

Economic Thoughts on COVID-19 for Canadian Food Processors¹

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[PRELIMINARY – COMMENTS WELCOME]

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¹Disclaimer: The COVID-19 outbreak is an unprecedented occurrence. The economic landscape engaged by these circumstances is changing constantly. Government (e.g., pandemic package) and industry responses is chasing a moving target as develops or unfold. The information contained on this article is generalized and is not intended to represent specific economic policy recommendation. Many thanks to for useful comments. This article reflects my perspective as of April 8, 2020.

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Abstract

The novel coronavirus (COVID-19) causes unprecedented health and economic crisis. We, however, have a limited understanding of the economic impacts of the event on food supply chain actors. Food supply chain actors - i.e., farm input suppliers, farmers, processors, raw material suppliers, logistic suppliers, wholesalers, retailers, customers – may be affected by the pandemic differently. First, COVID-19 may have an impact on the production activities of the food processing industry because of supply shocks (e.g., border measures, non-pharmaceutical interventions, labour market, and supply of agricultural raw materials) and demand shocks (e.g., panic buying, non-pharmaceutical interventions, food establishment closure, a slump in the demand for restaurant meals). Second, the impact of COVID-19 on food processing may depend on the type of products (e.g., fruits and vegetables, eggs, seafood, grain processing, meat vs bread). Third, panic buying by shoppers to stockpile goods may disrupt the food supply chain. Fourth, micro, small and medium businesses may be negatively affected and still worse, they may face closure - leading to potential bankruptcy and permanent unemployment. Fifth, stock prices of major food processors sector may also decline, making equity financing difficult for future investment in innovation and expansions. In response, the food processing sector adopted very comprehensive best practices for employee health and facility safety and some introduced employee financial incentives to maintain operations and mitigate the impacts of COVID-19. The federal and provincial governments have responded by categorizing the agri-food sector as an essential activity, and with bold non-pharmaceutical interventions and targeted fiscal measures. Measures taken by the government to flatten the medical curve may increase economic activities in food processing. The size and direction of the economic effect of the outbreak and public and private sector interventions on food processing sector are very uncertain. Short-term forecasts are difficult because of the virus.

Keywords: COVID-19, Food Processors, Demand Shock, Supply Shock, ...

1. Motivation

Throughout human history, pandemic infectious diseases have posed considerable societal, political, and economic impacts. The immediate and direct costs of pandemics include significant human morbidity and mortality. The 1918 pandemic infected 500 million people, killed between 50 million to 100 million people globally (estimated), and killed approximately 55,000 people in Canada ([Parks Canada, 2020](#)). In 2016, the top 10 communicable and non-communicable diseases killed more than 30 million people globally (WHO 2020). As of April 4, 2020, COVID-19 infected 1,181,825 and killed 63,902 people (John Hopkins Coronavirus Resource Center). What makes the novel coronavirus unique is its speed of transmission and its massive pressure on the patient care support system. As I am writing this paper, the COVID-19 pandemic continues to expand, and governments are responding with unprecedented pharmaceutical and non-pharmaceutical public health interventions and economic measures. The 1918 Spanish Flu provides a proxy for the impact of a global pandemic such as COVID-19 health and economy.

The social and economic effects of COVID-19 are potentially going to be of first-order importance. Recognizing that the most crucial impact of a global pandemic is the loss of human life, the spread of the disease can have grave repercussions for global and national economies. The pandemic may disproportionately affect various sectors of the economy. The pandemic will cause immense infrastructure, personnel, personal protection equipment, and critical patient care equipment demands on health care systems. For example, COVID-19 put unprecedented pressure on Italy's healthcare systems. As COVID-19 cases jump and deaths surge, the national health system struggled with a lack of space, resources and staff, leading to doctors making heart-breaking decisions on how to allocate scarce medical resources. It also creates substantial costs to economic activities (e.g., causing disruptions in food processing) as a result of sickness-

related absenteeism and self-isolation, social distancing, disrupted work schedules, fear-induced aversion to workplaces, and lost productivity. Post COVID-19, the pandemic can lead to shocks to economic growth because of the lack of investment in innovation. For example, estimates for the 1918 Spanish Flu in the U.S. show that the pandemic reduced manufacturing output by 18%; and the manufacturing activities of areas with more aggressive non-pharmaceutical interventions performed better after the pandemic (Correia, Luck and Verner 2020). These cases illustrate the seriousness of the consequences of an infection pandemic disease on the life and health of the public and the global competitiveness and financial success of the affected industries.

Unlike industries such as hospitalities, tourism, restaurants, airlines and others that are hit hard, the food industry is unique in the sense that it is a necessity to human life and health hence it will see relatively small swings in consumption levels. The food industry is relatively resilient to demand shocks caused by, for example, the financial crisis of 2008, and the SARS pandemic of 2002/2003. Despite the initial upsurge of demand for processed food from retail grocery stores, the effect of COVID-19 on economic activities and employment in the food processing industry is unclear. In this paper, I explore the potential effects of the 2019 COVID-19 on Canadian food processors². I provide thoughts on how COVID-19 might affect the Canadian food processing industry, how food manufacturers responded and what might *happen post-pandemic*³. In the meantime, however, all components of the food industry are considered critical infrastructure – i.e., essential business - by the government and it is therefore vital that

² The food supply chain includes input suppliers, producers, consumers, agricultural and seafood inputs, processing, storage, transportation and marketing, etc.

³ It is difficult to make forecasts as the spread of the disease, the complete policy measures, and individual behaviour are unknown.

the food industry continues to operate. Undoubtedly, the COVID-19 pandemic is not just a public health issue, but a food supply chain issue.

The fear that COVID-19 is a threat to the local and global food supply creates anxiety, panic reactions and a dramatic response by stockpiling with emergency supplies. According to a recent survey, Canada's major food and consumer goods manufacturers reported that they have experienced up to 500% increase demand in the last two weeks of March 2020, where the most spike in the demand for food products are canned goods, rice, pasta, baby food, baking supplies and milk/eggs ([Food and Consumer Products of Canada](#), 2020). Significant disruption for the global food trade is likely when countries restrain food exports to boost domestic food availability (Headey and Fan 2008). Further, the speed of the spread of the disease and the containment measures imposed by different levels of governments send unprecedented demand and supply shocks across the food supply chains. The goal of the government should be (1) to save lives, (2) to help households and businesses to get through the pandemic with a little suffering as possible, and (3) to mitigate long-term damage (e.g., permanent unemployment, bankruptcies) from the short-term containment measures. The COVID-19 pandemic will eventually come to an end. But its impact on governments, healthcare systems, the economy, people's lives may remain for some time to come.

The paper is organized as follows. In section 2, I provide relevant background about the Canadian food manufacturing industry. In sections 3 and 4 I reflect on the demand and supply shocks. In section 5, I briefly discuss the financial market implications.

2. Industry Background

The manufacturing sector plays a fundamental role in Canada's economy. Manufacturing contributes approximately \$174 billion to Canada's GDP, which is equivalent to more than 10% of Canada's GDP (Statistics Canada 2019) and to approximately 68% of Canada's total merchandise exports. Food processing is one of the manufacturing industries that received little attention before the 2008-09 financial crisis. Inelasticity of food demand makes the food industry less prone to recessionary pressures. Food processing was resilient enough to be the only manufacturing industry to experience positive revenue growth during the financial crisis (CANSIM table 301-0006). Within the manufacturing industry, first, the food processing industry contributes to approximately 17% of manufacturing revenue (2017) 1.8% to the Canadian GDP. Second, the food processing industry is Canada's (and Ontario's) leading employer in manufacturing (approximately 16.3%). Third, food manufacturing is the largest buyer of primary agricultural commodities (AAFC, 2016). In 2016, food processing used approximately 50% of raw agricultural products (AAFC, 2016). Fourth, food processing depends on both domestic and export markets, hence, the industry's ability to compete in international markets is important for the industry's long-term survival. In 2019, the food processing industry exported \$33.90 billion (34% of shipments) and imported \$27.50 billion. Five, food manufacturing supplies approximately 75% of all processed food and beverage products to the domestic market (reference). Six, food processing is a low margin business. High retail consolidation leads to squeezed margins for food processors, making it more difficult for them to secure financing.

3. Food Demand Shocks

In this section, I will use a simple diagram, inspired by the infection curve, to discuss the likely effect of COVID-19 and containment measures on the growth in derived demand for processed food by retail stores and foodservice establishments. The variable of interest is “short-term growth” in the derived demand for food processing outputs (or shipments) from retail grocery stores and foodservice establishments. The primary demand curves faced by retail stores and foodservice are for final consumers. In the spirit of Becker’s (1965) and Gronau’s (1977) household production model, we assume a household makes resource allocation decisions where a household is both a producing and consuming unit. Becker’s (1965) model assumes that a household consumes only goods that it produces, and the production of each good requires an input of labour time of one or more household members and a good purchased in the market. Gronau’s model of household production assumes that home-produced and purchased goods are perfect substitutes (Gronau 1977, 1986). In our case, we assume that retail and foodservice will be inputs into consumers’ meal production function. In the consumers’ meal production function, retail and foodservice are imperfect but close substitutes. The opportunity cost of time determines whether a household buys food from retail or foodservice. The opportunity cost of time in labour markets may, therefore, positively influence the consumption of food from retail vs foodservice. Based on the time allocation theory, as the wage rate goes up, households allocate less time to prepare food at home (hence buy less food from retail), use more time to work in the labour market, and purchase more convenience food products (hence buy more food from foodservice) (McCracken and Brandt 1987; Reynolds and Goddard 1993; Manrique and Jensen 1997). In the COVID-19 economy, ignoring take-outs, the virus decides what and how much food the consumer buys from the retail vs. food service.

Given the need to slow and stop outbreaks to save lives, governments have imposed containment measures. One popular way to flatten the infection curve is through collective non-pharmaceutical containment measures such as social distancing and self-isolation. In the absence of these measures, the infection curve rises faster and will quickly overwhelm the health care system beyond its capacity. To comply with the containment measures, many non-essential businesses are temporarily or partially closed. Unlike non-essential businesses that are severely slumped by COVID-19, the size of the effect of COVID-19 on the sales of food processors is unclear.

Now, the effect of COVID-19 on the short-term growth in the demand for food retail and foodservice depends on a host of factors: whether there are non-pharmaceutical interventions (NPIs), how stringent the NPIs are, consumers confidence in their suppliers of food and others. In this paper, we explore two cases (several scenarios can be explored, though). Case I: there are reported cases of COVID-19 in the specific geographic location the consumer resides, but there is no aggressive containment NPIs during the pandemic. Case II: there are reported cases of COVID-19 in the specific geographic location the consumer resides, and there are aggressive containment NPIs during the pandemic, and there is a strong and transparent advisory from public officials and food industry on the availability of enough inventory of food and other consumer products. Aggressive NPIs include social distancing, isolation, mandatory closure of non-essential services (e.g., restaurants and bars), etc. In Case I, there is a lot of uncertainty and fear of supply chain disruptions leading to panic buying. The other factor that causes panic buying is loss aversion – the idea that how feeling like the consumer is missing out on something. Herd mentality also adds to panic buying behaviour. Early provision of information by local public officials and industry associations reminding consumers that almost all food and

beverage are locally processed and that there were plenty of supplies could help reduce panic buying behaviour (Case II).

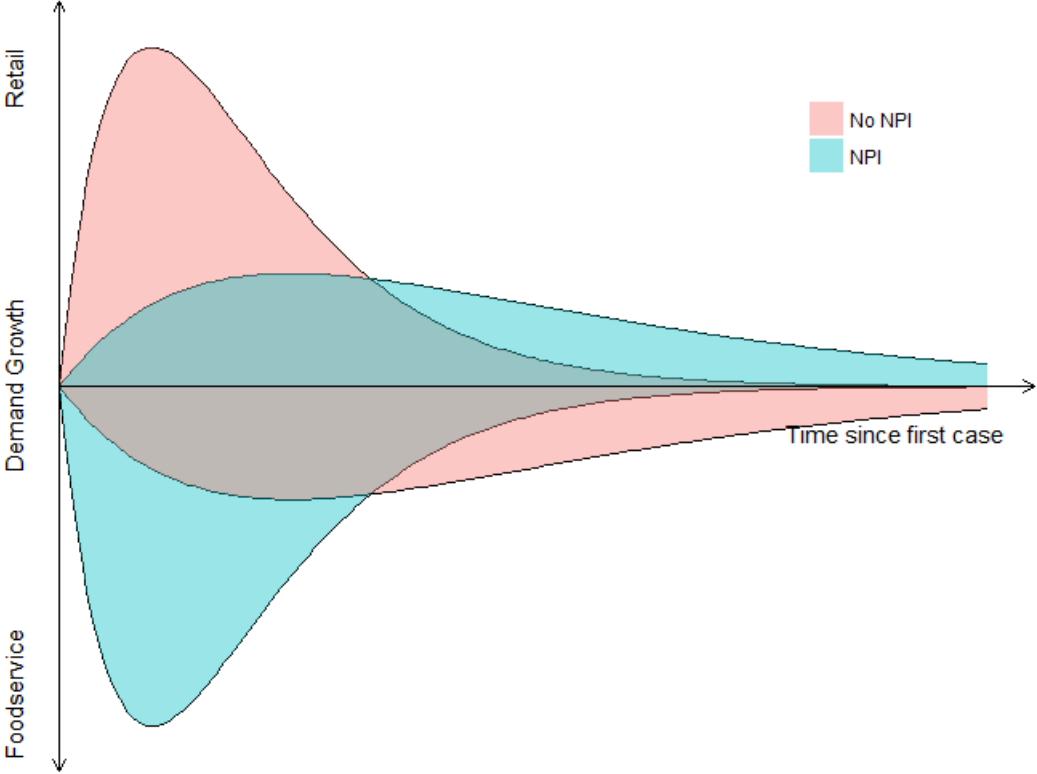


Figure 1 Demand Shock to Food Processors and the effects on non-pharmaceutical Intervention (NPI)

Figure 1 summarizes the effect of non-pharmaceutical interventions on the growth in the retailer and foodservice demand for processed food. The curve takes on different shapes, depending on the presence and strictness of the containment measures, and whether the industry is essential or non-essential. In the short run, the capacity of any food processing facility is limited. The curve takes on different shapes, depending on the presence and strictness of the containment measures, and whether the industry is essential or non-essential. In the short run, the capacity of any food processing facility is limited. The effect of COVID-19 on the growth in

derived retail and foodservice demand for processed food is represented by the pink curve in Figure 1.

Depending on how much the consumers trust their government officials and the industry, I expect a sudden temporary spike in the short-term growth retail demand under Case I compared to Case II, leading to a spike in the retail demand for processed food. Because retail and foodservice are substitutes, the derived demand for foodservice will see a slight decline because some people (risk-takers) can still dine in the restaurants. In Case II, when we have NPIs and food supply information are jointly provided, because consumers are well-informed, the derived retail demand for processed food will see a slight growth. However, the effect on derived foodservice demand for processed food will be a very drastic decline.

With public containment measures, combined with government and industry assurance of the availability of enough inventory of food and consumer products could slowdown the sudden spike in the growth in retail demand for processed food, yet, it could lead to a significant drop in the foodservice demand for processed food because of mandatory (partial) closure because of social distancing (Figure 1, light blue). In the COVID-19 economy, with and without the non-pharmaceutical interventions (e.g., social distancing, self-isolation), COVID-19 will have positive externalities on retailer demand for processed food (i.e., growth in retail demand) and negative externalities on foodservice demand for processed food (i.e., a decline in the derived retail demand and lost revenue). Figure 1 (pink) shows that even if no containment measures were implemented, a sharp growth in retail demand and a modest decline in foodservice demand will occur, because of the precautionary and/or panic behaviour of households and firms faced with the uncertainty of dealing with a pandemic with an inadequate public health response. This plot suggests that public measures that solve the health crisis can have both positive and negative

effects on the demand for processed food. Figure 1 may help explain the effects of many food-related economic activities on the food processing sector - such as online shopping, curbside delivery – and measures taken to help lessen panic buying.

3.1. The surge in Demand from Retail Industry – Panic buying

First, on the onset of the pandemic, consumer reaction was obviously to increase the purchase of food and other domestic needs to hedge against future supply disruptions in the immediate future, to avoid exposure to COVID-19 by some, and to comply with potential self-isolation restriction sending a shock to the food supply chain. How retailers respond (e.g., increasing price, imposing purchasing quotas, increasing procurement orders) can greatly affect consumer and supply chain partners' behaviours. As a result, the food processing industry may experience a significant hike in demand for certain processed food from the retail industry, and a change in purchasing behaviour - *i.e.*, a preference for shelf-stable processed foods and fewer “fresh” or perishable foods.

The temporary surge in demand, which causes a temporary shortage of food, creates a negative effect on the entire food supply chain for micro and small businesses with less storage and transportation flexibility, and severe financial constraints. When consumers stockpile cans of beans or tuna, for instance, they do not consume more than usual. They will end up working through those extra inventories later over time, just a little bit more. Retailers and processors recognize this ‘unusual’ behavior of the consumer based on historic demand for certain product categories in a geographic location and react accordingly.

Panic buying⁴ may lead to a phenomenon known in the supply chain literature as the bullwhip effect or the supply chain whiplash – which distorts true demand information leading to the risk of supply chain oscillations (Heizer et al 2020). This shortage gaming strategy might lead to an amplification of the actual demand, followed by a period of excess inventory of food stockpiling. This problem is particularly severe when the demand for food products does not reflect the actual household food consumption. For example, the now famous example of increased demand for toilet paper does not reflect consumption as the per capita consumption of toilet paper does not increase. The same is true for cereals, canned foods, milk and dairy products, eggs, wheat flour and chicken, which have seen an unprecedented increase in demand. For example, in the UK, according to Nielsen Scantrack (2020) sales of canned pasta increased by 226%, ambient noodles (+167%) and pot noodle snacks (+150%), canned fish (164%) and canned meat (200%) for the week ending March 21 vs same period 2019. For the US, the Nielsen data shows that dried beans sales grew by 377% year-over-year for the one week ending March 21, 2020, and 169.1% for a four-week period; rice sales grew 234.1% for the one week and 117.6% for the four-week period; and shelf-stable tuna sales grew 245.6% for the one-week period and 109.7% during the four-week period (Berthiaume 2020). In the presence of panic buying, firms of all sizes along the food supply chain struggle to fulfil the spike in demand from their customers. The food supply chain can, however, ‘flatten the curve’ in terms of demand

⁴ Panic buying occurs when consumers worry about the scarcity of food supplies. The concept of loss aversion heavily factors into panic buying, and herd mentality. The downside of this behavior are – making shortage worse, production schedule for processors, bullwhip effects, price gouging.

spike for certain food products by ensuring that supply chains have enough time to respond to and recover from the consequences of the temporary demand shocks.

One remedy to flatten the spike in the demand is to ensure consumers that there are plenty of supplies by signaling supply through collaborative information sharing and by actively managing the flows of information (Arnold and Goyal 2009). A high degree of cooperative behaviour requires that supply chain partners voluntarily share operating information and jointly plan strategies. However, recognizing the role of incentives, Grossman and Stiglitz (1980) note that an informationally efficient market is impossible in the sense that agents will not rationally incur the expenses of gathering and sharing information unless they expect to be rewarded. For example, Hays (2004) noted in the New York Times that "... Wal-Mart summarily announced that it would no longer share its sales data with outside companies, like Information Resources Inc. and ACNielsen, which had paid Wal-Mart for the information and then sold it to other retailers." The response by Wal-Mart underscores the risk of information leakage to competitors as a key deterrent to sharing information in supply chains (Lee and Whang 2000). Governments' response to categorizing the food supply chain as essential business may also reduce the negative effect of panic buying. Food processing firms can respond to the increase in demand for processed food by working through its existing excess inventory and an increase in production at their existing plants. Food processors cannot, however, ramp up and build a new plant in the short run to respond to a temporary demand spike.

3.2. Foodservice Establishments Demand Shock

The second demand shock operates through restaurants and other food service establishments. The COVID-19 pandemic has led restaurants and other food establishments across the country to close or to shift to delivery and pick-up channels. In March 2020, in Canada, as a result of the ongoing pandemic, 800,000 employees were laid off from the foodservice sector and revenues are expected to drop by \$20 billion during the second quarter of 2020 ([Financial Post](#), 2020). Many food processors supply their finished food products to retailers, to bulk food ingredient suppliers (such as Sysco) and foodservice establishments⁵. For food processors, sales to many restaurants and foodservice have plummeted leading to significant revenue loss from restaurant closures, reduced foodservice traffic and hotels, and other establishments. According to Statistics Canada, an average Canadian household spent \$5,763 on food purchased from stores and \$2,950 on food purchased from restaurants in 2017. This accounts for more than 30% of household expenditure on food away from home.

Assuming there is enough labour supply to the industry, one of the industry's supply response is to operate at the maximum capacity to meet the retail demand shock. The Canadian food processing facilities have ample capacity to ramp up and down as demand variations occur. Figure 2 shows capacity utilization for the food and beverage industry.

⁵ Foodservice establishment refers to any fixed restaurant, limited restaurant, coffee shop, cafeteria, short-order cafe, luncheonette, grill, tearoom, sandwich shop, soda fountain, tavern, bar, catering kitchen, delicatessen, bakery, grocery store, meat market, food processing plant, school, child care, or similar place in which food or drink is prepared for sale or service to the public on the premises or elsewhere with or without charge.

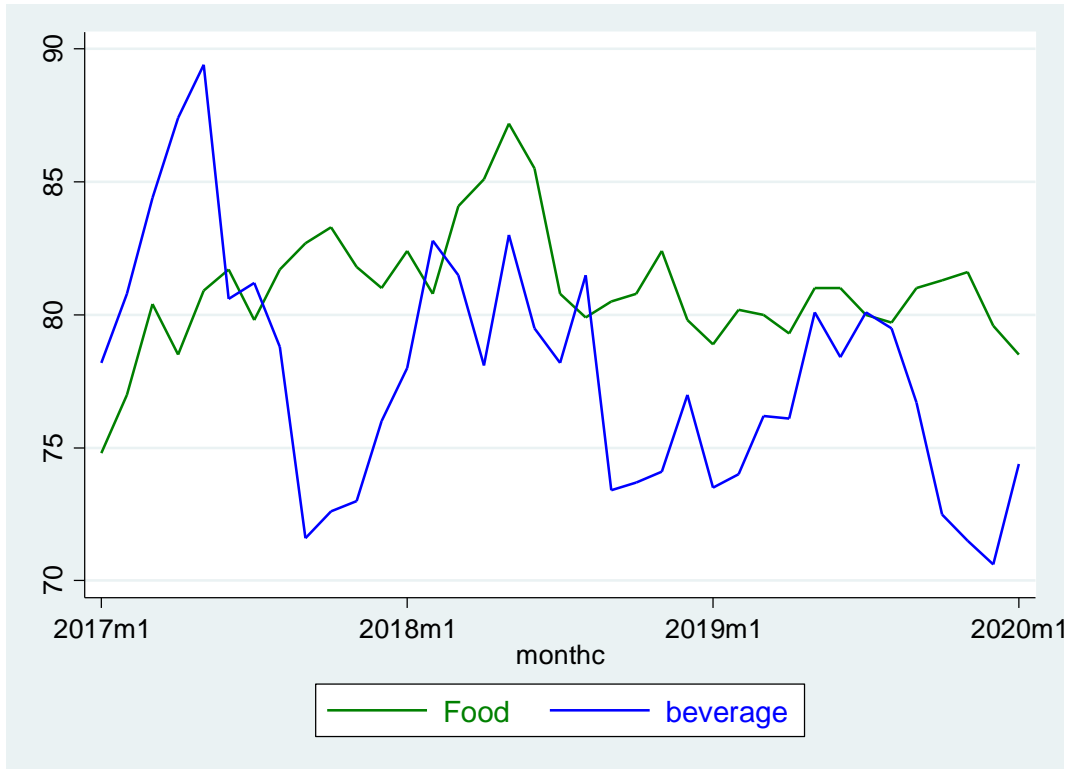


Figure 2 Capacity utilization for food and beverage

In January 2020, the food processing industry was at 78.5% of its capacity. Theoretically, firms with capacity utilization⁶ below 100% can significantly boost production without affecting the associated costs. With the increased in the demand for food products, the industry’s capacity utilization rate may rise above the historic average rate of 80%. However, it is unlikely that a food processing plant will function at a 100% capacity rate because of some bottlenecks in the production process (e.g., the malfunction of equipment or household reduced labour supply). If food processors are at full (optimal) capacity, short-term strategic responses include working

⁶ Theoretically, the optimal output of a food processor is the output when long-run average cost is at the lowest point under perfectly competitive market. Under the condition of monopolistic competition, however, the optimal output of a food processor is below the output of the lowest point of average cost function and the difference between the two is excess capacity. Monopolistic competition is more realistic for food processing as it is characterized with many firms with differentiated products.

overtime and decrease operating hours to process and deliver more food to retailers and other customers, and there is a labour abundance in the market as many non-essential businesses are laying off staff. One problem with this strategy is processors may run out of raw materials to be processed. Because most food processors follow just-in-time (JIT) supply chains – i.e., holding as little inventories as possible to meet demand – they may temporarily run out of processed foods if the self-isolation measure lasts longer and if border restrictions are in place. A just-in-time (JIT) inventory system aims to eliminate waste and to continuously improve productivity. To illustrate, Figure 3 shows monthly raw material inventory to sales ratio and finished good inventory to sales ratio.

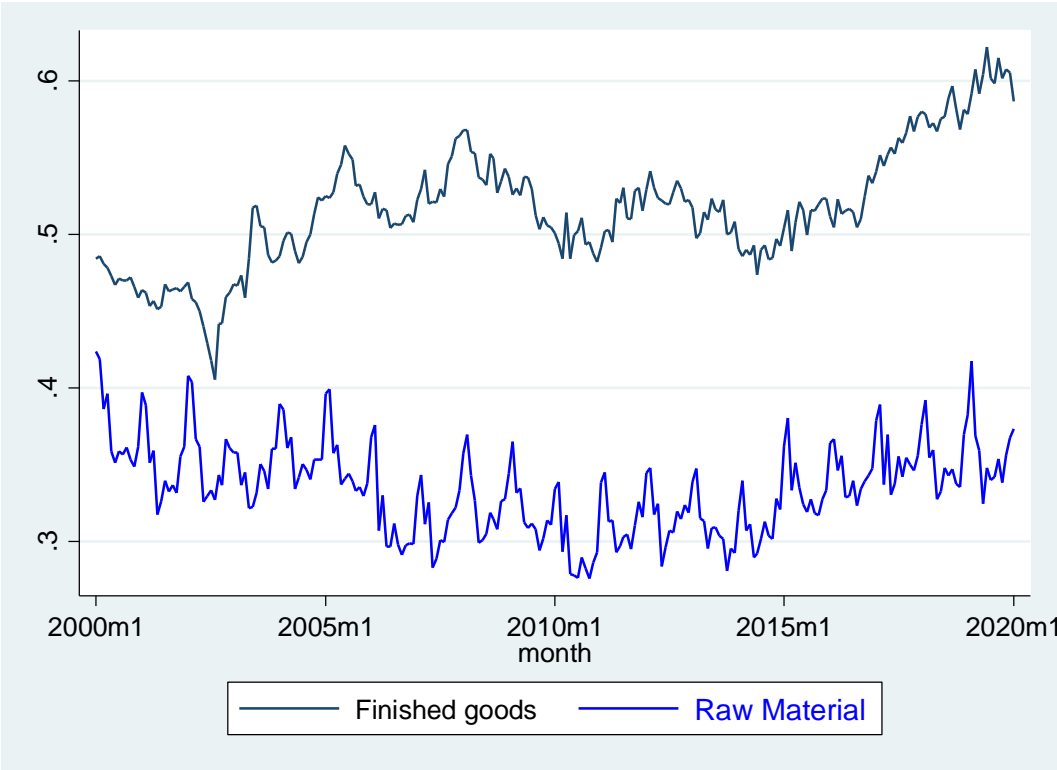


Figure 3 Monthly raw material inventory to sales ratio and finished good inventory to sales ratio

The average raw material inventory to sales is 0.37 and 0.58 for finished goods to sales, suggesting that, on average, the food processing sector has raw materials to cover over 10 days

of sales, and finished goods to cover over 15 days. These values vary by industry – e.g., meat vs flour. While JIT is about a reduction of waste and boosting productivity, it challenges the resiliency of the food processing sector to a pandemic such as COVID-19. The resilience of JIT can, however, be enhanced through intra- and inter-firm information visibility using information technology and transportation logistics pooling/sharing.

3.3. Export Market Demand Shock

The third demand shock is a decline in processed food exports because of border restrictions. As disease containment measures, many countries have imposed travel restrictions, closed borders, closed factories, disrupting the global trade and supply chains. Canada exports processed foods to more than 180 countries with a significant proportion being exported to the United States' market (70%). The Canadian food processing industry exported a total of more than \$37.50 billion in 2019 (Government of Canada, 2019). More than 71% of the processed food export was to the U.S., 8.35% to China, 6.4% to Japan, 2.2% to Mexico, and 12% to the rest of the world. Note that the importance of the export market varies by food processing subsector (see Figure 4). The pandemic may slump disproportionately sub-industries with higher export intensities (e.g., meat, grain and oilseeds, seafood products). Figure 4 illustrates that the grain and oilseed milling, meat and seafood subsectors constitute more than 50% of food processing exports.

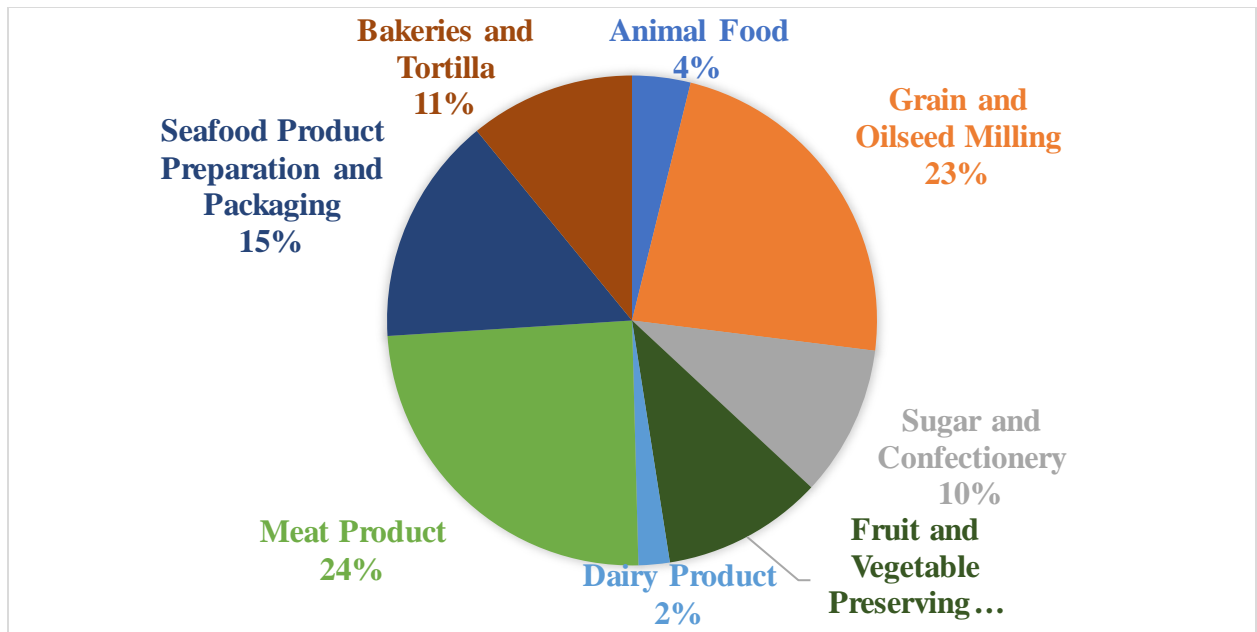


Figure 4 Share of export by food processing subsectors

In the face of demand slumps by restaurant closures or limited services to take-out or home delivery, slowdowns in exporting due to border measures by some countries, an apparent response by the food processing firms is to ‘divert their excess supply to the retail sector’. This strategy depends on whether the products are destined for export, retail, or food service, and whether they are perfect substitutes in production. For example, to meet the temporary surge in retail demand for meat, meat processing plants could still process the same amount of poultry as before, but with less further processing and cutting, and fewer varieties. Meat processors could package and deliver to retailers whole chickens and drumsticks instead of skinless breast fillets. Foodservice, which has seen a sharp decline in their operations amid mandated closures, on the other hand, order more specialized further processed cuts. For example, before the COVID-19 pandemic, Cargill had been supplying 60% to the retail industry and 40% to the foodservice industry (Food Processing 2020). By late March 2020, Cargill had switched to 85% retail orders

and 15% to foodservice orders. Switching may entail converting production lines from larger-piece operation to the smaller-piece operation and change in packaging to meet grocery store requirements. Diverting products destined to export market or food service to retail is much more nuanced process than repurposing the inventory. For example, for one of the largest Canada's dairy processors – Saputo Inc. -orders from retail stores for dairy products has spiked while orders from foodservices has fallen, in some cases order are being canceled (Sagan, 2020). The management is looking into the possibility to repurpose the inventory destined to foodservice, despite the challenge that orders from retail and foodservice are different in terms of product size and formats, suggesting that the two are not perfect substitute in production. Another challenge for the company is to keep running the foodservice facilities at reasonable capacity when orders are being cancelled. The management noted that the adopt a wait-and-see strategy to determine the normal order pattern.

4. Supply-Side Shocks

4.1. Food Supply Chain Shock

Processors must order and receive all agricultural and other raw materials to carry out their operations, which takes time and supply chain coordination. Trucks and drivers must operate to bring the raw materials to the factory and to take the finished products to distribution centers and retail grocery stores. The claim that “there is no food shortage” globally and locally does not mean that the global COVID-19 pandemic poses no threat to the food supply chain, which is a much more nuanced phenomenon than “volume of food”. Food processors can replenish the

empty shelves at the grocery stores – with a temporary interruption – only if industries such as farming, trucking, and packaging are continuing to operate. Any major disruptions in the supply chain component may cause real distress on the entire industry- e.g., ingredient and packaging shortage puts restraints on the industry. First, food processing firms in Canada rely, in part, on imported raw materials from the U.S. and other countries affected by COVID-19. Second, Canada imports processed food from more than 190 countries. Sixty percent of the import of processed food was from the U.S followed by 4.53% from China, 2.68% Thailand, 2.37% Italy, 2.33% Mexico, 1.90% Brazil and 25% from the rest of the world. The slow in imports of processed food from other countries because of temporary travel and border restriction may put pressure on the Canadian food processing sector. However, if there is enough supply of most agricultural product categories to be processed and other inputs, and given that the North American supply chain has not seen significant interruptions, this may not pose a major threat. That said, depending on the severity and the length of the pandemic, transport restrictions, temporary border closures from the fear of contagion and quarantine measures (e.g., social distancing) are likely to impede processors access to imported agricultural and seafood raw materials from the U.S and other countries.

4.2. Labour Market Supply Shock

As the pandemic persists, logistical constraints in transportation, labour shortages in food processing and primary agriculture, and other areas of the food supply chain could prove to be a challenge for the COVID-19 food economy, and post COVID-19 food economy. Containment measures(e.g., temporary border closure and travel restrictions) could reduce food processors’

productive capacities and hinder their ability to deliver certain food products to the market. Border interventions that affect the free movement of people, such as seasonal foreign and inter-provincial (farm) workers, might hurt agricultural production and food processing, thus affecting market prices of agricultural raw materials for the food processing sector. Besides, the shortage of truck drivers may threaten the North American food supply chain ([Jackson](#) 2020; [Smith](#) 2020). For example, fresh fruits and vegetables, seafood products, which are highly perishable and, therefore, need to be processed or stored in a relatively limited time are at particular risk, leading to significant financial losses for food processors from food loss and waste. One strategy would be for firms to collaborate to efficiently use trucking fleets and to avoid the ‘empty miles problem’ (non-revenue miles) – i.e., empty trucks driving long distances.

Food processing firms heavily rely on production labour. For domestic workers, fear, social distancing policies, sickness may have an important effect on the household supply of labour. The shortage of temporary foreign workers in the farm operations and seafood and meat processing industries may threaten the post-pandemic food supply. In Canada, foreign farmworkers are still allowed to come in and work, but the time they spend in mandatory self-isolation is costly ([Bensadoun](#) 2020). This is particularly important for labour-intensive agricultural products such as fruits and vegetables as most horticulture industry is heavily reliant on migrant farmworkers. For the greenhouse, nursery and floriculture production industry in Canada, for example, in 2016, 33.5% of the total number of agricultural jobs are filled by temporary foreign workers ([Statistics Canada](#), 2020). Farm labour shortage may influence the post-COVID-19 food processing economy if there will not be enough local agricultural raw material supply. In 2016, ten percent of employees in the meat processing industry were new immigrants or refugees; and approximately 3.0% of the employees were temporary foreign

workers (Food Processing Skills Canada 2019). The shortage of domestic and foreign farmworkers will hurt the food supply chain both during and post the pandemic. Firms in this situation may be forced to implement various practices including an increase in shift hours, and scaling down operating hours, overtime, incentive packages. For firms that heavily rely on labour, the size of the effect of the new practices on production activities may depend on how quickly the pandemic fades. For instance, "... Maple Leaf will be providing hourly staff with an \$80 per week additional support payment in addition to regular overtime and pay..." (Financial Post, 2020)... "...amid a threat of production disruptions if workers start calling in sick due to the deadly virus"(MSN, 2020). "Cargill, the third-largest U.S. beef packer, is paying an additional \$2 an hour for employees that complete all their weekly shifts as well as a \$500 bonus to the ones that work all their schedules through May 3. It's also offering paid leave for 2 weeks for employees affected by the coronavirus through March 31." (MSN, 2020). Micro, small and medium-sized firms - with limited cash flow flexibility - may have greater difficulty (or less flexibility) surviving the added financial demand to support themselves and their employees. The processors are also facing new cost categories, such as increased sanitation practices. The costs of social distancing measures to isolate people on production activities and employment in the food processing sector are far from clear.

4.3. Non-pharmaceutical interventions

While social distancing measures can considerably reduce the number of new COVID-19 cases, it will also reduce household labour supply, which limits the ability of food firms' to produce at maximum capacity and could further influence the ability to meet orders from retailers. Further, employee absenteeism can place significant stress on food processing and

transportation systems. These positions could be filled with people who have lost their job in non-essential industries as long as they have transferable skills. A recent survey of food processors conducted on March 18 (n= 330 food processors and service companies from around the world) by Food Safety Magazine (2020) finds that more than 40% of the respondents think that they can keep operating for more than 12 months if the crisis were to continue long term, while 13% indicated up to one month, 50% indicated more than six months – conditional on continuity of availability of supplies and employees to work. The survey also indicates that “... four companies reported that they have already been forced to close.” The survey also asked food manufacturers whether they have increased or decreased production. Thirty-seven percent of the firms noted that they have decreased their production because of reduced orders from foodservice operations, restaurants, schools and colleges; 24% report seeing demand increase of at least tenfold from retail customers, and 39% unchanged.

4.4. Micro, Small and Medium Firms at Risk

One of the characteristics of Canada’s food processing industry is a high proportion of micro, small and medium-sized firms. There are approximately 6,209 food processing establishments in Canada, where 26% of the establishments have less than 5 employees, 64% have between 5 and 99 employees, 9% between 100 and 500 employees, and only 1% of the establishments have more than 500 employees (AAFC, 2016). Most importantly, micro and small business account for 90% of employment in Canada’s food processing industry. Pandemics such as COVID-19 may impact small and large firms differently - their survival and their need for targeted government support. For many micro, small and medium-sized food processors, with limited working capital to survive the shocks, the survival rate may only be counted in days or weeks. As a result, smaller businesses, more than larger businesses, will tend to go out of

business or undermine their capacity to be competitive. Laying off workers by SMEs will only exacerbate the economic downturn brought on by the pandemic, and lead to a negative demand shock for processed food.

5. Financial Market and Financial Liquidity

The COVID-19 pandemic has severe consequences on food firms' stock prices. The stock prices of food processing firms have responded to the shock reflecting market participants' concerns about their investment and their expectations regarding future economic effects. In the financial market, stock prices have plummeted, stock price volatility has risen, and nominal interest rates have declined. The stock prices for food processing firms are not immune to the financial market shock. Figure 5 shows that stock prices for Maple Leaf Foods and Saputo Inc. have seen a significant drop and volatility has risen in March 2020. The same is true for S&P/TSX Composite index. Figure 6 shows a snapshot of unadjusted returns (i.e., unadjusted for a firm's exposure to the overall market) for Maple Leaf Foods stock and S&P/TSX Composite index. Returns also show high volatility. The takeaways from these two graphs are that (1) the stock market started to respond to concerns about the possible economic impacts of the pandemic (2) aggregate market and firm-level stock price fluctuation has occurred in late February and early to mid-March, and (3) investors are concerned about the potential spread of COVID-19 shock through financial channels. For the firms, while the plummeting stock prices do not have a direct consequence on the firm, it may influence its ability to raise equity financing to fund future investments.

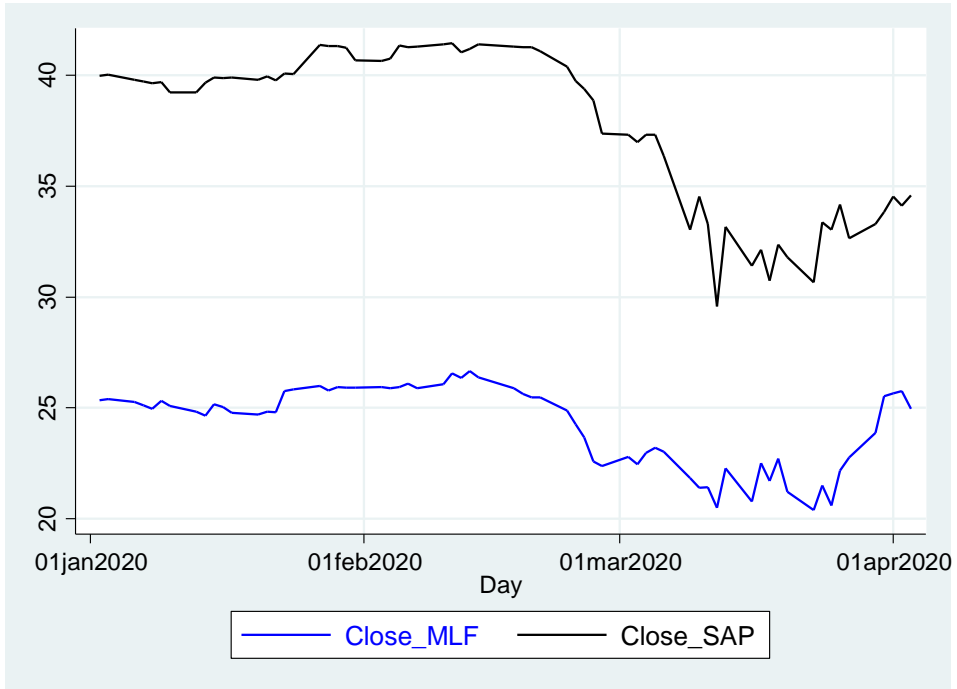


Figure 5 Stock Price Maple Leaf Food and Saputo

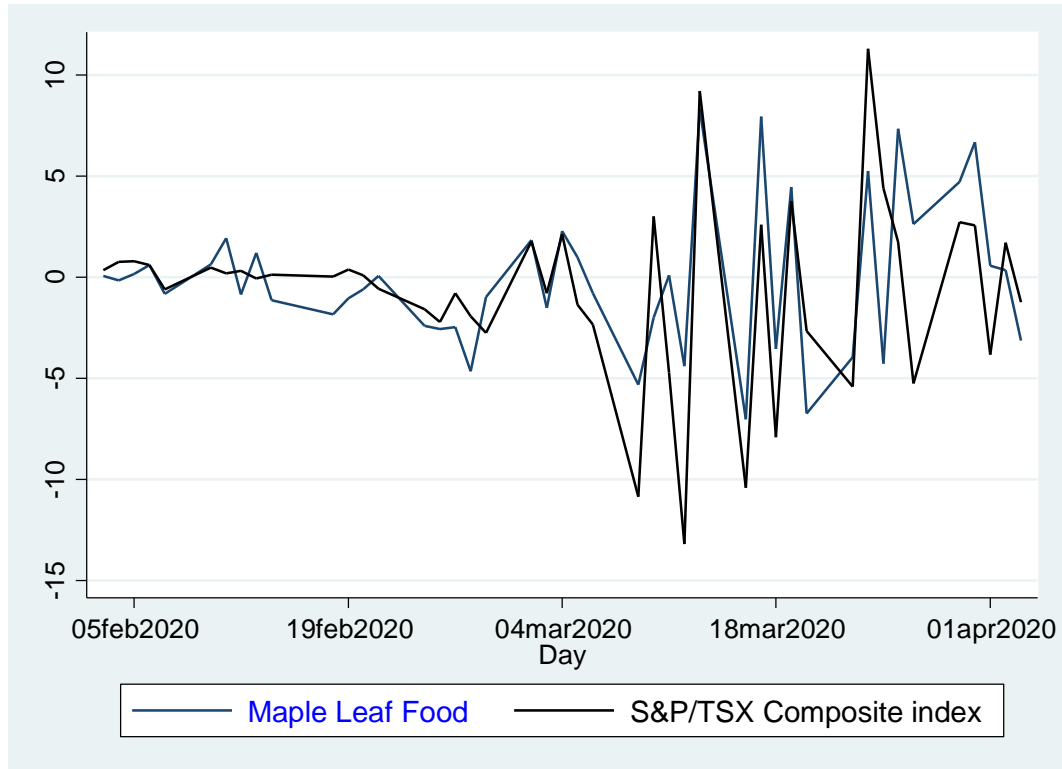


Figure 6 Stock Returns for Maple Leaf Food and S&P/TSX Composite index (GSPTSE) (Note: returns are not adjusted for Maple Leaf Food’s exposure to the overall market).

Liquidity constraint is another concern that faces cash-constrained firms. For many micro and small food processing business the cash-flow squeeze resulting from a partial or complete closure of their business operations or their customers’ business could quickly lead to bankruptcy because of liquidity constraints. Firms need to demonstrate that they can generate enough cash flow to meet payrolls for employees, pay income taxes and have cash remaining to meet term debt obligations. I use the interest coverage ratio to illustrate the likelihood of bankruptcy risks to SMEs. The ratio measures the firm’s ability to meet its financial obligations. The interest coverage ratio needs to be at least 1.0 but ideally, a higher ratio is preferred to allow for any

unexpected shortfalls in the projected cash flow because of extreme events such as the pandemic. An interest coverage ratio below one indicates that the firm may not generate enough revenue to cover its debt payment and the firm risks falling into bankruptcy. The lower the interest coverage ratio, the higher the firm's debt and the likelihood of bankruptcy. In 2018, the average interest coverage ratio was 4.2 while this value is negative -0.7 for the bottom revenue quartile (25%) of food processing firms, and 5.7 for the top revenue quartile (25%) (Government of Canada). This is worrisome because at least 25% of the food processing firms are already unable to meet their short-term financial obligations. With COVID-19 shocks, low-interest loans measures are aimed at easing such short-term liquidity issues for firms. However, considering the current low-interest rate (almost zero rates) environments and the unprecedented supply and demand shocks, low-interest loans and other concessional loans may have limited impact. Other targeted measures that are taken by governments such as tax breaks, extended deadline to pay taxes and a deferral to pay customs duties that reduce operational costs may be more effective in reducing or preventing bankruptcies of SMEs.

The federal, provincial and municipal governments have come up with various financial packages (e.g., concessional loans; tax reductions and grants; increased flexibility for businesses filing taxes; wage subsidies; technical assistance; and indirect measures; funding to support exporters) and other measures to reduce the operational stresses on businesses and individuals. The Government of Canada's emergency package for small business owners that includes loan guarantees and a 75 percent wage subsidy for qualifying businesses to cope with the economic consequences of the COVID-19 recognizes the vulnerability of small businesses and their importance to the Canadian economy. Additionally, the support through Farm Credit Canada (FCC) that will allow for an additional \$5 billion in lending capacity to ensure producers,

agribusinesses and food processors continue to have access to necessary capital at this challenging time. The measures are expected to help Canadian businesses to cope with financial risks and to reduce layoffs and prevent bankruptcy during COVID-19 pandemic, and to help business rebound and encourage business investments following the pandemic. Ultimately, what is unclear is how severe would the economic impact of COVID-19 has been in the absence of government emergency support. This would be an interesting future research area.

6. Summary

The COVID-19 pandemic has both positive and negative impacts on the economic activities of food processors through both supply and demand-side effects. Not every business is suffering from the COVID-19 pandemic. Given that food processing is an essential business and that the pandemic had a considerable negative effect on the network of food-related businesses, it is unclear whether it will lead to expansion or contractions of real food processing economic activities and its real gross domestic product. The experience for the 2008/09 financial crisis suggests growth in the GDP of the food processing sector. The food processing industry responded to the demand and supply shocks by targeting bottlenecks such as labour shortage, and care for the health and safety of the employees. Individual food processors have to make a trade-off between meeting increased demand and slowing down production or lowering labour productivity to prevent a COVID-19 outbreak at their facilities which could temporarily shut down production altogether. Anecdotal evidence suggests that some production plants have adopted lengthy screening protocols before employees could even enter the facility to void an outbreak. If over 50 % of food processing output is concentrated in 5% of the food processors, then, an outbreak in one of them could cause significant supply chain disruption. For example, Olymel, a meat processor, has temporarily shut down and cease operations for 14 days in its

slaughterhouse and cutting plant in Yamachiche, Quebec, after nine employees tested positive for COVID-19. The temporary closure of the facility affects nearly 1,000 employees, and the company directed employees to government assistance programs during the plant's closure.

In a crisis, it is important to provide targeted financial relief for those losing their jobs and incomes and provide targeted support SMEs. Both federal and provincial government area rolled out several fiscal and monetary measures and non-pharmaceutical measures to safeguard the health Canadians and to support businesses. No moral hazard questions asked in saving the lives of millions and the economy they depend on from the COVID-19. COVID-19 is an exogenous shock and it does not care about incentives, information asymmetry, trade restrictions, etc. Evidence from the Spanish Flu pandemic suggests that timely containment measures that can mitigate the severity of the pandemic can simultaneously reduce mortality and be beneficial to the economy (Correia, Luck, and Verner, 2020).

Post the current pandemic, the industry needs to equip itself for the danger of subsequent waves of infection. The Spanish Flu came in three waves from 1918 to 1920 in most countries. In light of this, in the second stage of the national effort - reopening the economy and prevent a second wave of infections - governments and private sectors must consider the food supply chain(s) as a critical component of disaster preparedness and resilience planning for a potential second wave. Empirical evidence on manufacturing activity for the 1918 Spanish Flu shows that the U.S. economy performed better in areas with more aggressive NPIs after the pandemic (Correia, Luck, and Verner, 2020).

While the economy is a first-order problem, the main task now is saving lives. That is exactly what the food processors are doing – produce and deliver reasonably priced and quality

food to Canadians. We are all together. “This common economic shock requires a common economic policy effort.” (Baldwin and Mauro 2020).

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