# IMPACTS ON US BEEF PACKERS, WORKERS, AND THE ECONOMY OF RESTRICTED CATTLE TRADE BETWEEN CANADA AND THE UNITED STATES

Prepared By:
Ted Schroeder, Ph.D.
John Leatherman, Ph.D.
Agricultural Economists
Kansas State University

Prepared For:
National Cattlemen's Beef Association
Canadian Cattlemen's Association
American Meat Institute
Canadian Meat Council

December 28, 2004

## Executive Summary

- On May 20, 2003 following discovery of a cow infected with Bovine Spongiform Encephalopathy (BSE) in Alberta, Canada, the US imposed border restrictions prohibiting exports of Canadian cattle and beef to the US. Prior to this, the US was importing more than one million head of cattle from Canada for slaughtering and processing. Thus, these restrictions have caused a substantial decline in available supply of slaughter cattle for US packers and excess supply in Canada where production has exceeded slaughter and processing capacity.

- The impacts of these border restrictions on slaughter cattle flow were much greater in particular regions of the US where packing plants relied heavily upon Canadian cattle imports for capacity utilization. Canadian imports represented 30% of Utah, 19% of Washington, and 10% or more of Minnesota, Michigan, and New Jersey cattle slaughter in 2002. Utah, Washington, Minnesota, Nebraska, and Pennsylvania each imported more than 100,000 head of Canadian cattle for slaughter and processing in 2002.

- The estimated value of beef and byproducts sales from Canadian slaughter cattle imported and processed in the US in 2002 was $900 to $956 million[1] resulting in a gross margin (beef and byproduct sales value less cattle purchase cost) of $145-$155 million. Utah, Washington, Minnesota, and Nebraska each had more than $100 million in total sales and $15 million in beef and byproduct sales margin from Canadian slaughter cattle imported in 2002.

- US beef packers lost a projected $1.7 to $1.8 billion in gross sales revenue of boxed beef and byproducts as a result of Canadian slaughter cattle import restrictions from 2003 through 2004. Beef packers located in Utah, Washington, Minnesota, and Nebraska each lost in excess of $200 million in beef and byproduct sales by not having Canadian slaughter cattle imports during this time.

- From May 2003 through 2004 a projected loss of beef and byproduct sales margin for US packers is estimated to be $270-$286 million attributable to the border restrictions. Assuming no substitution of other cattle in particular states, this lost sales margin resulted in $56 million loss in Utah; $46 million in Washington; $39 million in Minnesota; $32 million in Nebraska; $26 million in each Pennsylvania and Wisconsin; and more than $10 million in each Idaho, Michigan, and Colorado.

- To estimate the broader economy-wide impacts of cattle import restrictions, the reduced level of meat packing activity associated with the ban was investigated. Two snapshots were completed, with one being the overall impact to the US, and the second being a case study of Washington State, one of the states most impacted. The US analysis suggests the estimated decrease in production could have affected nearly 5,000 jobs and decreased US income by about $282 million (2003$ US) annually. These estimates represent the level of income and

[1] All dollars ($) US unless otherwise indicated.

employment closely associated with the level of reduction in meat packing activity.

- The more than a million head reduction in available annual slaughter cattle supply has resulted in underutilization of US packing facilities. Beef packer average costs increase dramatically when plants operate below designed slaughter and processing capacity. As such, costs of slaughter and processing have increased considerably for individual plants in the US, especially those located in areas hit hardest by the import ban.

- Canadian cattle prices have been discounted by as much as $20/cwt relative to the US in recent months as Canada experienced over supply of slaughter cattle relative to packer capacity and the US has faced reduced supply. These events are strongly encouraging the development of plans and investment strategies to expand Canadian beef slaughtering and processing capacity. The import restriction has already contributed to three US cattle slaughter plant closures and reduced operating shifts at others. Once the Canadian investments occur, and cattle trade between the two countries resumes, additional excess slaughter and processing capacity will exist. Additional US and/or Canadian slaughterer firms will not be able to survive, causing both long run structural (especially size) and location shifts in cattle slaughter, processing, and possibly cattle production. Such adjustments will come at substantial economic costs.

## Introduction

The United States (US) and Canadian cattle and beef industries were highly integrated prior to closure of the border to live animal trade into the US following the May 20, 2003 discovery of a cow in Canada infected with Bovine Spongiform Encephalopathy (BSE). Harmonized cattle and beef trade between US and Canada provided substantial economic benefits to both countries prior to this event. In particular, the most pronounced impact of closing the US to Canadian cattle imports was the adverse impact on selected US beef packers and Canadian cattle producers.[2] Prior to the border closure, the US was importing more than one million head of slaughter cattle annually from Canada for slaughtering and processing. Although this represents only about 3% of total US annual cattle slaughter of about 35 million head, regionally the impact has been substantially larger, especially for beef packing plants located near the Canadian border. For example, in 2002, Canadian cattle imports were 30% of all cattle slaughtered in Utah and represented more than 10% of cattle slaughtered in each of four other states – Washington, Minnesota, Michigan, and New Jersey.[3] The economic impacts of restricted cattle flow from Canada to the US are important to understand as future trade policy between the two countries is deliberated. Any policy decision made regarding whether to keep US border restrictions in place or lift them will have significant economic impacts on numerous facets of both countries. This report examines in particular the impacts of restricted cattle trade on the US beef packing industry, focusing on economic implications. Policy considerations that may have been related to possible or perceived animal health or food safety concerns related to the import restriction are not addressed in this analysis.

## Objectives

The primary purpose of this report is to present a preliminary assessment of the economic impacts of restricted cattle trade from Canada to the US on the steer and heifer and cow and bull beef packing industry. In particular, we estimate how US and specific state fed cattle and cow slaughter capacity utilization has been impacted by restricted cattle flow between the two countries. Economic costs to beef processors associated with restricted cattle flows are discussed. Case studies of a particular state and the US as a whole are used to estimate local and national economic impacts of restricted cattle flow. Finally, structural and location issues of beef slaughtering and processing are discussed related to recent past and probable future impacts of continued border restrictions on cattle movement between the US and Canada.

## Background

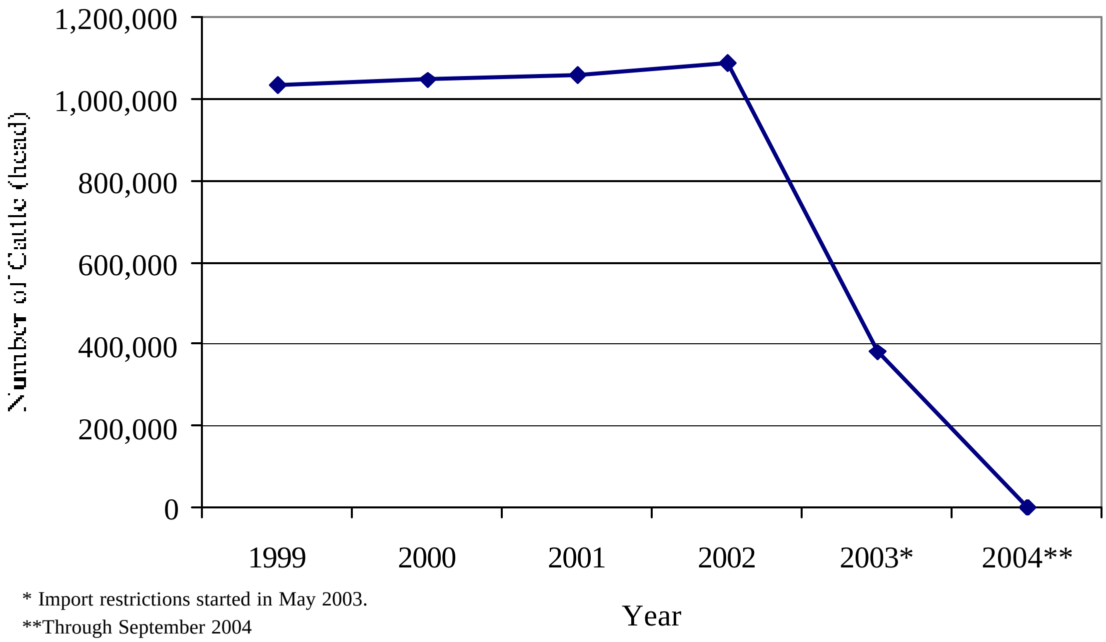
The US and Canadian cattle and beef industries operated largely as a single North American industry prior to discovery of an animal infected with BSE in Canada in May 2003. Feeder cattle, slaughter steers and heifers, slaughter cows and bulls, breeding

[2] In addition, US producers gained and US consumers lost welfare from the border closure. Estimates of the amount of these US welfare impacts are provided in the US Federal Register, Vol. 68, No. 213, November 4, 2003, pp. 62,386-62,405.

[3] About 70% of Canada's fed cattle are produced in Alberta explaining the large impact on Pacific Northwest US.

animals, and processed beef flowed freely between the two countries in response to economic signals. A substantial amount of this trade flow was cattle movement from Canada to the US. For example, in 2002 (the most recent full year of unrestricted trade in cattle between the two countries), approximately 62,000 dairy cattle, 8,000 veal animals, 583,000 feeder cattle, 17,000 breeding animals, and 1,024,000 slaughter cattle were exported from Canada to the US (data obtained from the Canadian Cattlemen's Association). Canadian slaughter cattle imports into the US were just over a million head in each of the several years prior to the adoption of import restrictions by the US (figure 1). However, on May 20, 2003 when a single cow in Canada was discovered to be infected with BSE, export of all ruminants and ruminant products from Canada to the US was suspended.

**Figure 1. Annual US Imports of Canadian Slaughter Cattle, 1999- September 2004**




* Import restrictions started in May 2003.
**Through September 2004
Source: US Department of Agriculture

Beginning in late August 2003 a restricted set of boneless beef products were once again allowed to be exported from Canada to the US and these products have continued to be imported since that time. In April 2004, USDA issued a notice to importers that the US was adding certain additional beef products to the approved list for import permitting. This announcement prompted a US organization, R-CALF USA, to file a legal challenge that led to a federal judge blocking the new policy and USDA agreeing to revert to the restricted beef product list that was put in place in August 2003. A proposed rule, first published on October 31, 2003, to allow the resumption of trade in certain classes of cattle and additional beef products, is still pending. As of December 28, 2004, live cattle imports from Canada to the US remain restricted with no scheduled date for trade resumption.

## Impact of Import Restrictions on US Cattle Slaughtering

In 2002, the last full year of unrestricted cattle trade between US and Canada, Canadian slaughter cattle imports represented about 3% of total US cattle slaughter. However, Canadian slaughter cattle import restrictions had much greater relative impact in particular states. Table 1 presents the number of Canadian slaughter cattle imports by state of destination, slaughter in each of those states, and the percentage of slaughter represented by Canadian imported cattle in 2002. Utah was clearly impacted the most by restricted Canadian slaughter cattle imports as beef packers in Utah imported more than 200,000 head in 2002, representing 30% of the state's total slaughter. Other states where packers were strongly impacted in number of head and/or percentage of slaughter represented by Canadian cattle imports included Washington, Minnesota, Nebraska, Pennsylvania, Wisconsin, Idaho, Michigan, and New Jersey.[4]

To determine the economic importance of Canadian cattle slaughtered in the US, table 2 summarizes live value and estimated market value of boxed beef, hide, and offal by state from Canadian cattle imports for 2002. For the US as a whole, the live value of Canadian imported slaughter cattle was around $755-$801 million (US) in 2002, depending upon whether Agriculture and Agri-Food Canada or USDA data are used. Of additional importance for US processing firms is the value of boxed beef, hide, and offal from slaughtering Canadian cattle and the gross margin of product sales relative to the cost of cattle. The value differential between the purchase price of the cattle and the value of beef, hide, and offal is estimated using data from the Livestock Marketing Information Center. The next section provides a more comprehensive assessment of economic impacts to the US (and Washington State beef packers as a particular case study) associated with lost slaughter resulting from the import ban on Canadian cattle for slaughter. The value presentation here is primarily to provide a relative estimate of individual state impacts associated with the import restriction (which is not done for the more comprehensive economic losses reported later).

For the entire US, the gross sales value of boxed beef and byproduct sales from Canadian imported slaughter cattle was $901-$956 million with the net value (sales value less the live animal price) being around $145-$155 million in 2002 (table 2). Individual states had substantial variability in sales value associated with Canadian cattle slaughter. For example, Utah had $203 million, Washington $161 million, and Nebraska and Minnesota each over $100 million in sales value of boxed beef and byproducts from slaughtering Canadian cattle. Pennsylvania and Wisconsin each had more than $80 million in sales of boxed beef and byproducts from Canadian cattle slaughtered in 2002.

[4] Import numbers of slaughter cattle for the leading importing states in recent years are reported in Appendix A table A2.

**Table 1. US Imports of Canadian Slaughter Cattle, Total Cattle Slaughter, and US Imports as a Percentage of Total Cattle Slaughter by State, 2002.**

| State of Slaughter | US Imports[a] (head) | Total Slaughter[b] (head) | Import Share (% of Total) |
|---|---|---|---|
| Utah | 205,931 | 680,800 | 30.2 |
| Washington | 180,242 | 970,040 | 18.6 |
| Minnesota | 145,684 | 1,252,600 | 11.6 |
| Nebraska | 125,703 | 8,621,400 | 1.5 |
| Pennsylvania | 101,941 | 1,471,800 | 6.9 |
| Wisconsin | 95,551 | 1,766,340 | 5.4 |
| Idaho | 52,868 | 1,051,000 | 5.0 |
| Michigan | 52,028 | 519,600 | 10.0 |
| Colorado | 33,584 | 2,594,200 | 1.3 |
| Illinois | 12,663 | NA[c] | NA |
| Iowa | 4,073 | NA | NA |
| California | 3,762 | 1,251,200 | 0.3 |
| New Jersey | 3,020 | 22,600 | 13.4 |
| Texas | 2,046 | 6,309,600 | 0.0 |
| South Dakota | 1,399 | NA | NA |
| Georgia | 1,394 | NA | NA |
| Kansas | 1,078 | 7,362,100 | 0.0 |
| North Carolina | 668 | 155,440 | 0.4 |
| Missouri | 438 | NA | NA |
| Montana | 175 | NA | NA |
| North Dakota | 41 | NA | NA |
| Maine | 36 | NA | NA |
| New York | 28 | 38,800 | 0.1 |
| Ohio | 25 | 69,900 | 0.0 |
| | | | |
| Total from Canadian Data[a] | 1,024,378 | 35,122,000 | 2.9 |
| Total from USDA Data[b] | 1,087,430 | 35,122,000 | 3.1 |

[a] Source: Agriculture and Agri-Food Canada

[b] Source: US Department of Agriculture

[c] NA refers to not available as USDA did not report for confidentiality reasons

**Table 2. Estimated Value of US Imports of Canadian Slaughter Cattle and Boxed Beef and Byproduct Sales Value and Sales Value Less Purchase Cost of Canadian Slaughter Cattle by US Slaughter Firms, by State, 2002.**

| State | Live Value of Imports[a] (US dollars) | Estimated Beef & Byproduct Sales Value of Imports[b] (US dollars) | Estimated Beef & Byproduct Value Less Live Cost[c] (US dollars) |
|---|---|---|---|
| Utah | 174,081,618 | 203,384,176 | 29,302,558 |
| Washington | 135,176,001 | 160,823,192 | 25,647,191 |
| Minnesota | 82,120,068 | 102,849,894 | 20,729,826 |
| Nebraska | 98,565,909 | 116,452,577 | 17,886,668 |
| Pennsylvania | 71,597,141 | 86,102,641 | 14,505,500 |
| Wisconsin | 66,995,411 | 80,591,658 | 13,596,247 |
| Idaho | 34,532,851 | 42,055,602 | 7,522,751 |
| Michigan | 39,761,838 | 47,165,063 | 7,403,225 |
| Colorado | 28,424,470 | 33,203,241 | 4,778,771 |
| Illinois | 10,979,184 | 12,781,041 | 1,801,857 |
| Iowa | 3,616,977 | 4,196,537 | 579,560 |
| California | 1,995,945 | 2,531,252 | 535,307 |
| New Jersey | 1,470,838 | 1,900,563 | 429,725 |
| Texas | 1,681,800 | 1,972,932 | 291,132 |
| South Dakota | 1,129,556 | 1,328,624 | 199,068 |
| Georgia | 937,108 | 1,135,464 | 198,357 |
| Kansas | 678,345 | 831,737 | 153,392 |
| North Carolina | 448,032 | 543,084 | 95,052 |
| Missouri | 416,620 | 478,944 | 62,324 |
| Montana | 136,303 | 161,204 | 24,901 |
| North Dakota | 13,905 | 19,739 | 5,834 |
| Maine | 32,679 | 37,802 | 5,123 |
| New York | 13,820 | 17,805 | 3,984 |
| Ohio | 28,411 | 31,968 | 3,557 |
| | | | |
| Total from Canadian Data | 754,834,832 | 900,596,741 | 145,761,908 |
| Estimated Total from USDA Data | 801,296,047 | 956,029,819 | 154,733,772 |

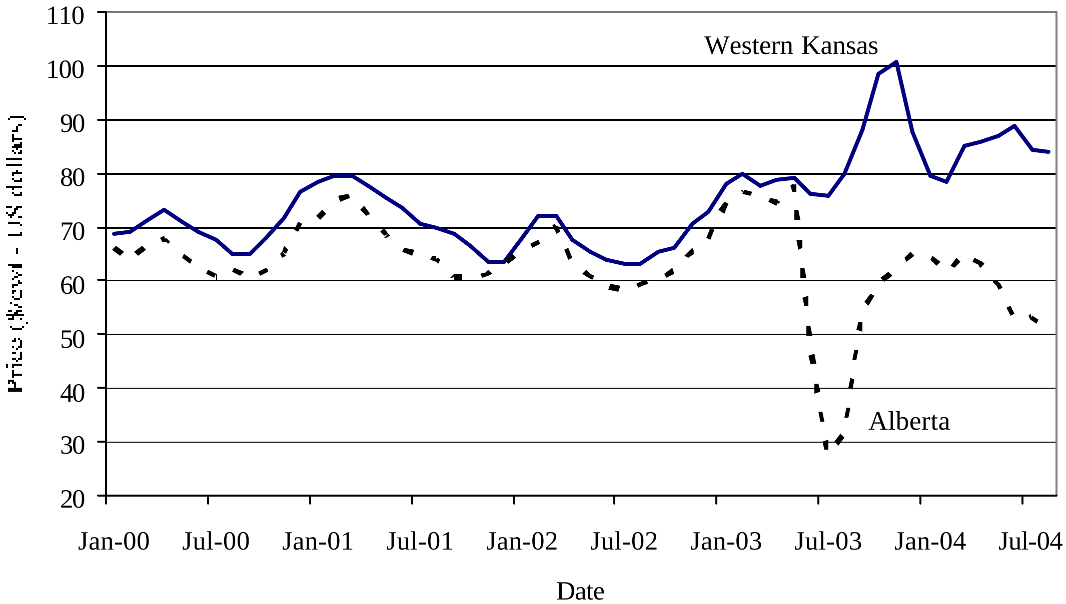
[a]Source: Agriculture and Agri-Food Canada. Converted to US Dollars using 2002 Exchange Rate of 1.57 Canadian to 1 US dollar (Source: Board of Governors of Federal Reserve System).
[b]Boxed beef and byproduct sales value is by definition the sum of the other two columns in this table.
[c]Calculated by multiplying number of head imported from Canada by $142.29 (US dollars). This number is the average 2002 live to cutout spread (boxed beef plus byproduct less cattle purchase cost) estimated by the Livestock Marketing Information Center, Lakewood CO.

Determining the precise amount of economic loss directly associated with restricted live cattle trade from Canada to the US is complex, and allocating these losses to specific states or regions is more so. One of the challenges is estimating how many slaughter cattle would have been imported into the US from Canada were the ban not in place. Several economic factors would certainly influence Canadian slaughter cattle exports to the US. First, it is noteworthy that in the years immediately prior to the adoption of import restrictions more than a million head of slaughter cattle were imported annually into the US from Canada (see figure 1). Because the cattle industry has significant biological lags and in the short run a very inelastic supply response, a good place to start future supply projections would be the most recent trade numbers (i.e., 2002 Canadian imports to the US). Of course other factors are also relevant to estimating these trade flows. For example, cattle production numbers in Canada would be important to consider. However, these have changed for a number of reasons, including Canadian domestic policies trying to slow down cattle supplies, since live cattle trade to the US was halted, so looking at actual current supplies is not particularly useful in this regard.

As a result of the border closure, Canadian slaughter cattle prices have declined significantly relative to US cattle prices since May 2003. For example, figures 2 and 3 illustrate monthly fed steer and cow prices in Western Kansas and in Alberta over the 2000 – August 2004 period. The Canadian dollar increased in value from around 1.57 in 2002 to 1.29 per US dollar in September 2004. All else constant, this would effectively make Canadian cattle prices higher in US dollars than without the increase in value of the Canadian dollar. However, even after adjusting for the increased value of the Canadian dollar, Canadian cattle prices have been considerably lower (often by more than $20/cwt) than US prices. How many cattle the US could import from Canada before slaughter cattle prices across the two countries would realign is beyond the scope of this study. However, it is likely the number would be similar to trade numbers of 2002, if the trade restriction had not been in place, and if the Canadian government had not taken steps to reduce domestic supplies of cattle.

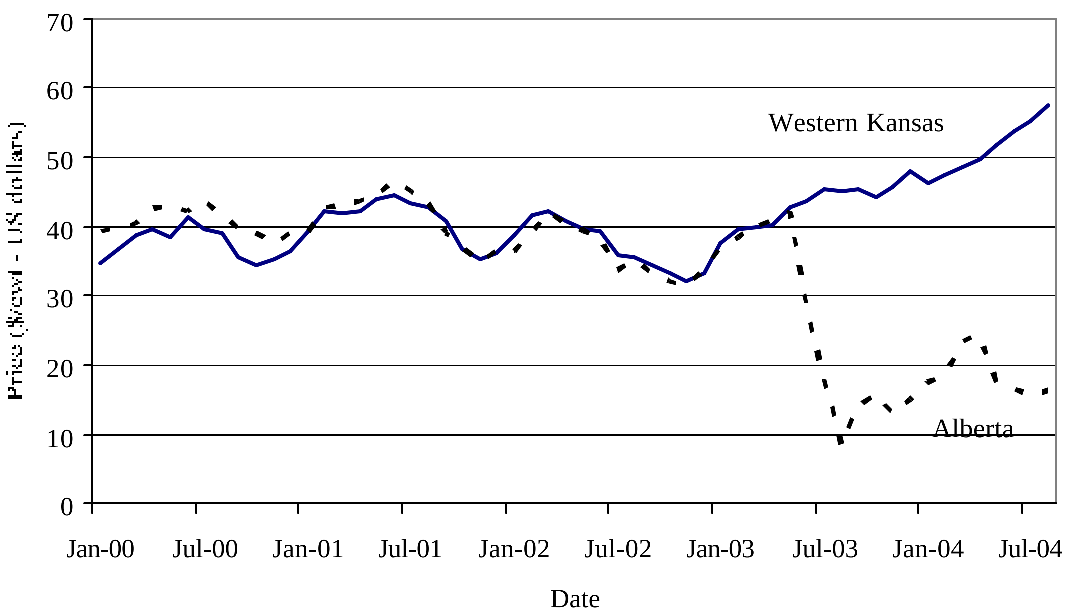
Some regions or states in the US have been affected in different ways by the import restriction on live cattle from Canada. Different impacts likely prevail even across states that were importing similar numbers of head. This is because certain parts of the US have geographic markets that are physically more isolated from other areas and have fewer cattle in their typical market trading region to pull from or competition for cattle in particular areas is especially keen. As such, beef packers located in some states further from the heart of cattle production in the US suffer greater loss associated with the Canadian cattle import ban than those located nearer major market centers. No adjustment for this has been made in the ensuing analysis, but based upon anecdotal evidence from discussions with industry participants as well as a review of relative slaughter share shifts over time, the states of Utah, Washington, Idaho, Nebraska, Pennsylvania, and Wisconsin (and perhaps New Jersey on a percentage basis) appear to have had the largest impacts from the ban on Canadian slaughter cattle imports.

**Figure 2. Monthly Alberta Canada and Western Kansas US Fed Steer Prices, 2000-August 2004**




Source: Livestock Marketing Information Center, Lakewood, CO

**Figure 3. Monthly Alberta Canada Slaughter Cow and Western Kansas US Slaughter Cow Prices, 2000-August 2004**




Source: Livestock Marketing Information Center, Lakewood, CO

Finally, another important issue that is not analyzed directly here that would increase the economic impact associated with the ban on Canadian slaughter cattle imports is reduced packing plant capacity utilization. Packing firms incur fixed costs whether they operate at capacity or not; with reduced cattle availability, especially in areas like those mentioned above, failure to operate at capacity creates a major competitive disadvantage for those plants and firms. For example, Swift suspended its second shift at its Nebraska and Colorado plants in large part because of the import restrictions. Such events result in particular packing plants and firms suffering significant economic difficulties because operating costs per pound of meat produced rise rapidly when plants operate below capacity. The result is that eventually some US plants are forced to close down. In addition, numerous other economic spillover effects occur to the rest of the local and national economy when cattle slaughter declines as is discussed in detail in the next section.

With these caveats in mind, it is possible to get a sense for what types of impacts the import restrictions likely have had across states over the 2003 through 2004 period. Table 3 provides an estimate of the lost sales value of boxed beef and byproducts produced by packers, and the resulting margin loss (i.e. the lost sales value less the cost of cattle) for 2003 and 2004, by state. Utah had the greatest estimated loss in sales value of boxed beef and byproducts – about $350 million which translated into about $56 million loss in gross margin. Washington was next with lost sales of $291 million and $46 million in gross margin loss. Nine states had lost sales estimates exceeding $60 million and lost gross margins exceeding $10 million over the 2003-2004 period. Total US boxed beef and byproduct sales loss associated with the border restrictions was estimated to be about $1.7 to $1.8 billion with $270-285 million loss in margin over the 2003-2004 period. An important assumption made in the calculations presented in table 3 is that the same number of cattle would have been imported into the US in 2003 and 2004 by each state as was imported in 2002. The validity of this assumption is not tested, and several economic factors, as discussed above, would affect it. However, since import numbers from 1999-2002 were similar each year, this assumption is at least consistent with recent history. Also, actual prices during 2003 and 2004 were used in this analysis and these would not necessarily be the same prices that would have prevailed if the border restrictions were not in place. It was assumed here that the reduction in slaughter cattle sourced from Canada to each state was not replaced with cattle from other states. This is likely not a fully valid assumption for all states. Based on analysis of slaughter shares over time of the 10 leading cattle importing states, it appears those that lost the most slaughter share were Utah, Washington, Nebraska, Pennsylvania, Wisconsin, Michigan, and Idaho (see appendix A table A3). So loss amounts could be overstated for some states and, if so, would be understated for others. The total US amount should still be accurate, just the incidence on individual states might differ.

**Table 3. Estimated Value of Reduced US Imports of Canadian Slaughter Cattle and Lost Beef & Byproduct Value by US Slaughter Firms, by State, May 20, 2003 through 2004.**

| State | Estimated Live Value of Reduced Imports 2003+2004[a] (US dollars) | Estimated Loss of Beef & Byproduct Sales Value 2003+2004[b] (US dollars) | Estimated Loss of Beef & Byproduct Value less Live Cost 2003+2004[c] (US dollars) |
|---|---|---|---|
| Utah | 293,610,572 | 349,632,112 | 56,021,540 |
| Washington | 244,536,510 | 290,988,629 | 46,452,119 |
| Minnesota | 202,465,636 | 241,009,702 | 38,544,067 |
| Nebraska | 172,149,609 | 204,879,066 | 32,729,457 |
| Pennsylvania | 136,029,982 | 161,830,660 | 25,800,678 |
| Wisconsin | 135,906,278 | 161,832,072 | 25,925,794 |
| Idaho | 73,561,766 | 87,567,462 | 14,005,696 |
| Michigan | 67,805,084 | 80,636,948 | 12,831,864 |
| Colorado | 55,928,321 | 66,732,702 | 10,804,380 |
| Illinois | 9,616,806 | 11,312,083 | 1,695,278 |
| Iowa | 5,548,867 | 6,603,328 | 1,054,461 |
| California | 6,151,694 | 7,338,490 | 1,186,796 |
| New Jersey | 3,991,072 | 4,747,368 | 756,297 |
| Texas | 2,307,986 | 2,738,274 | 430,288 |
| South Dakota | 2,339,716 | 2,791,850 | 452,133 |
| Georgia | 2,331,354 | 2,781,872 | 450,517 |
| Kansas | 1,802,869 | 2,151,261 | 348,391 |
| North Carolina | 962,230 | 1,145,988 | 183,758 |
| Missouri | 732,520 | 874,074 | 141,554 |
| Montana | 292,674 | 349,231 | 56,557 |
| North Dakota | 39,413 | 46,617 | 7,205 |
| Maine | 60,207 | 71,842 | 11,635 |
| New York | 46,828 | 55,877 | 9,049 |
| Ohio | 36,812 | 43,855 | 7,043 |
| | | | |
| Total from Canadian Data | 1,418,254,805 | 1,688,161,363 | 269,906,557 |
| Estimated Total from USDA Data | 1,501,301,911 | 1,786,940,671 | 285,638,761 |

[a]Calculated by multiplying number of head of reduced imports from Canada (see Appendix A table A1) by \$833.05/hd for 2003 and \$839.37/hd for 2004 (through late October). Live animal values estimates from Livestock Marketing Information Center, Lakewood, CO.

[b]Boxed beef and byproduct sales value is by definition the sum of the other two columns in this table.

[c]Calculated by multiplying number of head of reduced imports from Canada by \$172.73/hd for 2003 and \$150.45/hd for 2004 (estimated through late October). These are live to cutout spreads (i.e., value added from slaughtering) estimated by the Livestock Marketing Information Center, Lakewood, CO.

## Economic Impact of Cattle Import Restrictions

Two different "case studies" are used to estimate economic impacts of US restrictions on Canadian cattle imports. In particular, economic impacts of reductions in meat processing activity in the State of Washington, and in the US as a whole, that were associated with the loss of imported Canadian cattle are presented. Washington was chosen as a "case study" of the impact to a single state substantially impacted by the restrictions to demonstrate regional economic impacts. These estimates show the potential distribution and scale of impacts that might be expected under alternative assumptions of reduced production activity and import activity. These estimates are intended to provide an indication of the direction and probable scale of impacts given relationships known to exist in the economy.

Overall, the information should be considered an approximation of the direction and scale of impact. To accurately project economic, fiscal, or other impacts associated with economic policies or events is a challenging technical endeavor. Thus, simplifying assumptions were required to keep the time and resources needed to conduct such an analysis feasible. The limitations of this analysis are identified in this report and should be acknowledged when interpreting the results.

**Economic Analysis of Reduced Meat Processing**

Social accounting matrix (SAM) analysis was used to project the economic impacts of reduced meat processing activity in the State of Washington and the US that was consistent with the amount of reduced imports of slaughter cattle from Canada resulting from import restrictions. SAM analysis is a system of accounting for the economic transactions occurring in a regional or national economy at a point in time. A SAM model is a "computerized spreadsheet" of the economy, charting the flow of dollars between business sectors, households, government, and other non-local consumers of locally-produced goods and services. SAM analysis also accounts for transactions between institutions such as households, government, and enterprises. Thus, SAM analysis accounts for taxes and government payments to households and businesses. A SAM creates a "snapshot" of the economy at a point in time, typically one year. The accounting system enables estimates of how spending in one area of the economy "ripples" through the economy to other sectors as businesses buy and sell to one another and generate income for local labor and proprietors. The SAM system used in this research is the IMPLAN (IMpact analysis for PLANning) system developed by the US Forest Service. The system uses secondary data published in government economic reports as the basis for construction of economic accounts.

In SAM analysis, a number of simplifying assumptions are necessary (see Appendix B). Therefore, the impacts identified in this report are best considered general estimates to be used in conjunction with other information for decision-making related to investments or policy.

The analysis used published economic data from 2000. An inflator was used to present the value of the transactions in 2003 dollars (2003$). To the extent economic conditions or the composition of the state or national economy have changed since 2000, the impact may be somewhat different. The analysis also "compresses" the total economic impact into a single year. In reality, the full effects of economic events take several years to be realized. The further from the year of the analysis, however, the less reliable projections become. The information reported here should be considered a short-term projection, with increasing uncertainty in the medium- to long-term.

Economic impacts of slaughter cattle import restrictions from two sources are estimated: 1) impacts associated with the reduction of production activity in meat processing plants, and 2) impacts associated with reduced spending of income generated by labor for household purchases. The economic impacts are limited to direct, indirect (inter-business transactions), and induced (household spending) economic impacts measured as changes in employment and income (value added) to the state and nation.

**Economic Impacts - Concepts and Definitions**

Economic impacts are measured in several ways. Here, impacts are reported in terms of the number of jobs affected and the value of the associated income. Economic impacts also arise from several different sources. The "direct" impacts are the value of sales, wages or employment directly in a facility or combined industry sector. The value of total sales is assumed to stimulate additional economic activity.

"Indirect" economic impacts arise from businesses buying and selling to one another in the course of normal economic interaction. The increase/decrease in demand for one company's product stimulates changes in demand for the suppliers of inputs to that firm. In turn, the suppliers must increase/decrease their purchase of inputs. These inter-industry transactions cumulatively make up the indirect economic impact.

"Induced" economic impacts arise from household spending of income earned from labor or profit. Wages and salaries paid directly by a firm and its suppliers are used by workers to purchase household goods and services from a wide range of businesses. These purchases have the effect of spreading the impacts of economic activity broadly throughout the economy.

Two different impacts are reported. The first is value added, or total income. Value added is the broadest measure of income and consists of employee compensation plus proprietary income plus other property income (rents, royalties, corporate profits and dividends) plus indirect business taxes (all taxes paid by businesses except those associated with profits and income).

The second impact measure reported is "jobs." Jobs are the "average" jobs in the economic sector, and do not imply anything about whether the jobs are full- or part-time, or whether they are high- or low-paying jobs. Given assumptions inherent in the analysis used, the estimates of indirect and induced jobs are typically larger than would actually be realized.

**Procedures Used to Estimate Economic Impacts**

Published import and cattle slaughter data were used to estimate the percentage of beef processing activity affected by the import ban. Table 4 summarizes the cattle slaughter levels and slaughter reductions analyzed. In the Washington analysis, we expect that affected processors made adjustments to try to replace some of the cattle no longer being sourced from Canada out of domestic supplies from other states. Because we do not know how individual firms reacted to the restricted cattle flow, a range of potential impacts was identified and “low” and “high” estimates were produced. The “high” estimate was the approximate 2002 Canadian slaughter cattle imports to Washington. The “low” estimate was a little less than the smallest annual number of slaughter cattle imported into the state from Canada over the past four years prior to the import restriction (see appendix A table A2). To allow for limitations associated with the techniques used here, the high and low estimates of the Washington impacts were also halved to illustrate impacts if processors were able to make significant substitutions of domestic inputs. Because the US could not effectively substitute Canadian slaughter cattle from other sources (like a single state might be able to), only actual Canadian slaughter cattle imports for 2002 are used as a proxy for how much reduction in imports the restrictions would create in a single year without additional sensitivity analysis.

**Table 4. State of Washington and US Cattle Slaughter Values and Slaughter Reductions Used in Impact Scenarios**

| Cattle Slaughter and Slaughter Reductions | Head of Cattle | Percentage of Slaughter | Dollar Value[a] (million US) |
|---|---|---|---|
| State of Washington | | | |
| 2000-02 Average Total Washington Cattle Slaughter | 978,667[b] | 100.0 | 1,080.216 |
| Estimated Canadian Impact - Low (100%) | 120,000 | 12.3 | 132.434 |
| Estimated Canadian Impact - Low (50%) | 60,000 | 6.1 | 66.217 |
| Estimated Canadian Impact - High (100%) | 180,000 | 18.4 | 198.652 |
| Estimated Canadian Impact - High (50%) | 90,000 | 9.2 | 99.326 |
| US Total | | | |
| 2000-02 Average Total U.S. Cattle Slaughter | 35,175,000[b] | 100.0 | 24,403.334 |
| 2001-02 Average Canadian Live Cattle | 1,047,626[b] | 3.0 | 727.219 |

[a]Source: IMPLAN total industry output, 2000
[b]Source: US Department of Agriculture

In modeling the impact to processors, the proportion of total slaughter from foreign imports was estimated.[5] A confidence interval was established for Washington, and a single scenario was established for US processing. The industry output (total sales or value of production) associated with processing this proportion of beef was determined from the IMPLAN economic accounts. Total US output of meat processing was adjusted (together with all other relevant accounts) to take out processing of pork and lamb that are combined with beef in published US accounts.[6, 7]

**Economic Impact Analysis Results**

The SAM provides estimates of several types of economic impact. Impacts presented were total income and employment (the "cleanest" impacts given analysis limitations). The appropriate interpretation is that these levels of income and employment are closely related to the level of economic activity identified as having been impacted. This is not to suggest that all of the income and jobs were lost. To presume a complete loss of these levels of income and employment would be to say the impacted workers and companies did nothing and remained idle or left the state/nation. Clearly, this was not their response. However, at the least, these were the challenges created, requiring some type of response by the company and/or worker. The ultimate outcome to their welfare cannot be determined by SAM estimation techniques.

***Impacts to Washington State***

Two impact scenarios were estimated for the low and high bounds of the value of estimated cattle processing reductions. Further, given the uncertainty of company and worker response, and the likelihood that many would have responded to reduced production created, each scenario was replicated at one-half the initial estimate.

As shown in table 5, in the high-impact scenario, the total estimated impact of the import restrictions on income in Washington ranged from a reduction of approximately $22.5 million to $45.5 million. The impacts were generally concentrated in the manufacturing sector where meat processing is classified, but also distributed to trade and service sectors. This illustrates the effects of reduced household spending of labor income and

---

[5] Imports of live cattle to the US originate from essentially only two sources: Canada and Mexico. Slaughter cattle from Canada impacting US processors are ready for slaughter and were assumed to go directly to slaughter plants upon import. Cattle from Mexico require additional finishing and were assumed to all go to pasture or feed lots. Therefore, all cattle imports directly impacting American meat processors were assumed from Canada.

[6] In Washington, the vast majority of red meat processing is beef products. Therefore, total meat processing output of Washington State was assumed to be beef. For US estimates, the proportion of the total value of red meat processing (including byproducts) attributed to beef was estimated conservatively to be 58 percent.

[7] To prevent inflation of estimated economic impacts due to the substitution of livestock supplies (and its backward-linked suppliers), the regional purchase coefficients from domestic livestock resources were set to zero for the SAM analysis. This effectively tells the model that there was no substitution of state/national input supplies. Had this step not been taken, SAM analysis would have assumed all of the cattle had come from domestic supplies rather than from foreign import. The resulting analysis would have suggested a dramatic impact to domestic cattle and grain production in addition to the meat packing impacts of interest. More appropriately, any cattle and grain production impacts would accrue to Canadian producers.

serves to distribute the impact widely throughout the state's economy. The story is similar to the low-impact scenario with a range of reduction from approximately $15 million to about $30 million. These represent annual impacts that would occur each year over the duration of import restrictions.

**Table 5. Total Income Impact of Reduced Meat Processing Activity In Washington by Economic Sector, 2003 US Dollars**

| Impacted Sector | Low – 100% (millions $) | Low -50% (millions $) | High - 100% (millions $) | High - 50% (millions $) |
|---|---|---|---|---|
| Agriculture | -0.055 | -0.027 | -0.082 | -0.041 |
| Mining | -0.007 | -0.003 | -0.010 | -0.005 |
| Construction | -0.445 | -0.222 | -0.667 | -0.334 |
| Manufacturing | -14.252 | -7.126 | -21.377 | -10.289 |
| TCPU[a] | -2.116 | -1.058 | -3.174 | -1.587 |
| Trade | -4.985 | -2.493 | -7.478 | -3.739 |
| FIRE[b] | -3.551 | -1.776 | -5.327 | -2.663 |
| Services | -4.359 | -2.179 | -6.538 | -3.269 |
| Government | -0.347 | -0.173 | -0.521 | -0.260 |
| Total | -30.116 | -15.058 | -45.475 | -22.587 |

[a] TCPU is transportation, communications and public utilities
[b] FIRE is finance, insurance and real estate

The analysis also included estimates to impacts to state employment (table 6). Again, the number of jobs specified was not necessarily lost. The analysis simply says that these are the number of jobs in each economic sector that are closely tied with the level of economic activity affected. In some cases, the impact may have created slack worker capacity. In others, an actual job may have been lost. In many instances of actual job loss, the worker may have secured alternative employment.

In the high-impact scenario, the number of jobs impacted ranged from a reduction of about 450 to about 900. About half the jobs were in the manufacturing sector, concentrated in meat packing. The other half was distributed throughout the rest of the economy, with most losses in the trade and service sectors. The low-impact scenario ranged from a reduction of about 300 to 600 jobs.

**Table 6. Total Employment Impact of Reduced Meat Processing Activity to Washington by Economic Sector**

| Impacted Sector | Low - 100% (count) | Low -50% (count) | High - 100% (count) | High - 50% (count) |
|---|---|---|---|---|
| Agriculture | -1.9 | -0.9 | -2.8 | -1.4 |
| Mining | -0.1 | 0.0 | -0.1 | -0.1 |
| Construction | -7.9 | -4.0 | -11.9 | -5.9 |
| Manufacturing | -352.9 | -176.5 | -529.4 | -264.7 |
| TCPU[a] | -24.9 | -12.5 | -37.4 | -18.7 |
| Trade | -81.5 | -40.8 | -122.3 | -61.1 |
| FIRE[b] | -25.7 | -12.9 | -38.6 | -19.3 |
| Services | -105.2 | -52.7 | -157.9 | -78.9 |
| Government | -4.2 | -2.1 | -6.3 | -3.2 |
| Total | -604.4 | -302.2 | -906.6 | -453.3 |

[a] TCPU is transportation, communications and public utilities
[b] FIRE is finance, insurance and real estate

***US Economic Impacts***

Prior to completing the U.S. economic impact scenario, the IMPLAN model for the United States was adjusted. The first adjustment reduced the total meat packing activity to 58 percent of its original total to remove the estimated value of pork and lamb processing embedded in the US accounts. Once again, the regional purchase coefficients for all livestock sectors were set to zero to prevent domestic substitution.

The single scenario analyzed involved the reduction of $726.8 million in meat packing activity, the estimated value of processing Canadian imported cattle. The results of the analysis are shown in Table 7. The total loss of income to the US economy associated with reduced meat processing activity was estimated to be about $282 million annually. The number of jobs closely allied with this level of economic activity was nearly 5,000.

**Table 7. Total Employment Impact of Reduced Meat Processing Activity to the U.S. by Economic Sector, 2003 US Dollars**

| Impacted Sector | Total Income (millions $) | Employment (count) |
|---|---|---|
| Agriculture | -1.07 | -39 |
| Mining | -2.82 | -14 |
| Construction | -3.97 | -79 |
| Manufacturing | -100.90 | -2,163 |
| TCPU[a] | -24.65 | -266 |
| Trade | -41.34 | -753 |
| FIRE[b] | -48.79 | -317 |
| Services | -56.34 | -1,291 |
| Government | -2.33 | -38 |
| Total | -282.21 | -4,960 |

[a] TCPU is transportation, communications and public utilities

[b] FIRE is finance, insurance and real estate

## Market Structure and Location Implications

Import restrictions on Canadian slaughter cattle into the US have had substantial short run impacts as demonstrated by the discussion up to this point. However, sustained border restrictions are already having noticeable, and will in the future have even greater, impacts on beef packing structure and location in both the US and Canada. Loss of one million head of cattle supply to US packers with annual slaughter of 35 million head sounds manageable, though costly, if the impact was spread evenly across the country. However, clearly the impact is not spread evenly across the country as packers in certain regions rely to a much greater extent on Canadian cattle to keep their plants operating at efficient levels. High transportation costs and animal shrinkage and deterioration preclude shipping live cattle long distances.

One alternative solution to this problem would be for the US to increase its domestic production by one million head of slaughter cattle annually in these particular regions to offset the Canadian loss. However, this is not probable because global beef price would drop accordingly and production costs would increase making it unprofitable for US producers to engage in what would effectively be global herd expansion (assuming Canada and US can both get international trade opened up again following BSE discoveries in each country and subsequent loss of international demand for their beef). The US has increased imports of Mexican feeder cattle which were up about 45,000 head in 2003 relative to 2002 and up almost 200,000 head as of October 2004 relative to the same time in 2003. However, the increase in Mexican feeder cattle imports remains considerably smaller than the more than 500,000 head of Canadian feeder cattle imports in 2002 that were also restricted starting in May 2003. So increased Mexican feeder cattle imports does not even offset Canadian feeder cattle imports, let alone the more than a million head of slaughter cattle imports.

What is likely to happen is closing of beef slaughter and processing plants in the US (and reducing all related economic activity) and expansion of beef slaughter and processing in Canada. The US has roughly one million head annual excess cattle slaughter capacity relative to prior to the border restriction. Approximately 60%, or 600,000 head, of Canadian slaughter cattle imports have been steers and heifers and the remaining 40%, or 400,000 head, cows and bulls. This provides a rough indicator of the excess slaughter capacity created in the US by the border restrictions for packers operating in each type of cattle. This suggests closure of either several smaller US steer and heifer plants, or closure of one large plant. Smaller plants tend to be at more risk because huge economies of size in beef packing make smaller plants more vulnerable to supply shifts. The loss of cows and bulls from Canada will likely result in closure of several US cow slaughter plants because they tend to be smaller in scale than steer and heifer plants.

Recent evidence of US beef packing plant financial struggles is apparent through reduced shifts operating at two Swift plants starting in February 2004, closure of the Iowa Quality Beef plant (a producer-owned venture) in Tampa, Iowa in August 2004, closure of Simplot Meat Products plant in Nampa, Idaho in September 2003, and closure of Ferry Brothers in Ferndale, Washington. Other US beef slaughter and processing plant closures are probable in the future.[8] Of course closure of US beef export markets in December 2003 added additional strain to US beef packers so not all the recent beef slaughter firm activity is solely attributable to trade restrictions with Canada.

Expansion of cattle slaughter plants in Canada has been a topic of discussion since the border restrictions were initiated. Current Canadian plants have been operating at high utilization levels with expanded shifts and investment in new and expanded facilities is underway. For example, XL Foods has expanded its Moose Jaw slaughter facility, Levinoff in Quebec is expanding, Gencor in Ontario and Rangeland in British Columbia are planning reopening previously closed plants, and Atlantic beef is opening a plant at Prince Edward Island (this plant was underway prior to May 2003). However, additional physical slaughter capacity investment is probable if US border restrictions are not lifted soon. Future Canadian beef slaughter plants are being encouraged by the September 2004 announcement by the Canadian government of a plan to provide $66.2 million (CN)

---

[8] Another interesting and perhaps related recent development is the sale of reported 357,000 head of cattle feeding capacity by Swift to Smithfield (Reuters, October 19, 2004). These feedlots are located near Swift plants to help source cattle to their plants especially during particular seasons when other cattle in these regions are not readily available. These feedlots are not located near Smithfield's cattle slaughter plants. What this means for Swift's future is not clear, but at the very least it suggests a major change in the way they do business, and in December 2004, led to Swifts' announced layoff of 800 employees.

in funds to facilitate ruminant slaughter capacity expansion in Canada. Several plans are being formulated for slaughter plant investments in Canada by numerous firms and groups. If such expansion of Canadian slaughter capacity occurs, this will result in over capacity of North American cattle slaughter unless some US plants close. When the border reopens, if the US plants have already closed down, Canadian plants likely will permanently replace the US plants and all economic activity associated with slaughter and processing of the one million head of cattle previously shipped to US will remain in Canada. If the US plants have not closed, either US and/or Canadian plants will ultimately close with only the most efficient surviving until the region gets back to a sustainable efficient slaughter and processing capacity. Whatever the scenario of adjustments and investments and regional shifts in plant locations, the overall adjustment costs in the end will be substantial for both US and Canada.

## Appendix A

**Table A1. Estimated Reduced US Imports of Canadian Slaughter Cattle by State, May 20, 2003 through 2004.**

| State | Canadian Cattle Imports through May 2003[a] (head) | Estimated Reduced Imports 2003 Relative to 2002[b] (head) | Estimated Reduced Imports 2004 Relative to 2002[c] (head) |
|---|---|---|---|
| Utah | 60,972 | 144,959 | 205,931 |
| Washington | 68,308 | 111,934 | 180,242 |
| Minnesota | 49,432 | 96,252 | 145,684 |
| Nebraska | 45,710 | 79,993 | 125,703 |
| Pennsylvania | 41,364 | 60,577 | 101,941 |
| Wisconsin | 28,684 | 66,867 | 95,551 |
| Idaho | 17,833 | 35,035 | 52,868 |
| Michigan | 23,057 | 28,971 | 52,028 |
| Colorado | 286 | 33,298 | 33,584 |
| Illinois | 13,878 | -1,215[d] | 12,663 |
| Iowa | 1,516 | 2,557 | 4,073 |
| California | 168 | 3,594 | 3,762 |
| New Jersey | 1,272 | 1,748 | 3,020 |
| Texas | 1,337 | 709 | 2,046 |
| South Dakota | 0 | 1,399 | 1,399 |
| Georgia | 0 | 1,394 | 1,394 |
| Kansas | 0 | 1,078 | 1,078 |
| North Carolina | 186 | 482 | 668 |
| Missouri | 0 | 438 | 438 |
| Montana | 0 | 175 | 175 |
| North Dakota | 35 | 6 | 41 |
| Maine | 0 | 36 | 36 |
| New York | 0 | 28 | 28 |
| Ohio | 6 | 19 | 25 |
| | | | |
| Total from Canadian Data | 354,044 | 670,334 | 1,024,378 |
| Estimated Total USDA Data | 380,936 | 706,494 | 1,087,430 |

[a]Source: Agriculture and Agri-Food Canada

[b]Calculated as 2002 minus 2003 slaughter cattle imports by US based on Ag and Agri-Food Canada data

[c]Calculated as 2002 slaughter cattle imports by US based on Ag and Agri-Food Canada data

[d]For Illinois, Canadian cattle imports through May 2003 exceeded the 2002 total. The small negative number was retained to keep calculation procedures consistent.

**Table A2. Steer and Heifer and Cow and Bull Slaughter Shares as a Percentage of US Total Cattle Slaughter Represented by Leading Canadian Cattle Import States, 2000 – July 2004[a].**

| | Steers and Heifers | | | | | Cows and Bulls | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | 2000 | 2001 | 2002 | 2003 | 2004* | 2000 | 2001 | 2002 | 2003 | 2004* | 2000 | 2001 | 2002 | 2003 | 2004* |
| Utah | 2.2 | 2.3 | 2.2 | 2.1 | 2.0 | 0.7 | 0.7 | 0.7 | 0.6 | 0.7 | 1.9 | 2.0 | 1.9 | 1.8 | 1.8 |
| Washington | 3.1 | 3.1 | 3.0 | 2.8 | 2.4 | 1.6 | 1.4 | 1.9 | 1.3 | 1.1 | 2.8 | 2.8 | 2.8 | 2.5 | 2.2 |
| Nebraska | 25.7 | 26.9 | 27.2 | 26.9 | 25.3 | 10.8 | 11.8 | 12.5 | 10.6 | 11.0 | 23.1 | 24.2 | 24.5 | 23.8 | 22.9 |
| Minnesota | 2.1 | 2.4 | 2.6 | 2.7 | 2.4 | 6.7 | 7.2 | 8.2 | 8.0 | 8.2 | 2.9 | 3.2 | 3.6 | 3.7 | 3.4 |
| Pennsylvania | 3.3 | 3.3 | 3.6 | 3.7 | 3.3 | 7.0 | 6.1 | 6.9 | 7.7 | 7.8 | 4.0 | 3.8 | 4.2 | 4.5 | 4.1 |
| Wisconsin | 3.2 | 3.2 | 3.1 | 3.5 | 3.1 | 15.5 | 14.5 | 14.1 | 15.0 | 15.2 | 5.2 | 5.2 | 5.0 | 5.7 | 5.2 |
| Colorado | 8.9 | 9.1 | 9.0 | 8.7 | 9.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 7.4 | 7.5 | 7.4 | 7.1 | 7.7 |
| Michigan | 1.2 | 1.4 | 1.5 | 1.5 | 1.5 | 1.6 | 1.4 | 1.4 | 1.4 | 1.8 | 1.3 | 1.4 | 1.5 | 1.5 | 1.5 |
| Idaho | 2.7 | 3.0 | 2.8 | 2.6 | 2.2 | 3.8 | 4.0 | 3.9 | 3.7 | 3.7 | 2.9 | 3.2 | 3.0 | 2.8 | 2.5 |
| South Dakota | NA[b] | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Total US | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

[a]Source: Calculated using USDA data obtained from the Livestock Marketing Information Center, Lakewood, CO.

* 2004 includes data through July 2004 (excluding April which was not available).

[b]South Dakota slaughter is not reported for confidentiality reasons.

**Table A3. Import of Canadian Slaughter Cattle to US by State of Destination for Ten Leading Importing Destinations, 1999 - September 2004.**

| Import Rank | State | 1999 | 2000 | 2001 | 2002 | 2003* | 2004** |
|---|---|---|---|---|---|---|---|
| | | Number of Head | | | | | |
| 1 | Utah [a] | 132,010 | 146,832 | 209,288 | 205,931 | 60,972 | 0 |
| 2 | Washington | 181,427 | 178,924 | 125,500 | 180,242 | 68,308 | 0 |
| 3 | Nebraska | 120,091 | 108,641 | 135,122 | 125,703 | 45,710 | 0 |
| 4 | Minnesota | 59,408 | 60,147 | 106,961 | 145,684 | 49,432 | 0 |
| 5 | Pennsylvania | 71,687 | 72,072 | 99,125 | 101,941 | 41,634 | 0 |
| 6 | Wisconsin | 44,448 | 47,222 | 73,461 | 95,551 | 28,684 | 0 |
| 7 | Colorado | 72,474 | 32,014 | 124,175 | 33,584 | 286 | 0 |
| 8 | Michigan | 34,848 | 46,409 | 66,873 | 52,028 | 23,057 | 0 |
| 9 | Idaho | 19,756 | 31,629 | 25,498 | 52,868 | 17,833 | 0 |
| 10 | South Dakota | 26,099 | 21,306 | 31,322 | 1,399 | 0 | 0 |
| | Canada Reported Total All States [a] | 781,509 | 769,877 | 1,021,299 | 1,024,378 | 354,044 | 0 |
| | USDA Reported Total All States | 1,034,633 | 1,047,066 | 1,057,398 | 1,087,430 | 380,936 | 0 |
| | Top 10 States' Share of Total (%) | 97.5 | 96.8 | 97.7 | 97.1 | 94.9 | |
| | Canada Reported Total as % of USDA Total (%) | 75.5 | 73.5 | 96.6 | 94.2 | 92.9 | |

[a]Individual state of destination shipment data are from Agriculture and Agri-Food Canada

* Live animal exports from Canada to the US were halted May 20, 2003

** Through September 2004.

## Appendix B

**Important Limitations of Using SAM Analysis**
The impacts projected here must be considered in light of analysis limitations. Many of the limitations relate to the simplifying assumptions inherent in SAM analysis. Important limiting assumptions are identified.

The primary assumption affecting this analysis is that each firm uses a fixed production technology. All of the production, output, employment, inter-industry trading, and income relationships are assumed to remain constant according to the patterns identified at the time to which the accounts are calibrated. Any increase or decrease in the level of production is therefore assumed to follow a linear process. Changing the level of production creates no economies or diseconomies of scale, and there is no substitution of production inputs. This assumption has the general effect of over-estimating the projected impacts because it fails to recognize the adjustments by firms and individuals in response to changes in prices, shortages of inputs, etc.

A corollary to this assumption is that all of the financial relationships also are fixed and change in a linear fashion. This would include all taxes and other income transfers to households and businesses. This also diminishes the level of confidence in the results.

Given that all economic relationships are assumed to remain constant, the best that the analysis can offer is a “snapshot” view of change. This means that the impact estimates are most reliable for the short-term, for activities that are similar to what already exists in the economy, and for relatively small changes.