm product procurement and labour supply. Some of the effects were offsetting; for example, plants located near agriculturally intensive states were observed as having lower production costs, yet being located in a more rural state was cost increasing—perhaps due to smaller workforce, distance from markets, etc.

Baldwin and Gu considered the impact of liberalized trade and plant size in Canadian manufacturing for the period 1973 to 1997. The results of their analysis showed that the average size of plants that export was significantly larger than those not exporting, but that there was little difference in specialization. However, production runs in exporting plants were significantly longer than non-exporting plants. Reduction in tariff barriers was found to reduce the size of non-exporting plants, with an ambiguous effect on the scale of exporting plants.

Barkema et al, in reviewing observed increases in scale, economies of scale, and increased concentration in US livestock and meat processing, consider the policy implications of scale. They pose the question of whether increased concentration (due to increased scale) is good or bad, and make the following observations. While the natural concern relative to fewer larger firms is market power, the true extent of this issue is unknown—academic literature provides no clear evidence of concentration in livestock and meats influencing prices, but the prospect still exists of market power. At the same time, scale is linked to productivity and efficiency, and the best evidence of this is a lower proportion of income spent on food. Thus, there is a tradeoff in scale that presents the prospect of market power abuses, but with the benefit of increased efficiency. In consideration of the above, Barkema et al suggest renewed and refined anti-trust enforcement that addresses the prospect of market power abuse, the development of new marketing institutions that allow processors and their suppliers to work together better and differently, and programs that orient processors and rural communities/services better.

2.2 Measurement of Productivity and Scale

As the OECD notes ‘there are different measures of productivity; the choice between them depends on the entity being measured, the purpose of measurement and/or data availability’. For example, macro measures of productivity commonly use GDP relative to a measure of input, such as employment, labour hours, or labour cost. Therefore, at an industry level, a measure of value-added is ideal. Value-added is the difference between an industry’s total revenue and its cost of purchased inputs. So, for food manufacturing industries, value added is the difference between their selling prices (i.e. ‘wholesale’ prices) multiplied by the units sold, less the cost of raw farm products, packaging and energy.

There are different denominators that could be used in measuring productivity. This study uses two different methods:
• Value added per employee
  o Measures the ability of an industry to generate gross earnings relative to the number of employees engaged in the process
• Value added per labour cost
  o Measures the ability of an industry to generate gross earnings relative to the cost of labour consumed

There are also several ways to define scale/size. This study uses two definitions:

• Number of employees
• Throughput or sales

The principal difference between these two measures of scale relates to labour-saving technology. The notion of scale across industries in which the labour input is proportionally similar and constant over time is such that the two definitions of scale should be equivalent. Conversely, if an industry has invested in labour-saving technology where others have not, the notion of scale will differ according to employees or output.

2.3 Data and Limitations

The most comprehensive data sets in Canada and the United States are the Annual Survey of Manufactures (and Logging in Canada) conducted by Statistics Canada and the US Census Bureau. For the most part these surveys are consistent and comparable and based on establishment/plant data.

However there are differences in the data that should be acknowledged and observed in interpretation:

• The US Census Bureau conducts a census every five years – for the intervening years it generates annual data based on a survey that is less comprehensive. Baldwin et al. 2002 suggest that in these years some smaller firms and new firms can be left out of the survey. Conversely, the Canadian ASM is an annual survey.
• Value added measures between Canada and the United States differ slightly: Baldwin et al (2002) note that Canada includes head offices attached to plant establishments in its value added measurements, whereas the United States does not; however they estimate that this only had a 2% effect on the data. Baldwin et al (2002) also note that between years there are subtle differences in the definition of value added between the countries.
2.4 Observations

The above suggests the following. Productivity is a relatively simple concept that compares the volume or value of output and inputs; the greater the output relative to input, the more productive. The general notions of economies of size and scale are ultimately predicated on the spreading of fixed costs across larger volumes—thus reducing unit cost, and on increased market leverage, especially in procurement.

The more applicable concept in understanding how a firm’s productivity and profitability changes as it gets larger or smaller is economies of size, measured in terms of output. However, the much more commonly used term is economies of scale (measurement of inputs), which, if interpreted precisely, is unwieldy. In this study, we will attempt to bridge this gap by using measures of firms based on both output and input; this will be identified for the purposes of clarity. And the term “scale” will be retained due to its ubiquitous use, with its technical qualifications noted.

Applied research work has tended to deal with the use of aggregate data to estimate industry-level production relationships among inputs and outputs to derive returns to scale parameters and productivity measures. One use of this information is to infer measures of processor market power; here the findings appear to have been mixed with no clear sense that processors increase in scale in order to suppress farm product prices or increase selling prices. Another application is in measuring productivity and production efficiency. The literature reviewed here finds productivity generally increasing with scale, and with effective capacity utilization.

Other studies have considered whether productivity and scale are related to local effects—availability of a specialized workforce and infrastructure, and location close to farm product supplies and consumer markets. These appear to be validated, although the factors are complex, with some having offsetting effects—such as proximity to farm product supplies, which can raise labour costs. There is also some discussion that the size of markets can limit scale and specialization. Regulatory factors—approvals for new products or policies limiting farm product availability—were observed as playing a role in European food processing performance. There is also Canadian evidence that trade influences the scale of Canadian manufacturing plants, which in turn influences productivity.

Finally, a range of measures exist in examining productivity and scale; among the important considerations are the intended use of measures and the availability and quality of data. For example, in industries in which technology is mature and little difference exists in technology across plants, there will be a high correlation between scale measured as plant output volume/sales value and scale measured as employment; conversely, if a subset of plants apply sharply different labour-saving technologies, there is apt to be a difference between scale measured as sales vs. employment. The data available to measure productivity and scale in Canada versus the US each come from a survey, and there are differences that exist in the between the two that should be observed, and limit the precision with which inferences can be made. Conversely, the data are broadly representative of trends and observations that are not based on minute differences.
3. Scale and Productivity in Canada’s Food Processing Sector

This section of the report describes the current and historical food processing situation in Canada and show that scale and productivity are lagging. This is done by examining the size of the sector, the scale of plants, investments made, the retail environment that the sector operates in and its productivity. This section also compares Canadian food processing with its largest trading counterpart and closest competitor – the United States.

3.1 Description of Canada’s Food Processing Sector

“The food and beverage processing industry is the largest manufacturing industry in Canada in terms of shipments, accounting for 17% of total manufacturing shipments. It provides employment for 296,000 Canadians (about 1.7% of the Canadian workforce) and produces shipments worth $89 billion which account for 2% of the national GDP. It supplies approximately 77% of processed food and beverage products available in Canada. It is also the single largest market for Canadian agricultural products” (AAFC, 2010).

In this report we examine eleven sub-sectors of the Canadian food processing sector including the following:

- Grain and Oilseed Processing
- Breakfast Cereal Manufacturing
- Sugar and Confectionery
- Processed Fruits and Vegetables – Canning, Pickling and Drying
- Frozen Food
- Dairy Products (except Frozen)
- Ice Cream and Frozen Dessert
- Poultry Processing
- Red Meat Manufacturing
- Bread and Bakery Product Manufacturing
- Seafood Preparation and Packaging

The following section provides a snapshot of each sub-sector.
Grain and Oilseed Processing (NAICS 3112)

“Canada offers access to an abundant supply of different grain and oilseed commodities” (DFAIT, 2009), which has made grain and oilseed manufacturing one of the most significant food processing subsectors. Canada is a world leader in exporting grain and oilseed-based products. This category includes both milling (primary processed) and further processed such as breakfast cereals.

Total Revenue in 2008 = $9.29 billion
- Accounting for 11.4% of total food processing revenues
- Canadian sales = 8.9% of US sales
- Historically high grain prices in 2008 resulted in a substantial growth in revenues.

Employment = 7,200 employees across Canada
- Employment increases in the United States since 2004 are likely a result of the significant development of ethanol industry in the United States as a result of ethanol and biodiesel mandates and subsidies

Trade Importance: Since 2000 exports have accounted for 30 – 47% of total sales.
- 74.3% of exports to the United States

Recent Investments in Primary Processing:
- Louis Dreyfus Mitsul Foods: $90 mil. canola crushing plant in SK in 2009
- JRI: $100 mil. canola crushing plant in SK in 2010
- Twin River Technologies: $150 mil. canola seed and soybean crushing plant in QC, 2008

Breakfast Cereal Manufacturing (NAICS 31123)

Breakfast cereal manufacturing is a sub-sector of Grains and Oilseed Processing – it is one of the ‘further processed’ components.

Total Revenue in 2008 = $1.79 billion
- 2.2% of total food processing revenues
- Canadian sales = 15% of US sales
- Revenues have grown just under 5.5% on average each year since 1997

Employment = 2,760 employees across Canada
- In 2008 employment in this sub-sector increased, likely due to the new Kellogg’s plant located in Belleville, Ontario.

Trade Importance: Since 2000 exports have accounted for 20 – 31% of total sales.
- 97.0% of exports to the United States

The majority of establishments are located in Ontario and the prairies – close to the source of raw products.
### Fruit and Vegetable Processing (NAICS 31142)

Total Revenue in 2008 = $3.67 billion  
- 4.5% of total food processing revenues  
- Canadian sales = 8.6% of US sales  

Employment = 9,100 employees across Canada  
- Employment has been declining steadily in the last 20 years in both Canada and the United States, while Canadian revenues have remained flat.

**Trade Importance:** Since 2000 exports have accounted for 15 – 31% of total sales.  
- 86% of exports to the United States

### Sugar and Confectionery Manufacturing (NAICS 3113)

• “Sugar and chocolate confectionery account for 80% of industry sales, and chewing gum accounts for the rest”*.  
• Sugar users in Canada enjoy the significant advantage of very competitive prices in Canada compared to the United States. The United States maintains a high domestic price for sugar, therefore the average price of refined sugar is on average 30-40% lower in Canada than in the United States (Canadian Sugar Institute).  
• Sugar-free confectionery is the fastest growing segment. [http://www.ats.agr.gc.ca/pro/3298-eng.htm](http://www.ats.agr.gc.ca/pro/3298-eng.htm)  
• Competitive dairy prices for use in confectionery products were negotiated with the Canadian Dairy Commission (late 1990’s).  
  - Prior to this negotiation chocolate confectioners were faced with very high dairy prices.


Total Revenue in 2008 = 3.67 billion  
Employment = 9,200 employees across Canada  
- 4.5% of total food processing revenues  
- Canadian sales = 12.4% of US sales  

**Trade Importance:** Since 2000 exports have accounted for 26 – 45% of total sales.  
- 94.0% of exports to the United States

**Investment in Sugar Refining:**  
- **Rogers** sugar beet processing plant in Taber, Alberta – the only plant to produce sugar from sugar beets. Rogers contracts 35,000 acres of sugar beets each year for a processing capacity of 150,000 tonnes per year. In the late 1990’s Rogers completed a $40 million expansion.  
- **Redpath Sugar**, Toronto, ON. – In 1997, Redpath invested $40 million in expansion and modernization that increased capacity by 75%.

**Investment in Confectionery Processing:**  
- Italian confectioner **Ferrero** opened a manufacturing plant in Brantford in October 2006. In 2004 construction began on the plant: Ferrero invested $250 million and the government of Canada invested $5.5 million and $1.7 million for employee recruitment.
**Frozen Food Manufacturing (NAICS 31141)**

Frozen food manufacturing predominately takes place in Ontario and Quebec; however Prince Edward Island, New Brunswick, Alberta and Manitoba are very important due to frozen potato manufacturing in those provinces.

Growth in the industry over the last 20 years has occurred as a result of the popularity of convenience type foods and the development of innovative new food products.

Total Revenue in 2008 = $2.92 billion
- 3.6% of total food processing revenues
- Canadian sales = 10.5% of US sales
- The most significant growth in frozen food manufacturing occurred in the 1990s at an annual average of 6.6% throughout the decade, compared to an annual average growth rate of 3.3% between 2000 and 2008.

Employment = 10,800 employees across Canada
- Employment in Canadian frozen food manufacturing has nearly doubled since 1990; whereas it has declined in the United States.

**Trade Importance:** Since 2000 exports have accounted for 39 – 54% of total sales.
- 78% of exports to the United States
- This is likely due to the amount of frozen potato products that Canada exports.

**Bread and Bakery Processing (NAICS 31181)**

**Recent Investment:**
- Canada Bread (Maple Leaf Foods)– leading manufacturer and marketer of value-added flour based products
  - An investment of $100 million to build Canada’s largest bakery facility in Hamilton, Ontario
  - Grand opening in September 2011
  - Canada Bread will close three Toronto-area bakeries that are ‘constrained by urban development’ and move production into the larger facility

Total Revenue in 2008 = $5.53 billion
- Employment = 28,100 employees across Canada.
- 6.8% of total food processing revenues
- Canadian sales = 13.9% of US sales

**Trade Importance:** Since 2000 exports have accounted for 13 - 18% of total sales.
- 96% of exports to the United States
**Dairy Products (NAICS 3115)**

- The dairy market in Canada is largely a mature market – consumption per capita is declining and more substitutes for dairy products and drinks are developed.
- Market conditions in dairy processing have allowed dairy processors to grow – it is a protected market due to supply management regulations.
- There is little trade in dairy products for two reasons:
  - Trade tends to be lower in perishable products
  - Under supply management regulations processors can only trade certain amount – capped on volume or value whichever comes first.
- There is a latent threat from trade liberalization. Successful completion of the Doha Round could serve to destabilize the existing dairy market framework in Canada
  - Export subsidies would be eliminated
  - Reduction in domestic support
  - Increases in market access – decreased tariffs and increased TRQs
- Further processors and users of dairy ingredients in food products can access milk at special-class pricing (essentially US-equivalent prices)

The dairy industry has been broadly challenged by lethargic growth. Growth in dairy product volumes has broadly failed to keep up with population trends and rising incomes. This masks notable counter trends in certain products such as yogurt and variety cheeses, however in aggregate the market has seen exceptionally slow growth.

Dairy processors have good margins in Canada due to operating in a protected environment which has allowed them to buy up competitors in Canada in order to grown and they have started to purchase outside of Canada.

**Recent Investments in Dairy Processing in Canada:**
- Danone Canada: $50 million spent to expand in QC to produce DanActive probiotic drink line
- Agropur: In 2010 spent $4 million in Victoria BC on a new air filtration treatment system, and multi-million dollars in QC on a new cheese line.

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**Dairy Products (except Frozen) & Fluid Milk (NAICS 31151)**

Total Revenue in 2008 = $13.35 billion
- 16.4% of total food processing revenues
- Canadian sales = 13.4% of US sales

Total revenues in dairy products in Canada are likely to be higher than in the United States for the same amount of production as a result of artificially high raw product prices due to supply management.

Employment = 19,400 employees across Canada

Trade: Since 2000 exports have accounted for 3-6% of total sales.

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**Ice Cream & Frozen Dessert (NAICS 31152)**

Ice Cream and Frozen Dessert Manufacturing is a small portion of total dairy product manufacturing.

Total Revenue in 2008 = $774.2 million
- >1.0% of total food processing revenues
- Canadian sales = 8.9% of US sales

Employment = 2,800 employees across Canada.

Trade: Since 2000 exports have accounted for 4-15% of total sales.
Poultry Processing (NAICS 311615)

- Ontario and Quebec dominate chicken and turkey production
- There are over 50 federally inspected chicken and turkey plants of which over 30 are in Ontario and Quebec. Those 50 plants are operated by about 40 individual companies.
- The largest companies in Canada are Maple Leaf, Olymel, Maple Lodge, Lilydale and Exceldor. These companies have approximately 60% of the broiler market in Canada.
- Canada slaughters about 12 million chickens per week. The average slaughter per plant is about 450,000 per week. The largest plants might slaughter up to 800,000 head.

In the US the industry is located primarily in the Southeast.
- There are approximately 40 major broiler processing companies in the US. These companies slaughter about 160 million birds per week.
- The largest broiler processors in the US are Pilgrim’s Pride (JBS), Tyson, Perdue, Sanderson and Wayne. These five largest firms have about 60% of the market share. Tyson and Pilgrim’s have about 40%. The two largest companies slaughter about 32 million birds per week. A typical plant of these larger firms might slaughter approximately 1 million birds per week.
- The industry in Canada has been challenged by over capacity.
- The plant sizes in Canada are relatively small compared to those in the US.

Total Revenue in 2008 = $6.1 billion
- 7.5% of total food processing revenues
- Canadian sales = 10.4% of US sales

Employment = 21,500 employees across Canada.

Trade: Since 2000 exports have accounted for 3 – 6% of total sales.
- Exports to the US account for only 58% of total export – likely because exports in poultry are cuts that Canadians do not want or eat, cuts that the US likely does not eat also.

Seafood Packaging and Processing (NAICS 3117)

The Canadian seafood processing industry is a significant global player – with over 70% of total revenues being exported to over 80 countries world-wide – mainly to the United States, followed by China and Japan.

Total Revenue in 2008 = $3.93 billion: sales have been relatively flat since 1990.
- 4.8% of total food processing revenues
- Canadian sales = 35.2% of US sales: Seafood processing is a proportionately large sector compared to its US counterpart.
- Employment = 27,600 employees across Canada.

Trade Importance: Since 2000 exports have accounted for 69-78% of total sales.
- 55% of exports to the United States
Red Meat Manufacturing *
*NAICS 3116 (Total Meat) – 311615 (Poultry Processing)

Beef Packing in Canada
• The Canadian beef packing industry has approximately ten plants owned by eight companies operating across the country. Total daily slaughter capacity is about 13,000 head.
• In the US there are about 70-75 plants owned by 45-50 companies. The combined daily capacity in the US is about 135,000 head.
• Capacity utilization varies seasonally in both countries but capacity utilization likely averages well over 90% in each country.
• There are two large beef packers in Canada. Cargill Foods owns two plants one in High River, Alberta and another in Guelph, Ontario. The other is XL Foods, with plants in Brooks and Calgary, Alberta. The two companies have a combined capacity of over 10,000 per day or well over 80% of the Canadian total. Cargill is based in the US where it operates another eight plants. XL is based in Alberta but has two plants in the US. Both packers have recently invested up to $50 million in value added processing.
• Cargill and XL plants in High River and Brooks are both of a similar scale to the larger plants in the US.

Pork Packing in Canada
• There are about 23 pork slaughter plants in Canada owned by 19 companies.
• Daily slaughter capacity in the country amounts to about 85-90,000.
• There are 75-80 plants in the US owned by approximately 60 companies.
• Daily slaughter capacity in the US is about 420-430,000 head.
• Capacity utilization in both countries is well over 90%.
• The larger participants in Canada are Maple Leaf Foods and Olymel. Maple Leaf has two plants in Brandon, Manitoba and Lethbridge, Alberta. Olymel has four, in Red Deer, Alberta and Princeville, Valley Jonction, and St-Esprit, Quebec. The two companies have a combined capacity of 45,000 head per day or about half the Canadian total.
• The largest companies in the US are Smithfield, Tyson, JBS Swift, Cargill and Hormel. They operate 22 plants for a combined daily capacity of 305-310,000 or 70+% of the US total.
• Canadian slaughter takes place relatively evenly between east and west.
• The major investment has taken place in the west with the expansion of the Brandon plant to a double shift in 2008. The Brandon plant is the only plant that operates on a scale similar to the major US plants.

Total Revenue in 2008 = $16.5 billion
Employment = 46,500 employees across Canada.
• 20.2% of total food processing revenues
• Canadian sales = 11.9% of US sales

Trade Importance: Since 2000 exports have accounted for 35 – 45% of total sales.
• 65% of exports to the United States
3.2 Canada / US Food Processing Comparison

This section describes the Canadian food processing sector in more detail and compares it to its counterpart in the United States. Overall, the food processing sectors in the two countries are not structurally different in their importance to the economies but there are aspects of the sub-sectors that could lead to scale and productivity differences.

Size/scale of Establishments

The above description of the sub-sectors in the Canadian food processing sectors shows that the size of the Canadian food processing sector is smaller than the US, not surprisingly given the size of the domestic market. However, the scale of plants in Canada compared to the United States also lags.

Figures 3.1 and 3.2 show that on average US food manufacturing establishments are larger than Canada’s establishment, by number of employees and revenues (throughput) respectively. Drawing inferences from the aggregate data can be misleading however, especially if there are a large proportion of very small firms. Therefore, Figure 3.3 shows US manufacturing is generally larger when looking at the largest 10% of establishments in Canada and the US as well – however, sugar and confectionery manufacturing and seafood packaging and processing is larger in Canada (in terms of employees) at the 90th percentile.

Appendix B provides a series of North American maps by food processing sub-sector that show the general location of food manufacturing in Canada and the United States by size (number of employees) of plant. The US has many more plants with a greater number of persons employed. Canada appears to have a higher frequency of plants located outside of major metropolitan areas and/or in rural areas.
Figure 3.1: Average Establishment Size, by Number of Employees (2008)

Source: Institute for Competitiveness and Prosperity analysis based on (US) County Business Patterns; (Canada) Annual Survey of Manufactures and Logging; Canadian Business Patterns.

Figure 3.2: Average Establishment Size, by Revenue (2007)

Source: Canadian Annual Survey of Manufactures and Logging; US Economic Census.
Improving Productivity through Greater Scale

Productivity

It is well documented that Canada’s manufacturing productivity, and overall economy, lags other OECD countries and in particular the United States (Hodgson and Triplett, 2007; Rao et al. 2008; Conference Board of Canada, 2010). Food processing is no exception.

The George Morris Centre assembled data from the Canadian and US Annual Survey of Manufactures (and Logging in Canada) to compare productivity results. Figures 3.4-3.7 present measures of food processing productivity in Canada using, alternatively, revenues and value added as the numerator. The figures show that, using either sales or value-added relative to either employees or labour cost, productivity has consistently lagged that of the United States. The figures show that Canada has a significant gap in level with the US, particularly in value added; this could relate to the caveats due the format of the data described above.
Figure 3.4: Food Processing (NAICS 311) Productivity in Canada and the United States: Revenue per Employee

Source: GMC Analysis based on Canadian Annual Survey of Manufactures and Logging; US Economic Census and Annual Survey of Manufactures.

Figure 3.5: Food Processing (NAICS 311) Productivity in Canada and the United States: Revenue/Labour Cost

Source: GMC Analysis based on Canadian Annual Survey of Manufactures and Logging; US Economic Census and Annual Survey of Manufactures.
Figure 3.6: Food Processing (NAICS 311) Productivity in Canada and the United States: Value-Added per Employee

![Figure 3.6: Food Processing (NAICS 311) Productivity in Canada and the United States: Value-Added per Employee](image)

Source: GMC Analysis based on Canadian Annual Survey of Manufactures and Logging; US Economic Census and Annual Survey of Manufactures.

Figure 3.7: Food Processing (NAICS 311) Productivity in Canada and the United States: Value-Added/Labour Cost

![Figure 3.7: Food Processing (NAICS 311) Productivity in Canada and the United States: Value-Added/Labour Cost](image)

Source: GMC Analysis based on Canadian Annual Survey of Manufactures and Logging; US Economic Census and Annual Survey of Manufactures.

**Capacity utilization rates**

Capacity utilization is an economic indicator of how efficiently the factors of production are being utilized. Statistics Canada defines capacity use as the intensity with which industries use their production capacity – it is the percentage of actual use to potential use, or output. Efficient...
capacity utilization does not depend on the scale of an enterprise but the efficiency in which assets are utilized.

Figure 3.8 shows that since the mid-1980s capacity utilization in the United States has declined over time while Canada’s capacity utilization has remained rather flat (increasing slightly). The inability to utilize productive assets to their full potential in the food processing sector is surely a drain on productivity in both Canada and the United States.

Figure 3.8: US and Canadian Capacity Utilization Rates: Food Processing

![Capacity Utilization Graph](image)

Source: Statistics Canada, CANSIM database, Table V4331089; US Federal Reserve, data download program.

Since larger establishments exist in the United States and capacity utilization rates have been declining, there are larger opportunity costs associated with inefficient capacity use—more so than in Canada.

In speaking with food processors (see Section 4 below) it was clear that capacity utilization is top of mind to them. Interestingly, capacity utilization declines for plants of multinational firms when the Canadian dollar strengthens—as has happened over the last couple of years. For example, if a Canadian plant had some excess capacity it could fill that capacity by running a

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1 Measurement of capacity utilization by Statistics Canada is done at the plant level through a question in the annual Capital and Repair Expenditures Survey. In this context, capacity utilization is defined as the maximum production attainable under normal operating conditions (Gagnon, M). The Federal Reserve Board's capacity indexes “attempt to capture the concept of sustainable maximum output—the greatest level of output a plant can maintain within the framework of a realistic work schedule, after factoring in normal downtime and assuming sufficient availability of inputs to operate the capital in place.” Capacity Utilization Explanatory Notes” [http://www.federalreserve.gov/releases/G17/CapNotes.htm](http://www.federalreserve.gov/releases/G17/CapNotes.htm). The authors feel that these measures are comparable.
short-line (niche product) for the US market. However, when the dollar strengthened, that production becomes uneconomical resulting in that production moving to a plant in the US.

**The Effect of Scale on Productivity**

The above suggests that Canadian food manufacturing establishments lack scale compared to their US counterparts and are lagging in terms of productivity, but not capacity utilization. Our findings from the literature review in Section 2 would suggest that they are related and that productivity generally increases with scale, and with effective capacity utilization.

The following two figures show that productivity does indeed improve with scale in Canadian food processing. Statistics Canada conducted a special tabulation using the Annual Survey of Manufactures and Logging data to breakdown the aggregate data into quartiles, based on revenue, so that we could examine whether productivity improved with scale, as indicated by sales.

Figure 3.9 defines productivity as value added per employee and Figure 3.10 defines productivity as value added per labour cost. In both cases the trends are similar. The productivity of the largest 25% of food manufacturers in Canada is significantly higher than the rest. The middle 50% of food manufacturers’ productivity is similar, while the smallest processors’ productivity significantly lags the rest. Appendix C contains data on productivity by quartile for each of the food processing sub-sectors and total manufacturing: the trends are similar.

**Figure 3.9: Productivity of Food Manufacturing, by Scale (Productivity = VA/Employee)**

Source: Statistics Canada special tabulation based on ASML data.
Figure 3.10: Productivity of Food Manufacturing, by Scale (Productivity = VA/Labour Cost)

![Graph showing productivity over different scales]

Source: Statistics Canada special tabulation based on ASM data.

**Investment and R&D in Food Processing**

In Canada, food manufacturers tend to invest less in machinery than in other industries and they under invest relative to their US counterparts. Figure 3.11 shows that Canadian food manufacturers invest only slightly less than other industries in structures but significantly less in machinery and equipment per employee. Figure 3.12 notes an apparent lag in investment in Canadian food processing versus the US.

As noted above, Canada’s food processing sector lacks the scale of its US counterpart. Recent research examining the extent of innovation in the food processing sector suggests that it is those larger establishments (based on employment) that push the sector forward with respect to R&D. Figure 3.13 shows that as establishments get larger they are more likely to conduct or commission R&D. Figure 3.14 shows the proportion of food processing sub-sectors were conducting R&D in 2004 in Canada.
Figure 3.11: Investment per Employee, Food and All Other Manufacturing, Canada

Investment per Employee, Food & All Other Manufacturing, Canada (1983-2009)

- Structures
- Machinery & Equipment
- Total Investment

![Graph showing investment per employee for Structures, Machinery & Equipment, and Total Investment from 1983 to 2009 for Canada, Food mfg, and All other mfg.]

Source: Institute for Competitiveness & Prosperity analysis based on CANSIM tables 310-002, 281-0024, and 281-0005

Figure 3.12: Investment per Employee, Food Manufacturing, Canada & US

Investment per Employee, Food Manufacturing, Canada & US (1997-2009)

- Structures
- Machinery & Equipment
- Total Investment

![Graph showing investment per employee for Structures, Machinery & Equipment, and Total Investment from 1997 to 2009 for Canada, Food mfg, and All other mfg.]

Source: Institute for Competitiveness & Prosperity analysis based on CANSIM tables 310-002, 281-0024, and 281-0005

Note: US dollars converted to Canadian dollars using PPP for M&E.
Figure 3.13: Percentage of Establishments Conducting or Commissioning R&D, by # of Employee (2004)

- 200+ Employees: 62.3%
- 50-199: 54.7%
- 20-49: 39.3%
- <20: 27.3%

Source: The Nature and Extent of Innovation in the Canadian Food Processing Industry: Agriculture and Agri-Food Canada, 2006

Figure 3.14: Percentage of Establishments Conducting or Commissioning R&D, by Sub-sector (2004)

- Animal Food Manufacturing: 29.5%
- Grain and Oilseed Milling: 58.8%
- Sugar and Confectionery Product Manufacturing: 57.6%
- Fruit and Vegetable Preserving and Specialty Food Manufacturing: 62.8%
- Dairy Product Manufacturing: 57.6%
- Meat Product Manufacturing: 38.0%
- Poultry Processing: 59.9%
- Seafood Product Preparation and Packaging: 24.9%
- Bakeries and Tortilla Manufacturing: 47.7%
- Other Food Manufacturing: 59.2%

Source: The Nature and Extent of Innovation in the Canadian Food Processing Industry: Agriculture and Agri-Food Canada, 2006
3.3 Observations

The above puts some metrics on the previous findings and observations from Section 2. It also presents some challenges to Canadian food manufacturing that relate to scale. Canada has smaller food processing firms than the US, even when comparing the largest establishments in both countries. Productivity in Canadian food processing lags that in the US; acknowledging the caveats with the ASM data noted in Section 2, this was a robust finding in the sense that it was consistent using alternative data (revenue vs. value-added) and alternative measures (relative to employees or relative to labour costs). Canada also lags the US in capacity utilization in food manufacturing. Finally, Canadian food manufacturers appear to have lower investment rates compared with other manufacturers in Canada, and compared with US food processors.

The Centre for the Study of Living Standards recently conducted a study that considered productivity in Canadian food manufacturing (Ross, 2011). The study estimated labour productivity and multifactor productivity in Canadian food manufacturing and food manufacturing subsectors. The data were drawn from Canadian Productivity Accounts. The results showed that labour productivity, based on real GDP, in Canadian food manufacturing grew at a compound rate of about 2.8% per year between 2000 and 2009. Food manufacturing labour productivity in 2009 (expressed in 2002 dollars) was $48.75/hour worked. Extending this to an annual per worker measure, based on a 40 hour week and 52 weeks per year, GDP per worker (in 2002 dollars) is about $101,400. This compares favorably with the labour productivity results estimated in this study which ranged just over $100,000/worker, acknowledging the differences due to nominal versus deflated data. The study also compared estimated productivity growth in Canada versus the US, based on indices from the US Bureau of Labor Statistics. The comparison showed that Canada had a higher productivity growth rate than the US, but that this mostly occurred between 1987 and 2000. Comparisons of labour productivity levels were not made, but the study acknowledged that Canadian food manufacturing generally has a lower output per worker than its US counterpart.

The following sections attempt to uncover what may be occurring to drive these results.
4. Firm-level Analysis of the Importance of Scale in Achieving Productivity

To understand better the effects and implication of scale on productivity, a range of food processing firms were interviewed. In the interviews, questions were posed relating to the scale of processing plants and the overall scale of firms, and how this influenced firm operations and returns, and what factors limited scale. The interview guide that was sent to participants in advance is presented in Appendix D.

In all, 15 interviews with food processors occurred, across a broad range of products including red meats, poultry, dairy, grain and oilseed processing, vegetable processing, and prepared/packaged foods. In all cases, the interviews were conducted with firm CEOs or members of the senior management team, mostly by telephone. The sections below summarize the discussions and put them in context.

4.1 Plant Size/Scale and Efficiencies

Nature and Rationale for Plant Size

Discussions with processors revealed a range of rationales for a given plant size and determinants of efficiency relative to a given plant size. The most significant determinants of plant size tended to be the availability of local supply of farm product procured by a plant, and the market size that the plant serves. The availability of local supply was perceived as very important in establishing the scale of plants in which the value of the farm product was a high proportion of the ultimate food product. In such contexts (primary grain handling, livestock slaughter, etc.) full use of plant capacity was seen as especially significant in a firm being competitive in procurement of the raw farm product.

In other products, the size of the market being served was seen as the critical determinant of size. Individual plants did not significantly exceed the size of the market they served for reasons such as freight cost and product perishability. Dairy and bakery products were examples of these cases. Thus, in these product categories, market size and geographic dispersion of markets is the critical determinant of plant size.

In a final category of products typified by packaged foods, plant size and efficiency were limited by the length of product production runs. The more specialized a plant is, the greater the economies associated with scale. In plants that manufacture many different products, the same economies associated with scale are not attainable as production lines must frequently be changed over for different products, creating downtime and decreasing capacity utilization. In understanding the advantages of size/scale, some disadvantages with very large plants were identified. First, compared with a portfolio of smaller plants, there is additional risk from breakdowns and other contingencies in a single very large plant. There can also be greater risks associated with interruptions in services or logistical links to large plants versus a comparable network of smaller plants. Finally, some plants operate at a relatively small scale due to history (for example, because they were built before CUSTA for a strictly domestic market), or because increasing their scale would imply shifting of volume away from a large plant somewhere else-
with the efficiency gain in the small plant more than offset by the corresponding loss in efficiency in the other plant.

**Differences in Performance Attributable to Plant Size**

In many cases, clear differences in plant performance could be attributed to size. One respondent made reference to a plant that was double the capacity of another, and operated at a 25% lower unit cost as a result. The major source of this unit cost advantage was spreading of overhead costs—especially management and labour cost. There can also be important advantages in facilitating use of faster production lines, greater specialization in staff and on-site services, and improved energy efficiency. These appeared to be more significant the more specialized the plant was. In other cases, investment in technology could overcome many of the disadvantages in scale associated with smaller plants.

**Capital Access, Technology, and Plant Size**

Access to capital was not broadly seen as a determinant of plant size; for most firms interviewed limits to capital access did not influence plant size. Rather, the capital access issues existed within the companies themselves in the form of rate of return targets that a plant investment would be held to. In this regard, proponents of plant investments must compete with other projects within a company for capital. Related to this there was a sense that government capital grants could be quite influential in stimulating investment and attaining more efficient scale.

Technology was not seen as limiting scale developments in Canada as plant technologies were observed as being widely available, and even ubiquitous. Some interviewees felt that technologies in Canada were priced higher than elsewhere, but this was not a consistently held view. The most significant advances in technology recently observed have been in energy efficiency in plants.

**4.2 Firm Size/Scale and Efficiencies**

**Marketing Functions**

There was a connection observed between large processing firms and large customers (retailers, distributors) such that large processors are better positioned to supply large customers. This relates to the consolidated nature of the processed food distribution network; for example, in grocery retailing the top three firms account for about 70% of the volume. Firms need to be capable of supplying a threshold volume in order to penetrate this network. In addition, the fees associated with product listing are relatively high in Canada. In this respect, large firms can supply large customers as well as smaller firm but the opposite is not true—small processing firms struggle in attempting to supply large customers. As such, the sizeSCALE of a processor provides market access.

A range of advantages were observed for large firms in marketing. Larger firms were observed as being better positioned to marshal an in-house dedicated sales force to promote and market its products. This is essentially driven by the ability to spread selling costs over a larger volume of
product. Similarly, larger firms are better able to support logistics support and export promotion activities. Larger firms were seen as better able to accommodate in-house research and development, and support the development of brands. Finally, large firms with multi-plant locations have advantages in unit cost and reduced risk from being able to serve customers from multiple locations.

**Firm Scale and Human Resources**

There were advantages seen in working with a workforce in larger firms. Larger firms were seen as having an advantage in recruitment and retention of employees due to the upward mobility they could offer and the ability to train in-house. Greater ability to specialize was also seen as an advantage, as well as greater flexibility in work hours and work absence for employees. The above are all elements of the ability to spread human resource costs over larger volumes. Some interviewees felt that obtaining advantages in human resources (along with improved scale) in Canada was quite critical, as labour rates in Canada were much higher than what was observed in the US. There was also an admission that large firms can be slow to adapt and that a proactive corporate culture in larger firms was needed to mitigate this.

**Firm Scale Relative to Distribution Chain**

The scale of processing firms was observed to relate to the scale of the distribution change in several elements. Regulatory requirements, some of which occur downstream, tend to drive scale in processing in order to reduce unit costs. Processing firm scale cannot be out of scope versus the scale of customer/downstream segments, particularly in packaged food products. However, particularly in commodity products, the scale of downstream segments was not seen as a binding constraint.

Larger scale was also seen as being demanding in managing logistics through the distribution chain, as there is more scope for errors, etc. This can create additional costs. Particularly in packaged food products, Canadian plants were seen as being built on a model in which individual plants produce a range of products and move them through the distribution chain- this carries the implication of greater flexibility in manufacturing, but with corresponding loss in scale and higher unit costs compared with more specialized plants.

**Firm Scale and Supply/Service Procurement**

Firms operating at a large scale were seen as being better able to leverage terms with suppliers of inputs and with input suppliers. This in turn could be leveraged into partnerships and more intimate relationships with suppliers. Conversely, there were some observations that suppliers had themselves consolidated and that scale in processing was important in managing procurement relationships in bargaining with suppliers. At the same time, it was observed that with scale the need to operate effectively at capacity was increased, necessitating reliable relationships with suppliers.

**Firm Scale and Regulatory Requirements**
Firms that purchased farm products covered by marketing regulations, especially supply management, tended to see them as a limit on firm scale, and a disincentive to investment. Several firms mentioned the mechanisms of allocation of farm products across processing plants in a province as a strong limit on scale, and felt that the means of relating national quotas to the provincial level had a contributing effect in limiting scale. Another firm saw the international rules on Canadian supply management as sharply limiting on product exports. With regard to western grains, regulatory limits on the availability of rail cars across facilities was seen as limiting to scale. There was also a sense among some of the processors interviewed that regulated marketing focused excessively on farm product pricing, to the detriment of other elements of procurement such as product quality and delivery, and generally removed transparency in the procurement process.

With regard to product/processing regulatory standards, larger firms were seen as better positioned to cover the costs of regulatory compliance compared with smaller firms. There was also a sense that Canada was lagging the US in terms of the ability to get regulatory approval for product claims.

**Firm Scale in Canada vs. US**

Firms that were more oriented toward commodity businesses generally felt that their scale of operation would not change if the firm moved to the US. The more consumer-oriented and packaged foods firms did perceive that they would operate a larger scale if they were based in the US. This was because the size and density of customers in the US would increase the investment opportunity and allow greater specialization in plants versus Canadian plants which are multi-product in nature. Some other firms observed that there was an opportunity for much greater growth in a less regulated environment in the US, and that governments in Canada tend to support development of smaller firms at the expense of larger firms.

### 4.3 Observations

The above suggests the following. The scale of plants and resulting unit costs were viewed as being among the most important factors in firm competitiveness, especially in plants that specialized in a narrow set of products. Related to this, effective utilization of capacity in plants was viewed as critical in realizing the benefits of scale. Lack of efficient plant scale was observed as placing pressure on a company’s human resources, technology, and marketing elements. Overall, the main sources of advantage with size_scale were viewed as:

- Spreading of plant overhead costs over increasing volume
- Procurement of supplies
- Improved labour efficiency
- Exploiting non-linear relationship between plant output, labour cost, and transportation cost

Large firms have advantages in better being able to carry the costs of a dedicated sales force, human resource management, research and development, and brand development. They also appear to have distinct advantages in developing human resources within the firm, although large firms can also be slow and resistant to change. Large firms both shape and are shaped by their
distribution supplier and distribution chains. While larger firms are better able to handle the costs of regulatory requirements, marketing regulations can limit the extent to which they achieve size economies.

While limited in scope, the survey suggests the following view of Canadian food processing. For firms specialized in more commodity-oriented products for which the farm product value is a significant proportion of the final product, there was greater evidence of size/scale economies, and that these were being attained (example sub-sectors that fit this include red meat, frozen potato products and canola crushing). In other products, the size of the market was limiting scale- either because the size/density of the market vs. product perishability and transport cost of the product implied it, or because Canadian plants were multi-product in nature, and the resulting changeover and downtime effectively limited scale. There was also a sense that the elements of marketing regulations impacted efficiency of scale.
5. What is affecting Scale in Canadian Food Processing?

This section examines whether a range of plausible factors might help explain the observed scale of the sector (or in other words investment into the sector that would lead to scale) and therefore impact productivity. The following propositions were considered as prospective influencers of Canadian food processing scale and productivity:

- Factor conditions
- Industrial Policy
- Investment conditions
- Tax and regulatory environment

The following sections articulate propositions regarding these in detail, and then provide analysis and context around them.

5.1 Factor Conditions

1. The data show that Canadian manufacturers are generally sub-scale compared to their US counterparts; food processing in no exception.

Figures 5.1 and 5.2 show that Canadian manufacturers have smaller scale facilities compared to their US counterparts – whether scale is measured, by number of employees or throughput (revenue). Figures 5.3 and 5.4 show that since the 1950’s Canadian manufacturing, and food in particular, has lagged the scale of US processing plants (by employee and revenue respectively). It is interesting to note that, as shown in Figures 5.3 and 5.4, although the number of employees has declined in Canadian food processing, the value of output has increased- which means that fewer employees are generating higher sales, likely due to technology and investment improvements in the sector. However, this has lagged the US- comparing Figures 5.3 and 5.4, in food Canada has 47% of the labour complement per establishment compared to the US, but only 34% of the revenue per establishment.
Improving Productivity through Greater Scale

Figure 5.1: Scale of Manufacturing in Canada and the United States, by employee

![Diagram showing scale of manufacturing in Canada and the United States, by employee.](image1)

Figure 5.2: Scale of Manufacturing in Canada and the United States, by revenue

![Diagram showing scale of manufacturing in Canada and the United States, by revenue.](image2)
The fact that Canadian manufacturers lack scale compared to US manufacturers should be no surprise. The sizes of the domestic markets that are serviced differ drastically. Despite the fact that ‘free trade’ exists, borders remain important (see below) and many food processing facilities...
were likely built prior to free trade to focus on the domestic market. It can be said that market access and domestic market size play an integral role in the scale of food processing.

2. Differences in demographic factors do not account for establishment size differences between Canada and the United States.

Several OECD economies have above-average establishment size regardless of their smaller populations, as shown in Figure 5.5. Therefore, Canada market size is unlikely to be the only reason for its smaller scale in food processing.

As shown in Appendix F, Canada has a more rural orientation than the United States both in the proportion of the population that live in rural areas and the amount of food processing located in rural areas. However it is likely not the primary factor in Canada’s food processors having lower scale since the majority of food processing in Canada (just over half) takes place in urban areas. Also, overall, the geographic concentration of food manufacturing is similar in Canada and the United States.

As Appendix F shows, while the food processing industry in Canada is more rurally oriented than in the US. However, it is also the case that Canadian facilities are smaller than those in the US regardless of whether they are located in urban or rural areas.

Figure 5.5: Food and Beverage Manufacturing, Size and Population

Source: OECD Structural Business Statistics (2006): Average Establishment Size for Austria, Czech Republic, Denmark, Finland, France, Italy, Luxembourg, Norway and Sweden calculated using midpoints.

The same was found looking at population density, shown in Appendix E.
Improving Productivity through Greater Scale

3. Market access (both domestic and export) and borders affect scale.

Within the proposition that population/domestic market size influences scale is the issue of market access. If the domestic market is fairly small then, prospectively, manufacturing firms should be able to scale up by exporting produced goods. But borders still matter.

The literature on this suggests that despite free trade agreements, borders between countries can have a significant effect on trade. Market access is not just about policy orientation, it is also about implementation, and there are many trade irritants that exist, including shifts/differences in standards or inspection practices. Helliwell (2003) found that despite Canada-US free trade, inertia (of the border effect) results in more than expected east-west trade than north-south trade. Anderson and Wincoop (2003) found that borders reduce trade flows by 20-50%, although over time border effects decline but do not disappear. In contrast, trade among countries in a monetary union is 3 times that of trade among countries without a monetary union (Rose, 2000). The In a report written for the Canadian Federation of Independent Business (CFIB), Chera and Pohlmann (2010, p1) suggest that “the major events of the last decade (e.g. 9/11, BSE, SARS) have made it harder for businesses to trade”. In a 2004 survey conducted by the CFIB, 32% of respondents identified regulation and non-tariff barriers as the main obstacles of international trade, followed by 27% that identified border infrastructure.

Secondly, an examination of the number of food industry trade disputes within the NAFTA and CUSTA agreements indicates that the border still matters and reflects how sensitive we are; as shown in Figure 5.6.

**Figure 5.6: NAFTA and CUSTA Trade Disputes, #**

![Figure 5.6: NAFTA and CUSTA Trade Disputes, #](http://www.worldtradelaw.net/nafta/naftamain.htm)
Food processors also indicated the importance of market size and input supply on scale and productivity in Canadian food manufacturing. Processors interviewed suggested that the most significant determinants of plant size are 1) the market size the plant serves and 2) the local supply of farm inputs. Though both are important, the dominant factor depended on the type of food product produced by the plant.

- For plants producing products in which the value of the purchased farm inputs was a high proportion of the ultimate food product (e.g., primary grain handling, livestock slaughter), the availability of local supply was seen as more important.
- For producers of products such as dairy and baked goods, market size and the geographic dispersion of markets were seen as particularly important, due to freight costs and product perishability.

Other important determinants of plant size were the length of product production runs and the number of product lines in a given plant in Canada compared to the United States.

- These factors were particularly important for plants producing relatively more complex products, such as packaged goods.
- The presence of many different product lines limits scale as well as productivity, as lines must be changed over for different products, creating downtime and decreasing capacity utilization.

Some processors mentioned that plants operate in Canada at a smaller scale due to history, e.g., they were built before CUSTA for a strictly domestic market. However, these plants also are likely more flexible to take on smaller runs of niche products.

Market access and border irritants may be well-managed by larger processors, but these issues can have an adverse impact on smaller and mid-sized processors wanting to grow.

4. Differences in downstream elements of the supply chain (retailers) do not appear to account for firm size differences between Canada and the US in food manufacturing.

Canada has a more concentrated food retail environment than the United States. In 2006 market share of the four largest US food retailers was 50.2%, compared to 74.4% in Canada at that time. Today, Canada’s top four national grocers account for 88% of grocery market share and 59% of national food retail – including drugstores, general merchandise stores etc., as shown in Figure 5.7. However, “on a regional basis the concentration of the U.S. market is comparable to the Canadian market. In local markets such as Chicago, San Francisco and Washington the market share of...
the largest firm is estimated at 42.8 percent, 37.2 percent and 33.4 percent, which is relatively similar to Loblaw’s Canadian national market share” (Dessureault and Grier, 2006).

Food sales in general merchandise stores are not as mature in Canada as they are in the United States, but food sales by retailers such as Wal-Mart and Costco are growing significantly in Canada.

**Figure 5.7: National Grocery Market Shares**

![National Grocery Market Shares](image)

Nielsen Homescan, Spring 2010

This concentration means that the major food buyers in both the US and Canada have market power and that any change in demand of one or two of the major customers can cause a significant shift in a processor’s demand. Naturally, this concentration ratio would encourage growth of food processors along with the retailers. At the same time retailers are moving towards smaller orders, higher frequencies and shorter lead times. This results in the need for advanced technologies and logistics, and advanced inventory systems and controls. There is a need for scale in order to meet market demand but also in order to make these investments economical, but at the same time there is a need for flexibility on behalf of the processors as well.

Thus, based solely on the scale of major retailers, one would expect the scale of Canadian food processors to be comparable or even larger than food processors in the United States. This has not been the case, but it could be a driver of increased scale in Canadian food processing in the future.

### 5.2 Industrial Policy

5. *There is little evidence that competition policies have kept the Canadian food industry small.*

An alternative proposition is that the policy of governments in Canada has been to limit the scale of food processing firms. One element of this is Anti-combines and competition policy.
However, Figure 5.8 shows that Canada’s Competition Bureau has not disproportionately targeted the food manufacturing industry and has not been particularly obstructive of mergers in Canadian food processing. Therefore, there is no indication that competition policy has had an effect on the scale of food processing in Canada.

**Figure 5.8: Percentage of Total Mergers Contested by the Canadian Competition Bureau (1980 – 2011)**


6. **Regulations in marketing farm products in Canada contribute to smaller firm sizes in Canada’s food manufacturing industry.**

As discussed in Section 2.3 above, one of the key influencers observed in European food processing productivity and competitiveness identified in Wijnands *et al* is limitations on farm practices. The impact of regulations around farm products, particularly marketing/procurement of farm products, was raised extensively in consultations with processors. Thus there is rationale to consider whether, and how, regulations influencing farm product marketing transactions can be expected to influence scale and productivity in Canadian food processing.

Canadian agricultural policy contains a variety of measures that influence the transaction between farmers and processors. These were largely developed to protect market access for farm products, and to protect farmers against the market power of processors and first handlers. A range of regulations are applied in different farm commodities:

- Uniform product standards and quality standards
- Delivery terms
- Minimum price setting
- Mandatory pooling of physical farm product within grade
Improving Productivity through Greater Scale

- Classified end-use pricing and pooling of revenues
- Supply control
- Allocation of farm products across processors

The application of these occurs through provincial regulations on farm product marketing (most commonly on horticultural products today; but also on some other products), the Canadian Wheat Board (CWB) on wheat and barley for human consumption in western Canada, and in the supply managed commodities—dairy, eggs, chicken, turkey, and broiler hatching eggs.

Generally, the lowest intensity of regulation applies in provincial regulated marketing, where marketing boards have the power to negotiate terms of sale (pricing, delivery specifications) with processors on behalf of farmers. At present, the CWB exercises more authority as a single desk seller\(^3\), with power to set grades and quality standards, pool product and prices, and influence the allocation of railcars to elevators. Finally, the largest extent of authority is delegated to marketing boards in supply management. They set minimum prices, control product quantity through quotas, set product standards, allocate product to processors, and in some cases pool product and price.

In the main, marketing regulations are exercised at the provincial level through marketing boards. The clear exception to this is the CWB, and elements of supply management are implemented at the national level. But in all cases outside of the CWB, implementation of marketing regulations occurs at the provincial level; this creates certain rigidities that influence scale.

Anticipated Impacts of Regulated Marketing on Scale

Given the above overview, the most obvious impact of regulated marketing, especially supply management, is to impact the quantity available that processors can purchase. This is because the volume available in the marketplace is set administratively, not the result of supply demand interaction. Moreover, in a supply-managed system, the intrinsic relationship between price and quantity under a free market system is severed, so higher prices offered need not result in increased supply. Thus, limitations in the available supply of farm product in supply management limit the overall scale of processing in affected industries, and can be expected to limit the extent of scale in plants. In provincial regulated marketing arrangements, some elements of this also apply in the sense that marketing boards commonly negotiate with processors for a set tonnage of product; there can be constraints on processors wishing to purchase product above this level, as all bids (regardless of volume) are bound by the minimum price.

\(^3\)The federal government has announced that, effective August 1, 2012, it will change the marketing system for wheat and barley in western Canada. Under its announced decision, the government plans to allow open marketing of wheat and barley; this differs from the current system in which the Canadian Wheat Board (CWB) is the single desk seller of all exports of western wheat and barley and all domestic sales of western wheat and barley for human consumption. The discussion in this report reflects the current marketing structure and the past impacts. This report does not comment on the prospective market changes as a result of changes in the Canadian Wheat Board Act.
Regulated marketing systems also affect the allocation of farm product to processors. For example, the CWB has had a role in allocating rail cars among grain elevators; this is essentially done based on history. An elevator requires access to railcars to effectively market grain deliveries from the farm, so administratively determined car allocation effectively controls an elevator’s ability to access to raw product. In supply management, it is common that farm product is allocated among processors based on historic shares of production, rather than on open competition among processors. This has two impacts. First, a given processor is bound by historical market share, and cannot grow relative to rival firms without acquiring a rival’s entitlement to product at considerable capital expense (either through acquiring a rival’s plant supply quota, or by acquiring actual facilities where supply entitlement is tied to plants). Secondly, growth in the marketplace is distributed pro rata among processors; a processor experiencing growth at a more rapid rate than the market as a whole must either purchase supply entitlement from a rival firm, or acquire additional raw product from another province (which creates supply instability in that province). Thus, administrative allocation among plants within the regulated system creates inflexibilities and barriers to growth that influence investment and scale.

Administrative allocation of farm product among plants within the supply managed system can create significant friction between provinces, and thus policy uncertainty borne by processors investing in facilities. This has been most prominent in poultry and eggs. Processors experiencing rapid growth and attempting to more effectively utilize plant capacity can, in lieu of purchasing volume entitlement from rival firms, purchase farm product from other provinces. This shifts volumes across provinces, which is a problem because the national quota is fragmented provincially on essentially fixed weights. The observed result has been reciprocal trade in raw farm products across provinces to fill local supply deficits and get around regulatory boundaries, rather than trade based on comparative advantage. The impact on investment in facilities is most evident from a recent federal appeal court ruling in the chicken industry, in which it was ruled that a provincial marketing board (and government delegating authority to it) is not obligated to provide a supply of raw farm product to plants in that province. Authority on these matters falls to provinces, which can act to resolve the friction through revised regulations to control interprovincial movement, such as recently occurred between Ontario and Quebec in chicken. The ultimate result is restricted availability of raw product to processors and a degree of uncertainty regarding future supply.

Elements of marketing regulation also impose product and revenue pooling. For example, the CWB sells wheat and barley according to a grade; it does not facilitate transactions between processors and individual farmers. This is significant, because there has been an interest among some processors in direct relationships with farmers in developing specialty food products. Moreover, the CWB pools returns within a grade, so farmers are paid the average price for the grade of grain they market, which reduces farmers’ incentive to work directly with processors in sourcing product. In supply management, a similar situation exists in the dairy industry. The sole purchaser and seller of farmers’ milk is a provincial marketing board, and farmers are paid according to the pooled revenue across end uses for milk. The prospect of a processor working directly with dairy farmers on sourcing is thus sharply limited.

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5http://www.cfo.on.ca/_pdfs/UpdateIPMJanuary27.pdf
Related to the above, regulated marketing suffers from regulatory overreach; this concentration of authority and prospect of inflexibility affects investment by firms. For example, in 1998, the CWB Act was revised to give more control to Western Canadian farmers and the Act set up a ‘shared governance’ corporation by a board of directors. Also, any recourse to government for disputes between elevators and processors pertaining to the CWB was removed (de Kemp, 2011). As a result of having no mechanism in place to arbitrate any CWB changes in pricing rules/terms or procedures, no investment has been made in Canada in malt processing (de Kemp, 2011).

Some evidence is presented in Figure 5.9 below. Prior to the 1998 changes, there was major expansion in malt processing in Canada. In the 1980’s and early 1990’s malting capacity had grown by approximately 75% (CWB, Annual Report, 2000/01). However, in the decade since little investment has been made and this can be seen in the malt barley sales to domestic processors – sales have been rather flat (or slightly declining) over the last ten years suggesting little net new investment. Instead, investment in malting capacity has been taking place in other markets, for example, Grupo Modelo, one of Mexico’s largest beer producers and brewer of Corona, built its first major production facility outside of Mexico in Idaho in mid-2000, and Anheuser Busch doubled its existing capacity in its Idaho plant around the same time.

**Figure 5.9: Designated Barley Sales to Domestic Maltsters**

![Designated Barley Sales to Domestic Maltsters](source: CWB Annual Reports)

Finally, as noted by Baldwin and Gu, the extent of access to an export market influences the scale of Canadian firms, the general notion being that export access allows for more improved capacity utilization and production flexibility. In some elements of regulated marketing, notably the CWB, export market access is extensive and fundamental to the marketing system. In others, notably milk supply management, export market access is sharply limited. Following a WTO dispute in 1997-2003, all Canadian dairy exports were deemed subsidized, and thus limited to subsidized export levels negotiated in the 1994 WTO Agreement on Agriculture. As a consequence, some dairy processors that would otherwise export off-peak and fringe volumes of
product, or perhaps in some cases attempt to focus on exports, are unable to do so or only to a limited extent.

7. There is evidence that sugar policy in the United States accounts for larger confectionery plants in Canada than many of the other food processing sub-sectors.

In 1981 the US implemented a sugar policy with the goal of maintaining high domestic sugar prices by limiting imports. “Through preferential loan agreements and tariff-rate quotas, the U.S. government thwarts price competition to maintain an artificially high domestic price for sugar—a price that can be twice the world market price or higher” (Groombridge, 2001). In effect the high price of sugar benefits sugar manufacturers/refiners but has a negative consequence on US confectioners and any other processor that utilizes sugar as a input. As a result, the US sugar policy incents confectioners to move elsewhere ad export product to the US instead of manufacturing it there. Canada, being so close to the United States, has benefited from this policy as Figure 5.10 shows that there are larger (by number of employees) confectioners in Canada than in the United States.

The US sugar policy has also been identified in the United States as leading to lost employment in the confectionery industry. The US Department of Commerce (2006) found that “for each sugar growing and harvesting job that has been saved through the US sugar policy, nearly three confectionery manufacturing jobs are lost”. The US Department of Commerce (2006) is also aware that confectionery manufacturers have closed or relocated to Canada and Mexico where the prices are more competitive.

As noted in Section 2, foreign ownership in confectionery processing is high in Canada as most major manufacturers have a plant in Canada. Sugar users in Canada enjoy the significant advantage of competitive prices in Canada compared to the United States – sugar prices in Canada are on average 30-40% lower in Canada than in the United States (Canadian Sugar Institute) and this has helped them to compete internationally (Canadian Sugar Institute).

**Figure 5.10: Average Establishment Size, Food Manufacturing, Sugar and Confectionary**

Source: US Census Bureau (County Business Patterns, 2009), Statistics Canada (Annual Survey of Manufactures and Logging, 2009). Canadian Sugar and Confectionery Manufacturing numbers calculated using midpoints from Statistics Canada (Canadian Business Patterns, 2010)
8. *Internal trade and regulatory barriers affect scale and new investments.*

The effect of interprovincial trade barriers on scale in food processing is mixed and in effect there are many, small barriers whose existence compound to affect investment.

Barriers to internal trade do exist in Canada, but their scale and impacts are difficult to verify. The 1990s Agreement on Internal Trade (AIT) has not been effective at breaking down barriers to trade in affected industries. Macmillan and Grady (2007) found that there are a large number of remaining barriers in the agriculture sector including supply management, technical standards, labelling requirements, provincially regulated meat packing plants and more. Similarly, Coulibaly (2010) notes that non-tariff barriers in the form of differing legislation, regulation and standards in various provinces affect interprovincial trade. Macmillan and Grady (2007) also note that there are frequent AIT disputes in the agriculture sector and they do not envision much progress in removing the barriers in the near term. However, much of the wider Canadian agri-food sector seems to enjoy a relatively free movement across provincial boundaries.

Coulibaly (2010) references the Canadian Centre for Policy Alternatives indicating that there is no credible evidence of an internal trade crisis in Canada. However, any federal, provincial or territorial policies that fragment markets can make it more difficult for companies to scale up in one region and service the rest of Canada, thereby affecting scale and productivity.

While internal trade policy barriers can have some impact on food product trade flows, different regulatory barriers between the provinces can also affect scale and future investments in scale for Canadian food processors. Canada’s AIT does not focus on those regulatory barriers well within the constitutional responsibility of the provinces- planning legislation/regulation; workplace safety/labour regulation; environmental/waste management regulation, etc... These areas of provincial regulation are often not formally considered “trade barriers” as product flows are not directly affected, but these can/do affect both investment decisions on location/expansions and on future scale investments. Major differences in such internal regulatory rules in these provincial areas of responsibility can adversely affect decisions to expand and locate new facilities in other Canadian jurisdictions- costs of doing business/approvals/paper burden-can be sufficient to alter decisions to undertake risky investments and find second best alternatives to expanding scale. Those food processors with sufficient national/global scale may have the necessary resources/skills to accommodate differing provincial rules/regulations, whereas expanding firms/new firms may not have sufficient resources to invest to meet these differing provincial standards/rules.

In many cases, there are existing constitutional boundaries where the Provinces have the full authority to make rules to meet the needs of their own jurisdiction. However, in keeping with the broader goal of achieving a larger national market, with reduced barriers to smooth flow of product, services, and now investments across provincial jurisdictions, it may be appropriate to fully examine how best to reach “national” standards, or to at least have greater harmonization among the differing provincial regulatory agencies and implementation of differing provincial regulations. This is not a call, for example, that all planning approval processes must be identical across Canada, but different provinces should not have extremely different processes for similar projects. It is recognized that reforming areas of primary provincial jurisdiction are not easy to
obtain. But those provincial regulations which unnecessarily segment national food markets do decrease the capacity of Canadian food processors to obtain sufficient scale, or make needed investments in new facilities in other Canadian jurisdictions.

### 5.3 Investment Conditions

9. *Canadian manufacturers do not invest in technology to the same extent as their US counterparts and this reduces the quest for scale which in turn reduces the benefits from scale and so on in a vicious circle.*

Scale in manufacturing is important for technology adoption and plant size has been positively and significantly linked with investment and innovation capacity. Academic research indicates the importance of scale in manufacturing for technology adoption, as described below.

The research indicates that the Canadian industry operates at a lower level of sophistication and that this is the cause and effect of lower scale. Our firms invest less in technology (as shown in Figure 3.12 above) and hence do not seek out the benefits of scale; our firms are lower in scale and therefore have less incentive to invest in technology.

- The number of technologies used in a plant is positively and significantly correlated with plant size (p. 21-22 Baldwin, Sabourin & Smith, 2003)
- Where plant size is between 100 and 499 employees, there is a greater likelihood to use at least one advanced technology (versus plants with fewer than 100 employees); Plants employing more than 500 employees have a stronger propensity toward technology in nearly all cases (Table 2, Baldwin & Diverty, 1995)
- Plant size is positively and significantly correlated with innovation activity; much of the size differential in innovation rates is attributable to differences in the product and process development techniques being used by firms of differing sizes (p. 10-11, Baldwin & Sabourin, 1999)
- Reasons for the technology gap between the U.S. and Canada “can be ascribed primarily to differences in the size of plants and in the size of markets.” (p. ix, Baldwin & Sabourin, 1998)
- U.S. plant managers rank the need for market expansion almost at the bottom of the list of impediments while, in Canada, it is ranked at the top of the list.” (p. x, Baldwin & Sabourin, 1998)
- “The only cost category where there were significant differences across technology users is the area of market size (p. 15, Sabourin, 2001)

It has also been widely analyzed and discussed that investment in Canadian manufacturing lags many OECD countries, including the United States (Myers, 2010; Science, Technology and Innovation Council, 2009; Council of Canadian Academies, 2009; World Economic Forum, 2009).

Secondly, unionization, although higher in Canada, as shown in Figure 5.11 below, is a relatively minor impediment to technology adoption. As Baldwin & Lin (p. 13, 2001) note, “the importance of unionization in a plant is also posited to be related to impediments—though not
necessarily because of any connection to technological sophistication. Rather it is included because it is sometimes seen as a factor that would make technology adoption more difficult because it increases the costs to management of changing work patterns during the introduction of new technological processes.”

**Figure 5.11: Unionization Rates, 2010**

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durables</td>
<td>25.2%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Non-Durables</td>
<td>27.1%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Food, Beverage &amp; Tobacco</td>
<td>34.2%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Food</td>
<td>n/a</td>
<td>17.0% (2008)</td>
</tr>
<tr>
<td>Beverage &amp; Tobacco</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>


10. **Variability/strength of Canadian dollar does not explain firm size differences between Canada and the United States**

The academic literature does not support the theory that exchange rate volatility hampers business investment in Canada – and exchange rate risk is not seen as a major contributing factor to Canada’s size deficit. Both Campa and Goldberg (1999) and Lafrance and Tessier (2000) found that the real exchange rate had little significant impact on investment for Canadian manufacturing sectors.

But the data in Figures 5.12 and 5.13 below suggest that there is a (somewhat weak) relationship. Figure 5.12 shows that there has been less investment in buildings since 2003 with an appreciating dollar. In contrast, Figure 5.13 suggests a positive relationship between investment in machinery and equipment and the exchange rate.
Figure 5.12: Investment in Buildings vs. Canada/US exchange rate

Capital investment in food manufacturing and Canada/US exchange rate, 1986-2010

Index (1986 = 100)

Canada/US exchange rate

Investment in buildings, chained 2002 C$

r = -0.406
(one year lag)

Year


Source: Institute for Competitiveness & Prosperity analysis based on CANSIM Table 387 -0006; Fixed Capital Stocks and Flows

Figure 5.13: Investment in Machinery and Equipment vs. Canada/US exchange rate

Capital investment in food manufacturing and Canada/US exchange rate, 1986-2010

Index (1986 = 100)

Investment in M&E, chained 2002 C$

r = 0.203
(one year lag)

Year


Source: Institute for Competitiveness & Prosperity analysis based on CANSIM Table 387 -0006; Fixed Capital Stocks and Flows
Thus, the relationship the exchange rate and investment, if there is one, is ambiguous. From the stakeholder interviews it was clear that the strengthening Canadian dollar had a significant impact on capacity utilization. Industry stakeholders explained that Canadian food manufacturing firms attempt to maximize capacity utilization by producing product for export round out the last 10-20% capacity available. However, under a strengthening Canadian dollar export demand softens, and export production in multinational firms tends to be shifted to the US, and capacity utilization therefore declines. As shown in Section 3.2 capacity utilization rates in Canada have been stagnant at about 80% over the last number of years.

5.4 Tax and Regulatory Environment

11. Different tax codes and costs of financing (equity/debt) do not account for firm size differences between Canada and the United States.

Research indicates Canada’s cost of equity is higher than in the US, but user cost of capital differences, including tax differences, have had a negligible effect on investment – and thus scale of processing, and that user cost of capital has historically been similar between Canada and the United States. For example, in a study of differences of user cost of capital (incorporating cost of equity, debt and taxation) between Canada and the US for the period 1976-1996, McKenzie and Thompson (1997) found that the cost of capital has generally been higher than in the United States. McKenzie and Mintz (1992) reached a similar conclusion. Both studies found that this was primarily due to higher real interest rates in Canada, although the tax system also contributed. McKenzie and Thompson (1997) also found that changes in the relative cost of capital have had a small, but statistically significant impact on relative investment levels in the two countries for equipment investment, although not for structures investment. However, in the manufacturing sector, the difference in the average user cost of capital from 1976-1996 between the two countries was negligible, due to the relatively more favourable tax treatment of this sector in Canada. These findings suggest that under-investment in Canadian manufacturing relative to the United States is not primarily due to the differing tax regimes.

Conversely, the analysis of tax treatment of small businesses in Canada suggests that small business tax relief could create a ‘taxation wall’ that reduces the incentive to grow. Chen and Mintz (2011) have suggested three ways in which tax treatment could incent a company to remain small:

- Companies may split into smaller units to take advantage of tax benefits
- Individuals may create small corporations to reduce their personal tax liabilities rather than grow companies
- Tax treatment can lead to a “threshold effect” that holds back small business from growing beyond the official definition of “smallness”

Chen & Mintz (2011) found that as a business in Canada grows, effective tax rates on capital investments virtually double when the business grows from as little as $1 million to over $30 million in asset size.

The results of the food processor interviews suggest that capital constraints do not influence investments in scale by large firms. The food processing interviews were conducted primarily
with larger food processors, and among those interviewed, access to capital was not broadly seen as a constraint on plant expansion. Rather, capital access issues exist within the companies themselves, where plant managers compete for investment capital with other plant managers within the same company and the business case for investment must be made. Overall, capital is not a key constraint to achieving scale – but competition for investment funds within a company could be, if other factors such as a strong Canadian dollar are at play.

5.5 Observations

The discussion above suggests the following. First, while NAFTA has been a boon to trade in food products with the US and Mexico, it is evident that border effects remain in terms of trade disputes, product standard differentials, etc. The observation that Canadian manufacturing firms generally are smaller than US firms (not just food processors) is some evidence of this. The broad structure of food processors (rural/urban, geographic concentration) in Canada and the US is similar; in the absence or real or perceived border effects the expectation is that Canadian firms would scale up to export; this appears not to have occurred at a broad level.

The scale at which downstream customers operate is an influencer of processing firm scale, especially in more perishable products. This factor, taken in isolation, would suggest that Canadian food processing firms should be at or above the scale of US firms, as food retailing in Canada is generally more concentrated than in the US. This may provide a motivation for restructuring in Canadian food processing yet to come.

Regulations that influence farm product procurement by food processors appear to have material impact on scale in Canada. These relate to constraints on the volume of farm product available for processing, reduced flexibility that processors have in pricing and procurement relations with raw product suppliers, the procurement environment in which administrative allocation supplants competition for raw product among processors, and limited export market access. Conversely, the regulated sugar market in the US is associated with a scale advantage to Canada in the confectionery area.

There is no evident effect on scale effect observed due to other candidate factors. Competition policy appears not to have constrained mergers and acquisitions in food processing disproportionately compared with other manufacturing sectors. Interprovincial trade barriers do not appear to have had a material effect on scale. Differences between the US and Canada in either technology adoption, cost of capital, or taxation policy do not appear to have material effects on scale in food processing in Canada vs. the US.
6. Conclusions and Recommendations

The purpose of this study was to provide an economic analysis of the relationship between scale and productivity in Canada’s food processing sector and its significance for Canadian public policy and management purposes. To do so, we reviewed elements of the economic literature relevant to economies of scale and productivity, with an emphasis on Canadian food processing. We collected, analyzed, and synthesized industry data from Canada and the United States. Finally, we conducted a series of interviews with key Canadian food processors. Based on the above, we arrived at the following conclusions regarding scale and productivity in Canadian food processing.

6.1 Conclusions

Our key findings are:

- Productivity and scale are relatively straightforward economic concepts. Productivity relates to the efficiency in transformation of raw inputs into output, accounting for the value of each. Scale (or size) economies relate to the ability of larger firms to spread fixed costs and use market leverage to decrease unit costs compared with smaller firms.

- Canadian food processors are significantly smaller in scale than their US counterparts. On average, Canadian food processing facilities have half the number of employees and less than half the sales revenue of US facilities. Major scale differences are found in all sectors of the food processing industry.

- Larger facilities are more productive – value added per employee for establishments at the 75th percentile is twice the level for the median establishment. To the extent Canadian establishments have not achieved scale, this hurts the industry’s overall productivity.

- Investment in machinery and equipment in Canadian food processing facilities trails the US; for every dollar invested per worker in the US, Canadian facilities invest only 62 cents.

Firm scale is an important part of the productivity challenge. The analysis here finds that manufacturing productivity increases with scale, as does capacity utilization. Food processing in Canada is not structurally different than its US counterpart in terms of its importance to the economy and the various sub-sectors that comprise it, but as a whole, US food processors have greater productivity and significantly greater plant scale compared with Canada’s processors. Although scale is not the only challenge to improving productivity, it is a factor that has helped to maintain or improve productivity in the US sector while Canada’s lags. As new labour-saving technologies emerge across various sub-sectors of North American food processing, the gap in scale will only be exacerbated.

- In interviews with a group of large Canadian food processing firms, they noted the following:
  - Operating plants at a competitive/efficient scale is fundamental, especially in specialized facilities
  - Firm scale allows for the overhead of enhanced marketing, human resource, and research and development functions
Among the firms consulted, the more dependent the firms were on the raw farm product as a share of product value, the greater the extent to which they were currently operating at competitive scale.

In other cases, the perishable nature of the product and transportation cost relative to the size/concentration of the local market limited scale. Marketing regulations and firms that experienced downtime in multiproduct plants were also found to limit scale of Canadian firms.

- Even with free trade agreements, border effects can be significant. This ongoing friction has the effect of broadly limiting the scale of Canadian firms, particularly those looking to expand into global markets.
- We found no single external or public policy factor that limits Canadian processors in the pursuit of greater scale. Instead we see a system based on inertia. Our firms generally do not drive for greater scale and hence do not achieve the sophistication that is necessary to gain the productivity and innovation advantage that can result from scale. Without world class sophistication, Canadian firms can operate successfully in smaller facilities. This is a vicious circle that can only be broken with concerted government and industry effort.
- The scale of downstream market in Canada is a significant factor for many food processors. Given that food retailing is more concentrated in Canada than in the US, this suggests the potential for consolidation in food processing in the future.
- Marketing regulations that affect the available supply of farm product, flexibility of procurement arrangements, ability to export and the ability to for firms to compete with rivals in raw product procurement are a limit to scale. In effect, some of these regulations create sub-national markets which limit scale by their very nature.
- To the extent that public policy creates barriers to firm scale and/or could better promote scale as a means of narrowing the productivity gap, this should be engaged. Policy by governments has tended to contain scale biases - either implicitly favoring scale or opposing scale. The current emphasis on “local” (even regional) appears to fall toward the latter, including public incentives (taxation, direct assistance) that targets small/medium size food processors. Federal and provincial public policy should be even-handed regarding scale, and transparent that policy initiatives are scale-neutral.

The productivity gap in food processing is a significant issue. Increased food prices heighten the awareness that food processing productivity is a crucial element in stabilizing food price inflation - which is inherently the equivalent of a regressive tax - and which ultimately lowers the Canadian standard of living. As a structural exporter of a broad range of food products, lagging food processing productivity will compromise Canada’s cost competitiveness in both the domestic and export markets. It is also evident that access to some markets - both domestic and export - require scale, as increasingly concentrated retailers find it difficult and expensive to purchase from suppliers lacking in scale.

Past successes in food manufacturing have demonstrated that Canada is more than the proverbial hewer of wood and drawer of water; but clearly this must be nurtured to be sustainable lest we become the exporters of raw farm products and the importers of processed and ready to eat foods. This is both critical to economic development and to future food security.
Moreover, there is little point in moralistic discussions of “big” versus “small” firms. Some small firms are very successful at a small size, and some customers/consumers prefer to purchase from small firms. Conversely, there are other, different advantages associated with scale, and some small firms aspire to scale to obtain these advantages. Thus, within the observation that Canada is lagging in scale in food processing which influences our productivity, it must be acknowledged that there is also a role for smaller firms.

Many observers argue correctly that an important element of our economic progress is the success of our small and medium enterprises. We hear observations that these smaller businesses are the back bone of our economy, that they are the engine of job growth, and that our innovation performance is highly dependent on their success. Small- and medium-sized suppliers are critical to the success of our globally competitive firms and exporters. Ambitious entrepreneurs challenge the current business environment, making the status quo uncomfortable and sometimes providing the spark for creative destruction as described by the famed economist, Joseph Schumpeter. Small businesses are indeed the back bone of our economy.

All of this is true, but much of our public policy is based on an exaggerated sense of the extreme importance of small businesses to our economy and on the need for special support for that sector of the economy. We should avoid over emphasizing their importance and the impulse to favour them in our public policy.

Businesses with fewer than 500 employees make up more than 99 percent of our enterprises in Canada. Yet larger businesses account for about 40 percent of our employment. Larger businesses also account for 46 percent, or nearly half, of our economic output as defined by Gross Domestic Product (GDP). Larger businesses have a stronger productivity and innovation record. Consequently they pay higher wages.

No doubt, the large globally successful firms of today were once small businesses. But the odds of a specific small firm becoming a global leader in the future are infinitesimally small – like lightning striking the same place twice or winning the lottery.

Our tax system has a preferential inclination for all small businesses – from the lower tax rates on smaller firms to the greater tax credits supporting R&D. Yet, larger firms conduct most of Canada’s business R&D. Other examples of the imbalance in public policy exist. We are not arguing that the balance should be tipped in favour of larger firms and establishments – rather public policy should be more even handed.

6.2 Recommendations

The findings and conclusions lead logically to the following three sets of recommendations:

Reduce border frictions to enhance market access and scale
Despite reduced North American trade barriers across our economy, the border is still a barrier for our food processors to gain full market access to the rest of North America. The prospect (and realization) of interrupted market access appears to limit those food processors’ willingness to invest in scale and to fully use available capacity. Those Canadian food processors with existing market access made necessary border investments which should limit adverse impacts. As such, government and industry have roles to work with trading partners to improve trade flows:

- Government should continue and intensify efforts to minimize border friction. This includes increased trade advocacy activity, fast tracking of border infrastructure investments, and ongoing diplomatic engagement regarding border interruptions and costs. The results of these efforts should be communicated to industry, so that more transparent assessment can be made of export market prospects, with the goal of greater certainty in securing improved market access.
- For its part, industry stakeholders should bring forward recommendations on how food safety and other regulation can be harmonized between Canada and the US. It should also embark on an initiative to assess reasons for trade disputes and identify ways of reducing them.

**Rationalize Marketing Regulations**

Marketing regulations are engrained in our food industry and it is unrealistic to see their elimination in the short term. However, there are elements of regulated marketing that could be reformed now:

- Reform the system of farm product allocation among plants in supply management. Administratively-derived allocation is inflexible and creates unproductive entitlements to supply. It is unclear that these contribute to income stabilization for farmers. Administrative allocation mechanisms should be reformed to a more freely competitive system of allocation among food plants.
- Move regulated marketing to a national basis where possible. Regulated marketing is largely fragmented at the provincial level. This creates unnecessary friction among provinces and additional costs in the system. We cannot afford to manage sub-national markets. Acknowledging that some of this orientation has a statutory basis, especially in supply management, the system should be reformed to be national in structure. Dairy marketing agencies have attempted to move in this direction; this should be supported and continue for all provincial marketing boards in supply management with the goal of having a single national marketing board for each of the supply managed commodities.
- Reform regulated marketing, including the Canadian Wheat Board and supply management, to better meet the needs of differentiated markets and facilitate cooperation between processors and their suppliers where there is a willingness on behalf of both parties to do so. This would allow improved access to specified farm products on behalf of processors, and allow farmers an alternative to imposed product standards.\(^6\)

\(^6\)As this report is being completed, the Canadian government is moving to change the Canadian Wheat Board Act such that the Canadian Wheat Board will no longer be a single desk marketer in Canada. The specific nature of changes that follow this are yet to be determined.
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- Review the objectives and instruments of regulated marketing to determine whether overreach is occurring. For example, the Canadian Wheat Board has had single desk marketing authority, and has also been involved in allocating rail cars to elevators, which by nature limits the volume at which facilities can operate; but is the involvement in railcar allocation a necessary element of its marketing authority, or is it an example of regulatory overreach?
- Ensure the effect on firm and industry scale is considered by governments when they develop new regulatory and support policies for the food processing industry.

Expand awareness and Education on the benefits of scale

Productivity is a conceptually straightforward concept, but it appears not to be well understood, despite the fact that it is regularly discussed. Nuances associated with data format and alternative definitions and metrics also make it difficult to measure. The link between firm scale and productivity is somewhat direct, but apparently not well understood.

- Industry and government can and should do more to raise the profile of scale as an important issue in food processing. Industry associations should encourage discussion and debate among their members on the importance of scale for productivity and innovation. Industry needs to bring forward policy and challenges and opportunities to its government partners on a continuous basis. To the extent government funds are deemed necessary to help the industry, public resources or incentives should be provided to firms to examine and upgrade processes and technology related to scale that can improve competitiveness.
- The data associated with scale and productivity are imperfect. If competitiveness in food processing is important to the Canadian economy (as we believe it is) then the nature of the data should be reviewed and formatted appropriately for more precise comparisons, and government should be “minding the store” and regularly monitoring the situation.

New technologies and innovation will be a driver for food processing scale. Currently, government announcements focus on the number of jobs that grants and investments will bring to a community. As new labour and energy saving technologies are adopted, fewer jobs may be created but the focus should be on the fact that more skilled jobs will be created as a result.

It must be made clear that this report and its conclusions are not based on a ‘big versus small’ argument. There is room for all sizes of food processing firms that target various markets segments and niches in Canada; indeed, some consumers are adamant in their preferences relative to small firms supplying their food. However, Canada has a structural export orientation in agri-food, based solely on its natural resource base and population; thus, it must effectively compete against foreign food processors, both in the domestic market and export markets. More focus is required on improved scale and productivity so that we have firms that can compete internationally because our farm and food products outstrip domestic need. Innovation, technology and effective management will be the key to moving the sector forward and using resources efficiently. There is an opportunity for good public policy to play an important role in creating a business climate that will facilitate this growth and investment for the betterment of the entire agri-food value chain.
References


### Appendix A: Description of Food Manufacturing Sub-Sectors

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<tr>
<th>NAICS Code</th>
<th>Description</th>
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| 311        | **Total Food Manufacturing**  
This subsector comprises establishments primarily engaged in producing food for human or animal consumption. It does not include beverage manufacturing or tobacco manufacturing.7. |
| 3112       | **Grain and Oilseed Milling**  
This industry group comprises establishments primarily engaged in milling grains and oilseeds; refining and blending fats and oils; and making breakfast cereal products. Exclusions include milling grain to make animal feed. |
| 3113       | **Sugar and Confectionery**  
This industry group comprises establishments primarily engaged in manufacturing sugar and confectionery products. Example activities include beet and cane sugar refining, confectioners’ sugar, granulated sugar, invert sugar, molasses, sugar and syrup sugar refining. Shelling, roasting and grinding cacao beans, chocolate bars, other bars made from cacao beans, chocolate, cocoa, confectionery chocolate, fudge made from cacao beans, chocolate covered nuts and chocolate syrup. Candied fruit and fruit peels, candy (except chocolate), chewing gum, non-chocolate confectionery, candy corn, cough drops, fudge, granola bars and clusters, marshmallows, covered nuts, popcorn balls and other candy-covered popcorn products, and toffee. |
| 31141      | **Frozen Food**  
This industry comprises establishments primarily engaged in manufacturing frozen fruits and vegetables; and frozen dinners and side dishes of several ingredients, except seafood. Exclusions include freeze drying fruits and vegetables (31142), frozen dairy products (31152), frozen meat products (31161), frozen seafood products (31171), frozen bakery products (31181), frozen doughs (31182), and freezing eggs (31199). Example manufacturing activities include: Frozen fruit and vegetable juice concentrates, frozen dinners (except seafood-based), frozen French fried, frozen French toast, frozen food entrees (except seafood based), frozen fruits and vegetables, frozen pot pies, frozen side dishes, frozen soups and frozen pizzas. |
| 31142      | **Processed Fruits and Vegetables – Canning, Pickling and Drying**  
This industry comprises establishments primarily engaged in preserving fruits and vegetables by canning, pickling, brining and dehydrating (including freeze-drying). Canning uses heat sterilization; pickling uses vinegar solutions and brining uses salt solutions. Establishments primarily engaged in manufacturing mixtures of dried ingredients, such as soup mixes and salad dressing mixes, are included provided they dehydrate at least one of the ingredients. |

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Exclusions include canned dairy products (31151), canned meat products (31161), canned seafood products, including soups (31171), mixing purchased dehydrated potatoes, rice, pasta and other ingredients, canning or dehydrating eggs or canned puddings (31199) and canned fruit-flavoured drinks (31211).

Example manufacturing activities include: Baby foods, baked beans, bouillon, brined fruits and vegetables, canned fruits and vegetables, canned soups (except seafood), dehydrated fruits and vegetables, dried fruits and vegetables, freeze-dried fruits and vegetables, canned fruit and vegetable juices, fresh fruit and vegetable juices, pickled fruits and vegetables, jellies and jams, ketchup, marmalade, canned pasta-based products, pickles, pork and beans, dehydrated potato products, canned potatoes, raisins, relishes, dry salad dressing mixes, salsa, tomato-based sauces, sauerkraut, soup mixes, and spaghetti sauce.

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<thead>
<tr>
<th>31151</th>
<th>Dairy Products (except Frozen)</th>
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<td>This industry comprises establishments primarily engaged in manufacturing dairy products, except frozen. Establishments primarily engaged in manufacturing substitute products are included. Exclusions include margarine or margarine-butter blends (31122), ice cream, frozen yogurt or other frozen desserts (31152) and cheese-based salad dressings (31194). Example Processing Products include: Fluid Milk Manufacturing: acidophilus milk, buttermilk, cottage cheese, chocolate milk, cream, sour cream, sour cream-based dips, chocolate milk drinks, eggnog, fluid milk substitutes, fluid milk, milk-based drinks, non-dairy creamers, sour cream, whipped toppings, whipping cream and yogurt (not frozen).</td>
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<tr>
<th>31152</th>
<th>Ice Cream and Frozen Dessert</th>
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<td>This industry comprises establishments primarily engaged in manufacturing frozen custard, frozen desserts (except bakery), frozen fruit pops, ice cream specialties, ice cream, ice milk specialties, flavoured ices, sherberts, frozen juice pops, tofu frozen desserts, and frozen yogurt.</td>
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<th>311611</th>
<th>Animal (except Poultry) Slaughtering</th>
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<td>This industry comprises establishments primarily engaged in slaughtering animals, except poultry and small game. Establishments that slaughter animals and then prepare meat products are included. Exclusions include rendering animal fat, bones and meat scraps, or processing purchased meat carcasses (311614), and slaughtering poultry and small game (311615). Example manufacturing activities include: Abattoirs, animal feed, bacon, beef carcasses and cuts, animal fats, fresh, frozen and chilled meats, hams, hides and skins, horse meat, lamb carcasses and cuts, lard, luncheon meat, cured or smoked meat, fresh, chilled or frozen meat, pork carcasses and cuts, sausages and similar products, tallow, variety meats (edible organs), veal carcasses and cuts, wieners – all made in slaughtering plants.</td>
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<th>311615</th>
<th>Poultry Processing</th>
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<td>This Canadian industry comprises establishments primarily engaged in slaughtering poultry and small game or preparing processed poultry and small game meat and meat by-products. Exclusions include cat and dog food made from poultry products, frozen preparations of poultry such as frozen dinners (31141), preparations of non-frozen poultry for manufactured foods such as baby food (31142), fresh preparations of poultry, such as fresh pot pies (311990). Example manufacturing activities include: Canned poultry, fresh, frozen, canned or cooked processed chicken, slaughtering and dressing of chicken, duck small game,</td>
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rabbits, turkey and geese, meat products (hot dogs, hams, luncheon meats, sausages) made from a combination of poultry and other meats.

| 3117 | **Seafood Preparation and Packaging**  
This industry group comprises establishments primarily engaged in canning seafood, including soup; smoking, salting and drying seafood; preparing fresh fish by removing heads, fins, scales, bones and entrails; shucking and packing fresh shellfish; processing marine fats and oils; and freezing seafood. Establishments known as "floating factory ships", that are engaged in shipboard processing of seafood, are included.  
Example activities include: canned, cured, dried, curing, pickling, salting, frozen, fish, crustaceans and molluscs, canned, fresh and frozen chowders, cod liver oil extraction, frozen seafood dinners, fish oil manufacturing, fish meal, floating factory ships processing seafood, frozen seafood products, canned lobster, fish roe, canned salmon, dulse processing, shucking and packing fresh shellfish, and fish and seafood soups. |

| 311814 | **Commercial Bakery and Frozen Bakery Products**  
This industry comprises establishments primarily engaged in manufacturing bakery products, other than for retail sale. Establishments primarily engaged in manufacturing frozen baked products are included.  
Example activities include frozen bakery products, partially cooked bakery products, bread and bread-type rolls, buns, croissants, croutons, bread crumbs, doughnuts, frozen bread products, pastries, pies, unleavened bread, |
Appendix B: Size and Location of Food Manufacturing in North America\textsuperscript{8}

\textsuperscript{8}Source: Martin Prosperity Institute analysis based on Statistics Canada (Canadian Business Patterns, 2006), US Census Bureau (County Business Patterns, 2008)
Improving Productivity through Greater Scale

Sugar and Confectionery Product Manufacturing (NAICS 3113)

Fruit and Vegetable Preserving and Specialty Food Manufacturing (NAICS 3114)
Appendix C: Effects of Scale on Canadian Food Processing Productivity

Statistics Canada provided the research team with data from the Annual Survey of Manufactures and Logging broken down in quartiles based on revenue (a proxy for scale of establishment). Therefore, the first quartile represents data from the largest 25% of establishments based on revenue; the fourth quartile represents data from the smallest 25% of establishments based on revenue. Therefore, the first quartile represents the largest establishments, the second quartile represents the next largest establishments, and the fourth quartile represents the smallest establishments. This data allow us to examine productivity by scale of establishment.

Grain and Oilseed Processing: NAICS 3112

*Source: Special Statistics Canada tabulation, based on Annual Survey of Manufactures and Logging.*
Breakfast Cereal Manufacturing: NAICS 31123

Value Added / Labour Cost

Value Added / Employee

1st Quartile  2nd Quartile  3rd Quartile  4th Quartile
Improving Productivity through Greater Scale

Sugar and Confectionery Manufacturing: NAICS 3113

Value Added / Labour Cost

Value Added / Employee
Frozen Food Manufacturing: NAICS 31141

Value Added / Labour Cost

Value Added / Employee

1st Quartile
2nd Quartile
3rd Quartile
4th Quartile
Processed Fruits and Vegetables: NAICS 31142

**Value Added / Labour Cost**

- 1st Quartile
- 2nd Quartile
- 3rd Quartile
- 4th Quartile

**Value Added / Employee**

- 1st Quartile
- 2nd Quartile
- 3rd Quartile
- 4th Quartile
Dairy Product (except Frozen) Manufacturing: NAICS 31151

Value Added / Labour Cost

Value Added / Employee
Ice Cream and Frozen Dessert Manufacturing: NAICS 31152

Value Added / Labour Cost

Value Added / Employee
Animal Slaughter: NAICS 311611

**Value Added / Labour Cost**

- 1st Quartile
- 2nd Quartile
- 3rd Quartile
- 4th Quartile

**Value Added / Employee**

- 1st Quartile
- 2nd Quartile
- 3rd Quartile
- 4th Quartile
Poultry Processing: NAICS 311615

Value Added / Labour Cost

Value Added / Employee
Seafood Processing and Packaging: NAICS 3117

Value Added / Labour Cost

Value Added / Employee

[Graphs showing trends in value added per labour cost and value added per employee for different quartiles from 2004 to 2008]
Bread and Bakery Product Manufacturing: NAICS 31181

Value Added / Labour Cost

Value Added / Employee
Appendix D: Food Processor Interview Template

Plants
1. What do you view as the critical considerations in determining the scale of a plant?
2. What differences in performance, costs, and returns have you observed across plants that can be attributed to scale?
3. Is access to capital an important issue influencing the scale of a plant?
4. How significant is scale in determining plant performance?
5. How would you rank scale as to contribution to productivity relative to other factors?
6. Are there limitations on use/availability of technology that limit scale? What barriers exist in obtaining plants of greater scale?

Firms
1. How does your company’s scale influence its ability to market? Could you/would you market differently if you operated at a sharply different scale? How?
2. To what extent is your ability to maintain HR functions and access a workforce dependent upon scale? How would it change if your scale was markedly different (would it?)
3. Does the distribution chain for your products and the scale of your customers markedly influence the scale at which you operate? Conversely, does your scale influence your efficiency in distribution?
4. Are there advantages associated with your scale in relation to procurement? Is the scale of your suppliers an influence? Are these an important determinant of scale?
5. Do marketing regulations (supply management, Canadian Wheat Board, provincially regulated marketing) influence the scale at which your firm operates?
6. If your firm were to relocate to the United States, would it allow you to operate at a different scale? Why?
Appendix E: Population Density and Manufacturing Scale

Some low population density OECD countries have achieved high average scale in food and beverage manufacturing.

Average Establishment Size for Austria, Czech Republic, Denmark, Finland, France, Italy, Luxembourg, Norway and Sweden calculated using midpoints.
Appendix F: Urban/Rural Patterns in Food Processing

Fewer Canadians living and working in manufacturing in metropolitan areas.

![Bar chart showing manufacturing employment and population distribution between rural and metropolitan areas in Canada and the US in 2006.](chart)

Source: Statistics Canada (Canadian Business Patterns, 2010), US Census Bureau (County Business Patterns, 2008)

Most manufacturing facilities are in metropolitan areas, especially the largest ones.

![Bar chart showing the distribution of manufacturing establishments by size in Canada and the US.](chart)

Source: Statistics Canada (Canadian Business Patterns, 2010); US Census Bureau (County Business Patterns, 2008)
Food manufacturing is more rural in Canada.

Source: Statistics Canada (Canadian Business Patterns, 2010); US Census Bureau (County Business Patterns, 2008)

Food manufacturing facilities have a more rural skew than all manufacturing.

Source: Statistics Canada (Canadian Business Patterns, 2010); US Census Bureau (County Business Patterns, 2008)
But rural effect is minimal in explaining scale differences across manufacturing.

The effect is also minimal in food manufacturing. This pattern holds in all food processing sub-sectors except bakeries where Canada’s average is slightly higher than the United States.

Source: Statistics Canada (Canadian Business Patterns, 2010); US Census Bureau (County Business Patterns, 2008)