

Integration to Fragmentation: Post-BSE Canadian Cattle Markets, Processing Capacity, and Cattle Prices

James Rude¹, Jared Carlberg¹, and Scott Pellow²

Abstract: This paper examines the potential impacts of expansions to Canadian cattle slaughter capacity with different assumptions about the ability to export live cattle the U.S. A synthetic model is calibrated to historic data and then used to gauge the impacts of slaughter capacity; commercial grade beef import competition; and export potential for lower quality cuts on the Canadian cattle and beef sector. Expanded slaughter capacity improves steer prices, but cow prices remain at below pre-BSE levels. Reduced ability to export lower quality beef or increased import competition from commercial grade beef also further depress cattle prices.

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Contact:

James Rude
Department of Agribusiness and Agricultural Economics
Room 373 Agriculture Building
University of Manitoba, Winnipeg, MB R3T 2N2
Telephone (204) 474-9655
Fax (204) 261-7251
Email: James_Rude@Umanitoba.ca

¹ University of Manitoba

² Agriculture and Agrifood Canada

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Introduction

With the May 2003 BSE discovery in Alberta, exports of Canadian live cattle and beef products ground to a halt. Having lost access to international markets for their products, Canadian beef packers dramatically reduced kill levels. The closure of international borders to shipments of live Canadian cattle suddenly made a large and liquid North American market into a small and thin regional Canadian one. Processor demand for slaughter cattle and cull cows declined sharply, as did live Canadian cattle prices. After four months, the U.S. market for boneless beef from cattle under thirty months re-opened, relieving some of the pressure on fed cattle prices. Beef packers could again compete in the North American boxed beef market. Finally on July 18, 2005 the U.S. border was reopened to exports of live Canadian cattle (under thirty months of age). Several new regulatory requirements were introduced for cattle that are to be shipped south.

The central question addressed in this paper is the extent to which Canadian cattle markets can recover to pre-BSE levels. This question is asked under two circumstances first, if the only product that can be traded is boxed beef from cattle that are under 30 months of age; and second, if boxed beef and animals under 30 months can be exported. Although the border has opened to under 30 month cattle, it is instructive to ask what would have happened if it had remained closed. This is a relevant concern because there are a number of ongoing threats Canada's continued ability to export live cattle to the U.S. These threats include possible trade actions and other potential animal health issues that could close the border again. Other pertinent questions, including the price impacts

associated with the competitive challenges of selling lower quality cuts of beef, are also considered.

This study examines existing processing capacity, planned expansions of capacity and discusses the implications of expansion for Canadian cattle prices. A small synthetic model of Canadian cattle and beef markets is built where cattle prices are determined domestically, high and low quality beef is exported into the US market, and Canadian high quality beef prices are linked to US prices. The impacts on cow, steer, and feeder prices resulting from a closed border for exports are also considered¹. The model is a dynamic annual model that is simulated over a sufficiently long period to allow markets to adjust, given the projected expansion in slaughter capacity. The study also examines cattle prices under two additional scenarios: first, if plants are not able to continuously operate at capacity or if additional projected capacity does not materialize. Second, since not all types of beef can be freely exported, downward pressures on the price of lower quality beef will affect live cattle prices. The effects on cattle prices under varying assumptions about the potential to export lower quality beef and the amount of import competition off-shore commercial beef are also calculated.

Canadian Slaughter Capacity

Prior to the closure of the U.S. border, Canada was heavily dependent upon the U.S. as a market for its slaughter cattle. Live exports of fed cattle were 594,636 head out of 3.5 million head total marketings (17 percent) in 2002, while 429,742 cull slaughter animals out of 990,860 head total marketings (44 percent) were exported that year (Canfax). Canada is also a major exporter—and importer—of beef products, and the U.S.

¹ Steer prices are used to reflect the price of fed cattle throughout this study and cow prices are used to reflect the price of cull animals.

is the largest market for those products. Total exports of beef into the U.S. from Canada were slightly over 363,453 tonnes in 2002, representing approximately 40 percent of total beef production; an additional 9 percent was exported to other destinations (AAFC)². When evaluating the entire cattle-beef supply chain over 2000-2002, on average the industry exported 60% of its production. Given Canada's reliance on U.S. slaughter capacity and the subsequent loss of this marketing avenue, it is no wonder that several new slaughter facilities were initiated once access to U.S. slaughter plants was lost.

Historically, the slaughter sector expanded fairly steadily from a kill of around one million head in the 1920s to a peak of 4.5 million head in 1976. After that, there were nearly two decades of decline in slaughter numbers, with the annual kill reaching 2.7 million head in 1993 (Statistics Canada). This was due to a rationalization of the industry as the previous generation of facilities became obsolete, and exports of fed cattle and culls to larger scale facilities in the U.S. grew. Since the mid-1990s, Canadian slaughter capacity has trended upward again as new facilities have come online, mainly in Alberta. That province has become one of North America's most prominent cattle-feeding regions, and is now home to over three-quarters of Canada's fed cattle slaughter capacity.

The North American beef packing industry has evolved into two types of operations. The first involves high-throughput plants (over one million head slaughtered each year) specializing in slaughtering fed steers and heifers and selling their output as boxed beef. During the period when the U.S. border was closed to all live cattle exports,

² This trade data was obtained from Statistics Canada HS 2013010 - 1602909900. These trade numbers may differ from frequently cited export volumes (CANFAX and Livestock Market Review) because they were obtained from Statistics Canada while the alternative number are reported from USDA import numbers for Canada.

boxed beef from these young animals was the only product allowed into the U.S. market. The second subset of packers generally operates smaller plants, slaughter cattle of varying quality (often even multiple species), caters to smaller specialized niche markets, and does not produce boxed beef.

Canada's post-BSE cattle slaughter industry is in a state of rapid expansion. Several new processing facilities and expansions of existing plants have been announced since May 2003. Table 1 shows beef slaughter facilities in Canada with current or planned capacities of greater than 1,000 head per day as well as the category of cattle slaughtered at the plants. Cargill Foods in High River and Lakeside Packers in Brooks are Canada's largest packers, with planned processing capacities of 5,000 head per day in the near future (MacArthur, Briere, and Bell). Note that Lakeside now has both of its slaughter lines killing fed cattle. Prior to May 2003, the plant would kill cull cows on line at the end of the second shift each day.³ Table 2 provides a longer term forecast (2003-2009) of all sizes and types of Canadian slaughter facilities. The projection separates out capacities for fed (under 30 month) and cull cattle (non-fed) as well as providing weekly and annual capacities. It was necessary to extend the projection to 2009 for this modeling exercise, so an additional growth rate of 8 percent was applied to federally inspected slaughter projection to provide the forecast in the final column of table 1⁴.

The breakdown of slaughter by category of cattle has important implications for the cattle and beef industries in Canada. In August 2003, one of the conditions for access

³ Personal communication with a Lakeside official suggests that slaughter of these cull animals represented 15-20 percent of the total kill.

⁴ The final projection is consistent with estimates by John Masswohl of the Canadian Cattlemen's Association for self sufficiency in slaughter capacity.

to the U.S. market for boneless beef was that plants would only be eligible for export if they solely slaughtered under thirty month cattle⁵. This rule played an important role in so far as plants that slaughter cattle that are under 30 months for export could not slaughter cattle over 30 months, and plants slaughtering older cattle had to sell all of their production in the domestic market. It is expected that with planned expansion, in a few years Canada's slaughter capacity for cattle under 30 months will be able to accommodate all marketings at pre-BSE levels. This is not the case for older cattle, for which it is expected that kill levels will not soon approach those required to accommodate normal marketings. Existing under-thirty month facilities are reluctant to add capacity for animals over thirty months into their existing operations not only because of the inability to export meat from these animals but also because new over thirty month ventures are a potentially risky. The risk relates to the historical seasonality of cull cattle supply—cows are usually culled from the herd in the spring and fall, and as a result there is a lack of consistent supply of cattle aged over thirty months in Canada (Grier). The Colbex Abattoir in Quebec is able to take advantage of a fairly steady supply of cull dairy cattle to maintain a consistent kill rate of over 700 head per day.

Given the projected growth in Canadian slaughter capacity what are the implications for Canadian cattle prices? Before this question can be addressed it is necessary to describe the model that is used to determine the price impacts.

Empirical Model

The vertical structure of the Canadian cattle and beef production and processing industry is quite complex and consists of cow-calf operations, backgrounding and feeder

⁵ Note with the 9th District Appeals Court accepting the USDA rule in July 2005, plants can now kill both under thirty and over thirty month cattle in the same plant.

production, slaughter cattle production, cattle slaughter and meat processing, and wholesale and retail distribution. The small synthetic model employed compresses several of these activities into input demand and output supplies that are interdependently linked by various marketing margins. The basic structure of the model is described in a flow chart in figure 1 and the major variables are defined and described (1995-2001 mean and standard deviation) in the legend to this figure. The behavioural equations are shown in square boxes and the identities are shown in ovals.

This study distinguishes a cow and bull breeding inventory, the marketing of cull cows/bulls, production and marketing of slaughter cattle, separate slaughter demands for fed cattle and cows/bulls, and final demands for high and low quality beef. There are marketing clearing conditions that determine prices within the Canadian market for cows, fed steers, and low quality beef. The market clearing condition for high quality beef determines the volume of net exports, with Canadian high quality beef prices determined with a price linkage equation to US prices. The market for feeder cattle is not considered explicitly (feeder cattle are implicitly included in the supply equation for the marketing of fed animals), but the price of feeder animals is determined by the price of slaughter steers.

The stock of cows and bulls is an identity consisting of last year's stock plus investment in breeding heifers less the marketing of cows and bulls. Investment in heifers is a function of three period lagged prices of feeder cattle and a lagged dependent variable. Withdrawals for the stock accumulation identity are marketings of cows and bulls. The decision to supply cull breeding animals is a function of the ratio of the price of cows to the price of feeder calves, the stock of cows and bulls, and a lagged dependent

variable. The relation between the marketing of culls and the size of the stock is an indication of whether the herd will be built (the 15 year average culling rate is 11 percent of the cow and bull stock). The supply function for the marketing of cull animals is a dynamic equation with adaptive expectations where the lagged dependent variable captures the adjustment of expectations.

Slaughter demand for culled cows and bulls is a function of the live price of D1, D2 cows normalized by the average wages in Canadian packing plants, price of D1 cow carcasses normalized by wages, and a lagged dependent variable that facilitates a stock adjustment model. The model must also account for the possibility that slaughter demand may exceed slaughter capacity. A condition is added that ensures that the number of cows and bulls slaughtered does not exceed the capacity constraint.

A market clearing identity equates the marketing of cows and bulls less net exports to the lesser of slaughter demand or the capacity constraint. The price of cows adjusts so that this identity exactly holds and therefore the price of cows is exclusively determined within the Canadian market.

Low quality beef comes from both cull cows and bulls (89 percent of the dressed carcass) as well as from fed animals (43 percent of the carcass).⁶ The production of low quality beef is sum of the share of low quality beef in cows and bulls times the average cold carcass weight times the number of animals slaughtered plus the share low quality beef in fed steers and heifers times the cold carcass weight of these animals times the number of steers and heifers slaughtered.

⁶ Low quality meat would consist of the chuck, brisket and shank, and flank of fed animal. Low quality meat also consists of trimmings from other parts of the carcass. Low quality meat consists of 43 percent of the carcass after these cuts and trimmings are account for. High quality meat is 57 percent of the carcass and includes the hip, sirloin, loin and rib.

The low quality beef market clears for the domestic market with an identity that equates the exports of low quality beef to domestic production less domestic demand plus net inventories less imports. Net inventories and imports of low quality beef are held constant. Canada's tariff-rate quota for off-shore beef is 76,409 tonnes each year, however each year there are supplemental quotas for tariff-free imports (CCA). In 2004, imports of low quality beef were just over 96 thousand tonnes (AAFC); it is therefore assumed that imports of low quality beef will be held constant at this level. Exports of low quality beef are more difficult to determine. Low quality beef from animals over 30 months cannot be exported (except to Macau). However, low quality cuts (chuck, brisket, shank, plate and flank) and trimmings for fed steers and heifers are also considered low quality beef and these products from young animals can still be exported. Grier observes that 40 percent of the trimmings, 50 percent of the chucks, and 10 percent of thin meats⁷ are consumed in Canada. So with roughly 70 percent of low quality beef derived from animals aged less than 30 months, and 60 percent of young animal lower quality beef cuts that are exported, then 42 percent of total low quality beef can be expected to be exported. It is necessary to make an assumption as how much low quality, derived from steers and heifers, will be exported to the US. Rather than specifying an export demand equation the historic share of exports to low quality beef production is used to determine the volume of exports to the U.S. This assumption is adjusted in the sensitivity analysis discussed below. The price that clears this market clearing identity is the wholesale price of low quality beef in Ontario⁸. Finally the consumer price of low

⁷ Thin meat cuts include flank steak, outside skirt, inside skirt, and boneless brisket.

⁸ This price is constructed from the industrial product price for ground hamburger.

quality beef⁹ is linked with a mark-up equation to the wholesale price of low quality beef; likewise the wholesale price of D1 cow carcasses is linked to this wholesale price.

The other side of the model in figure 1 considers the production and marketing of steers/heifers and high quality beef. The marketings of steers and heifers is a function of the price of steers and the price of feeder cattle, each normalized by the price of feed grains, and a 70 percent share of the stock of cows and bulls lagged two periods¹⁰. The coefficient on cattle prices in this equation are calibrated to elasticities for an 18 month lag (Marsh 1995) so each price variable is constructed as a weighted average of current and one year lagged prices which represent the expected prices in this supply function.

The slaughter demand for fed steers and heifers is function of an input price (the Alberta steer price) normalized by wages, an output price (the wholesale price of 225-325 kg steers carcasses) normalized by wages, and a lagged dependent variable. Again, a condition is imposed to ensure that slaughter demand does not exceed capacity. Finally, a market clearing identity equates the marketing of fed steers and heifers less net exports to the lesser of slaughter demand or the capacity constraint. The price of steers adjusts so that the identity holds exactly and the market clears.

High quality beef comes primarily from steers and heifers, but cull cows do have some cuts such as ribs and loins that can be considered higher quality beef (11 percent of the carcass). Fifty-seven percent of the carcass¹¹ of steer/heifer carcass grades as high quality beef. The production of high quality beef is the sum of the share of high quality beef in steers and heifers multiplied the carcass weight for each animal slaughtered plus

⁹ This price is constructed as an weighted average of the retail price of blade roast plus the retail price of stewing beef plus the retail price of ground beef.

¹⁰ The 70 percent share is the historic share of steer and heifer marketings to the cow and bull inventory for the period 1995 to the present.

¹¹ This share includes the hip, sirloin, loin, and rib.

the share of cows and bulls that qualify as high quality beef times the carcass weight for each animal slaughtered.

The market clearing identity equates exports of high quality beef with domestic production of high quality beef less domestic demand plus net inventories less imports. In the case of high quality beef, Canadian prices are determined by US prices, so net exports of high quality beef adjust to clear the market.

The structural model consists of 24 equations and 24 endogenous variables. Of these equations, 17 are behavioural (demand, supply and price linkage equations) and 7 are identities. Three of the identities are market clearing conditions for steer/heifer, cow/bull, and low quality beef markets. The remaining identities convert live animals to meat and per capita demand to total demand. The model is synthetic with linear equations.

The slopes of the linear equations are obtained from existing estimates of elasticities which were gathered from a wide variety of sources. In some cases, the elasticities used in an equation were all obtained from the same study. For example the parameters in the breeding heifer investment equation were obtained from Mbaga and Coyle (2003) who used an autoregressive distributed lag model to represent investment for breeding heifers for Alberta. In some instances, the elasticities were taken from studies of comparable markets in the US. Finally, in some cases equations were estimated to provide the appropriate parameters. Table 3 gives these elasticities and describes their sources.

Although it is common practice to do policy analysis against a forward looking baseline, it was decided that it would be more expedient to do the comparative analysis

against a historic baseline for the period 1995-2001. This is a time period that pre-dates BSE and is sufficiently long to allow the model to fully adjust after the initial shock of closing the border to live cattle trade. The data used were obtained from AAFC's Farm-bank database.

The calibration method converts elasticities to linear slope coefficients by multiplying each elasticity by the ratio of the average (1995-2001) dependent variable to average independent variable. The next step in the calibration process is to determine the intercept terms on all the behavioural equations by subtracting the sum of the product of the independent variables in each equation and the appropriate slope coefficients from the dependent variable. Intercepts are calculated for each year of the simulation so that the calibrated model exactly reproduces the baseline data set for the entire simulation period. Given this perfectly calibrated model it is then possible to conduct policy analysis. This is the objective of the following section.

Policy Analysis: Price Impacts with Projected Slaughter Capacity

The closure of the US border to exports of live Canadian cattle required that cattle previously slaughtered in the US had to compete for spots in Canadian plants with cattle that were normally slaughtered in Canada. The excess supply of cattle relative to the limited slaughter capacity drove down cattle prices. During the initial weeks after May 2003 and the discovery of a Canadian case of BSE the markets for cattle and beef were characterized by the inability to export live animals or meat, unwillingness to market cows or fed cattle, dramatically reduced slaughter capacity, and general uncertainty about the market. Over the course of the year, US and Mexican markets reopened to boneless beef from Canadian animals less than 30 months of age. Backlogs in the system began to

decrease as slaughter activity increased and cattle were delivered to market. After two years the border opened on July 14, 2005 to exports of live cattle that are less than 30 months. With only a few weeks of observations it would appear that exports of fed cattle are well below the pre-BSE average. (CANFAX).

Modeling the series of events beginning with border closure and ending with its reopening in an annual model is problematic, so no attempt is made to approximate the initial adjustment. Rather, the model is shocked so that exports of live animals cease in the first full year but exports of high quality beef are allowed to continue uninterrupted. In one scenario, exports of under than 30 month cattle are assumed to be discontinued for the entire simulation period. An alternative scenario reopens the U.S. border to exports of younger cattle in the third year of the simulation. At this point in time, the Canadian price of steers is assumed to be determined by U.S. prices. Exports of low quality beef are also allowed but the share of exports consisting of older animals is eliminated. The model is adjusted so that in the first two years, the marketing of cows is artificially adjusted by approximately 300 thousand animals each year to account for the fact that cull cows have been held back and bred for an additional year (Schroeder and Farrell). Slaughter capacity for cull cows/bulls and fed steers/heifers is increased from current levels to the projected levels discussed above.

The results of the impact of the border closure on all major endogenous variables are shown in table 4. This table shows the impact relative to a baseline with an open border and no BSE, and the impacts are shown as both absolute and percentage changes from the baseline. The first six columns show the impact for the scenario where border is closed to imports of cattle under 30 months of age. Columns seven to 12 describe the

scenario where the border is open to imports of cattle under 30 months of age. The first two columns show first year impacts and these impacts are common to both scenarios. The alternative scenario begins in the third year.¹² The final year impacts are for the seventh year of the simulation period for both scenarios, and the average impact is for this full seven year period. In the case of the open border scenario, the average impact included the first two years of the closed border scenario.

The immediate impact in the summer months of 2003 were price declines of \$38/cwt for steers, and \$44/cwt for cows. The model results are more modest, with steer prices down \$30/cwt from the baseline and cow prices down \$27/cwt. Nonetheless, the magnitude of these price impacts is consistent with price experience for the first full year of the border closure.

With steer prices down by 35 percent, cow prices 53 percent lower, and the price of feeders reduced by 40 percent, there are considerable pressures on the system over the first year of the simulation. The marketing of cows and bulls declines by 46 percent resulting in an 8 percent increase in the stock of cows and bulls. This has ramifications in future years as future marketings of fed animals increase with the stock of breeding animals. As a result, steer marketings increase over the entire period despite reduced steer prices. In the first year, the slaughter of cows and bulls declines by 20 percent but the slaughter of fed animals increases by 32 percent¹³. Given the increased slaughter of fed steers and heifers, the production of high and low quality beef increases by an

¹² All lagged values in this model come from second year variables in the closed border scenario.

¹³ The decline in cull cow slaughter can be attributed to two factors. The cull rate was reduced from roughly 11 percent to 6 percent and Tyson's Lakeside plant stopped slaughtering animals over 30 months.

equivalent proportion.¹⁴ The price of low quality beef is determined in Canada and as a result of increased production, prices decline by 9 percent in the first year.

The open border scenario links the Canadian price of steers to the US price of steers, but includes a \$5 per cwt border inspection fee which includes pregnancy testing for heifers, age and brand verification. Since Canadian prices are now linked to baseline US prices, steer prices only decline by 1% versus a 31% decline in the closed border scenario for the third year of the simulation. Even cow prices, where these older cull animals cannot be exported, are stronger than in the scenario for a closed border for under 30 month animals. In this case, cow prices decline by 33 percent versus 53 percent with a closed border. In the third year, exports of fed steers and heifers are down 51% with exports of 336 thousand head.

The price paths for steer and cow prices are shown in figures 2 and 3. Each graph shows the path of prices in no-BSE baseline and the temporal adjustment of prices in response to the scenarios with a closed border for under 30 month animals and an open border for these animals. In the case of steer prices, with an open border prices return to baseline levels in the third year. Even with a closed border, the price series gradually closes over the seven-year adjustment with steer prices recovering almost to baseline levels at the end of the period. In the case of cow prices, the gap between the no-BSE baseline and the domestically determined closed border price, is not eliminated. This result is not surprising because just prior to the closing of the border, the ratio of live animals exported to the total number marketed was much higher for cows and bulls (45 percent) than for fed steers and heifers (17 percent). Furthermore, the projected growth

¹⁴ The production of low quality beef increases because fed steers and heifers are 44 percent low quality and slaughter numbers are so much higher for steers than cows and bulls/

in maximum potential slaughter capacity for fed steers and heifers is somewhat faster than for cows and bulls (43 versus 42 percent). When the simulations are run, the capacity constraint for cow and bull slaughter was binding for the second and third years, while this slaughter constraint is not binding for fed cattle.

Opening the border to exports of fed steers and heifers initially strengthens cow prices. But by the end of the period, the initial gap of 50 percent closes to 22 percent with open border for young animals, but only 25 percent with closed border. With a closed border, the inventory of cows and bulls rises initially (from a baseline of 4.6 million to 5.3 million in the second year), and then declines over the simulation period as culls increase and heifer retention decreases. However, with an open border, the price of feeder cattle increases back to baseline values and investment in breeding heifers follows a path similar to the baseline. As a result the inventory of cows and bulls ends up at 5.2 million animals.

By the end of the simulation period, the stock of cows and bulls declines by 2 percent with a closed border, but stocks increase by 6 percent when the border is open to younger animals. Marketings of cows and bulls decline by 10 percent from the baseline with a closed border, and only declines by 2 percent with an open border. With a closed border cow and bull slaughter is up by 46 percent from the no-BSE baseline; and with trade in younger animals the increase is 58 percent. The slaughter of steers and heifers is up by 29 percent with a closed border, but when trade in these animals is allowed, slaughter only increases by 12 percent from the baseline. Low quality beef production is up by 33 percent with a closed border, and 24 percent when fed cattle are traded. As a result, low quality beef prices are down by 19 percent with domestic consumption of low

quality beef only increasing by 5 percent when there is no trade in live animals. When fed cattle can be exported these prices decline by 8 percent and consumption increases by 2 percent.

The average impacts of an open border for cattle aged less than thirty months are generally more muted than when the border is open. However, larger increases in the stock of cows and bulls results in smaller average declines in marketings of these older animals and increased marketings for fed animals. As a result, slaughter of these animals increases while the slaughter of fed animals declines.

Analysis: Price Impacts with Limited Slaughter Expansion

Given that cow and bull slaughter can have a significant effect on cattle prices, it is important to determine implications for these prices should new slaughter capacity not materialize. It is also the case that a wide variety of factors may prevent firms from operating at capacity limits, including the need to perform regular maintenance and labour shortages. Therefore, an alternative scenario is run with slaughter capacity for cows and bulls reduced by 20 percent below the projected growth rates.¹⁵ In order to conserve space this sensitivity analysis is run only for the scenario where there are no live cattle exports to the U.S. This reduction in processing capacity is imposed from the second to the final year of the simulation and the impacts of the reduction in capacity are shown in Figures 2 and 3.

The most noticeable effect is the decline in cow prices to \$10/cwt in the third year of the simulation.¹⁶ As a result of the reduction in processing capacity, cow prices are

¹⁵ Sensitivity analysis is not run for steer and heifer slaughter capacity given that a significant amount of this investment is being made large existing processors Cargill, Tyson Foods, and XL Foods. Furthermore, the capacity constraint was not binding for initial simulations.

¹⁶ Cow prices did fall to this level in July of 2003.

on average are an additional 11 percent below baseline prices relative to the scenario with a closed border scenario but no restriction in the growth in slaughter capacity. The reduction in projected cow and bull slaughter capacity also reduces steer prices on average by an additional 8 percent below baseline prices relative to the first scenario. The effect on steer prices is more noticeable later in the simulation period. Initially lower cow prices increase inventories of cows and bulls. The increased breeding inventory then has a lagged effect, where two years later there are increased marketings of fed steers and heifers. This in turn puts downward pressure on the price of steers.

Analysis: Price Impacts with Different Downstream Assumptions

The price of live animals is not only affected by slaughter capacity, but also by the structure of downstream markets for beef. The price of high quality beef is based on U.S. prices and as such, high quality beef prices do not change and thus do not directly affect live cattle prices. However, the price of low quality beef is assumed to be determined in the Canadian market, and changes in this price will in turn affect the price of cows and steers. The price of low quality beef is determined by the domestic supply of and demand for low quality beef, as well as exports of low quality beef and imports of low quality (commercial) beef from off-shore markets. Increased domestic slaughter significantly increases the production of low quality beef, which is considerably greater than the increase in domestic consumption as result of lower prices, due the inelastic demand for this product. As result, there is sustained downward pressure on low quality beef prices. This downward pressure could be completely eliminated if the surplus could be exported. As well, reducing imports of offshore commercial beef can ease some of the downward price pressure.

While some of the downward pressure can be offset by increased exports of low quality beef to the US and Mexico, not all of the low quality beef is under 30 months in age. Roughly 70-75 percent of the production of low quality beef comes from fed steers and heifers, and this product can be exported to the US. A significant amount of this lower quality beef consists of “trim and grind”¹⁷. The post-BSE experience is that Canada has experienced several difficulties with respect to the export of trimmings. For a short period in 2004, Canada was prohibited from exporting trimmings to the US. Furthermore, the US fed beef industry produces an excess of 50/50 trim but not enough 90 percent lean beef to mix with it to satisfy domestic ground beef demand. Rather than grinding higher value muscle cuts to satisfy the mixing requirements, the US imports lean beef from off-shore markets. Trimmings (50/65 trim) from fat Canadian cattle may not find a ready market in the US, because they are not competitive against much leaner off-shore imports and are more comparable in fat content to US excess trim.

In order to account for the uncertainties associated with exporting lower quality beef, sensitivity analysis was run to account for the possibility that potential exports were either over or under approximated. To conserve space this sensitivity analysis is only conducted for the scenario with no trade in live animals. The equation for low quality beef exports is adjusted for two contingencies: high export potential¹⁸ and low export potential¹⁹. The impact on these alternative assumptions on the price of cows and steers is shown in Figures 4 and 5.

The impact of reduced export potential has similar ramifications as reducing cow and bull slaughter capacity by 20 percent. The major difference in scenarios is that with

¹⁷ Approximately 1/3 of this beef has historically been hamburger.

¹⁸ The share of exported to total under-30 month low quality beef is reduced by 14 percent

¹⁹ The share of exported to total under-30 month low quality beef is increased by percent

reduced export potential, the price depressing effects are more sustained and prices do not recover over the course of the simulation. The scenario of high export potential does not produce symmetric effects to reducing export potential. Increasing the proportion of beef from animals aged less than 30 months that is exported induces a proportionally greater recovery in cattle prices (see Figures 4 and 5). This suggests that marketing strategies to increase the volume of low quality beef exported are necessary if expansion of slaughter capacity is to be successful.

The volume of imports of commercial beef from off-shore sources will also affect low quality beef prices in Canada. Canada has a tariff rate quota (TRQ) of 76.4 thousand tonnes for off-shore markets (primarily Australia and New Zealand), however imports of commercial beef have historically been around 220 percent of the TRQ. Of these imports, an average of 56 thousand tonnes was granted supplemental import permits (AAFC-LMR). Furthermore, almost half of the imported offshore beef is for grinding, and the remainder is beef cuts. Again, the lean offshore beef is being used to mix with fatter trimmings for fed cattle to create ground beef with the targeted percentage of fat. Since the supply of lean Canadian cull cow meat is only available in significant volumes for four months in the fall of the year, Canadian processors of ground meat have relied on the imports of offshore beef. The seasonal flow of this beef is unlikely change as slaughter capacity is increased.

The simulations so far have held imports of low-quality beef at 96 thousand tonnes over the simulation period. Although this volume exceeds the TRQ by 20 thousand tonnes in 2003 the supplemental import quota was 55.6 thousand tonnes. The alternative import scenario start imports at 132 thousand tonnes and then has imports

grow at the historical growth rate to reach 160 thousand tonnes in the final year of the simulation. The impact on prices is shown in Figures 4 and 5. The results show price paths that are only slightly weaker than the low export potential scenario.

Conclusions

Uncertainties about the future ability to export live animals into the U.S. have prompted plans for a rapid expansion of Canada's slaughter capacity for cattle. The primary objective of this paper was to determine the impact that these plans for expanding domestic slaughter capacity would have on Canadian live cattle prices. Two scenarios were considered: a closed U.S. border for live animals, and an open border for exports of animals under 30 months of age. In both scenarios, exports of beef products from cattle over thirty months of age were not allowed. The findings were that while steer prices would almost recover to baseline pre-BSE levels, the price of cows would remain well below pre-BSE levels. This finding held regardless of whether younger fed animals could be exported.

Live animal prices could improve with further expansions to slaughter for animals aged over 30 months, but that price recovery also depends on the ability to market lower quality beef. Increased import competition from commercial beef from off-shore markets or reduced ability to export lower quality beef cuts (from animals under 30 months of age) both could further depress the price of lower quality beef and the prices of live animals. This implies that the recovery for Canadian beef markets is not a simple matter of killing more animals and shipping more boxed beef south of the border. Canadian exporters have to be able to sell significant amounts of low quality beef into the U.S. market.

Overall, it is fair to say that the landscape of Canadian beef packing has been fundamentally altered. Planned expansion of the industry, if successful, will in time allow live cattle prices to recover to “normal” levels, provided Canada remains able to export boneless beef from young animals into foreign markets. An opening or partial opening of borders to meat from older animals would further relieve pressure on the Canadian cattle industry. In the end, the industry’s ability to expand and adapt will over time, mitigate the effects of rent-seeking behaviour by Canada’s trading partners.

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Table 1. Canadian Weekly Cattle Slaughter, Federal & Provincial Inspection

Class	2003	2004	2005	2006	2009
Federally Inspected					
Fed Cattle	61,220	71,270	76,910	81,410	88,397
Non-Fed	11,920	10,020	15,720	15,470	16,798
Annual Total	3,657,000	4,064,500	4,631,500	4,844,000	5,259,741
Provincially Inspected					
Fed Cattle	2,763	3,500	3,500	3,500	3,500
Non-Fed	943	1,500	1,500	1,500	1,500
Annual Total	185,300	250,000	250,000	250,000	250,000
Total Slaughter					
Weekly Total	76,846	86,290	97,630	101,880	110,195
Annual Total	3,842,300	4,314,500	4,881,500	5,094,000	5,509,741

Note: slaughter numbers are end-of-year

Source: Personal correspondence with AAFC and CANFAX

Table 2. Largest Canadian Beef Packing Plants, Current & Planned Capacities

Company	Plant Location	Category	Daily Kill	
			Current	Planned
Cargill Foods	High River, AB	Fed Cattle	4,100	5,000
Lakeside Packers	Brooks, AB	Fed Cattle	4,000	5,000
Better Beef Ltd.	Guelph, ON	Fed Cattle	1,900	1,900
XL Beef	Calgary, AB	Mixture	1,000	1,000
XL Beef	Moose Jaw, SK	Fed cattle	900	1,200
Colbex/Levinoff	St. Cyrille, QC	Cull Cows	720	1,040

Note: in some cases numbers have been converted from weekly to daily. A five-day kill week was assumed.

Sources: Canfax, Cattlemen , and MacArthur, Briere, and Bell

Table 3 Elasticity Estimates and Sources

<i>Definition</i>	<i>Elasticity Estimate</i>		
Cattle Supply			
Heifer investment w.r.t. feeder price ^a	0.4 (t-1)	0.07 (t-2)	0.04 (t-3)
Steer marketing w.r.t. steer price ^b	0.6 [18 month]		
Steer marketing w.r.t. feeder price ^b	-0.7 [18 month]		
Cow marketing w.r.t. steer/feeder price ^c	0.6 [SR]	1.4 [LR]	
Cow marketing w.r.t breeding stock ^c	0.4 [SR]	1 [LR]	
Cattle Demand			
Steer slaughter w.r.t. steer price ^d	-0.6 [SR]	-5.3 [LR]	
Steer slaughter w.r.t. beef price ^d	0.6 [SR]	5.2 [LR]	
Cow slaughter w.r.t. cow price ^e	-0.9 [SR]	-3.1 [LR]	
Cow slaughter w.r.t. beef price ^e	0.8 [SR]	2.7 [LR]	
Beef Demand			
High quality beef w.r.t price high quality ^f	-0.5		
High quality beef w.r.t price low quality ^f	0.04		
Low quality beef w.r.t price low quality ^f	-0.7		
Low quality beef w.r.t price high quality ^f	0.05		
Other			
Feeder price w.r.t. steer price ^g	1.3		

Sources:

^a Mbaga and Coyle (2003)

^b Marsh (1994)

^c Estimated (1980-2002)

$$Mkt^{cow} = -532.2 + 997.8 \cdot P^{cow}/P^{feeder} + 0.1 \cdot Stock^{cow/bulls} + 0.6 \cdot Mkt^{cow}_{t-1}$$

(-1.1) (2.6) (1.8) (2.9) (t-stat) $R^2 = 0.4$

^d Estimated (1980-2002)

$$D^{slaughter\ steer} = 217.1 - 7696 \cdot P^{steer}/wage + 707.1 \cdot P^{whsl.\ steer\ carcass}/wage + 0.89 \cdot D^{slaughter\ steer}_{t-1}$$

(0.8) (-2.2) (2.6) (11.5) (t-stat) $R^2 = 0.92$

^e Estimated (1980-2002)

$$D^{slaughter\ cow} = 299.3 - 5553.6 \cdot P^{cow}/wage + 375.9 \cdot P^{whsl.\ cow\ carcass}/wage + 0.7 \cdot D^{slaughter\ cow}_{t-1}$$

(1.7) (-2.1) (1.7) (5.6) (t-stat) $R^2 = 0.79$

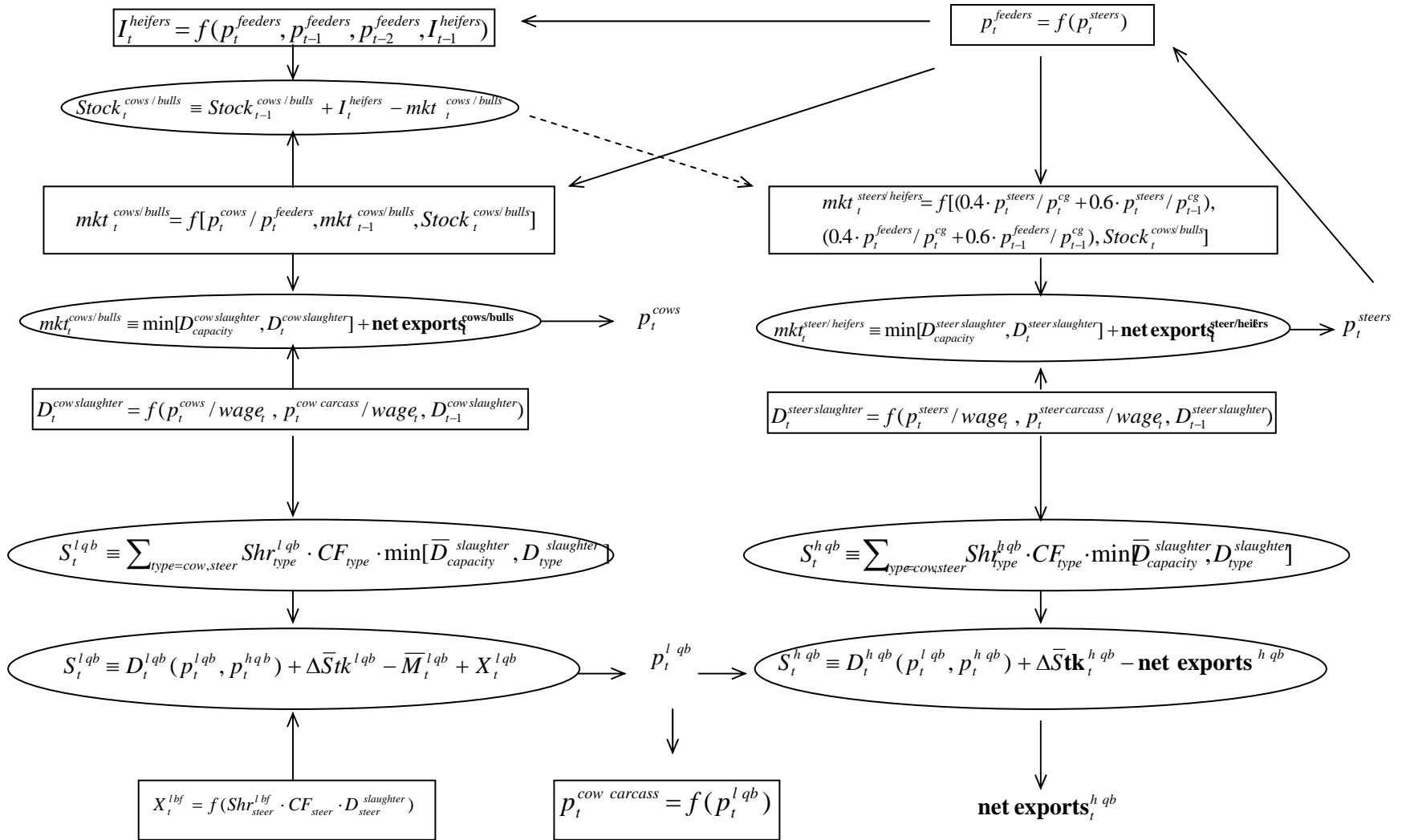
^f AAFC Food and Agriculture Regional Model (2004)

^g Marsh, Brester, and Smith (2005)

Table 4: Impact of BSE border arrangements with projected processing capacity

		Closed border to cattle under 30 months						Open border to cattle under 30 months					
Primary	Units	First year		Final Year		Average		Third year		Final Year		Average	
		Unit Δ	% Δ	unit Δ	% Δ	unit Δ	% Δ	Unit Δ	% Δ	unit Δ	% Δ	unit Δ	% Δ
Cow and Bull Inventory	000 head	363	8%	-99	-2%	298	6%	691	15%	295	6%	481	10%
Cow/Bull Marketings	000 head	-363	-46%	-82	-10%	-154	-16%	-130	-13%	-19	-2%	-126	-13%
Steer/heifer Marketings	000 head	-30	-1%	134	4%	193	6%	328	10%	317	9%	273	8%
price of cows	\$/cwt lw	-27	-53%	-16	-25%	-20	-37%	-17	-33%	-14	-22%	-17	-31%
price of steers	\$/cwt lw	-30	-35%	-8	-8%	-15	-17%	-1	-1%	-2	-2%	-7	-9%
price of feeders	\$/cwt lw	-39	-40%	-11	-7%	-19	-18%	-2	-1%	-3	-2%	-10	-10%
Cow/Bull Slaughter	000 head	-110	-20%	241	46%	154	28%	215	33%	304	58%	181	33%
Steer/heifer Slaughter	000 head	697	32%	822	29%	873	33%	708	28%	336	12%	538	21%
Processed Beef													
Production low quality	000 tonnes	66	15%	196	33%	170	30%	154	30%	141	24%	129	23%
Production high quality	000 tonnes	123	30%	174	29%	172	33%	135	28%	79	13%	108	21%
Wholesale price low quality	\$/cwt	-10	-9%	-25	-19%	-27	-24%	-6	-5%	-10	-8%	-14	-12%
Disappearance low quality	000 tonnes	13	2%	30	5%	34	6%	7	2%	12	2%	17	3%
Disappearance high quality	000 tonnes	-1	0%	-1	0%	-1	0%	-1	-31%	0	0%	-1	0%
Exports high quality	000 tonnes	123	91%	176	59%	174	78%	136	67%	80	27%	109	52%
price whls. carcass (cows)	\$/cwt	-9	-7%	-22	-15%	-24	-20%	-5	-4%	-9	-6%	-12	-10%
price whls fore quarter (steer)	\$/cwt	-4	-3%	-11	-5%	-12	-7%	0	-3%	-4	-2%	-6	-3%

Figure 1: Schematic Description of the model (legend next page)



Legend for Figure 1

Label	Definition	Quantity	Mean	St Dev
$I^{heifers}$	Investment Breeding Heifers	000 head	914	68
$Stock^{cows/bulls}$	Stock of cows and bulls	000 head	4695	114
$mkt^{cows/bulls}$	Marketings of slaughter bulls & cows	000 head	870	116
$D^{cow\ slaughter}$	Total inspected slaughter bulls & cows	000 head	582	66
P^{cows}	Weighted avg.. cow, Canada (D1-D2)	\$/cwt lw	54	7
$P^{feeders}$	Alberta feeder steers 5-600 lbs	\$/cwt lw	121	29
P^{steers}	Steer Price (Alberta)	\$/cwt lw	88	8
$S^{l\ bf}$	Production low quality beef	000 tonnes	539	58
$Shr^{l\ qb\ steer}$	share of low quality beef in fed cattle	%	43%	0
$Shr^{l\ qb\ cow}$	share of low quality beef in cull cattle	%	88.50%	0
$Shr^{h\ qb\ steer}$	share of high quality beef in fed cattle	%	57%	0
$Shr^{h\ qb\ cow}$	share of high quality beef in cull cattle	%	11.50%	0
CF_{steer}	Average cold carcass weight of steer/heifer	kg	351	15
CF_{cow}	Average cold carcass weight of cow/bull	kg	288	18
$D^{l\ qb}$	Disappearance low quality beef	000 tonnes	565	6
$M^{l\ qb}$	Imports low quality beef	000 tonnes	199	26
$X^{l\ qb}$	Exports low quality beef	000 tonnes	173	73
$\Delta Stk^{l\ qb}$	change in stocks low quality beef	000 tonnes	0	6
$P^{l\ qb}$	Wholesale price of low quality beef	\$/cwt	111	10
$mkt^{steers/heifers}$	Marketings of slaughter steers and heifers	000 head	3329	220
$D^{steer\ slaughter}$	Total inspected slaughter steers & heifers	000 head	2633	294
$S^{h\ bf}$	Production high quality beef	000 tonnes	531	77
$D^{h\ qb}$	Disappearance high quality beef	000 tonnes	355	26
$\Delta Stk^{h\ qb}$	change in stocks high quality beef	000 tonnes	-1	4
$net\ export^{h\ qb}$	net export high quality beef	000 tonnes	176	59
$P^{h\ qb}$	Retail price of high quality beef	\$/kg	11	1
$P^{cow\ carcass}$	Wholesale price D1 cow carcass	\$/cwt	122	11
$P^{steer\ carcass}$	Wholesale price (A) steer carcass	\$/cwt	167	17

Source: AAFC FARMBANK Data Base

Figure2: Impact of a closed border on cow prices

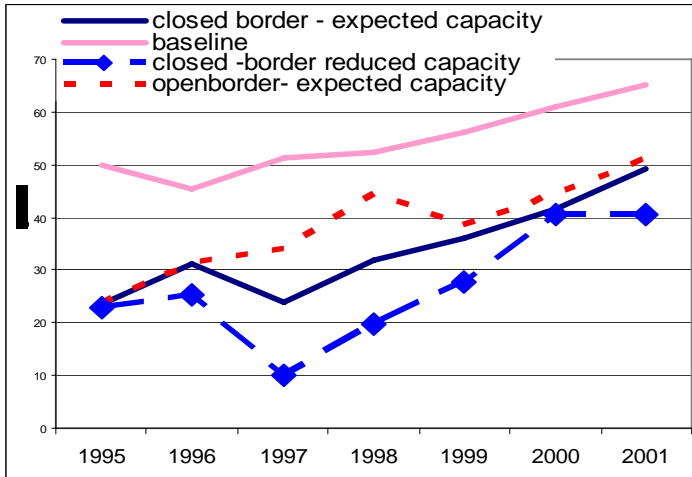


Figure3: Impact of a closed border on steer prices

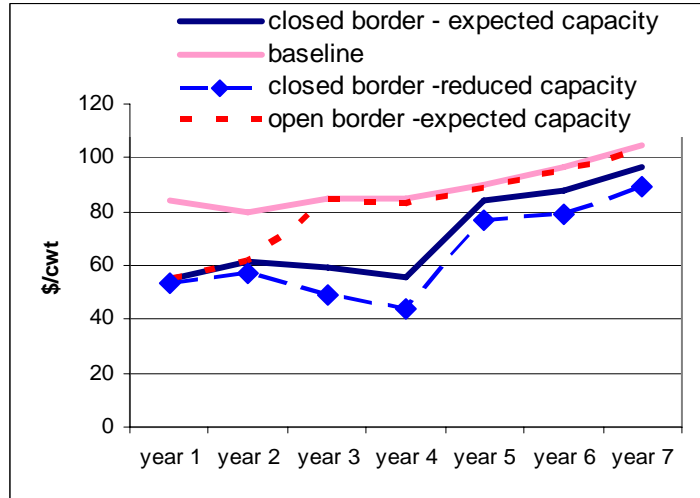


Figure 4: Impact of a closed border on cow prices (Low quality beef export/import sensitivity)

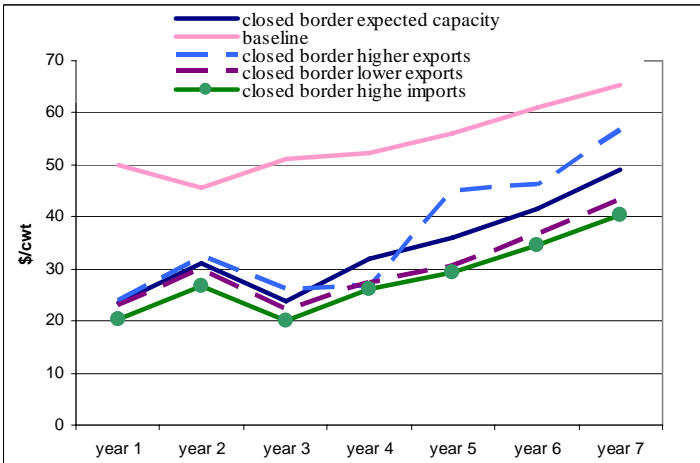


Figure 5: Impact of a closed border on steer prices (Low quality beef export/import sensitivity)

