



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Structural Implications of Persistent Disharmony in North American Beef and Pork Industries



Jean-Philippe Gervais and Ted Schroeder

INTRODUCTION

Trade relations between the North American Free Trade Agreement (NAFTA) partners have been particularly strained in recent years. Current trade issues have important implications for the future economic environment of both the beef and pork industries in all NAFTA countries. The discovery in Canada of an animal infected with Bovine Spongiform Encephalopathy (BSE) in May 2003 plunged the Canadian beef industry into substantial financial turmoil. The immediate border closures between Canada and its major trading partners have had far reaching consequences that extend beyond the beef industries and impact other Canadian agrifood sectors (e.g., the dairy industry) and other countries (e.g., the US and Mexico). As of May 2005, live cattle trade between Canada and the US remains blocked. This has created an incentive for Canada to lessen the dependence of the Canadian beef industry on its American counterpart.

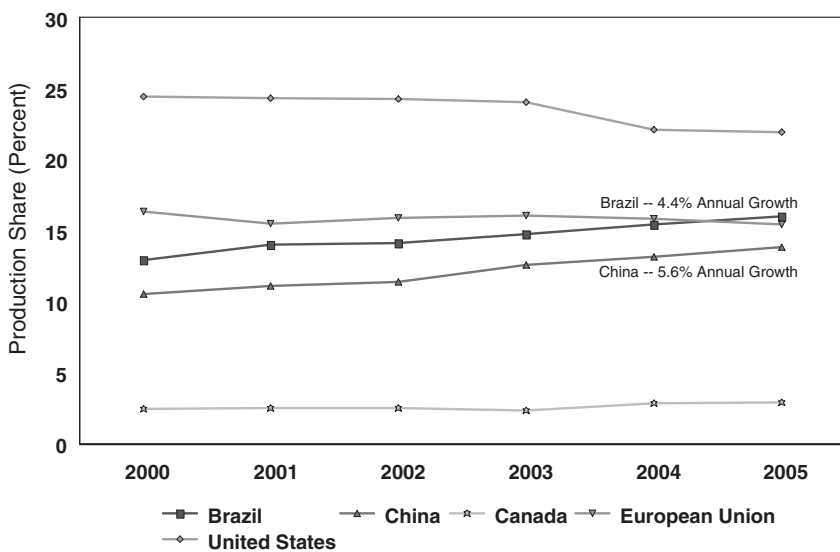
Trade challenges faced by the North American pork industry are of a different nature. The National Pork Producers Council (NPPC) petitioned the US Department of Commerce (DOC) in March 2004 to impose countervailing duties (CVD) on Canadian exports of live hogs. The NPPC argued that federal and provincial subsidies to hog producers constituted unfair subsidies that injured US hog producers. Anti-dumping (AD) measures were also sought on the basis that the export price of Canadian firms was below domestic prices (or the cost of production) in the Canadian market. The DOC ruled in both August 2004 and March 2005 that Canadian hog producers do not receive countervailable subsidies. With respect to the dumping allegations, the US International Trade Commission (USITC) ruled on 6 April 2005

that Canadian exports of live hogs do not injure US hog producers. This decision terminated the case against Canadian hog producers and deposits are to be returned to Canadian firms.

In addition to trade actions in the hog industry, the 2002 US farm bill called for mandatory labeling of some agrifood products according to their country of origin. There is currently a great deal of uncertainty surrounding this legislation. As it stands, the law is supposed to be enacted in 2006. Pork meat and bovine meat sold by mid-size and large retailers in the US would need to bear a label indicating the country of origin of the product. Opponents of the Country of Origin Labeling (COOL) legislation abound in all NAFTA countries. The NPPC has publicly voiced its dissatisfaction with the current law and proposes a voluntary COOL program. Outside the United States, industry stakeholders fear that COOL is simply an attempt to segment North American markets and inhibit market integration.

Even when trade measures are of a temporary nature, they can cause permanent structural adjustments and reactions in an industry. The NAFTA pork and beef sectors have both experienced significant border issues, yet the problems are fundamentally different. The hog/pork industry issues (CVD/AD and COOL) are tantamount to efforts aimed at segmenting the Canadian, US, and Mexican markets. Market

Figure 4.1: Market shares of world beef production by country for the four largest producers and Canada, 2000-2005 forecasted.



Sources: US Department of Agriculture, Foreign Agricultural Service.

segmentation is likely to have important welfare implications. The border closure following the BSE case has introduced market failures in beef markets (e.g., market power) such that standard marketing arrangements no longer ensure economically efficient transactions between producers, packers, and retailers. Hence, policy responses and industry adjustments are likely to differ between sectors.

This chapter discusses the various adjustments available to policy-makers and industry stakeholders to deal with current border problems in the beef and pork sectors. Options considered include herd contraction in Canada and Mexico, relocation of processing activities, reforming agricultural policies and other trade measures. The analysis highlights how some of these adjustments and policy responses are likely to shape future production and processing across Canada and the United States. These responses are likely to make North American supply chains less integrated and have significant welfare implications.

The chapter first describes the structure of the North American beef and pork industries. This is followed by an analysis of the potential policy responses and industry adjustments in light of the BSE trade issue. Next follows an investigation of industry adjustments that are likely to occur if COOL and AD/CVD lessen the integration of the NAFTA pork markets. Finally, concluding remarks are presented.

OVERVIEW OF THE STRUCTURE OF THE NAFTA BEEF AND PORK INDUSTRIES

Beef

The US has long been the world's largest beef producer with 2005 forecasted production of more than 11.2 million tonnes representing about 22 percent of total world beef production. In contrast, Canada's 2005 beef production is forecast to be 1.5 million tonnes representing just under three percent of total world production (USDA-FAS). Figure 4.1 illustrates the recent trend in world beef production by the top four producing countries and Canada. Phenomenal growth in beef production has been occurring in recent years in Brazil and China. Brazil's beef production has grown at an average annual rate of 4.4 percent from 2000 to 2005 and China's production has increased even faster at an average annual rate of 5.6 percent over the past six years. Brazil has gone from having production that was about one-half that of the US in 2000 to a projected level equal to 75 percent of US beef production by 2005.

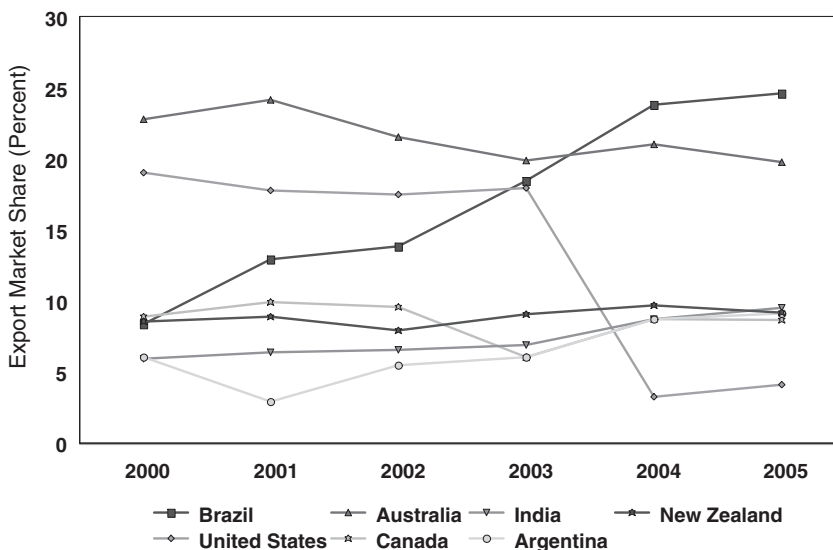
The US and Canada are important exporters in the world market. However, formidable competitors are present. Noteworthy global beef export competitors include Brazil, Australia, Argentina, New Zealand,

and lately India (Figure 4.2). With the US loss of major export markets resulting from the December 2003 discovery of a cow in Washington State with BSE, the US went from representing just under 20 percent of world exports in 2003 to about three percent in 2004. During this time, Brazil greatly increased its world export market presence going from a 14 percent share of world beef exports in 2002 to an expected 25 percent in 2005 (USDA FAS). Canada lost considerable export market share in 2003 following discovery of a cow infected with BSE; however, they have regained some of that lost share and represent nine percent of world beef exports in 2005.

Two important summary points regarding the above discussion are: 1) the US is a large country in terms of beef production and trade while Canada is probably more of a price taker in the world arena, and 2) substantial competition in the global beef market is present and this will continue to influence the future structure of the beef industries in the US and Canada.

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

Figure 4.2: Market shares of the seven largest world beef exporters by country, 2000-2005 forecasted.



Sources: US Department of Agriculture, Foreign Agricultural Service.

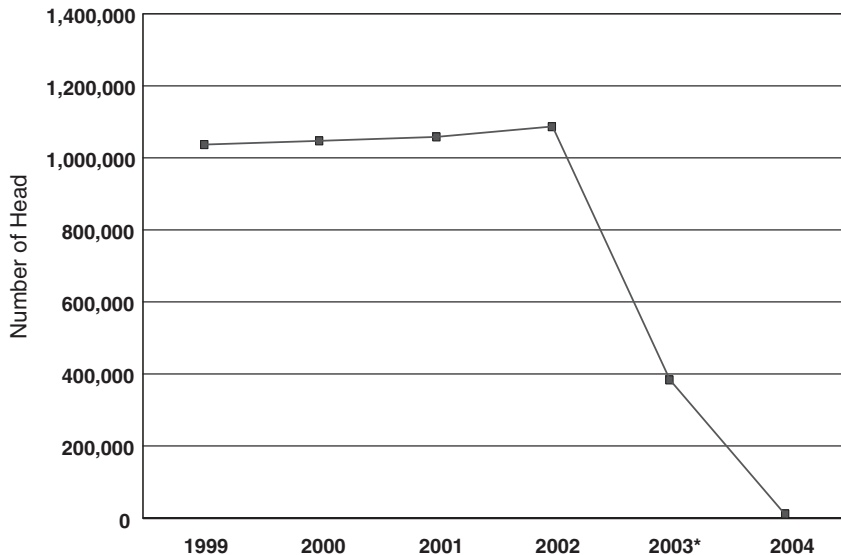
economic signals. A substantial amount of this trade flow consisted of cattle movement from Canada to the US. For example, in 2002 (the most recent full year of unrestricted trade in cattle between the two countries), approximately 62,000 dairy cattle, 8,000 veal animals, 583,000 feeder cattle, 17,000 breeding animals, and 1,024,000 slaughter cattle were exported from Canada to the US (CanFax). Canadian slaughter cattle exports to the US were just over one million head from 1999 to 2002, prior to the adoption of import restrictions by the US (Figure 4.3) following the 20 May 2003 discovery of a single cow in Canada infected with BSE. At that time, exports of all ruminants and ruminant products from Canada to the US were suspended.

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 exported since that time. As a result, US imports of Canadian boxed beef reached record levels in 2004 with the volume of beef representing approximately 1.77 million head of fed cattle (Figure 4.4).

Pork

The US, Canada, and Mexico are among the major pork producing countries in the world. The US and Canada were the third and fifth

Figure 4.3: Annual imports of Canadian slaughter cattle, 1999-2004.



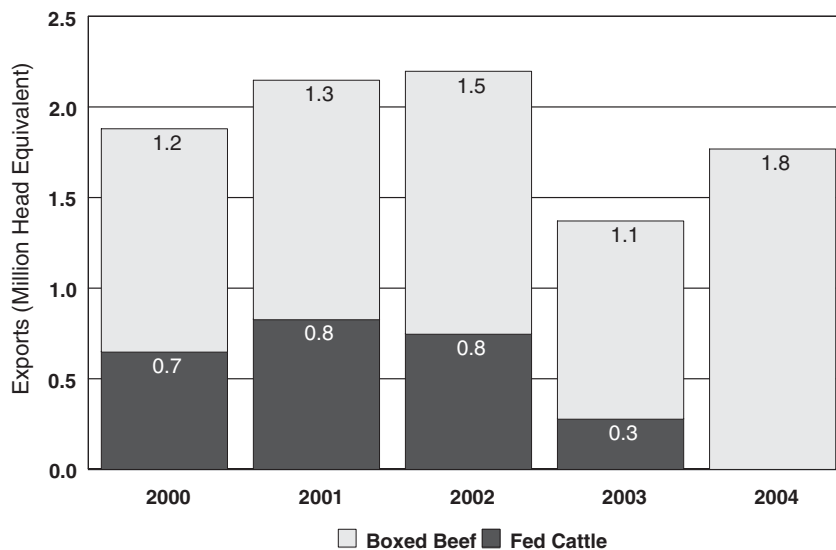
Source: US Department of Agriculture.

Note: *Import restrictions started in May 2003.

largest pork producing regions in 2003 with production of 9.1 and 1.9 million tonnes, respectively. Mexico was the eleventh most important pork producing country with production of 1.15 million tonnes. Production growth in the three countries has differed. Canada has experienced the most significant growth over the last 25 years as production expanded more than 80 percent from 1.03 million tonnes in 1980 to the current level. As production grew, the trade balance of Canada with its most important trading partners also evolved. Total Canadian pork exports have grown from 0.15 million tonnes in 1980 to 0.98 million tonnes in 2003 (Haley).

In order to understand and explain the potential adjustments in the North American hog/pork industry brought about by current trade issues, it is necessary to understand the inner workings of each affected industry. In this regard, this chapter focuses on the Canadian and US hog/pork industries and not the Mexican situation. There is no doubt that the legal challenge brought by the NPPC and other regional hog producers' associations against Canadian firms was caused by the recent and continuous increase in Canadian exports of live hogs to the US. So before providing an organizational picture of the US hog/pork industry, it is instructive to break down the organizational structure of its northern neighbor.

Figure 4.4: Annual Canadian boxed beef (converted to approximate head) and fed slaughter cattle exported to the US, 2000-2004.



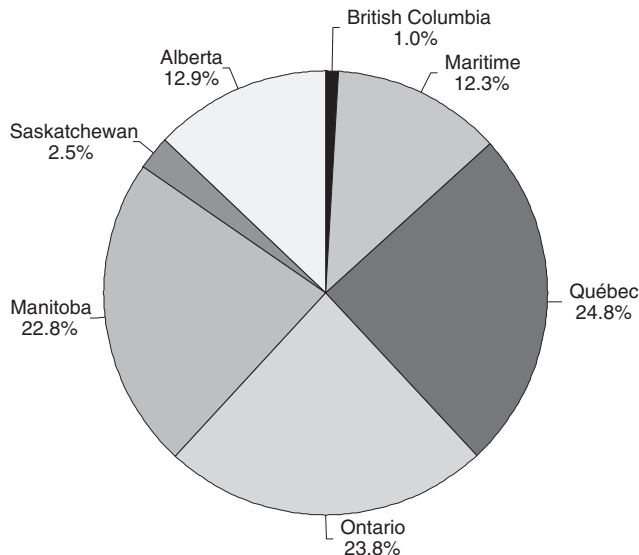
Source: Data from Livestock Marketing Information Center, boxed beef converted to number of head by authors.

Figure 4.5 shows the market share of each Canadian province in terms of the number of hogs produced in 2003. Quebec, Ontario, and Manitoba are the three most important hog producing provinces. The relative importance of Quebec is even greater if market share is measured in terms of kilograms of production or market value. The reason for this is that Ontario and Manitoba export significant quantities of feeder pigs resulting in their proportional shares being greater in terms of head produced relative to total kilograms or dollars. Since these three provinces account for more than three quarters of Canadian hog production, the remaining discussion focuses on the hog/pork industry in these provinces.

Figure 4.6 illustrates the market destinations for live hogs produced in Quebec, Ontario, and Manitoba in 2003. There are some striking differences among the three provinces. First, all hogs raised in the province of Quebec are slaughtered within the province.¹ Processing activities are of less importance, in relation to hog production, in Manitoba. Manitoba exports a significant quantity of feeder pigs to the United States, as does Ontario. The chart illustrates that Ontario also transfers hogs to other provinces (e.g., Quebec). These include hogs ready-to-be slaughtered and feeder pigs.

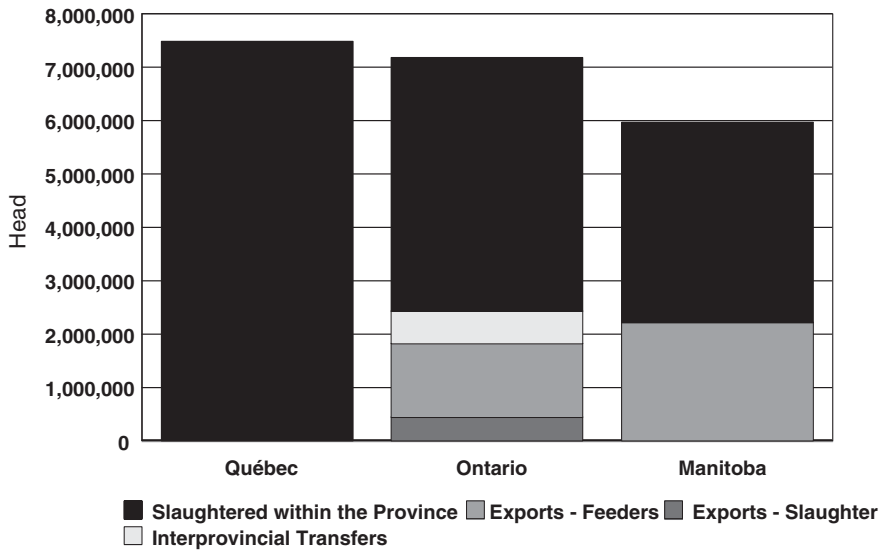
¹ Larue, Gervais and Lapan stress the importance of hog marketing institutions in explaining the simultaneous growth in production and processing activities in Quebec.

Figure 4.5: Provincial share of total Canadian hog marketings (as percentage of total number of head), 2003.



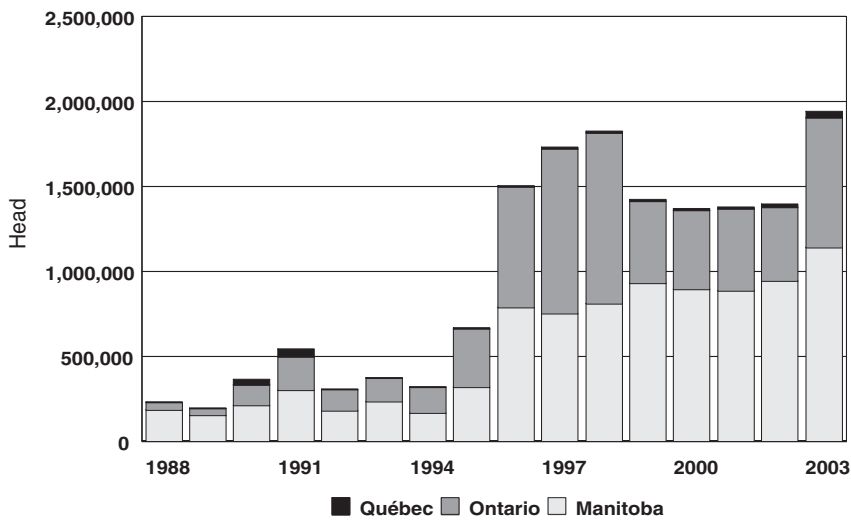
Source: Agriculture and Agri-food Canada.

Figure 4.6: Market destination of all hogs marketed in Quebec, Ontario and Manitoba in 2003.



Source: Agriculture and Agri-food Canada.

Figure 4.7: Exports of slaughter hogs from Quebec, Ontario and Manitoba to the U.S., 1998-2003.

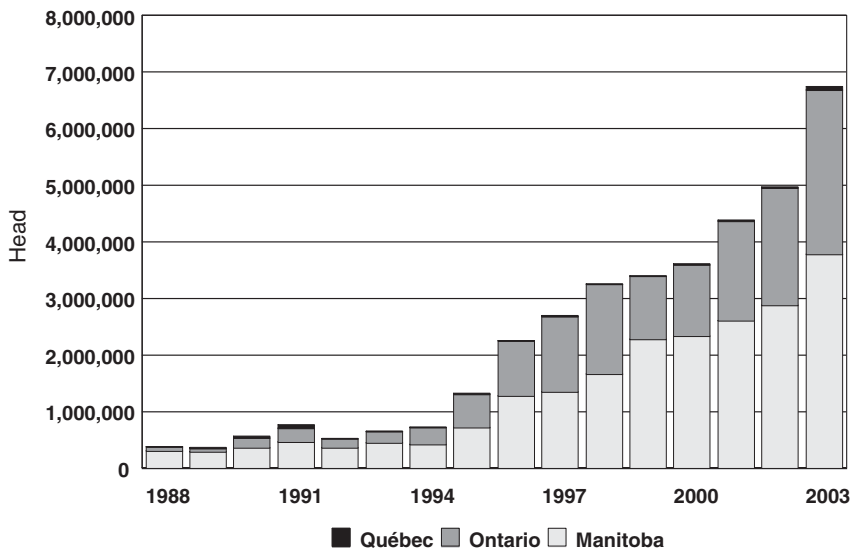


Source: Agriculture and Agri-food Canada.

Figures 4.7 and 4.8 present the growth in exports of live slaughter hogs and feeder pigs, respectively, from the three provinces. Hog exports from Quebec are almost nonexistent. Exports of slaughter hogs increased dramatically around 1996 in Ontario and Manitoba. Figure 4.8 illustrates how feeder pig exports have grown steadily since 1994 to reach record levels in 2003. Hayley reports that the destination of Canadian feeder pigs in the US is mainly to cornbelt states (e.g., Indiana, Minnesota, Michigan, Ohio, Wisconsin, Iowa, Kansas, Missouri, and Nebraska). Canadian slaughter hog exports are more evenly spread across the United States and go to such states as Colorado, Montana, North Dakota, South Dakota, Utah, Arizona, and California.

Table 4.1 provides a picture of the US and Canadian hog/pork industries over a ten-year period (1994 to 2003). US hog production reached 100.8 million head in 2003 while Canadian production was about 22 percent of this level. Hog slaughter in Canada, increased in relative terms, compared to the US between 1994 and 2003; going from 15.9 percent of US production to more than 22 percent. Pork meat imports have increased in the US and so have Canadian imports. Even though Canada's production is smaller than the US, it exports more than its counterpart. Canadian pork exports were roughly 22 percent greater than total US pork exports in 2003. Although not illustrated in the data, it is worth noting that the share of Canadian products in total US pork

Figure 4.8: Exports of feeder pigs from Quebec, Ontario and Manitoba to the US, 1998-2003.



Source: Agriculture and Agri-food Canada.

Table 4.1: The US hog/pork industry in comparison with the Canadian industry, 1994-2003.

Year	Hog slaughter (thousand head)		US pork imports (thousand MT)		US pork exports (thousand MT)	
	US	Canada	US	Canada	US	Canada
1994	95,905	15,249	338,077	27,908	284,114	278,840
1995	96,517	15,539	301,801	26,833	365,259	359,799
1996	92,394	14,968	281,311	35,256	413,166	385,209
1997	91,966	15,174	287,316	51,738	458,311	420,741
1998	101,028	16,698	320,302	63,023	528,939	481,144
1999	101,694	18,724	375,961	57,730	580,501	649,364
2000	97,977	19,691	439,359	75,272	581,497	636,627
2001	97,962	20,542	432,157	92,528	702,377	718,703
2002	100,263	21,979	486,694	95,830	727,155	827,379
2003	100,777	22,228	538,724	109,189	757,406	924,344

Source: US Department of Agriculture; Agriculture and Agri-Food Canada (2004).

imports has increased between 1998 and 2003. Conversely, from the Canadian perspective, the relative importance of the US market has declined over the years. However, it still remains the most important destination for Canadian pork exports.

The stylized facts of the pork industry show that besides the obvious differences in bilateral trade balances between the US and Canada, there are some essential geographic differences in production activities within each country that are likely to affect policies and industry adjustments. These are of major importance when analyzing the effects of border restrictions and market segmentation.

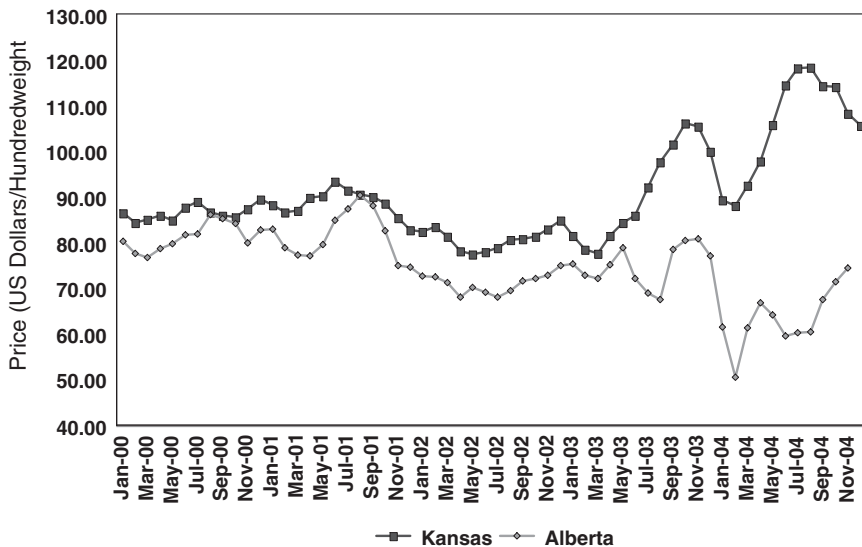
BEEF INDUSTRY ADJUSTMENTS AND POLICY RESPONSES

Closure of the US-Canada border to cattle trade created substantial price discounts in Canada for feeder and fed cattle and cull cows relative to the US. Prior to the border closure, Canadian and US prices followed each other fairly closely as fluid trade assured spatially integrated markets. However, after the border closure, because the Canadian cattle industry relied upon the US market for slaughter cattle sales, prices diverged with Canadian prices dropping by \$20/cwt and more relative to US levels (Figures 4.9-4.11).

On 4 January 2005 the Animal and Plant Health Inspection Service (APHIS) of the USDA published a final ruling that would permit imports of certain Canadian live cattle into the US beginning on 7 March 2005. That ruling required that such cattle must be less than 30 months of age and sent directly to slaughter or, if destined for additional feeding, sent in sealed trucks directly to the terminal feedlot that finishes and markets the cattle for slaughter at less than 30 months of age. As published, the ruling also allowed for imports of boneless beef from Canadian cattle older than 30 months of age. However, US Secretary of Agriculture Mike Johanns announced an indefinite delay of imports of Canadian animals over 30 months of age prior to the 7 March 2005 date (USDA). Thus, the current US policy allows imports from Canada only of cattle that are under 30 months of age and beef from animals of the same age. However, on 2 March 2005 a federal judge in Montana granted a temporary injunction against the USDA ruling to keep the Canadian border closed to live cattle trade. In late July 2005, the Ninth Circuit Court of Appeals overturned the temporary injunction allowing imports of Canadian cattle under 30 months of age to resume; more than two years after the initial BSE discovery.

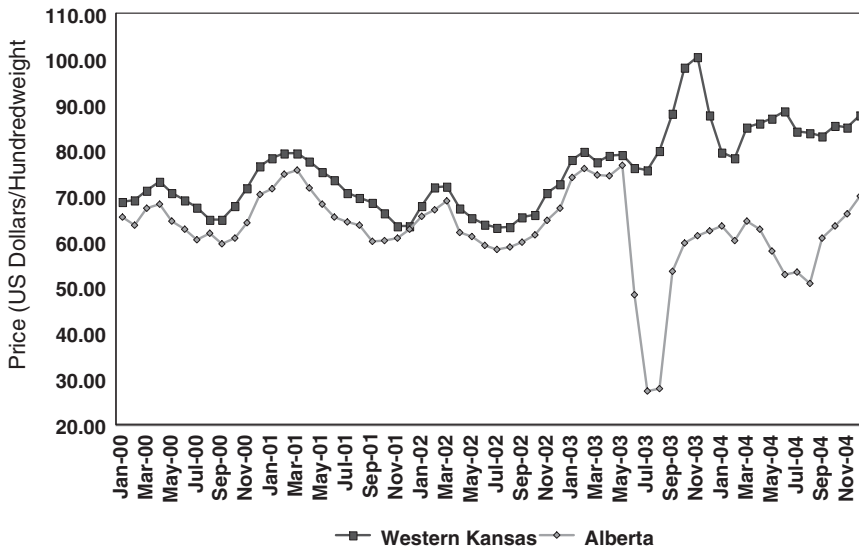
The impact of this trade policy between Canada and the US has resulted in substantial costs to the US beef packing industry (compounded by the loss of major export markets by the US following the discovery of

Figure 4.9: Monthly average prices for 700-800 pound steers in Kansas and Alberta, January 2000-December 2004.



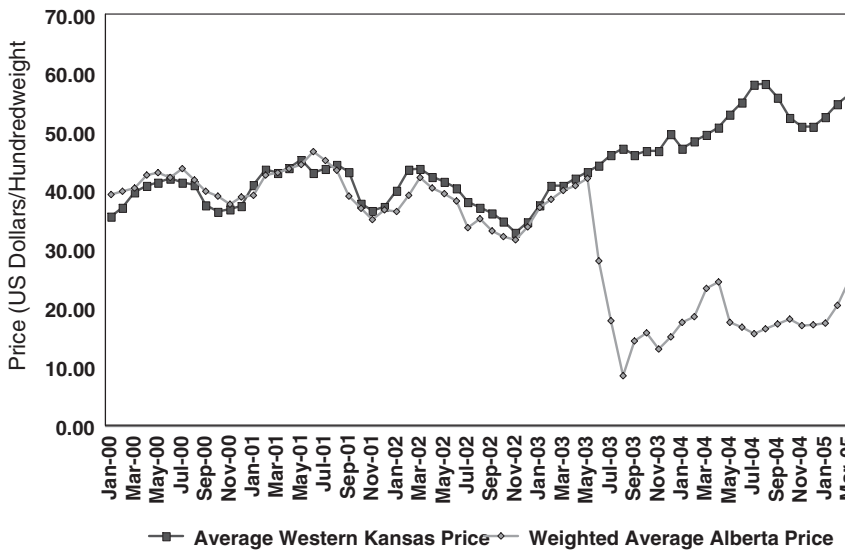
Sources: US Department of Agriculture; CanFax.

Figure 4.10: Monthly average prices for fed steers in Kansas and Alberta, January 2000-December 2004.



Sources: US Department of Agriculture; CanFax.

Figure 4.11: Average monthly prices for slaughter cows in Kansas and Alberta, January 2000-December 2004.



Source: Livestock Marketing Information Center.

Table 4.2: 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 (2004).

^b Source: US Department of Agriculture.

^c NA refers to not available as USDA did not report for confidentiality reasons.

a BSE infected cow in the US in December 2003). In 2002, the last full year of unrestricted cattle trade between the US and Canada, Canadian slaughter cattle imports represented about three percent of total US cattle slaughter. However, Canadian slaughter cattle import restrictions had a much greater relative impact in certain US states. Table 4.2 presents the number of Canadian slaughter cattle imports by US state of destination, slaughter in each of those states, and the percentage of slaughter represented by Canadian imported cattle in 2002. The

impact of restricted Canadian slaughter cattle imports was perhaps the most significant in Utah as beef packers in that state imported more than 200,000 head in 2002, representing 30 percent of the state's total slaughter. Other states where packers were strongly affected 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.

To determine the economic importance of Canadian cattle slaughtered in the US, Table 4.3 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 between \$755 and \$801 million in 2002, based on Agriculture and Agrifood Canada (AAFC 2004b) and USDA data. 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 cattle and value of beef, hide, and offal is estimated using data from the Livestock Marketing Information Center.

For the entire US, the gross value of boxed beef and byproduct sales from Canadian imported slaughter cattle was between \$901 and \$956 million with a net value of sales (gross value less the live animal price) between \$145 and \$155 million in 2002 (Table 4.3). 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.

One more important issue that increases the economic impact associated with the ban on Canadian slaughter cattle imports into the US is reduced packing plant capacity utilization in the US. That is, packing firms still incur fixed costs whether they operate at capacity or not and with reduced cattle availability, especially in regions like those mentioned above, failure to operate at capacity creates a major competitive disadvantage for those plants and firms. For example, Swift suspended the second shift at its Nebraska and Colorado plants in large part because of the import restrictions (MeatNews). 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 entire US cattle slaughtering and beef processing industry faced increased costs when such a large reduction in cattle supply was imposed by the import restrictions. The result is that eventually some US plants have been forced to close down. In addition, there are numerous

Table 4.3: 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 (\$)	Estimated beef and byproduct sales value of imports ^b (\$)	Estimated beef and byproduct value less live cost ^c (\$)
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 (USDA data)	801,296,047	956,029,819	154,733,772

^a**Source:** Agriculture and Agri-Food Canada (2004). Converted to US Dollars using 2002 exchange rate of 1.57 Canadian to 1 US dollar.

^bBoxed beef and byproduct sales value is by definition the sum of the other two columns in this table.

^cCalculated by multiplying number of head imported from Canada by US\$142.29. 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.

Table 4.4: Total Annual Employment Impact of Reduced Meat Processing Activity to the US by Economic Sector, 2003 US Dollars.

Impacted Sector	Total Income (millions of \$)	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.

Source: Schroeder and Leatherman.

other economic spillovers in the rest of the local and national economies when cattle slaughter declines.

Schroeder and Leatherman use social accounting matrix (SAM) analysis to project the annual economic impacts of reduced meat processing activity in the US that is consistent with the amount of reduced imports of slaughter cattle from Canada resulting from import restrictions. The total loss of income to the US economy associated with reduced meat processing activity is estimated to be about \$282 million annually (Table 4.4). The number of jobs closely allied with this level of economic activity is nearly 5,000.

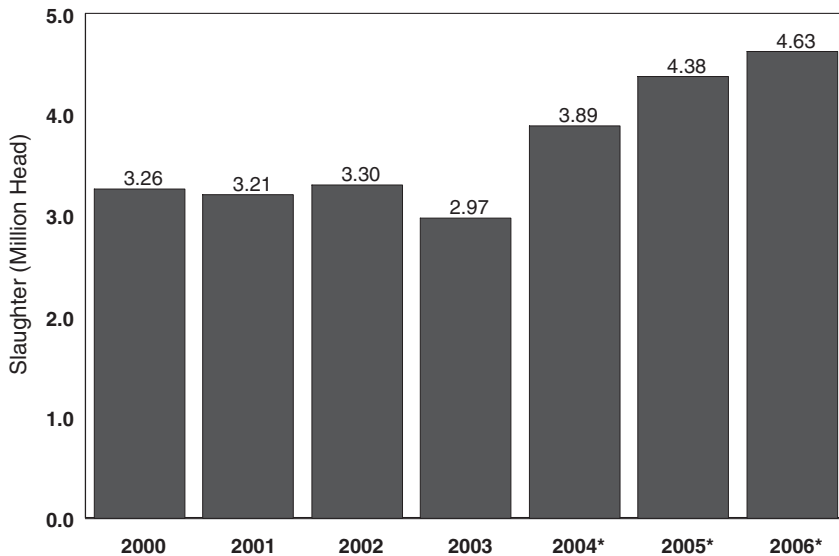
A long-run implication of the US border closure on Canadian live cattle production and trade is that it fuels structural change. In particular, closure of the border has created substantial incentives for Canada to invest in cattle slaughtering facilities. As such, substantial public support and private investment in cattle slaughter plant expansion is ongoing in Canada. Figure 4.12 illustrates the projected expansion in Canadian cattle slaughter facilities. Slaughter increased nearly one million head in 2004 relative to 2003 and is expected to increase by another half a million head in 2005 with continued planned expansion.² If this expansion continues and the border remains closed, Canada will expand its slaughter capacity in order to fully accommodate its own production. If and when the US border reopens to live cattle trade, excess cattle slaughter capacity will exist in North America and only those firms well-positioned to compete will survive. Obviously this could

² The federal government decided to encourage expansion through a C\$66.2 million program (AAFC 2004a).

lead to substantial economic costs for both trading partners that may strain the return to open relations.

The BSE crisis has also had far-reaching consequences that extend beyond the beef industry. Prices of Canadian dairy cows plummeted following the BSE discovery. Livestock producers must generally commit to production levels before uncertainty about prices is resolved. Insurance markets have an important role in reestablishing the case for free trade for a small country that faces exogenous terms of trade (Eaton and Grossman). When the border closes due to a random event like BSE, risk sharing mechanisms that may exist between packers and cattle producers are significantly affected. Private risk sharing mechanisms on financial markets were also not available in the BSE case. The border closure introduced a market failure in the Quebec and Ontario dairy industries because the market for culled dairy cows was then controlled by a single buyer. Dairy producers relied on the US export market to expand the relevant market of the sole beef packer in Eastern Canada, which otherwise had monopsony power over purchases of cull cows. While packers' costs have undoubtedly gone up after May 2003 due to factors such as the loss of export markets for certain beef cuts and increased storage costs, in that particular case, the monopsony position generated abnormal profits by reducing prices of dairy cows to historical lows. Even though dairy producers can rely on supply management to

Figure 4.12: Annual federally inspected Canadian cattle slaughter 2000-2004 and projections through 2006 assuming 90% utilization planned expansion.



Source: Canfax; * as projected by CanFax.

support income, there is nevertheless a market failure (monopsony), and thus a (theoretical) justification for government intervention.

It did not take long for the Canadian dairy lobby to get rolling after the BSE discovery. Dairy producers argued that the mad cow case was responsible for a ten to twenty percent reduction in their net income. They lobbied the government for months trying to get a minimum price for culled cows. The Quebec provincial government led a financial mediation effort between producers and the owners of the Colbex-Levinoff company which held the monopsony position. It resulted in the sale to dairy producers of an 80 percent stake in the company. After complaining for months that they were not receiving a fair price for their cows and that the government needed to step in to impose a floor price, producers were quick to point out that they were not able to pay the higher price they sought without financial help. The government then offered a financial package to dairy producers that guaranteed a floor price for all dairy cow sales.³

It is unclear at this stage if Quebec dairy producers have sufficient funds to cover their stake in the company and whether the government has promised to inject funds in the project. Given the monopsony situation, it would normally make economic sense to subsidize purchases of cull cows to resolve the market failure. In short, the buyer has an incentive to reduce cow purchases to lower the price of dairy cows. A market failure is said to arise in that case because the value of a dairy cow at the margin is higher than the market price. However, the supply of dairy cows is very inelastic (supply is almost vertical) and subsidizing purchases would likely not increase sales of dairy cows. In this situation, the subsidy is tantamount to a pure income redistribution tool in that it increases the price received by producers without altering the price paid by the packer. A floor price can also provide an incentive to the packer to push prices down even further (now that producers receive a guaranteed price) and thus may yield an unfair competitive advantage (at least with respect to other Canadian competitors) in the meat market. Finally, it should be noted that consumers clearly lost when the Canadian Dairy Commission (CDC) announced a 7.8 percent increase in the price of milk on 10 December 2004 in part “to offset some of the negative impacts of the BSE crisis on farms” (CDC). Consumers will permanently bear some costs of BSE because it is well known that milk prices exhibit downward price stickiness.

³ Although the sale of Colbex-Levinof plants to Quebec dairy producers was announced on 2 December 2004, the transaction has not been finalized at the time this chapter was written. The purchase price has never been confirmed (although it is rumored to be in the neighborhood of C\$50 million). Moreover, the provincial government’s plan to establish a floor price was conditional on the participation of the federal government; but they had not obtained a federal commitment before publicly announcing their plan to help producers.

PORK INDUSTRY ADJUSTMENTS AND POLICY RESPONSES

Market Impacts of CVDs and COOL

It is extremely difficult to dismiss the political dimension of the current trade issues in the NAFTA hog/pork industries. Nevertheless, there is more to this than simple political economy. The economic implications of these trade issues will be considered before focusing on potential industry adjustments and responses available to policy-makers. Price signals following import duties or country of origin labeling will ultimately determine industry adjustments.

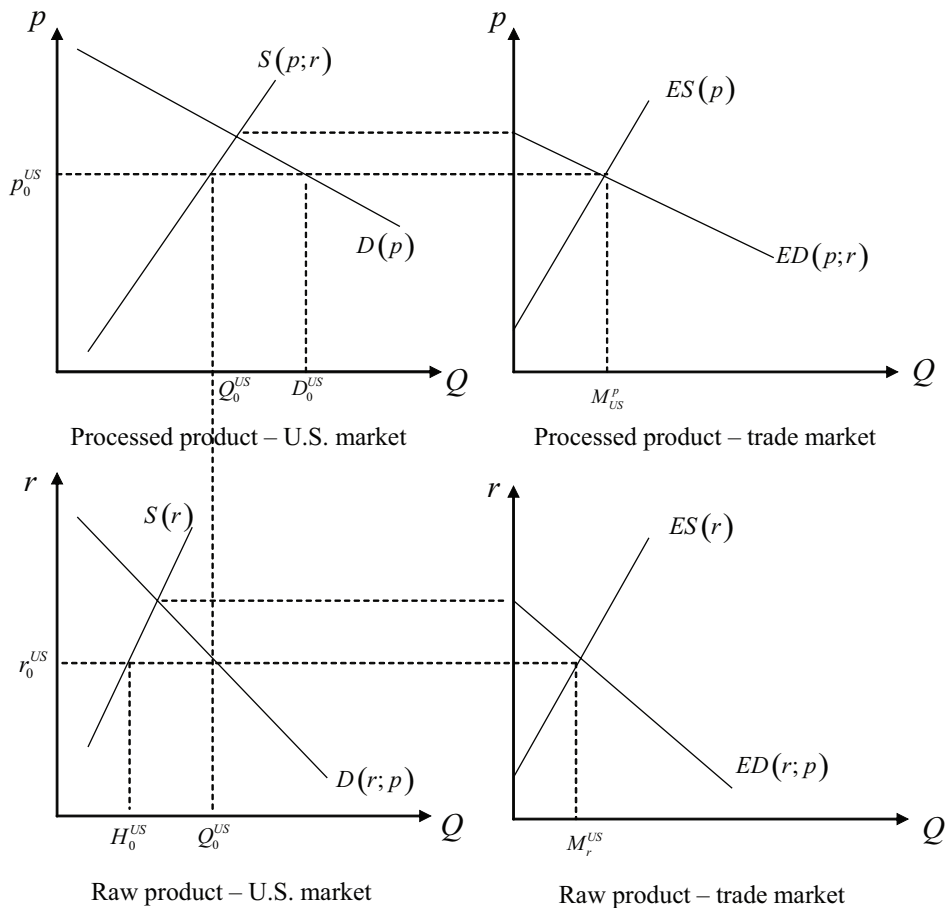
First, imposing barriers to trade in the hog sector is often overlooked as a possible tool to improve economic welfare in the US. This is somewhat surprising as it is now well understood in the economics literature⁴ that a large importing country can increase national welfare if it faces endogenous terms of trade by restricting trade below the free trade level. This objective can be achieved using either a tariff or a quota. The improvement in the terms of trade (in terms of lowering the import price) is achieved at the expense of introducing distortions in consumption and production activities.

The NAFTA prevents member countries from restricting trade in pork and beef. However, a number of policy combinations will achieve a potential first-best tariff solution from the US perspective because an import tariff can always be decomposed into a production subsidy and a consumption tax. In other words, even though NAFTA members cannot impose import tariffs – except through legal contingency protection actions, there exists the possibility to achieve the desired equilibrium through a combination of production and consumption tax/subsidies. A countervailing duty (which is essentially an import tariff in retaliation for foreign subsidies) could potentially increase US welfare. The CVD on imports of live hogs amounts to a subsidy to US hog producers and a “consumption” tax for US processors. Equivalently, if feeder pigs are taxed at the border, the trade policy amounts to a subsidy to feeder pig production and a tax on slaughter hog production and processing activities. It is far from obvious that the total welfare in the US hog/pork industry would increase following the imposition of an import duty; but this possibility should not be overlooked. It is important to understand the terms of trade motives for protection in order to explain the political pressures to apply import duties.

⁴ Gervais and Larue provide a survey of the terms of trade motive for protection. Despite the attention devoted to the theory of the “optimal tariff,” many economists remain sceptical of its practical value when analyzing “real life” issues. Krugman and Obstfeld state that it is of “doubtful usefulness.” Still, Bagwell and Staiger give primary emphasis to the terms of trade approach in their book on the economics of the world trading system.

In order to understand the market impacts of CVDs, consider the vertically related markets drawn in Figure 4.13. The diagrams on the left-hand side of the figure represent the US market for live hogs (bottom left) and the US market for pork (top left). In the bottom left diagram, the segment $S(r)$ represents the supply curve of US hog producers and $D(r;p)$ represents the hog demand of US processors. The demand for hogs is dependent on the price of pork meat (p) determined in the top diagrams. The segment $S(p;r)$ is the supply schedule of pork processors while the segment $D(p)$ represents the US demand for pork meat. Given the trade position of the US with Canada, Figure 4.13 assumes that the US is a net importer of both live hogs and pork meat. The diagrams on the right-hand side of Figure 4.13 are labeled as “trade markets” as they show the excess demand function in the US and the excess supply function of Canadian hog producers and pork processors. Because the US

Figure 4.13: Vertically related markets.

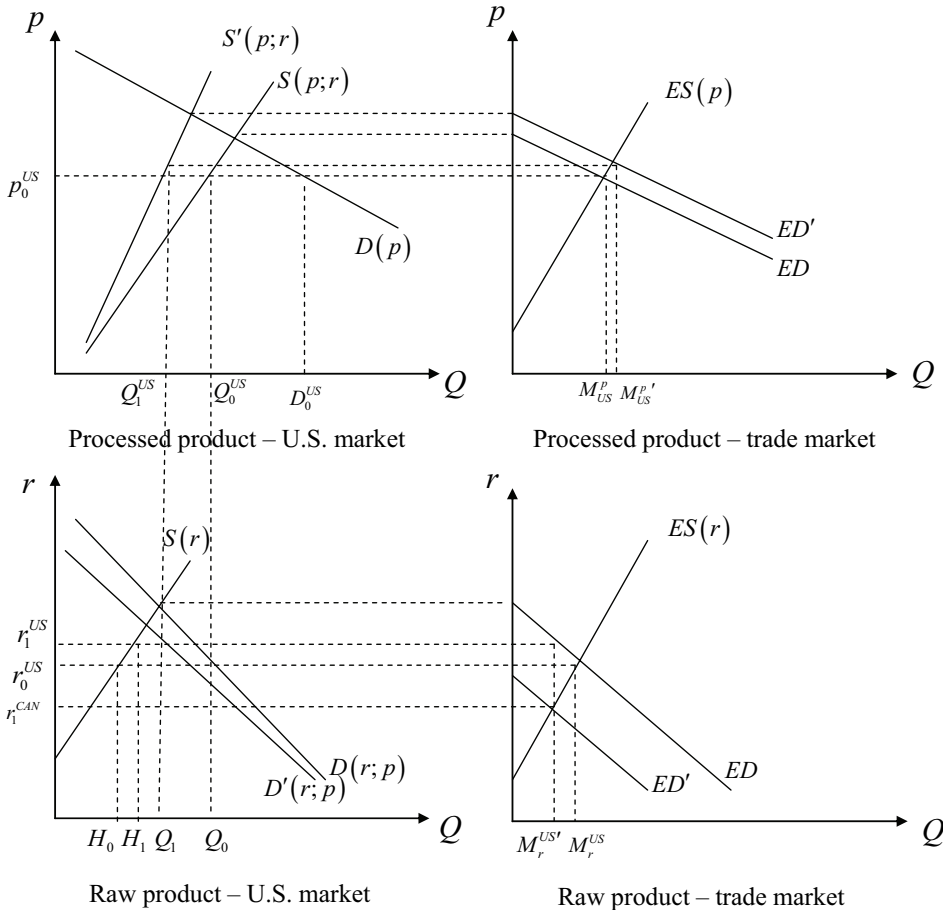


Source: authors.

has an influence on the price at which it trades (i.e., the large country assumption), it faces upward sloping export supply functions for hogs (denoted $(ES(r))$ and pork (denoted $(ES(p))$). Free trade between the two countries determines the equilibrium prices in the US market (r_0^{US}, p_0^{US}) and the quantities traded (M_r^{US}, M_p^{US}). Domestic quantities of hogs produced and slaughtered are denoted by H_0 and P_0 , respectively.

Now consider the application of countervailing or antidumping duties on exports of live hogs from Canada. The market effects of this policy are illustrated in Figure 4.14. The CVD/AD duties shift the excess demand for live hogs in the United States inward, reducing imports of live hogs to $M_r^{US'}$. The import duties create a spread between the US and Canadian price of hogs. The increase in the US hog price shifts the US supply of pork inward in the top left diagram. The price of pork

Figure 4.14: Application of countervailing or antidumping duties on exports of live hogs from Canada.



Source: authors.

meat increases as do imports of pork meat into the US. As a result, less hogs are slaughtered in the US but more hogs are fed domestically (i.e., $H_1 > H_0$; $Q_0 < Q_1$). As mentioned before, the import duties have similar effects to a tax on live hogs (causing a reduction in the demand for live hogs) combined with a subsidy to hog production. Even though the US is able to improve its terms of trade for hogs, it experiences deterioration in its terms of trade for pork. Hence, the net welfare effects are ambiguous. Nevertheless, the analysis in Figure 4.14 illustrates the shift in production across countries following import duties. Imports of live hogs decrease, but imports of pork meat by the US increase. Note that the ability of a large importing country to influence the terms of trade of the raw product is not hampered by free trade in the processed commodity in that the CVD/AD imposed on hog exports lowers the import price and increases the domestic price of live hogs.

Before analyzing the regional implications of import duties and border “frictions,” it is worth discussing the (dis)similarities between the CVD/AD duties and COOL. While COOL has similar effects to import duties, they differ in the potential response that these policy tools can bring. With respect to labeling, the US is using potential vertical differentiation in meat products (according to the country of origin) to induce a price differential between US and foreign meat products. The price differential caused by the label can only be achieved at the expense of imposing a tax on the domestic industry in the form of additional transaction costs necessary to preserve the national identity of the products through the supply chain. The idea of those supporting the COOL policy in the US is that the potential premiums in the meat market would be transferred back to US hog producers through higher prices. Preliminary research results reported by Abdesselem, Bonroy, and Gervais indicate that COOL could potentially raise the US hog price by about one-half of one percent while raising pork meat prices in the US by six percent. Canadian export prices of pork meat could fall by about two percent. The effect of COOL on hog prices is likely to be smaller than the effect of CVD/AD duties. Moreover, the results rest on rather optimistic assumptions with regard to consumer attitudes. As with CVD/AD, the welfare implications of a COOL policy are unclear.⁵

What is the optimal response from Canada’s perspective? The best policy in light of AD and CVD is *laissez faire*. There are no market failures from the Canadian government’s perspective. With respect to the COOL

⁵ Abdesselem, Bonroy, and Gervais use a spatial partial equilibrium model of trade in hog/pork products for North America. The results reported above are based on a COOL transaction cost estimate of C\$0.10 per kg and a premium of C\$0.25 per kg at the retail level for products with a US label. These estimates were adapted from Sparks and Loureiro and Umberger. Abdesselem, Bonroy and Gervais contains a discussion of the problems of calculating welfare measures in the context of a vertically differentiated trade model.

issue, one option for the Canadian industry is to use generic promotion of their product in certain geographical areas (such as the US Northeast). Larue, Gervais, and Rancourt show that Canadian pork processors are not pure price takers in the US market because export price margins do not adjust in a one-to-one proportion following variations in the exchange rate. The exchange rate has always been an important concern of the Canadian hog/pork industry because it is believed to be a major determinant of the industry's relative competitiveness. While there is no doubt that it is a significant factor, data suggests that it played a secondary role in the recent expansion of the Canadian hog/pork industry (Tamini and Gervais).

Location of Hog/Pork Production Activities

Is the location of hog and pork production activities supply or demand driven? The stylized facts described earlier suggest that locating hog/pork operations is supply driven in that processing activities tend to occur where ready-to-market hogs are fed and feeding operations tend to locate in regions that have a cost advantage in feeding activities. Before analyzing the potential localization impacts of CVDs and COOL, it is worth discussing further the assumptions behind Figures 4.13 and 4.14 that are likely to affect location decisions. First, Figures 4.13 and 4.14 implicitly assume that markets are competitive and that there are decreasing returns to scale (positively sloped marginal cost) in slaughtering/processing activities. MacDonald and Ollinger show that significant scale economies in hog slaughtering activities are present. There are major differences in plant sizes between Canada and the US. In Quebec, the biggest processing plant has a weekly capacity of 25,000 head. In comparison, the average capacity of a plant in the US was about 45,000 head per week ten years ago. Some plants in the US now have weekly capacity of 70,000 head and a few hit 150,000 head (Pork Board). Another implicit assumption is there is perfect competition in the industry. The concentration ratio of the four biggest firms (CR4) in the US packing industry increased from 32 percent in 1985 to 64 percent in 2004 (Hendrickson and Heffernan). In Quebec, the two largest packers have announced their intentions to merge. If the merger is approved by the Competition Bureau of Canada, the new entity would control more than 70 percent of the market in Quebec.

Concentration and economies of scale are not so important in understanding the adjustments of the industry at the macro level (i.e., national) but are important in understanding the regional impacts of COOL and CVD/AD duties. As shown in Figure 4.14, the CVD/AD and COOL policies will likely result in lower hog prices and more hogs slaughtered in Canada. There is no indication that there are packing capacity problems in Canada. In fact, the industry has argued that there

are not enough hogs to process domestically.⁶ In Quebec, most if not all plants operate a single shift, and this is true throughout Canada.

Still, there is no denying that if US policies increase the marketing margins of Canadian packers (in terms of stronger demand for pork meat and lower hog prices), a number of factors suggest that there may be sizeable investment opportunities. Traditional investment models rely on standard discounted cash flow methods such as net present value or internal rate of return models. Dixit and Pindyck changed the way academics (and to some extent, practitioners) think about investment decisions by focusing on real options. Real options are essentially future opportunities that are created by today's investments. Given a potential terms of trade movement (i.e., reduction in the Canadian hog price and increase in the border price of meat), some firms may perceive a significant increase in future discounted cash flows. However, at the time of the investment, a firm loses the option to wait for further information such as the strength of future foreign demand and input costs. The option value associated with waiting before building additional capacity will depend among other things on whether firms perceive movements in the marketing margin to be mean-reverting. In turn, this will depend on beliefs about the intransigence of border measures. If firms do not perceive the trade impediment to have some permanent component, it would be logical to expect these firms to delay investment in additional production capacity. Processing firms produce a homogenous product and are financially vulnerable to (bad) capacity decisions of other firms. The timing option (i.e., the option to wait) has a significant value given the relatively uncertain state of the industry. Hence, it is doubtful that CVDs or COOL would cause additional investment in pork processing capacity.

Canadian hog marketing institutions can also have an important impact on capacity investment decisions. Hog marketing rules basically create certainty for Quebec processors in that a substantial share (currently 50 percent) of all hogs are allocated to processors according to their historical market share. For all practical matters, all hogs in the province need to be marketed through the Quebec marketing board. On the Prairies, no statutory marketing rights are conferred to provincial boards. Producers are free to contract with one packer over the other. This definitely gives more flexibility to processors in terms of pricing arrangements. Hogs are sold either through contracts or using the spot market. Prices are determined through negotiations between individual packers and hog producers. Conversely, hog prices of pre-attributed

⁶ Klein *et al.*, (p.57) argue: "Virtually all packers in Canada would like to receive more hogs of constant specified qualities. They sense market opportunities for additional pork but cannot obtain the hogs to meet this demand." Mitchell, a packing plant representative says: "... we have the sales; we don't have the hogs."

supplies in Quebec are based on a reference price (i.e., the US price). The remaining hog supply is sold through an auction.

A recent study also cast some doubt about whether Canadian hog producers would benefit from increased processing capacity. Horning and Ward analyze whether the opening of the Maple Leaf plant in Brandon, Manitoba had any positive influence on Prairie hog prices. They identified a significant and positive price differential between the Manitoba market and two different reference markets due to the opening of the Brandon plant.

Capacity is perhaps more problematic when analyzing hog finishing operations. Growth opportunities in hog finishing operations are severely constrained because of environmental concerns and/or profitability considerations. The former is perhaps the most apparent in Quebec. The hog industry faces stringent environmental regulations and public pressure to regulate the industry does not show any sign of easing. A two-year moratorium in Quebec was imposed on all new hog finishing operations in June 2002. The moratorium was lifted 15 December 2004 after strict new environmental regulations were issued. For all practical matters, the moratorium is still in effect because ready-to-market hogs produced in hog finishing installations that were built in the post-moratorium period will not be slaughtered until mid-2007, once every production delay is considered (e.g., licensing, investment). Many industry stakeholders doubt that the vigorous growth in the industry observed between 1994 and 2002 will ever be repeated.

Besides the need to solve obvious environmental constraints, hog finishing operations must be able to compete with American production units for feeder pigs. CVDs and COOL might provide sufficient financial incentives for Canadian production units to expand hog finishing operations. One would expect that hog finishing units would locate in the Prairie region because of its potential cost advantage in feed grains. However, Manitoba is now a net importer of corn (Charlebois and Wensley) and feed wheat would likely need to be shipped in from Saskatchewan (Kraft and Rude) if the province is to expand hog production.

Cost increases for finishing operations could be less of a problem if income support programs account for this increase. In Quebec, hog producers of both feeder pigs and slaughter hogs benefit from a generous public income support program known under the French acronym ASRA. ASRA basically guarantees hog producers that they will receive no less than the producers' average cost of production, which includes a payment for the producers' own labor. The Canadian Agricultural Income Stabilization (CAIS) program available to other producers in Canada is less generous and is based on an entire farm's production margin but could partially

shield producers from the market effects induced by temporary border restrictions. What is the likelihood that these programs will be reformed in the near to medium future? These programs are the specific targets of the American legal actions. Even though Quebec producers do not export live animals, ASRA has explicitly been singled out as depressing hog prices in North America (Giordano). Because of the moratorium on new hog production facilities, some hog producers in Quebec have converted their nursery permit into hog finishing operations (i.e. they have switched their business operations from producing piglets to feeding hogs). This has caused a movement in feeder pigs from Ontario to Quebec. In the world trade arena, there is some pressure to reform domestic support and aggressive cuts in *de minimis* support could force reductions in support offered through ASRA-like programs.⁷

CONCLUDING REMARKS

Prior to the BSE case in 2003, the US and Canada clearly had a highly integrated beef industry. Likewise, the US and Canadian hog/pork industries also involved a fairly integrated market. Border trade restrictions, countervailing and antidumping duties, as well as country-of-origin labeling legislation threaten this market integration. Historically, cattle and beef trade between the two countries has been largely market driven. However, since May 2003, cattle and beef trade in North America has been substantially restricted and dictated by political and judicial decisions. This has resulted in structural change in the beef industry in both Canada and the US. Canada has invested sizeable amounts of public and private money into further development of its cattle slaughtering industry. At the same time the US cattle slaughter industry lost substantial cattle numbers that are critical for plant utilization and for operating at cost efficient levels. Losses have been especially acute in regions that are not in the heartland of US cattle feeding and especially in states near the border. Reduced cattle slaughter has resulted in significant income losses especially for local communities in the US where beef packing plants have either reduced operations or closed down entirely.

What will happen when the border reopens to live cattle trade? Obviously this depends upon when it reopens and the conditions surrounding its opening. However, it is likely that excess capacity will be present in North American cattle slaughtering resulting in costly plant closures. In the mean time, while North American trade policy creates substantial

⁷ *De minimis* support is the trade distorting domestic support (product and non-product specific) that is less than five percent of the value of production (ten percent for developing countries). There are currently some proposals in the Doha Round to cut the level of *de minimis* support in half.

cost increases in its industry, formidable global competitors have continued to expand. Regaining world market dominance will be a daunting challenge for the North American beef industry.

It is difficult to predict what will happen in the North American hog/pork industry given that policy options on both sides of the border are yet to play out. The US trade policies (i.e., CVDs and AD duties) and domestic policy (i.e., COOL) are likely to lower prices of feeder pigs in Canada and raise pork meat prices in both markets. These terms of trade effects will have implications for the future organization of the North American hog/pork industry. Four factors must be taken into account when analyzing organizational issues: 1) environmental pressures are likely to slow further development of finishing operations in Canada; 2) the relative value of the Canadian dollar with respect to the US dollar reached a ten-year high in late 2004 and further appreciation would negatively impact the profitability of pork processing operations in Canada; 3) internal pressures in Canada as well as international pressures to lower domestic support levels are likely to reduce total support and thus limit future growth in hog production; and 4) concentration and consolidation arguments to raise the competitiveness of Canadian pork packers could result in lower Canadian hog prices. The current business context in the Canadian hog/pork industry is not conducive to massive investments in processing and hog finishing operations. Thus, if border policies have any sense of permanence, it is likely that the Canadian industry will struggle in trying to bring feeder pigs to ready-to-market weight and there will likely be a contraction in the marketing of feeder pigs.

In summary, both the US and Canada stand to lose if special interests have their way in promoting trade barriers. What is the solution? Mexican President Fox is promoting the idea of “NAFTA-plus” which in his words includes more development, more trade, and more integration. The support for such an idea seems to come exclusively from eastern Canada; Quebec Premier Charest endorsed the idea, but also pushed for stronger dispute settlement mechanisms. Both the US and Canada have reiterated their official position not to renegotiate NAFTA. There is no momentum in Western Canada to renegotiate specific NAFTA provisions. There is even less interest in the US to renegotiate a deal which some once considered as weakening US domestic policies. The answer perhaps lies in a stronger commitment and leadership to promote multilateral liberalization at the WTO. This appears to be the most appropriate means to address North American farmers’ concerns about development, market access, and tariff reductions.

REFERENCES

- Abdesselem, A., O. Bonroy, and J.P. Gervais. 2005. *An Assessment of Price and Trade Impacts in the Canadian Hog/Pork Industry Following the US COOL Policy*. CREA working paper, Laval University, Quebec, Canada, forthcoming.
- Agriculture and Agri-food Canada (AAFC). 2004a. "Government Announces Strategy to Reposition Canada's Livestock Industry." News release available at <www.agr.gc.ca/cb/index_e.php?s1=n&s2=2004&page=n40910a>. Accessed 4 May 2005.
- _. 2004b. *Red Meat Market Information*. Available at <www.agr.gc.ca/misb/aisd/redmeat/main.htm>. Accessed 1 March 2005.
- Bagwell, K. and R.W. Staiger. 2002. *The Economics of the World Trading System*, Cambridge: MIT Press.
- Canadian Dairy Commission (CDC). 2004. "Support Prices for Butter and Skim Milk Powder Will Increase on February 1st, 2005." News release available at <www.cdc-ccl.gc.ca/cdc/main_e.asp?catid=134&page=2088>. Accessed 4 May 2005.
- CanFax. Calgary, Alberta, Canada. Personal communication and data provided April 2005.
- Charlesbois, P. and M. Wensley. 2003. *An Econometric Analysis of the Manitoba Corn Market*. Agriculture and Agrifood Canada, Policy Analysis Division, April.
- Dixit A.K. and R.S. Pindyck. 1994. *Investment under Uncertainty*, Princeton, NJ: Princeton University Press.
- Eaton, J. and G.M. Grossman. 1985. "Tariffs as Insurance: Optimal Commercial Policy When Domestic Markets Are Incomplete." *Canadian Journal of Economics* 18: 258-272.
- Gervais, J.P. and B. Larue. 2005. "Tariffs: National Welfare and Distributional Issues." In J.D. Gaisford and W.A. Kerr, eds. *Handbook on International Trade Policy*. Edward Elgar Publisher, forthcoming.
- Giordano, N. 2005. "Why Canadian Hog Subsidies Are Injuring US Hog Producers?" Paper presented at Banff Pork Seminar, National Pork Producers Council, January. Available at: <www.nppc.org/hot_topics/banfftradetalk012005.pdf>. Accessed 4 May 2005.
- Haley, M.H. 2004. *Market Integration in the North American Hog Industries*, Washington, DC: US Department of Agriculture, Economic Research Service (ERS), November. Available at <www.ers.usda.gov/publications/ldp/NOV04/ldpm12501/ldpm12501.pdf>. Accessed 4 May 2005.
- Hendrickson, M. and W. Heffernan. 2005. "Concentration of Agricultural Markets." University of Missouri. Available at <www.foodcircles.missouri.edu/consol.htm>. Accessed 4 May 2005.
- Horning, J. and C. Ward. 2005. "Positive Market Effects from a Meatpacking Plant Opening: Perceptions and Reality." *Current Agricultural, Food and Resource Issues* 6: 40-49.
- Klein, K.K., M.D. Faminow, K. Foster, B. Larue, R. Romain, and A.M. Walburger. 1995. *An Evaluation of Hog Marketing Systems in Canada*, Working Paper 4/95, Agriculture and Agri-food Canada, Policy Branch, April.

- Kraft, D.F. and J.I. Rude. 2002. "Feed Grains and Ethanol Processing In Manitoba." Paper presented at the public consultation on expansion of the ethanol industry, Manitoba Ethanol Advisory Panel, University of Manitoba, September. Available at <www.umanitoba.ca/afs/agric_economics/info/EthanolPaperSept2002.pdf>. Accessed 4 May, 2005.
- Krugman, P.R. and M. Obstfeld. 2003. *International Economics: Theory and Policy*, 6th Edition. Addison Wesley.
- Larue, B., J.P. Gervais, and H. Lapan. 2004. "Low-Price Low-Capacity Traps and Government Interventions in Agricultural Markets." *Canadian Journal of Agricultural Economics* 52: 237-256.
- Larue, B., J.P. Gervais, and Y. Rancourt. 2003. "Investigating Pricing to Market Behavior of Canadian Pork Exporters Using Threshold Autoregressive Techniques." Paper presented at the CAES meetings, Montreal, July.
- Livestock Marketing Information Center. Data available at <www.lmic.info/tac/spreadsheets/spreadsheets.html>. Accessed 4 May 2005.
- Loureiro, M.L. and W.J. Umberger. 2003. "Estimating Consumer Willingness to Pay for Country-of-Origin Labeling." *Journal of Agricultural and Resource Economics* 28: 287-301.
- Macdonald, J.M. and M.E. Ollinger. 2000. "Scale Economies and Consolidation in Hog Slaughter." *American Journal of Agricultural Economics* 334-346.
- MeatNews. 2005. "Swift Cuts Output." Article available at <www.meatnews.com/index.cfm?fuseaction=Article&artNum=9135>. Accessed 8 March 2005.
- Mitchell, F. 1998. *Risk Factors In A Global Market*. Proceedings of the Banff Pork Seminar.
- Pork Board. 2002. *Pork Facts 2002/2003*. Available at <www.porkboard.org/docs/pkfacts2002.pdf>. Accessed 4 May 2005.
- Schroeder, T. and J. Leatherman. 2004. *Impacts on US Beef Packers, Workers, and the Economy of Restricted Cattle Trade between Canada and the United States*. Report prepared for National Cattlemen's Beef Association, Canadian Cattlemen's Association, American Meat Institute, and Canadian Meat Council, 28 December.
- Sparks Companies Inc. 2003. "Cool Cost Assessment." Paper prepared for the Sparks/Cattle Buyers Weekly Consortium, April.
- Statistics Canada. *Canadian International Merchandise Trade Database*. Available at <www.statcan.ca/trade/scripts/trade_search.cgi>. Accessed 1 June 2004.
- Tamini, L.D. and J.P. Gervais. 2005. "Developing an Economic Index for the Quebec Hog/Pork Industry." *Canadian Journal of Agricultural Economics* 53: 1-24.
- US Department of Agriculture. 2005. "Statement by Agriculture Secretary Mike Johanns." Release No. 0047.05, 9 February.
- US Department of Agriculture, Foreign Agricultural Service (FAS). 2004. *World Beef Trade Overview*. Available at <www.fas.usda.gov/dlp/circular/2004/04-10LP/beefoverview.html>. Accessed 4 May 2005.