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DISRUPTION IN THE SUPPLY CHAIN FOR BEEF AND PORK: WHAT HAS HAPPENED AND WHAT WAS NAFTA DOING¹

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INTRODUCTION

Regulations enforced since 1990 have made bovine spongiform encephalopathy (BSE) a reportable disease in both Canada and the United States. Since then, five cases have been discovered in North America. All five cases involved cattle that had been on farms in Alberta.

On December 8, 1993 BSE was found in a purebred beef cow that had been imported from the United Kingdom in 1987. That animal and its herd mates were destroyed along with all offspring and all remaining animals imported from the United Kingdom since 1982.³ While cattle imports to Canada from the United Kingdom had been banned since 1990, the Canadian government implemented more stringent disease detection and control measures on farms and at slaughter plants. Then in 1997, in response to the high profile BSE crisis in the United Kingdom, the Canadian and U.S. governments introduced ruminant-to-ruminant feed bans. The

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³ Between 1982 and 1990, 191 breeding cows had been imported to Canada from the United Kingdom. Eighty of the British cattle had died by 1992 and one or more of them could have been rendered into meat and bone meal.

central governments of each country continued their policy of prohibiting imports of ruminants and ruminant products from countries with a reported case of BSE. Cattle and beef exports from Canada were not affected.

On May 20, 2003, BSE was confirmed in an Angus cow in Wanham, Alberta. Unlike the earlier case, the infected animal was born, fed and raised in Canada. The consequences of this discovery were devastating for cattle producers and other industry stakeholders in Canada as the potential risks to human and animal health from BSE had become a major economic and political issue. Governments of 34 countries, including the United States and Mexico, banned imports of ruminant and ruminant products originating from Canada using the same criteria established by Office International des Épizooties the Canadian government had used to justify its import prohibitions. The resulting dislocation in the cattle industry in Canada was unprecedented, and could have been much worse if the USDA had not readmitted imports of boxed beef muscle cuts and veal from Canada in September 2003.

The third case of BSE in North America was found in a Holstein cow in Yakima, Washington on December 25, 2003. The discovery unleashed additional, significant economic havoc on the North American cattle market. Within hours of the United States Department of Agriculture confirmation of this discovery, governments of more than 50 nations, including Canada, Mexico, Japan, South Korea, Chile, Mexico and Taiwan, banned American beef imports. Like in Canada, border closures led to a collapse of the beef export business, a reduction of trade between backgrounders and feedlots, a decrease in the market value of slaughtered animals, and devastated export-oriented meat processing plants. However, since the cattle industry in the United States was not as export dependent as was the Canadian industry, the impact on cattlemen in the United States from the border closures was relatively less acute.

Initially it appeared the BSE status of Canada and the United States would be identical. Later it was determined the cow in Washington was actually born in Alberta. The situation for the Canadian beef industry got even worse because opponents of cattle and beef trade used the cow's Canadian connection as a tool to slow and frustrate the normalization of live cattle trade across the Canada-United States border.

Cattle producers in Canada showed tremendous resourcefulness and resilience as they worked to get past this difficult situation. Finally on December 29, 2004 the USDA announced that it would re-open its borders to live cattle under 30 months of age as of March 7, 2005. The ensuing enthusiasm in Canada did not last long. On January 2, 2005 a fourth case of BSE was confirmed in an eight year old Holstein cow from a farm in Barrhead, Alberta. Then on January 11, 2005, a fifth case was confirmed in a seven year old Charolais cow from Innisfail, Alberta.

While material from the two most recent cases did not enter the food or feed systems, they raised concerns in the United States about lifting the import ban on Canadian cattle. On March 2, 2005, a federal judge in Billings, Montana, granted an immediate preliminary injunction against USDA regulations that would have allowed imports of Canadian slaughter and feeder cattle less than 30 months of age. The next day, the United States Senate voted 52-46 in favour of keeping the border closed to Canadian cattle. While an appeal of the Montana judge's decision is to be heard in the 9th Circuit Court of Appeals in San Francisco in June, a hearing on a permanent injunction is scheduled for July 27 in Billings.

Before May 20, 2003 the cattle sector was a shining example of harmonization and market integration under NAFTA. It is now a stunning and troubling exemplification of disharmony, market segregation and confusion. Losing access to the live cattle market in the United States has motivated Canadian decision makers in both the public and private sector to focus almost entirely on the domestic market for solutions. The loss of foreign live cattle markets has not been as devastating for cattlemen in the United States. With no import competition from cattle producers in Canada and sustained final consumer demand for beef, cattle producers in the United States and exporters from Mexico have enjoyed some of the highest prices in recent history.

The purpose of this paper is to assess the economic relationship between the NAFTA and the current disruption and adjustments occurring in the cattle and hog industries. The NAFTA had only a minor effect on cattle trade within North America (with the exception of the elimination of tariffs on cattle imports into Mexico) when it was implemented in 1994. In view

of the current crisis in the cattle industry, the Agreement also appears to have little effect on limiting the ability of a central authority to impose trade restrictions for the alleged purpose of protecting human, animal and environmental health.

The paper is organized into six sections. The next section describes how government intervention in the cattle industry led to the expansion and integration of the cattle industry in North America, but also to its vulnerable structure and plunge into chaos. The third section identifies the various taxpayer financed producer assistance programs that governments in Canada implemented in response to the BSE crisis and assesses the economic effects of these programs. Section four briefly describes the effect of BSE on the North American hog market. The fifth section discusses the results of an empirical model used to quantify the effects of the BSE crisis on the Canadian cattle market. The last section summarizes and concludes the paper.

BACKGROUND

Most beef cattle in North America are located in the United States. At present there are 95 million head in the United States, 27 to 30 million in Mexico (estimates vary by source), and 15 million in Canada.

Cattle feeding activities in Canada and the United States often occur in large scale, high density feedlots. Cattle are fed using domestic supplies of feed grains and forages. Methods of production are different in Mexico. While beef cattle breeds in Northern Mexico are the same as those in the Canada and the United States, dual purpose breeds dominate in Southern Mexico. Cattle feeding activities in Mexico have not developed along the same lines as in the other NAFTA regions because of a comparative disadvantage in feed production and because of differences in domestic agricultural policies.

This section briefly describes the evolution of the cattle trade across the Canada-United States border, how central governments encouraged the integration of the cattle industry within the NAFTA region, and the outcome of this policy objective.

Cross Border Trade in Cattle

Through much of its development, trade was not the lifeblood of the cattle industry in Canada or the United States. During the 20th century cross border trade often was hampered by tariffs, prohibitions, and transportation subsidies on commodities shipped east. Domestic markets were the industry's mainstay in both countries. This was an especially contentious issue with western Canadian cattlemen. They saw their natural market a few miles south rather than satisfying far away customers in Eastern Canada and in the United Kingdom.

Access to the American market has been and is considered "business as usual" by Canadian cattlemen. However, the opportunity to satisfy this market has been unreliable. Open borders contributed to expansion in the Canadian cattle industry and dependence on the U.S. market, while blocked access has led to difficult and painful contractions. The boom-bust cycle created by government interference in live cattle markets occurred three times in the last century, with varying consequences.

Cross border trade first expanded rapidly after Woodrow Wilson repealed a live cattle tariff in 1913. Exports to the United States increased from fewer than 10,000 head in 1912 to more than 450,000 in 1919. In response to high war time prices, the herd in Canada grew from 6 million head in 1913 to more than 10 million head in 1919. In the early 1920s, the United States government re-imposed tariffs and by 1930 had increased them to 30%. Cattlemen in Canada were effectively shut out of the United States market. Packing plants closed, prices spiraled down and cattle feeding activities contracted.

During the early years of the Second World War, demand for live cattle increased, prices escalated, and the Canadian herd more than doubled to 11 million. There also was a partial opening of the United States border. Satisfying the American market again became the objective of cattlemen in Canada. In 1941 however, fears of domestic shortages led the Canadian government to shut off this export market and subsidize cattle feeding activities through producer price guarantees and an Eastern feed freight assistance program. After years of

lobbying the federal government, cattlemen in Western Canada regained access to the United States market in 1948. Despite the change, most live cattle shipped from the region to be fattened and then slaughtered continued to go east rather than south because of grain transportation subsidies.

The inescapable problems created by government intervention in the grains sector and policies to remedy them provided the catalyst for expanding livestock production in Western Canada during the 1980s. The Alberta government developed major new programs to stimulate large scale expansion of cattle production and processing activities. The Alberta government (along with the Canadian and other provincial governments) was keenly interested in obtaining better and more secure market access for products that were being actively promoted and subsidized. The pursuit of these narrow domestic mercantilist objectives coincided with the negotiation of a broader bilateral mercantilist agreement. The Canada – United States Trade Agreement (and later NAFTA) granted preferential trade status to goods produced within the signing countries while penalizing goods from outside, including beef. The integration of the North American cattle industry was encouraged from behind a wall of protection from the world beyond North American shores and boosted further in Canada through taxpayer transfers.

Multilateral Protectionism

Quantitative import restrictions into the United States under the Meat Import Act of 1979 created a significant trade impediment for beef exporters in Canada. Following the implementation of the CUSTA, beef produced in Canada became exempt from import quotas in the United States and beef exporters in the United States gained unhampered access to the Canadian market. Tariffs on live cattle were eliminated. However, import barriers were maintained and enforced by governments in Canada and the United States for beef producers outside the CUSTA region. The Canadian International Trade Tribunal, for example, limited imports of subsidized beef from the European Union and less expensive, unsubsidized beef from Latin America and Oceania. Every five years, the appeal for protection was successfully

renewed. In 1994, this preferential trade system was extended to the government of Mexico under the NAFTA.⁴

An outcome of the Uruguay Round Agreement was to convert nontariff trade barriers, like those used to limit beef imports into the NAFTA region, to bound tariffs. This was done to improve the transparency of existing agricultural trade barriers and to facilitate their future reduction. The current tariff rate quota in Canada for offshore beef is 76,000 tonnes. Imports above that quantity face a 26.5% tariff or require a supplementary import permit. A supplementary import permit allows a processor or wholesaler tariff free access to specific beef products which cannot be sourced from suppliers within the NAFTA region. Non-NAFTA beef imports into the United States above 696,621 tonnes incur a 26.4% tariff. In Mexico, the over-quota tariff for non-NAFTA beef is 25%.

The economic consequences of a tariff policy are well known. The protection shifts production from the most advantageous natural conditions to regions less well suited. It diminishes the productivity of capital and labor and it increases production costs. The tariff benefits cattle and beef producers in the NAFTA region at the expense of the producers of other goods and services and at the expense of all consumers. Shielded from the full competitive pressure of producers outside the NAFTA region, cattle and beef producers in North America focused on satisfying consumers within their trading bloc and in high price regions like Japan and South Korea.

Regional Protectionism

In addition to limiting beef imports into the NAFTA region, protectionist prescriptions were designed and applied to further help the cattle producers in Canada. During the 1980s governments in Canada provided taxpayer transfers to reduce the costs of local feed grains (offsetting other subsidies – like those provided under the Western Grains Transportation Act –

⁴ On November 11, 1992 tariffs on cattle and beef in Mexico increased from zero to 15% on live cattle, 20% on fresh/chilled beef, and 25% on frozen beef. These tariffs were then eliminated for products originating from Canada or the United States when the NAFTA came into force, and remain in place for producers outside the NAFTA region.

which hampered cattle feeding activities in Western Canada), to increase processing capacity and to develop offshore markets for Canadian cattle and beef.⁵

Long frustrated by the effect of subsidized freight rates for prairie grains that increased the on-farm prices of grain, the Alberta government instituted a subsidy to offset the detrimental impacts of the subsidy on the grain freight rates. Beginning September 1, 1985, the Alberta Feedgrain Market Adjustment Program offered subsidies of C\$21/tonne for grain used for livestock feeding. On July 1, 1987, the program was changed and became known as the Alberta Crow Benefit Offset Program. The level of subsidy was reduced – first to C\$13/t for the 1987-88 and 1988-89 crop years, and then to C\$11/t for the 1989-90 crop year. The Alberta government reported spending nearly C\$49 million on this program in 1989-90 (Alberta Agriculture 1989-90).

The Alberta subsidy made cattle production more profitable in Alberta than in the other Prairie Provinces. In response, both the Saskatchewan and Manitoba governments announced that they too would offer a Crow Offset program to livestock producers in their provinces. Beginning September 1, 1989, Saskatchewan producers received C\$13/t for each tonne of feed grain used to feed cattle and hogs in a feedlot. Manitoba restricted its program to slaughter cattle only and paid C\$9/t for feed used (Klein et al 1991).

A second major initiative entailed the expansion of cattle slaughter capacity in Alberta. Following Canada's exemption from the Meat Import Act in the United States, multi-national beef slaughtering enterprises made large investments in Alberta. In May 1989, Cargill opened a C\$55 million state-of-the-art facility in High River. The cost of erecting this plant was subsidized by a C\$4 million grant from Alberta's Processing and Marketing Agreement, a regional development program designed to encourage secondary manufacturing firms and add value to create agricultural products (Byfield and Johnson, 1987).

When plans for the new plant became public, Alberta's existing meat packers denounced the taxpayer transfer required to build it. They observed that Alberta's cattle kill was only

⁵ Mandatory producer check-offs on every animal sold also were used for these purposes.

21,000 cattle per week, yet the province's existing plants had slaughter capacity sufficient to handle 30,000 per week. Competitors feared the subsidy would enable the new plant to operate at a loss long enough to drive all the existing competitors out of the market (Byfield and Johnson, 1987). The counter argument from the provincial government and Alberta feedlot operators was that some 200,000 finished cattle were being exported from Alberta each week at that time, and a new kill plant would add value to more cattle in Alberta. In addition, the creation of a big new market for cattle and low prices for grain would provide an incentive to increase the production of finished slaughter cattle in southern Alberta feedlots.

To help diversify export destinations for beef, a third major initiative involved developing a beef export promotion agency. The market development division of Alberta Agriculture worked closely with Alberta meat processors, packers, exporters and the Alberta Cattle Commission (representing the producers) to develop an industry organization to address the market opportunities presented by the liberalization of the Japanese beef market (Alberta Agriculture, 1988-89). The Canadian Beef Export Federation (CBEF) opened its first trade office in the Canadian Embassy in Tokyo in November 1989. The Alberta Government financed 80% of the CBEF's C\$800,000 initial budget (Edmonton Journal, 1989). The selection of Tokyo for its first office was a direct result of the liberalization of the Japanese beef market through the Beef Market Access Agreement between Japan, the United States and Australia. The Alberta government and the Alberta Cattleman's Association forecasted a possible market for Canadian beef of C\$300 million per year (Edmonton Journal, 1989) (a little optimistic since sales in this market peaked at C\$171 million in 2001 and declined to only C\$96 million in 2002 – ahead of the BSE problem in Canada).

Cattle production throughout Canada also was supported during this period through the National Tripartite Stabilization Program. This program encouraged production by guaranteeing prices and production margins at 90% of a 10 year moving average. In 1988, C\$7.7 million of producer premiums triggered payouts to slaughter cattle producers in Alberta of over C\$62 million. In 1989, the average payout to Alberta producers of slaughter cattle was over C\$35,000 (Alberta Agriculture, 1988-90). This program was terminated in 1995.

Changes in the Cattle Market in the United States

Live cattle imports to the United States from Canada and Mexico increased from about 600,000 in 1980 to 2.5 million in 2002. The growth in live cattle imports was due to several factors. The decline in beef demand, increase in production per cow, the cattle cycle, and the related issues of production costs combined to create an advantage in feeding and slaughtering cattle and relatively less advantage in producing calves. These underlying economic conditions led to increased imports of feeder and fed cattle from Canada and feeder cattle from Mexico and increased beef exports.

These changes in the cattle market in the United States were not to the liking of some industry stakeholders. Groups unhappy over increased cattle imports from Canada had been active for many years and had grown in strength before 2003. Finding the May 2003 BSE positive cow caused the border closure and gave these groups the ability to act to keep it closed. BSE simply was the event that allowed these forces to get a foothold.

Policy Outcomes

Policies in the 1980s and early 1990s were directed at increasing cattle production and processing activities within the NAFTA region. *Prima facie* evidence suggests that these objectives were realized.

In Canada, beef exports increased by almost 500% between 1989 and 2001.⁶ Over the same time period, cattle inventory in Canada increased from 11 million head to almost 14 million.⁷ The beef industry became an important part of the agri-food economy and the second largest (after wheat) earner of foreign exchange in the agricultural sector. In 2002, farm cash

⁶ <http://www.agr.gc.ca/misb/aisd/redmeat/01beefex.pdf>

⁷ <http://www.agr.gc.ca/misb/aisd/redmeat/04catinv.pdf>

receipts from cattle and calves totaled nearly C\$8 billion, 21% of the total C\$36 billion in farm cash receipts (Statistics Canada).

In the United States, beef exports doubled from 1 billion lbs in 1989 to 2.3 billion lbs in 2001 (USDA, Red Meat Yearbook). Over the same period beef imports increased from 2.3 billion lbs to 3.2 billion lbs (USDA, Red Meat Yearbook). While cross border beef trade had increased, the United States remained a major importer of beef. In contrast, the response to expansionary policies in Canada meant that exports became very important. Net exports of cattle, which had been small and occasionally negative before 1987, grew to about 1.5 million head by 2002. Net exports of dressed beef, again of a minor magnitude until 1995, grew to about 350,000 tonnes by 2002. By 2002, beef export earnings of about C\$4 billion from exports against only C\$1 billion in beef imports (Canfax, 2003).

As a large and growing portion of beef production in Canada was exported, producers became increasingly dependent on access to foreign markets. Though beef can be frozen and stored for some time before serious deterioration in quality takes place, producers can ill afford lengthy embargoes on exports. Worse, with increased integration of the North American beef market, slaughter capacity in Canada became inadequate to handle all the animals produced in that country. This was particularly critical for older breeding stock which are regularly culled as new replacements enter the herd. A large proportion of culls had been exported from Canada and slaughtered at plants located in the United States. They had no place to go when the American border was closed to live cattle imports and the major slaughter plants in Canada became overwhelmed with deliveries of more profitable high grade, younger animals.

A long history of producing mostly for the domestic market led to institutions and “ways of thinking” that left producers ill prepared for major exposure to the severe demands of the international market place. This was not so much a problem as long as producers responded to market signals related (mostly) to the demands of domestic consumers. However, meddling in the industry by governments that began in the mid-1980s led producers to a situation where they became extremely vulnerable to any closure of export markets.

Efforts by governments to negotiate international trade accords that would prevent indiscriminate border closures ultimately proved fruitless in the face of the BSE discovery in Canada.⁸ In fact, the way in which the cattle market in North America was integrated has come back to haunt primary producers and policy makers. Consequences to primary producers were negligible when the central governments in the NAFTA region prohibited consumers from accessing meat produced in non-NAFTA countries when there was an incident of BSE in these regions. When BSE appeared in South America and Europe the central governments prohibited cattle and beef imports without fear of reprisal. The central governments had the legal authority to do this under Sanitary and Phyto-sanitary Agreement in the Uruguay Round. However, when BSE was discovered in Canada, the weakness of the protectionist policies were laid bare while cattle producers in Canada (and packers in the Pacific Northwest states) had once again become dependent upon unimpeded access to the United States market.

GOVERNMENT AND PRODUCER RESPONSES IN CANADA

The response to the May 2003 discovery of BSE in a single cow was swift, decisive and aggressive. Cattle prices at one Alberta auction dropped from C\$1.20 a pound to 32 cents before most cattle were taken home again. Slaughter plants in Canada stopped accepting new cattle. The Canadian government stopped all beef shipments not already in transit. Some live animals already in the United States were returned to Canada. Packing plants in Canada reduced slaughtering activities and laid off employees. Truckers who specialize in hauling live cattle saw the demand for their service evaporate as did the suppliers of inputs to feedlots and cattle ranchers. The incident was a rude wake-up call to all industry stakeholders.

Compulsory Compassion

Figure 1 provides a timeline of milestone events of BSE crisis in North America. It identifies the various disaster assistance programs that were developed in full consultation with industry representatives and implemented by governments in Canada. In addition to the

⁸ Article 712.2 of the NAFTA enables a signatory to, in protecting human, animal or plant life or health, establish its appropriate levels of protection in accordance with Article 715.

programs developed jointly with the Federal and Provincial governments, each provincial government implemented their own assistance programs. Because most live cattle are located in Alberta, the description of the programs which follows focuses on programs designed and delivered in that province.

In Canada, government assistance programs were aimed at short term solutions as policy makers and industry representatives believed the live cattle import ban in the United States would be lifted within weeks. In retrospect, this was an optimistic assumption given that seven years is the usual period before a government re-opens its border after an exporting region reports a case of BSE.⁹

Compounding the uncertainty about how to assist cattle producers, existing government assistance programs in Canada were undergoing a major change. The Federal-Provincial disaster based safety net compensation program, called the Farm Income Disaster Program, expired on March 31, 2003. In the spring of 2003, policy makers were negotiating its replacement, the Agricultural Policy Framework. By May 20, 2003, Federal and Provincial governments had committed to the Agricultural Policy Framework, but they had not worked out the details of the farm safety net program. Given the expectations of a near term border opening and without the specifics of a farm safety net program in place, assistance programs have been implemented quickly and repeatedly.

Short Term Relief Grants Within weeks of the May 20, 2003 case, packing plant workers in Alberta who had been laid off qualified for short-term training and a relief grant while they are in the two-week waiting period for Employment Insurance benefits. They were offered to two weeks of workplace safety or other job-related training, and received a relief grant of up to C\$330 a week for participating, without affecting their employment insurance benefits. The provincial government estimated the cost of this program to be C\$1 million.

Federal-Provincial BSE Recovery Program On June 18, 2003 the federal government announced a major assistance scheme for the beef industry to offset BSE-devastated prices. The

⁹ Once beef shipments resumed, many in Canada believed that trade in live cattle would recommence also.

federal government initially committed C\$190 million, to which it expected provincial governments to add another C\$126 million. The objective of the Federal-Provincial BSE Recovery Program was to make up the difference between actual prices and a trigger price set by Ottawa. Payments were made on a maximum of 900,000 head of cattle or until exports resumed to the United States, whichever came first. The scheme also set aside C\$30 million to offset declines in prices of meat in storage as of May 20. The program ran until August 31, 2003.

The Federal-Provincial BSE Recovery Program was intended to stabilize the market and get urgent help to producers facing a sharp reduction in demand and prices after the ban on exports to the United States. Despite its laudable objective, aid programs gave producers the incentive to sell cattle as slaughter was required to trigger payments and domestic cattle prices plummeted further. As large owners of cattle themselves, packers in Alberta received C\$45-million of the total assistance, which was doled out not on the basis of financial need but according to the number of cattle owned. At the same time, retailers were selling the beef at close to normal prices thanks to stable consumer demand and a lack of processing capacity.

On July 25, 2003 cattle producers in Alberta were eligible to receive C\$79 million more in taxpayer transfers. This funding was in addition to the federal-provincial compensation program announced in June, and later expanded August 7 to include additional livestock industries, such as bison, elk, deer and sheep. Specifics of the program included a C\$65 million Fed Cattle Competitive Bid Program and C\$4 million Stranded Beef Export Container Initiative, and a loan guarantee program.

Alberta Fed Cattle Competitive Bid Program This program was designed to eliminate some of the backlog on Alberta feedlots by allowing buyers to purchase fed cattle, which they were required to hold for a minimum of eight weeks. Initial sellers were eligible for payments on the same basis as cattle sold for slaughter under the federal-provincial compensation plan. These cattle were not eligible for any further program payments.

Stranded Export Beef Container Initiative The Stranded Export Beef Container Initiative paid for the storage and demurrage costs of Canadian beef that has been turned away or

held in warehouses in foreign markets. It was hoped this program would maintain long-term trade relationships with foreign buyers and allow for easier re-entry into those markets when the borders re-opened.

Loan Guarantees To address cash flow issues facing Alberta producers, terms and conditions were adjusted under the Alberta Farm Development Loan Guarantee Program and the Alberta Disaster Assistance Loan Program. Loan limits were increased to C\$1 million for all primary producers. The taxpayer transfer of this program was estimated at C\$10 million per year.

Alberta Fed Cattle Competitive Market Adjustment Program On August 25, the Alberta Fed Cattle Competitive Market Adjustment Program was implemented for the purpose of increasing live cattle sales and prices in until the United States border opened. Unlike the Alberta Fed Cattle Competitive Bid Program announced on June 25, purchasers were not required to delay slaughter or transportation of the eligible animals. All cattle were required to enter the “competitive” marketplace and were then branded with an “X” to avoid double-dipping. This program initially was intended to continue until the United States border opened to live cattle, but was terminated on September 13.

Alberta BSE Slaughter Market Adjustment Program Until September 23, 2003 producers of other ruminants like bison, veal, sheep, goat, elk and deer producers had not received any compensation. A program similar to the Federal-Provincial BSE Recovery program was implemented for producers of these species. The Alberta BSE Slaughter Market Adjustment Program for Other Ruminants was forecast to cost the taxpayer C\$3 million. Producers who sold animals for slaughter were eligible for compensation on a sliding scale equal to the difference between a base price and an average weekly market price.

Alberta Steer and Heifer Market Transition Program The fourth program available only to cattlemen in Alberta was the Alberta Steer and Heifer Market Transition Program. Its purpose was to provide additional support for animals on feed at May 20, 2003 and still on feed as at

September 12, 2003. The projected taxpayer transfer associated with this program was C\$55 million.

Beef Product and Market Development Program The Beef Product and Market Development Program was announced on October 24, 2003. The purpose of this program was to find new uses for beef in processed foods, especially beef from cattle over 30 months old. The original budget for this program was C\$4 million. As food processors submitted applications and project proposals, forecasted transfers doubled to C\$8 million.

Food Processor Assistance Initiative The objective of this program was to provide financial assistance to companies who normally export products into markets that were closed due to BSE. Payments were designed to help companies resume business in export markets once they are opened, or, to divert products to the domestic market. Announced on October 24, 2003, taxpayer transfers associated with this program were expected to total C\$400,000.

Alberta Mature Market Animal Transition Program This program was one of two targeted at resolving the problem of increasing inventories of cull animals. A federal program required that producers slaughter cull animals to receive transfers. Officials at Alberta Agriculture and Rural Development believed this strategy was flawed as the market for the resulting beef would not maximize returns to producers. Instead, the Mature Market Animal Transition Program offered producers in Alberta two alternatives to resolve the cull animal problem. Producers could choose to receive a payment on a per head basis or they could market eligible cull animals and receive a deficiency payment. The objectives of the provincial program were to: [1] redevelop market price discovery for culls and other mature ruminants after a partial border opening, [2] to provide an incentive to minimize on farm killing and disposal, and [3] to support transition to a restructured, domestic focused cull animal market. The budget transfer with this program was C\$60 million.

Winter Feed Program Taxpayer transfers under this program announced on November 24, 2003 were directed to producers of deer, elk, llamas and alpacas on a per head basis. The

purpose of the program was to provide taxpayer transfer of C\$4 million to help overcome marketing difficulties.

Table 1 shows that between June 25, 2003 and June 4, 2004 the BSE compensation programs for livestock enterprises in Alberta covered 972,721 animals and transfers were made to 22,312 enterprises on a per animal basis. The total sum transferred to livestock producers was C\$402,882,627.28 (Alberta Agriculture 2004) and was the subject of a major audit (Alberta Attorney General 2004).

Outside of Alberta, the federal and other provincial governments transferred hundreds of millions of dollars to help cattle producers deal with the fallout of BSE. The federal and provincial governments provided C\$520 million through the BSE Recovery Program. The federal government provided an additional C\$120 million to help producers deal with a growing surplus of older cull animals and it announced a C\$488 million strategy to reposition the livestock industry on September 10, 2004.

Federal-Provincial Livestock Industry Repositioning Initiative This joint federal-provincial initiative was aimed at continuing efforts to reopen the United States border, taking steps to increasing ruminant slaughter in Canada (C\$66 million), introducing measures to sustain the cattle industry until capacity comes online (C\$385 million) and expanding access to export markets for both livestock and beef products (\$37 million). The Alberta government's 40-percent share of two new national cattle programs in that province and funds to help cover BSE surveillance costs was estimated at C\$230 million.

In Alberta the initiative was announced as a six point plan: [1] establishing a loan loss reserve to increase lenders' willingness to support projects to increase ruminant slaughter capacity, [2] to find new uses for beef in processed foods, especially beef from cattle over 30 months old, [3] implementing set-aside programs for fed and feeder cattle in which producers were eligible for transfers on a per head basis if they held back market ready livestock, [4] BSE surveillance subsidies for producers of \$150 per eligible sample (abattoirs received \$75 per head to compensate for their additional costs), [5] research initiatives and [6] funding for the new

income safety net program (Canadian Agricultural Income Stabilization Program) that provides transfers to producers who have experienced a loss of income as a result of BSE or other factors.

Additional Recent Programs On March 7, 2005 an additional C\$37 million transfer was announced for BSE recovery initiatives in Alberta. C\$30 million was directed toward a Beef Market Development and Retention Fund to help find more export markets and increase sales in existing ones. The remaining C\$7 million will be used to create commercial uses for discarded specified risk materials.

On April 7, 2005, C\$2.1 million was made available to assist sheep, goat, deer, elk, reindeer, and bison producers. A total of \$1.1 million is to be distributed through the Diversified Livestock Fund of Alberta, to subsidize marketing activities in domestic and international markets. The other \$1 million will be a grant used by elk producers to expand local and international markets for both meat and velvet antler.

Policy Harmonization

Officials from Canada, Mexico and the United States met on March 29, 2005 in Mexico City to harmonize import standard within North America for BSE. The harmonized North American standard is designed to protect of human and animal health and food safety, while also establishing a framework for safe international trade opportunities for cattle and beef products from Canada, Mexico and the United States. Implementation is subject to the completion of the respective regulatory processes in each of the three countries.

The government of Mexico has indicated that they will amend their import permits to allow for the importation of a broader range of commodities from Canada. These measures will be consistent with those that were proposed to be implemented in the United States on March 7, 2005. The U.S. has agreed to consider such action as consistent with its requirements for continued access by Mexico to its market.

Chapter 11 NAFTA Challenge

On August 12, 2004, a group of about 100 cattlemen from Canada notified the United States government about their intention to launch NAFTA claim. Under the Chapter 11 investment challenge, Canadian producers must prove the American action is harming a Canadian's investment in the United States. At issue is whether United States government is providing better treatment to its own investors than to Canadians because it allows producers in the United States to keep Canadian-origin cattle while stopping other animals of the same age at the border. In addition, the United States government is allowing complete access to all rendering plants for its investors, while forbidding access to the same plants for Canadian investors. More claims will follow, to be consolidated into a single case for hearing in 2005 before an impartial and independent tribunal made up of three international arbitrators.

THE EFFECT ON THE HOG MARKET

Along with the cattle industry, hog industries in Canada, the United States and Mexico have become more integrated. As the hog industry in the United States consolidated and vertically integrated over the last 15 years, market ties with buyers and sellers in Canada became more important. Management and production technology like separate farrowing and feeding production, all in-all out production, and contract production created the opportunity to exploit economic advantages. Weaner pigs can be trucked long distances. Fewer diseases in Canada allowed the growth of farrowing and weaning operations in Canada to truck small feeder pigs to the United States to exploit feed advantages. These changes have led to increased live hog exports to the United States, much to the concern of many American producers.

The prohibition of live cattle trade in 2003 had complex effect on the hog market. Beef prices increased throughout the supply chain in the United States because of the reduced availability of live cattle. Imports of cattle and beef from Canada account for about five percent of supply in the United States. With strong demand, a five percent drop in supply had a big impact on prices. Live cattle prices in the United States averaged over C\$80/cwt in August, an all-time record. Wholesale and retail beef prices also rose. While there was some downward

effect on prices when Canadian boxed beef shipments resumed in September 2003, it was minimal.

Higher beef prices raised demand for pork. This increased demand was met largely by an increase in pork and hog exports from Canada. Shipments of live hogs almost doubled and the rate of hog processing increased to near-record levels. Exports from Canada increased to more than 40,000 head per week, compared to a normal 20,000 to 25,000. Hog exports from Canada also were encouraged by low domestic beef prices. Although beef price declines at wholesale and retail were small, it still had the effect of reducing pork prices.

In 2003, live-hog exports from Canada to the United States in 2003 reached a record 7.3 million head, up a third from the previous year. About 2.1 million were mature animals slaughter pigs, sows and boars and the rest were weaner and feeder pigs. Alleging that hog imports from Canada were both subsidized and sold below fair market value, on March 5, 2004 the United States National Pork Producers Council filed separate petitions for countervailing and anti-dumping duties were with the U.S. Department of Commerce and the International Trade Commission.

A preliminary finding of dumping by the Department of Commerce resulted in the application of a 14.06% countervailing duty beginning October 20 on almost all Canadian hog shipments. On March 7, 2005 the U.S. Commerce Department issued its final ruling in the hog duty case. The decision confirmed that there is no reason for a countervailing duty because there are no significant Canadian government subsidies to pork producers. But it affirmed the anti-dumping duty on grounds that Canadian hogs were exported to the U.S. at less than the cost of production. The rate of countervailing duty was reduced because of new information, but only to an average of 10.63% from 14.06% originally imposed in October.

The matter was settled on April 6, 2005 when the United States International Trade Commission ruled that Canadian live slaughter, weaner and feeder pig exports to the U.S. do not cause or threaten injury to American producers. Duties of roughly 14% imposed in October then reduced in March would be terminated on April 18 and the duties collected would be returned.

SOME QUANTITATIVE IMPACTS

It is clear from the above discussion the border closure to live cattle has created significant negative impacts on the Canadian cattle industry. The federal and provincial governments in Canada have undertaken a number of policies to mitigate the impacts of the trade disruptions. To quantify the impacts of the border closure and the likely impact of mitigation mechanisms, a model of the Canadian industry was developed and calibrated for the year 2004 using demand and supply elasticities reported in the literature. The following section briefly describes the structure of the model and its predictions. A full description of the model and detailed results are provided in the appendix 1.

The model assumes there are two types of cattle in the market: cattle less than 30 months of age (calves, steers and heifers) and cattle more than 30 months of age (cull animals). It considers that the slaughtering capacities for cattle older than 30 months of age are limited in Canada. It accommodates the fact that before the BSE crisis, the United States border was open to all types of beef and live cattle produced in Canada and at present the border is open only for beef produced from cattle less than 30 months of age. Consequently, the model predicts that the impacts on the cull cattle market due to BSE crisis are higher than those in the other cattle market.

Several policy experiments were performed to quantify the changes on prices and supply levels of cattle. They include the following; (i) opening of border for live cattle and beef markets (i.e., no BSE crisis), (ii) an increase in Canadian slaughter capacity by 10 percent (Alberta government has already made an investment so as to increase the slaughtering capacity by 10%), (iii) a 20 percent herd reduction (as proposed by some policy makers), and (iv) a five percent reduction in slaughter efficiency along with a five percent increase in feed prices to account for the loss of by-products used as feed ingredients (assuming that the feed regulation would lead to a decrease in slaughtering efficiency and an increase in feed prices by five percent).

The results indicate that if the border were open, the prices would have been 20 percent higher, and hence cattle supply levels would have been around 12 percent higher. By increasing slaughter capacities by 10%, cattle prices can only be increased up to 15% and 7% of animals below and above 30 months of age respectively. By destroying 20% of the cattle herd, prices can be increased only up to 11% and 6% of animals below and above 30 months of age respectively, however, it will be associated with a drop in cattle supply levels. When the feed regulation is introduced, cattle prices will decline due to reductions in slaughtering efficiency (which offset the increase in feed price), and it will be associated with a drop in cattle supply.

The above results, which are more suggestive than conclusive, indicate that an increase in slaughter capacity, which is happening at this time, would have a greater impact on cattle prices than would a herd reduction program. Further simulations need to be conducted with different elasticities, policy packages and policy levels to confirm the results.

LESSONS LEARNED AND A LOOK FORWARD

This paper described the history of BSE in North America and its effects on producers of cattle and hogs and on taxpayers. While cattlemen in the United States and Mexico have enjoyed higher prices than would otherwise have been the case, Canadian cattle producers have faced extreme financial hardships as a result of the loss of export markets in spite of abundant and costly relief programs.

Industry stakeholders in North America had several years to learn from the disastrous experiences with BSE in the United Kingdom and other European countries. However, few changes were made to production systems in North America that might have forestalled or even prevented some of the financial chaos that has occurred.

The discovery of BSE in North America demonstrates the need for better methods to deal with border closures. Although the Office International des Epizooties has a protocol to close borders immediately on discovery of BSE or other serious diseases, there is no similar science-based mechanism in the NAFTA or the WTO to re-open the borders when there is no significant

chance of further incidence of the disease. This shortcoming has been devastating for suppliers of a perishable product that are highly dependent on export markets. Cattlemen in the NAFTA region have learned a painful lesson about existing institutions and trade rules and the need to be ever cognizant and prepared for the seeming capriciousness of their intended foreign customers and their central governments.

It would be a serious setback to growth and productivity in the NAFTA region if the freedom of individuals to exchange live animals and beef products continues to be restricted by government. Consumers in both countries have come to rely on safe and nutritious beef made available at reasonable cost. The best way to ensure long-term competitiveness is through minimal government interference in market processes throughout North America. Attempts to manipulate the outcomes of market processes have led to the current difficult situation that central authorities could neither specifically predict nor effectively prevent. The response of governments in Canada to try and make the initial NAFTA scheme work has taken the form of ever wider, more numerous and more obtrusive interventions which are in further conflict with the workings of market mechanisms. The overall outcome of government intervention in the live cattle market in North America is a situation that is even more unsatisfactory (at least for cattlemen in Canada) than the preceding state it was designed to remedy. Unfortunately, there is no evidence that governments are abandoning their counter productive quest to influence this market.

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APPENDIX 1: MODEL

Introduction

Canadian cattle market is characterized by two types of cattle, young (less than 30 months old cattle such as calves, steers and heifers, i.e., fed cattle) and old (more than 30 months old cattle such as cull bulls and cows that were used in breeding stocks and cull dairy cows). Before the BSE crisis both young and old cattle raised in Canada were slaughtered in both US and Canadian processing plants and there were significant exports of live animals from Canada to the US. After the BSE crisis, the US border was closed for live cattle, both young and old. The border is expected to be open soon for the young cattle. After the BSE crisis, initially, US border was closed for both young and old beef, and later it was open for young beef. The marketing channels of cattle and beef in Canada are presented in Figure A1.

Conceptual framework

The Canadian cattle and beef market structure can be depicted in a multi-market partial equilibrium model with four markets; two vertically related (cattle and beef) and two horizontally related (young and old) assuming Canada as a small exporting economy facing world market prices of cattle and beef. This assumption implies that changes in quantities produced and consumed in the Canadian market are rather small compared to quantities produced and consumed in the rest of the world (including the U.S. and Mexico) and hence it implicitly considers that the changes in the Canadian market do not influence the equilibrium in the beef and cattle markets in the neighboring countries.

Figure A2 depicts the equilibrium in the four markets before and after the BSE crisis. Equilibrium in the cattle markets (young cattle and old cattle) and beef markets (young beef and old beef) under free trade, i.e., before the BSE crisis, were determined by the world market prices of cattle and beef respectively. Panel A shows the old market and panel B shows the young market. The supply, demand and price in the young cattle market are given by S_{yc}^b , D_{yc}^b , and P_{yc}^w respectively and those in the old cattle market are given by S_{oc}^b , D_{oc}^b , and P_{oc}^w

respectively before the BSE crisis. The supply, demand and price in the young beef market are given by S_{yb}^b , D_{yb}^b , and P_{yb}^w respectively and those in the old beef market are given by S_{ob}^b , D_{ob}^b , and P_{ob}^w respectively before the BSE crisis. The demand for cattle is kinked due to limited slaughtering capacity and the supply of cattle is kinked due to biological constraints (limited number of animals in the stocks).

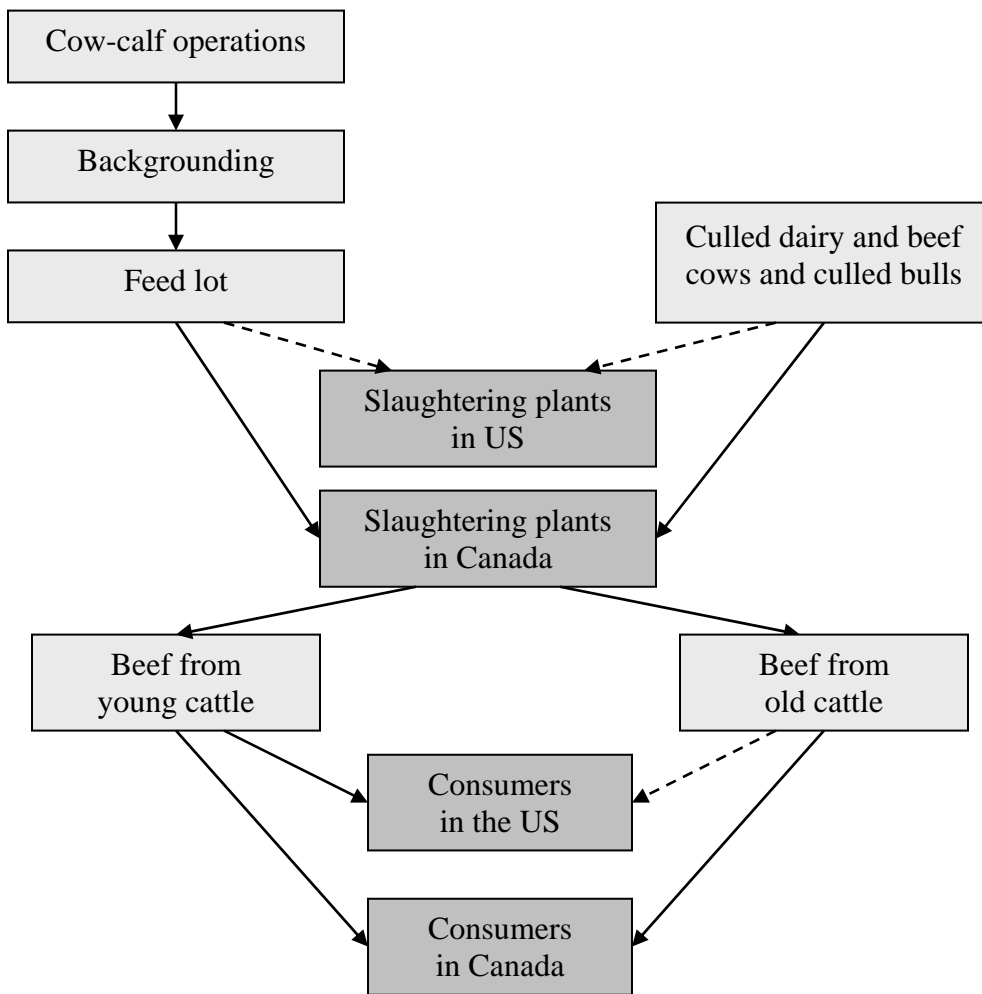


Figure A1: Marketing channel of cattle and beef in Canada

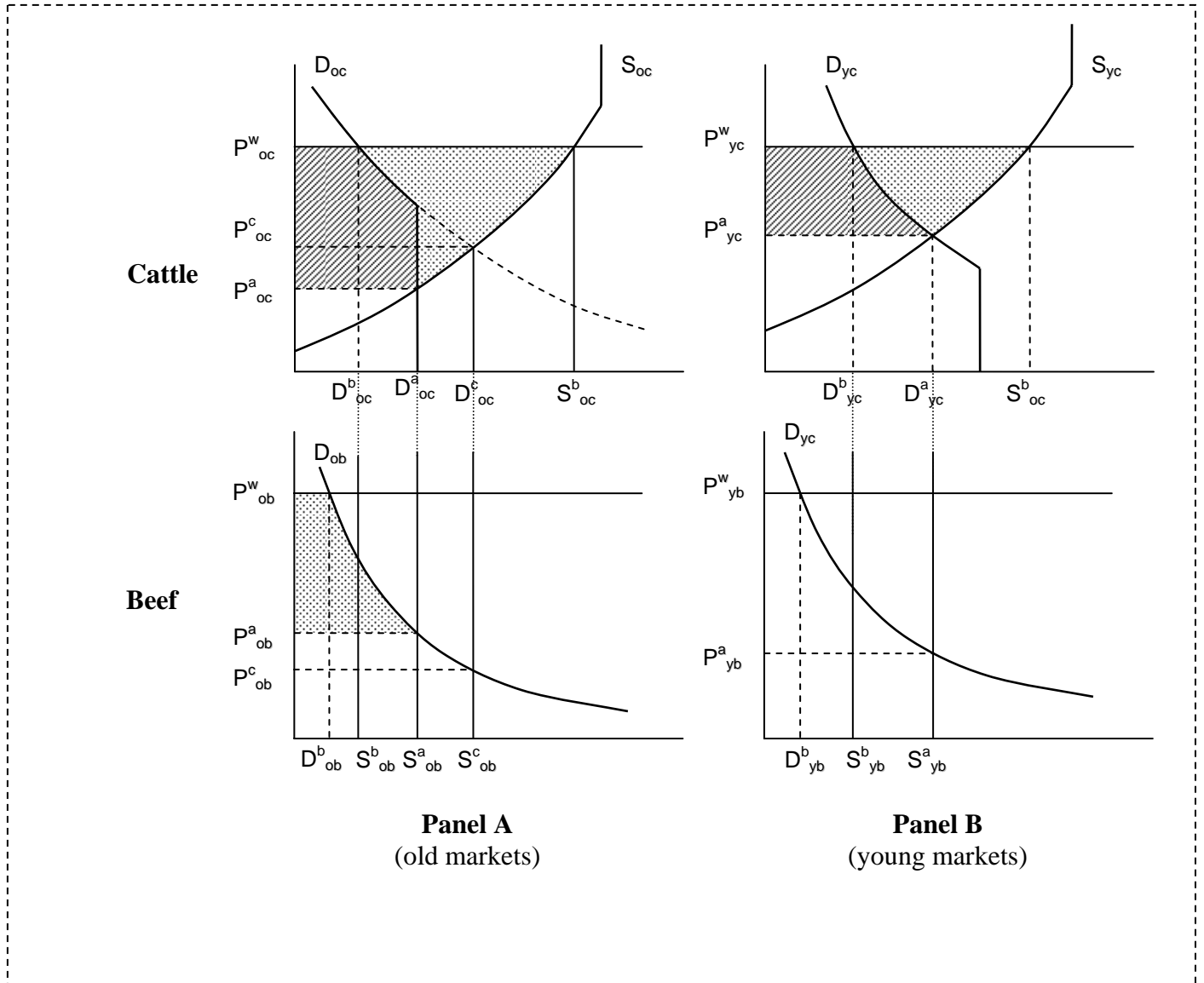


Figure A2: Equilibrium in cattle and beef markets before and after BSE crisis¹⁰

¹⁰ Notations:

Supply and demand curves:

S_{oc} = Supply curve of old cattle; D_{oc} = Demand curve for old cattle; S_{yc} = Supply curve of young cattle; D_{yc} = Demand curve for young cattle; S_{ob} = Supply curve of old beef; D_{ob} = Demand curve for old beef; S_{yb} = Supply curve of young beef; D_{yb} = Demand curve for young beef.

Prices and quantities under free trade

P^w_{oc} = World market price of old cattle; S^b_{oc} = Supply of old cattle; D^b_{oc} = Demand for old cattle; P^w_{yc} = World market price of young cattle; S^b_{yc} = Supply of young cattle; D^b_{yc} = Demand for young cattle

Prices and quantities in the period soon after BSE crisis

P^a_{oc} = Price of old cattle; S^a_{oc} = Supply of old cattle; D^a_{oc} = Demand for old cattle; P^a_{yc} = Price young cattle; S^a_{yc} = Supply of young cattle; D^a_{yc} = Demand for young cattle

Soon after BSE was identified the border was closed for all types of cattle and beef. As a result, prices were internally determined and the interactions between the demand and supply curves determined the levels of supply and demand and hence the prices. Note that, demand curves for both old cattle and young cattle are kinked due to limited slaughtering capacities in the country. It is assumed that slaughtering capacity in the old cattle market is binding; where as the slaughtering capacity is just above the market clearing quantity in the young cattle market. Consequently, the biggest change due to BSE crisis is observed in the old cattle and old beef markets. The interaction between demand for old cattle, which is kinked at D_{oc}^a and the supply of old cattle, S_{oc} , determines the price of old cattle and it is P_{oc}^a . When D_{oc}^a is processed in the market, S_{ob}^a amount of beef can be produced. The price of old beef is determined when quantity supplied is equal to quantity demanded after the BSE crisis and it is P_{ob}^a .

In the young cattle market, it was assumed that the slaughtering capacity is not binding. Hence, after the BSE crisis, price of young cattle is determined at P_{yc}^a (note that it is higher than P_{oc}^a) and the market will clear at D_{yc}^a . The resulting beef quantity will be S_{yb}^a , and the beef price will be determined at P_{yb}^a . The prices of young beef and old beef after the BSE crisis may or may not be different and the elasticity values of beef demands with respect to price would determine the prices¹¹.

Later, the ban on exports of young beef was removed. As a result, price of young beef increased up to the world market price with a decrease in quantity local demand and free trade equilibrium was realized in the young beef market. It is expected that the ban on exports of young cattle will be removed in the near future. As a result, free trade equilibrium would be realized in the young cattle market as well.

As indicated earlier, as a policy response to the crisis, the Canadian government has subsidized the investment in increasing slaughtering capacities. The impacts of such a policy can also be discussed using Figure 2. Suppose that slaughtering capacity in the old cattle market

¹¹ Note that in the graphical representation prices in the old market and young market were considered to be the same before the BSE crisis. It does not imply that the nominal prices are the same; rather it implies that price indices were the same (before the BSE crisis the prices of old cattle and young cattle moved together). This representation allows seeing the impacts after the BSE crisis more clearly.

is increased to D_{oc}^c . This can increase the price of old cattle to P_{oc}^c , increase the supply of beef to S_{ob}^c and lower the price of old beef to P_{ob}^c . This type of policy has the capacity to mitigate the losses incurred by old cattle producers. The net benefit of this policy could be assessed by comparing the size of the investment and expected returns over a specified period of time.

What will be the outcome of destroying a part of beef cow herd? Let's consider that a stock of young cattle was destroyed. Such an action will shift the supply curve of young cattle to the left and the interaction between new supply curve and original demand curve will determine the price (not shown in figure 2). As a result, price of young cattle will be increased and quantity of young cattle slaughtered will be decreased. If the market for young beef is closed these changes in the cattle market will lead to a decrease in supply of beef and to increase price of beef. If the market is open, the world market price will determine the quantity demanded and the difference between supply and demand will be exported. What if a stock of old cattle is destroyed? It too will shift the supply curve the left, however the impacts depend upon the point of intersection between supply and demand. If the new supply curve intersects with the perfectly inelastic portion of the demand curve, there will be no change in the equilibrium quantity, however, the price of old cattle will rise. If the new supply curve intersects with the downward sloping portion of the demand curve, there will be a reduction in the equilibrium quantity with a rise in price of cattle. It will result in a lower beef supply and hence a higher price for beef.

Feed regulation to remove risk material from the carcasses will have an effect on the demand for cattle¹². Though very small, such a regulation could reduce the efficiency in slaughtering and it will shift the demand curves of cattle to the left. It will lead to further reductions in cattle prices, decrease in quantities demanded and supplied in the cattle market and decreases in beef quantities supplied. If the beef market is open, then world market prices determine the quantity demanded. If the beef market is closed, reduction in beef supply will lead to increase in beef prices. Furthermore, feed regulation may increase prices of feed as SRM is not allowed to be included in feed. An increase in price of feed could shift the supply curve of cattle to the left and it will increase the price of cattle.

¹² Feed regulation involves (i) removal and separation of specified risk materials (SRM) in beef slaughter plants, (ii) separation, dedicated transportation and provision of rendering facilities for SRMs and for the other inedible beef byproducts, and (iii) distinction of rendered SRMs.

The welfare implications of BSE crisis and implications of above proposed policies can be discussed under a number of headings, i.e., the impacts on producers, processors and consumers on the young and old markets in Canada¹³. The sum of cattle producers' surplus, cattle processors surplus and beef consumers surplus will determine the total social surplus. In both young and old markets, BSE crisis has depressed cattle and beef prices, decreased cattle supply, increased demand for cattle and supply of beef, and increased demand for beef. As a result, cattle producers incurred losses and cattle processors and beef consumers gained. The biggest loss is incurred by the old cattle producers. The loss in producer surplus of old and young cattle producers are shown by the light shaded areas in the top diagrams in Panel A and B respectively. The gain in processor surpluses are given by the dark shaded areas in the top diagrams in Panel A and B respectively. It is clear that loss in producer surplus cannot be compensated by the gains in processor surpluses and there are net losses in the cattle markets as shown by the remaining areas.

The gainers of the BSE crisis are the final consumers of beef. The gains in consumer surpluses of old beef consumers are shown by the light shaded areas in the bottom diagrams in Panel A (there is no change in the consumer surplus in the young cattle market as consumers face world market prices before and after BSE crisis). The drop in prices of beef will reduce the demand for beef substitutes and final consumers of pork and chicken will be adversely affected due to BSE crisis.

An increase in slaughtering capacity can reduce the losses incurred by cattle producers. Discarding a stock of cattle will be a net loss to the cattle producers at least in the initial period despite its positive impact on cattle prices. A feed ban will be an extra burden on cattle producers.

¹³ Since Canada is assumed to be a small open economy, these welfare changes do not influence the equilibrium in cattle and beef markets in the U.S. or Mexico.

Algebraic Representation

- (1) $S_{yc} = a_{yc} + b_{yc}P_{yc}$ Supply function of young cattle¹⁴
- (2) $D_{yc} = c_{yc} + d_{yc}P_{yc} + e_{yc}P_{yb}$ Demand for young cattle
- (3) $S_{yb} = cf_{yc} * D_{yc}$ Supply of young beef
- (4) $D_{yb} = f_{yb} + g_{yb}P_{yb} + h_{yb}P_{ob}$ Demand for young beef
- (5) $S_{oc} = a_{oc} + b_{oc}P_{oc}$ Supply function of old cattle
- (6) $D_{oc} = \bar{D}_{oc}$ Demand for old cattle
- (7) $S_{ob} = cf_{oc} * D_{oc}$ Supply of old beef
- (8) $D_{ob} = f_{ob} + g_{ob}P_{yb} + h_{ob}P_{ob}$ Demand for old beef

Market clearing conditions:

Before BSE crisis:

$$(9) P_{yc} = P_{yc}^w; (10) P_{oc} = P_{oc}^w; (11) P_{yb} = P_{yb}^w; (12) P_{ob} = P_{ob}^w$$

Soon after BSE crisis:

$$(9') S_{yc} = D_{yc}; (10') S_{oc} = D_{oc}; (11') S_{yb} = D_{yb}; (12) S_{ob} = D_{ob}$$

At present:

$$(9') S_{yc} = D_{yc}; (10') S_{oc} = D_{oc}; (11) P_{yb} = P_{yb}^w; (12) S_{ob} = D_{ob}$$

Endogenous variables:

$S_{yc}, S_{oc}, D_{yc}, D_{oc}, P_{yc}, P_{oc}, S_{yb}, S_{ob}, D_{yb}, D_{ob}, P_{yb}, P_{ob}$,

Exogenous variables:

$$\bar{D}_{yb}, \bar{D}_{ob}, P_{yc}^w, P_{oc}^w, P_{yb}^w, P_{ob}^w, cf_{yc}, cf_{oc}$$

¹⁴ A cross price term can be incorporated to this equation to find out the change in young cattle supply due to changes in lagged price of old cattle. This way, biological constraints can be included in the model. In this paper, the model is calibrated to 2004 data set and hence, the price of old cattle in 2001/2002 should be included as the appropriate biological lag would be around 30 months. The BSE crisis began in 2003 and hence lagged price does not play an important role when the model is calibrated for 2004 data.

The above model was calibrated for the following dataset and elasticity estimates and it was run using minos algorithm in GAMS.

Data and parameters

According to the Annual Report of CanFax (2004), the sex of Canadian cattle and calves slaughtered reported by Canadian Beef Grading Agency are as follows. Steer: 2,011,460; Heifer: 1,383,732; Cow: 466,726; Bull: 52,671 and Calves: 353,050. If we consider cows and bulls as old cattle, the number of old cattle slaughtered will be 519,397. If we consider steers, heifers and calves as young cattle, the number of young cattle slaughtered will be 3,748,242.

The same source indicates that the warm carcass weights for steers, heifers, cows and bulls are 869, 766, 604 and 1041 lbs respectively. For vealers it is considered to be 700 lbs. Hence the weighted average carcass weights of old cattle and young cattle will be 695 and 801 lbs respectively. Using above information, one can approximate the production of old beef and young beef in Canada. It will be 3,610,335 cwt (equivalent to $519,397 * 695 / 100$) of old beef and 30,026,199 cwt (equivalent to $3,748,242 * 801 / 100$).

Even though it is recorded that slaughter plant capacity is 3.9 million head in 2004, the actual numbers slaughtered is more than it. As indicated earlier, 519,397 of old cattle and 3,748,242 of young cattle were slaughtered (the differences in figures may be due to differences in the capacities in the beginning and end of the year).

It recorded in CanFax that Alberta fed steer price as \$ 78.40 per cwt, Alberta calf price as \$ 100 per cwt and Ontario D1,2 cow price as \$ 21.75 per cwt in 2004. This information can be used to calculate the average price of old and young animals if the average weight of an animal is known. The average weight can be determined by using the dressing percentage and carcass weight. The dressing percentage of cull bulls can be considered as somewhere between 48-58% (source unknown). A majority of cull dairy cows are sold as cutters or canners (dressing%=40-50%). Cull beef cows range from commercial grade to boning or breaking utility (dressing percentage 50-60%). This information can be used to calculate the weighted average of old cattle dressing

rate and it will be 50%. According to Agriculture, Food and Rural Development of Alberta government ([http://www.agric.gov.ab.ca/app21/rtw/sendmail.jsp?docurl="+document.location, 'MailAFriend', 'toolbar=0,location=0,menubar=0,width=600,height=475,left=50,top=50'\)](http://www.agric.gov.ab.ca/app21/rtw/sendmail.jsp?docurl=), the dressing % of medium steers and heifers are 58.5 and 57.0 respectively, which imply that the weighted average young cattle dressing rate is 58%. For vealers (calves) the dressing rate can be considered to be 50%. Hence the average weights (carcass weight/dressing rate) of old and young animals will be 13.82 and 14.02 cwt respectively. As a result prices of old and young animals can be expressed as \$ 300.54 and 1144.23 respectively.

According to Grier and Martin (2004) live cattle prices would have been 20% higher than the current price if there was no BSE crisis. Canadian AAA cutout value for beef is reported to be \$ 172.60 per cwt. Steaks and roasts are produced from young steers and heifers. Older cows are used for manufacturing (grinding or ground) beef. According to <http://lmic.info/meatscanner/meatscanner.shtml> the average price of ground beef in the US was 2.38\$ and the average price of other types of beef was 4.24. It implies that the price difference between old beef and young beef is 1:1.78, and hence the old beef and young beef prices can be considered as \$ 124.11 and 221.09 respectively.

In 2004, total beef consumption was 66% of local production, which is equivalent to 22,460,118 cwt. Since old beef was not allowed to be traded, the entire old beef production was consumed in Canada. The amount of young beef consumed in Canada hence was 18,849,783 cwt. According to CanFax weekly, cattle:barley ratio was 22:1 in Calgary.

The above data set was calibrated to obtain the parameters of the model using the elasticity estimates reported in table A1.

Table A1: Elasticity estimates

	Estimate	Source and year
Cattle supply w.r.t. own price (weighted average of 0.07 and 0.75)	0.07 0.75	FARM: cow calf own price—short term FARM: Feed lot own price—short term
Cattle demand w.r.t. own price	-0.52	FARM: Fed cattle by packers (short term)
Cattle demand w.r.t beef price	0.66	FARM: Assuming these are same as beef supply w.r.t cattle price.
Old beef demand w.r.t own price	-0.693	FARM: Low quality beef (BFL)
Young beef demand w.r.t. own price	-0.477	FARM: High quality beef (BFH)
Old beef demand w.r.t cross price	0.055	FARM: BFL w r t BFH price
Young beef demand w.r.t. cross price	0.043	FARM: BFH w r t BFL price
Cattle supply w.r.t. feed price	-0.01	FARM: Cow-calf supply w.r.t. feed price—short term

Results

The above framework was used to quantify the impacts of BSE crisis and BSE recovery programs. Appendices show the algebraic model, data and parameters used in the analysis. The model was calibrated to 2004 economy, which is characterized by a BSE shock, and the following policy experiments were conducted.

- (i) No BSE crisis: Prices will be the US equivalent prices (a 20% increase in prices is expected according to Grier and Martin, 2005).
 - a. Young cattle US equivalent price¹⁵: 1373.08
 - b. Old cattle US equivalent price: 360.65
 - c. Old beef US equivalent price: 148.93

¹⁵ If the border were to open for live cattle, live cattle transportation costs to the US could rise as there will be more paperwork required and physical restrictions on the transport of live cattle. It was assumed that the 20% increase in young cattle price includes this increase in transaction costs.

- (ii) Increase in cattle slaughtering capacity by 10% (Note that Tyson in Brooks, Alberta is in the process of expanding its facility from 4500/head/day to about 5000/hd/day. The construction of smaller plants, even if there are several, will not increase the slaughter capacity in Canada by more than 10%).
- (iii) Feed regulation: Decrease in slaughtering efficiency by 5% and an increase in feed prices by 5%.
- (iv) Eliminating 20% of the young and old stocks of animals (Under normal conditions, 10% is culled from the herd and an elimination by 20% implies a net elimination by 10%).

Impacts of above policy experiments on quantities demanded and supplied and on prices are summarized in Tables A2 and A3.

Table A2: Results of the simulations

Market	Variable	Units	Baseline value	No BSE crisis	Increase in slaughter capacity	Destroying 20% of the cattle stock	Feed regulation
Old cattle	Supply	Number	519,397	586,147	571,336	519,397	493,427
	Demand	Number	519,397	519,397	571,336	519,397	493,427
	Price	\$/cattle	301	360	347	334	282
Young cattle	Supply	Number	3,748,242	4,235,323	3,927,140	3,624,307	3,642,946
	Demand	Number	3,748,242	3,357,657	3,927,140	3,624,307	3,624,946
	Price	\$/cattle	1144	1373	1228	1216	1111
Old beef	Supply	Cwt	3,610,335	3,610,335	3,971,368	3,610,335	3,429,818
	Demand	Cwt	3,610,335	3,100,459	3,971,368	3,610,335	3,429,818
	Price	\$/cwt	124	149	106	124	133
Young beef	Supply	Cwt	3.0020E7	2.689E7	3.1459E7	2.9033E7	2.9183E7
	Demand	Cwt	1.8589E7	1.8752E7	1.8474E7	1.8589E7	1.8647E7
	Price	\$/cwt	221	221	221	221	221

Table A3: Results of the simulations (% change from the base)

Market	Variable	No BSE crisis	Increase in slaughter capacity	Destroying 20% of cattle stock	Feed regulation
Old cattle	Supply	12.852	10.000	0.000	-5.00
	Price	20.00	15.42	10.84	-6.245
Young cattle	Supply	12.995	4.773	-3.306	-2.809
	Price	20.00	7.360	6.359	-2.867

The above results indicate that if there were no BSE crisis, old cattle and young cattle supply levels would have been higher by 12.852% and 12.995% respectively due to higher prices prevailed in the markets. By increasing slaughter capacities by 10%, old and young prices can be increased by 15% and 7% respectively. By destroying 20% of the cattle stock, old and young prices can be increased only up to 11% and 6% respectively; however, it will be associated with a drop in cattle supply levels. When the feed regulation is introduced, cattle prices will decline due to reductions in slaughtering efficiency, and it will be associated with a drop in cattle supply.

Suggestions for further analysis

Further simulations need to be conducted with different elasticities, policy packages and policy levels to confirm the findings. The model needs to be expanded to accommodate the dynamic effects of BSE crisis which would carry through the inventories. For example, when the border was closed, the supply levels of old cattle and young cattle were not dropped instantaneously. The supply response was perfectly inelastic in the short run and hence S_{yc}^b and S_{oc}^b were supplied according to the present formulation. Due to limited slaughtering capacities in the country, an excess supply of young and old cattle was created and they were absorbed by the inventories. The young inventories were later converted into old inventories as time passed. The model only considers upward slopping supply curves implying that they depict the equilibrium in the long run. Also, the model does not consider the accumulation of young cattle stock due to increased use of older animals for breeding rather than slaughtering as a result of lower prices for old cattle prevailed in the market.

Figure 1: BSE timeline

January 2003 — An eight-year-old cow was sent for slaughter to a provincially licensed meat facility in Alberta. The animal showed signs of illness, and a provincial meat inspector condemned the carcass as unsuitable for human consumption. No meat from the animal entered the food chain. The head of the animal was collected and submitted routinely as part of the BSE surveillance program. The remains of the cow were sent for rendering.

May 20 — The World Reference Laboratory in Weybridge, U.K, confirmed that the sample is positive for BSE.

May 20-June 16 — Herds in Alberta, Saskatchewan and B.C. that could be connected to the infected cow are depopulated and tested for BSE. All test results are negative.

June 9 — An international panel of scientists confirms Canada's BSE investigation is thorough and effective.

June 12 — Training and short-term relief grants are announced for workers laid off as a direct result of BSE.

June 18 — A federal-provincial compensation program for cattle producers is announced, with Alberta committing \$100 million.

July 4 — The Canadian Food Inspection Agency releases its report on the BSE investigation.

July 25 — Alberta's cattle industry is provided with \$79 million in interim support as borders remain closed to Canadian cattle and beef.

August 8 — The U.S. government announces they will partially lift a ban on Canadian beef.

August 25 — A market adjustment program to stimulate the province's cattle marketplace begins.

September 10 — Boxed beef imports to the United States from Canada resume.

September 23 — A compensation program is introduced for bison, veal, sheep, goat, elk and deer producers also affected by BSE.

October 9 — Two new compensation programs for cattle producers and processors are announced.

October 24 — Two new programs are introduced to help Alberta's meat processing industry develop innovative solutions to deal with the surplus of cattle over 30 months of age.

October 31 — The U.S. government releases proposed rules to consider opening the border to live cattle less than 30 months of age. If the rules were approved as written, 85 per cent of cattle exports from Alberta to the U.S. would have been restored.

December 23 — The U.S. government announces a "presumptive positive" case of BSE from a cow in Washington state. The diagnosis is confirmed on December 25.

January 6, 2004 — American and Canadian officials announce jointly that DNA evidence shows that in all likelihood the infected cow was born in Alberta. The animal was born before the 1997 ban on feeding rendered ruminant carcasses — such as sheep, goats, cattle, deer and elk — to other ruminants.

March 8 — The U.S. announces a second comment period on opening the border to live cattle less than 30 months of age.

April 7 — The comment period closed.

April 19 — The U.S. announces that it has removed all restrictions on the import of beef from cattle less than 30 months of age, including ground beef, processed beef products and bone-in beef.

April 23 — The American lobby group R-CALF files an injunction in an attempt to prevent the USDA from allowing Canadian bone-in beef, ground beef and processed beef products to enter the United States. Boneless beef shipments are unaffected.

May 6 — The USDA reaches an agreement with R-CALF, allowing the injunction to stay in place until the USDA publishes final rules regarding the importation of Canadian beef products.

July 27 — The Auditor General of Alberta releases his report on the government's BSE-related assistance programs.

September 10 — A second federal-provincial BSE assistance program announced with the Alberta government committing \$230 million in new BSE funds.

November 30 — Hong Kong lifts its ban on boneless beef from animals under 30 months of age.

December 14 — Cuba opens its borders to beef and beef products of any age, with minor exceptions, such as mechanically separated meat, vertebral column, trimmings, and tissues derived from the head.

December 29 — A new federal-provincial program that will provide \$8 million in support to Alberta's sheep, goat, deer, elk, reindeer and bison producers is announced. The United States announces that it will open its borders to live cattle and bison under 30 months of age as of March 7, 2005. Other ruminants such as sheep, goats, deer, elk, llamas and alpacas will also be allowed entry. The U.S. will also allow imports of beef from cattle older than 30 months.

December 30 — The Canadian Food Inspection Agency announces preliminary tests have produced a positive result from a 10-year-old Alberta dairy cow.

January 2, 2005 — The positive result is confirmed. The proposed border opening is unaffected as the U.S. continues to consider Canada as a minimal-risk region.

January 11 — The Canadian Food Inspection Agency announces it has detected BSE in a six-year-old Alberta beef cow.

February 28 — The Alberta Prion Science Initiative is announced. The \$38 million research program will investigate the genetics, diagnosis and treatment of diseases related to prions and other proteins. Prions are best known for their link to BSE.

March 2 — A Federal District Court judge in Montana grants a temporary injunction preventing the proposed March 7 rule from coming into effect.

March 7 — An additional \$37 million in funding for BSE recovery initiatives is announced.

March 31 — Cuba reopens its border to live Canadian cattle. Canadian exporters are now able to ship live cattle, goats and sheep, meat from these animals, as well as bovine semen and embryos.

April 7 — An additional \$2 million in marketing assistance is provided for sheep, goat, deer, elk, reindeer and bison producers in Alberta.

Source: Government of Alberta. <http://www.gov.ab.ca/home/index.cfm?page=751>

Table 1: Program Transfers in Alberta as at June 4, 2004.

Program Name	Date Announced	Forecast Expenditure	Number of Applications	Number of Animals Covered	Dollars Transferred	Funding Structure
Canada-Alberta BSE Recovery Program	June 18, 2003	C\$297,046,000	4,369	478,024	C\$248,091,473	Federal (60%) Provincial (40%)
Alberta Fed Cattle Competitive Bid Program	July 25, 2003	C\$60,909,000	423	106,750	C\$58,527,130	Alberta (100%)
Alberta Fed Cattle Competitive Market Adjustment Program	August 25, 2003	C\$66,606,000	979	149,991	C\$64,862,978	Alberta (100%)
Alberta BSE Slaughter Market Adjustment Program for other Ruminants	September 23, 2005	C\$3,000,000	1,014	36,975	C\$1,443,340	Alberta (100%)
Alberta Steer and Heifer Market Transition Program	October 9, 2003	C\$55,000,000	975			Alberta (100%)
Beef Product and Market Development Program	October 24, 2003	C\$8,000,000				Alberta (100%)
Food Processor Assistance Initiative	October 24, 2003	C\$400,000	7			Alberta (100%)
Alberta Mature Market Animal Transition Program	November 24, 2003	C\$60,000,000	22,565	146,317	C\$26,051,449	Alberta (100%)
Winter Feed Program for deer, elk, llama and alpaca producers	November 24, 2003	C\$4,000,000	734	54,744	C\$3,906,257	Alberta (100%)
TOTAL		C\$554,964,000		972,721	C\$402,882,627	