STRUCTURAL IMPLICATIONS OF PERSISTENT DISHARMONY IN NORTH AMERICAN BEEF AND PORK INDUSTRIES

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Prepared for the North American Agrifood Market Integration Workshop,
San Antonio, TX, May 5-6, 2005.

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INTRODUCTION

Trade relations between the North American Free-Trade Agreement (NAFTA) partners have been particularly strained in recent years. Currently important trade issues have persistent 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 agri-food sectors (*e.g.,* dairy industry) and other countries (*e.g.,* U.S. and Mexico). Live cattle trade between Canada and the U.S. 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 U.S. Department of Commerce (DOC) to impose Countervailing Duties (CVD) on Canadian exports of live hogs. NPPC argued that federal and provincial subsidies to hog producers constituted unfair subsidies that economically harmed U.S. hog producers. Anti-Dumping (AD) measures were also sought on the basis that the export price of Canadian firms was below domestic prices in the Canadian market. Pork industry representatives in Canada disagree with the U.S. claims and point out that the motives behind the trade actions are somewhat similar to previous legal trade challenges that occurred between the mid-1980s and the early 1990s. The DOC twice ruled that Canadian hog producers do not receive countervailable subsidies. Moreover, the U.S International Trade Commission (USITC) ruled on April 6th that Canadian exports of live hogs do not injure U.S. hog producers. This decision has the effect of nullifying the dumping margins previously established by the DOC.

In addition to legal trade actions in the hog industry, the 2002 U.S. farm bill called for mandatory labeling of some agri-food 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 U.S. would need to bear a label indicating the country of origin of the product. Opponents to 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 the North American markets and partially break market integration.

Even when trade measures have a temporary nature, they can cause permanent structural adjustments and reactions in an industry. The pork and beef sectors both experience 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, U.S. and Mexican markets. Market segmentation is likely to have important welfare implications. The border closure following the BSE case has introduced market failures in beef markets such that standard marketing arrangements can no longer be assumed to ensure economically efficient transactions between producers, packers and retailers. Hence, policy responses and industry adjustments are likely to differ between sectors.

The objective of this paper is to discuss the various adjustments available to policy makers and industry stakeholders to deal with current border problems in the beef and pork sectors. Various options can be considered and they include herd contraction in Canada and Mexico, re-location of processing activities, reforming agricultural policies and other trade measures. We highlight 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 remainder of the paper is structured as follows. The next section presents the North American beef and pork industry structures. The third section analyzes the potential policy responses and industry adjustments in light of the BSE trade issue. Section four investigates 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 in the last section.

BRIEF OVERVIEW OF PORK AND BEEF INDUSTRY STRUCTURE

Pork

The U.S., Canada and Mexico are among the major pork producing countries in the world. The U.S. and Canada were respectively the third and fifth largest pork producing regions in 2003 with a production of 9,073 and 1,895 metric tons. Mexico was the eleventh most important pork producing country with production of 1,150 metric tons. 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% from 1,034 Metric Tons (MT) in 1980 to the current level. As production grew, the trade balance of Canada with its most important trade partners also significantly evolved. Canadian total pork exports have grown from 149 MT in 1980 to 975 MT in 2003 (Haley, 2004).

In order to understand and explain potential adjustments in the North American hog/pork industry brought by the trade issues, it is necessary to understand the inner working of each industry. In this regard, we particularly focus on the Canadian and U.S. hog/pork industries. Haley (2004) describes in detail the U.S. hog/pork industry. There is no doubt that the legal challenge brought by the NPPC and other regional hog producers' association against Canadian firms was caused by the recent and continuous increase in Canadian exports of live hogs. Before providing an organizational picture of the U.S. hog/pork industry, it is instructive to break down the organizational structure of their northern neighbor.

Figure 1 breaks down the market share of each Canadian province in terms of 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 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 dollars or kilograms. The pie chart presents the rationale behind our decision to focus exclusively on the hog/pork industry in these three provinces for the remainder of the paper. These provinces account for more than three quarters of Canadian hog production.

Figure 2 illustrates the market destination of live hogs in Quebec, Ontario and Manitoba for 2003. There are some striking differences between the three provinces. First, all hogs raised

in the province of Quebec are slaughtered within the province.[1] Processing activities have a relatively lesser importance with respect to total hog production in Manitoba. Manitoba exports a significant quantity of feeder pigs to the United States as does Ontario. The chart also illustrates that there are hogs in Ontario transferred to other provinces (*e.g.,* Quebec). These include hogs ready-to-be slaughtered and feeder pigs.

Figures 3 and 4 present the growth in exports of live slaughter hogs and feeder pigs respectively in Quebec, Ontario and Manitoba. Hog exports from Quebec are almost non-existent. Exports of slaughter hogs increased dramatically around 1996 in Ontario and Manitoba. Conversely, Figure 4 illustrates that exports of feeder pigs have grown steadily since 1994 to reach record levels in 2003. Hayley (2004) reports that the destination of Canadian feeder pigs in the U.S. is mainly to corn belt states.[2] Canadian exports of slaughter hogs are more evenly spread across the United States and go to such states as Colorado, Montana, North Dakota, South Dakota, Utah, Arizona, California, etc.

Figures 5a, 5b and 5c present respectively the total growth in pork exports from Quebec, Ontario and Manitoba as well as to their two most important destinations: the U.S. and Japan. Pork exports have increased substantially in Quebec starting in 1994. As exports grew, the relative importance of the U.S. market has declined over the years; but it still remains the most important destination for Canadian pork exports. This market diversification has not been as strong in Ontario and Manitoba.

Table 1 provides a very brief picture of the U.S. hog/pork industry over a ten-year period (1994 – 2003). The numbers between parentheses can be used to assess the size of the Canadian industry with respect to its counterpart. For example, hog production reached 100,777 million heads in 2003 and Canadian production represented about 22% of U.S. production. Hog slaughters in Canada increased in relative terms compared to the U.S. between 1994 and 2003; going from 15.9 percent of U.S. production to more than 22 percent. U.S. Pork meat imports have increased in the U.S. and so did Canadian imports. Figures 5a through 5c already established that Canadian exports are more diversified in terms of destination in that the relative importance of the U.S. market as slightly declined over the years. Although not illustrated in the data, the share of Canadian products in total U.S. pork imports has increased between 1998 and

[1] Larue, Gervais and Lapan (2005) stress the importance of hog marketing institutions in explaining the simultaneous growth in production and processing activities in Quebec.
[2] These states are IN, MI, MN, OH, WI, IA, KS, MO, and NE.

2003. Finally, Canada has been the largest pork exporter of the two countries between 2000 and 2003 as pork exports from Canada represent 118.4 percent of total U.S. pork exports.

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

Beef

The U.S. has long been the world's largest beef producer with 2005 forecasted production of more than 11.2 million MT representing about 22% of total world beef production. In contrast, Canada's 2005 beef production is forecasted to be 1.5 million MT representing just under 3% of total world production (Foreign Agricultural Service, USDA). Figure 6 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 rate of 4.4% from 2000 to 2005 and China's production has increased even faster at an average annual rate of 5.6% over the past six years. Brazil has gone from having production that was about half that of the U.S. in 2000 to a projected nearly 75% of U.S. beef production by 2005.

The U.S. and Canada are important exporters in the world market. However, formidable competitors are present. Particularly noteworthy global beef export competitors include Brazil, Australia, Argentina, New Zealand, and lately India (figure 7). With the U.S. loss of major export markets resulting from the December 2003 discovery of a cow in Washington State with BSE, the U.S. went from representing just fewer than 20% of world exports in 2003 to about 3% in 2004. During this time, Brazil greatly increased its world export market presence going from 14% share of world beef exports in 2002 to an expected 25% in 2005 (Foreign Agricultural Service, USDA). 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 representing about 9% of world beef exports in 2005.

Two important summary points regarding the above discussion are: 1) the U.S. is a large country in terms of beef production and trade and 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 have great influence on the future structure of the beef industry in the U.S. and Canada.

The U.S. 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 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 U.S. 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 U.S. (data obtained from the Canadian Cattlemen's Association). Canadian slaughter cattle imports into the U.S. were just over a million head in each of the several years prior to the adoption of import restrictions by the US (figure 8). 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 U.S. was 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, U.S. imports of Canadian boxed beef reached record levels in 2004 with volume representing approximately 1.77 million head of fed cattle (figure 9).

BEEF INDUSTRY ADJUSTMENTS AND POLICY RESPONSES

Closure of the U.S.-Canadian border to cattle trade created substantial price discounts in Canada for feeder and fed cattle and cull cows relative to the U.S. Prior to the border closure, Canadian and U.S. 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 U.S. market for slaughter cattle shipments, prices diverged with Canadian prices dropping $20/cwt and more relative to U.S. levels (figures 10-12).

On January 4, 2005 the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) published a final rule that would permit imports of certain Canadian live cattle into the U.S. beginning on March 7, 2005. That rule provided that such

cattle must be less than 30 months of age 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 rule also allowed for imports of boneless beef from Canadian cattle older than 30 months of age. However, U.S. Secretary of Agriculture Mike Johanns announced an indefinite delay of imports of Canadian beef from animals over 30 months of age prior to the March 7 date.[3] Thus, the current policy allows for imports from Canada only of cattle that are under 30 months of age and beef from animals of the same age category. However, on March 2, 2005 a federal judge in Montana granted a temporary injunction against USDA to keep the Canadian border closed to live cattle trade. As of the date of this paper, the U.S. border remains closed to imports of Canadian cattle and it appears the current status will persist at least into this summer.[4]

The impacts of this trade policy between Canada and the U.S. has caused substantial costs to the U.S. beef packing industry (compounded by the loss of major export markets in the U.S. following the BSE discovery in December 2003). In 2002, the last full year of unrestricted cattle trade between U.S. and Canada, Canadian slaughter cattle imports represented about 3% of total U.S. cattle slaughter. However, Canadian slaughter cattle import restrictions had much greater relative impact in certain U.S. states. Table 2 presents the number of Canadian slaughter cattle imports by U.S. state of destination, slaughter in each of those states, and the percentage of slaughter represented by Canadian imported cattle in 2002. The state of 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.

To determine the economic importance of Canadian cattle slaughtered in the U.S., table 3 summarizes live value and estimated market value of boxed beef, hide, and offal by state from Canadian cattle imports for 2002. For the U.S. as a whole, the live value of Canadian imported slaughter cattle was around $755-$801 million in 2002, depending upon whether Agriculture and Agri-Food Canada or USDA data are used. Of additional importance for U.S. processing firms is

[3] USDA *Statement by Agriculture Secretary Mike Johanns.* Release No. 0047.05, February 9, 2005.
[4] Source: Meatingplace.com http://www.meatingplace.com

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.

For the entire U.S., the gross sales value of boxed beef and byproduct sales from Canadian imported slaughter cattle was $901-$956 million with a net value of these output sales value less the live animal price being around $145-$155 million in 2002 (table 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 U.S. is reduced packing plant capacity utilization in the U.S. 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 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 entire U.S. 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 U.S. 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.

Schroeder and Leatherman (2004) used social accounting matrix (SAM) analysis to project the annual economic impacts of reduced meat processing activity in the U.S. that was consistent with the amount of reduced imports of slaughter cattle from Canada resulting from import restrictions. The total loss of income to the U.S. economy associated with reduced meat processing activity was estimated to be about US$ 282 million annually (table 4). The number of jobs closely allied with this level of economic activity was nearly 5,000.

The long run implication of the U.S. border closure to Canadian live cattle is that it is fueling structural change. In particular, closure of the border has created substantial incentives for Canada to invest in cattle slaughter facilities. As such, substantial public support and private investment in cattle slaughter plant expansion is on-going in Canada. Figure 13 illustrates projected expansion in Canadian cattle slaughter facilities. Slaughter increased nearly 1 million head in 2004 relative to 2003 and is expected to increase another half a million head in 2005 with continued expansion planned.[5] If this expansion continues and the border remains closed, Canada will expand its slaughter capacity to be able to fully accommodate its own production. If and when the U.S. border re-opens 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 leads to substantial economic costs for both trading partners that will strain open relations.

The BSE crisis has also had far reaching consequences that extend beyond the beef industry. Prices of Canadian dairy cows have plummeted following the BSE discovery. Livestock producers must generally commit production before uncertainty about prices is resolved. Insurance markets have an important role in re-establishing the case for free trade in the case of small country that faces exogenous terms of trade (Eaton and Grossman, 1985). 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. For example, the border closure introduced one market failure in Quebec and Ontario dairy industries because the market for dairy cows was then controlled by a single buyer. Dairy producers used to rely on the U.S. 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. Packers' costs have undoubtedly gone up after May 2003 due to the loss of export markets for certain beef cuts, increased storage costs, etc. However in that particular case, the monopsony position generated abnormal profits by pulling prices of dairy cows to historical lows. Even though dairy producers can rely on supply management to support income, there is nevertheless a market failure (monopsony) and thus a (theoretical) justification for government intervention.

It did not take long for the dairy lobby to get rolling after the BSE discovery. Dairy producers argued that the mad cow case was responsible for a 10-20% reduction in their net

[5] The federal government decided to encourage expansion through a Can$ 66.2 million program. Details are available at: www.agr.gc.ca/cb/index_e.php?s1=n&s2=2004&page=n40910a

income. They lobbied the government for months trying to get a minimum price for their cows. The Quebec provincial government led a financial mediation between producers and the owners of the Colbex-Levinoff company who held the monopsony position. It resulted in the sale to dairy producer of an 80% 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 that target price without financial help. The government then offered a financial package to dairy producers that guaranteed a floor price for all dairy cow sales.[6]

It is unsure at this stage if Quebec dairy producers have sufficient funds to cover their stake in the company and whether the government promised to inject funds in the project. Given the monopsony situation, it would normally make good economic sense to subsidize purchases of cull cows to resolve the market failure. However, dairy producers' supply of dairy cows is very inelastic and subsidizing purchases is tantamount to pure income redistribution. The subsidies needed to support the floor price amount to input cost subsidies for the packing plant. It may give an incentive to the packer to push further down prices (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 output market. Finally, it should be noted that consumers clearly lost when the Canadian Dairy Commission (CDC) announced on December 10, 2004 an increase in the price of milk in part "to offset some of the negative impacts of the BSE crisis on farms" (CDC, 2004). Consumers will permanently bear some costs of BSE because it is well known that milk prices exhibit downward price stickiness.

PORK INDUSTRY ADJUSTMENTS AND POLICY RESPONSES

Market impacts of CVDs and COOL

It is extremely difficult to dismiss the political dimension of the trade issues in the hog/pork industries. Nevertheless, there is more to this than simple political-economy factors. The economic implications of these trade issues will be considered before focusing on the potential

[6] Although the sale of Colbex-Levinof plants to Quebec dairy producers was announced in December 2nd, 2004, there is still ongoing discussion to finalize the transaction at the moment this paper is being written. The purchase price was never confirmed (although it was rumored to be in the neighborhood of 50 millions dollars). Moreover, the provincial government's plan to establish a floor price was conditional on the participation of the federal government; but they did not obtain the federal commitment before publicly announcing their plan to help producers.

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 U.S. This is somewhat surprising as it is now well understood in the economics literature[7] 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 prevent countries to restrict trade in pork and beef. However, a number of policy combinations will achieve a potential first-best tariff solution from the U.S. perspective because an import tariff can always be decomposed into a production subsidy and a consumption tax. A countervailing duty (which is essentially an import tariff in retaliation for foreign subsidies) could potentially yield an increase in U.S. welfare. The CVD on imports of live hogs amounts to a subsidy to U.S. hog producers and a "consumption" tax for U.S. processors. Equivalently, if feeder pigs are taxed at the border, the trade policy amounts to a subsidy to feeder hog production and a tax on slaughter hog production and processing activities. It is far from obvious that the total welfare in the U.S. hog/pork industry would increase following an import duty; but this possibility should not be overlooked. We argue that it is indeed important to understand the terms-of-trade motives in order to explain the political pressures to apply import duties.

In order to understand the market impacts of CVDs, consider the vertically related markets drawn in Figure 14. The diagrams on the left hand-side of the figure represent the U.S. market for live hogs (bottom left) and the U.S. market for pork (top left). In the bottom left diagram, the segment $S(r)$ represents the supply curve of U.S. hog producers and $D(r;p)$ represents the hog demand of U.S. processors. The demand of 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

[7] Gervais and Larue (2005) provide a useful survey of the terms of trade motive for protection. Despite the large 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 (2003) in particular state that it is of "doubtful usefulness". Yet, Bagwell and Staiger (2002) give primary emphasis to the terms of trade approach in their most influential book on the economics of the world trading system.

pork processors while the segment $D(p)$ represents the U.S. demand of pork meat. Given the trade position of the U.S. with Canada, Figure 14 assumes that the U.S. is a net importer of both live hogs and pork meat. The diagrams on the right hand-side of Figure 14 are labeled as "trade markets" as they draw the excess demand function in the U.S. and the excess supply function of Canadian hog producers and pork processors. Because the U.S. has an influence on the price at which it trades (*i.e.*, the large country assumption), it faces upward 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 U.S. market $\left(r_0^{US}, p_0^{US}\right)$ and the quantities traded $\left(M_r^{US}, M_p^{US}\right)$. Domestic quantities of hogs produced and slaughtered are respectively denoted by H_0 and Q_0.

Now consider the application of countervailing and anti-dumping duties on exports of live hogs from Canada. The market effects of this policy are illustrated in Figure 15. The CVD/AD duties shift inward the excess demand of live hogs in the United States; reducing imports of live hogs to $M_r^{US\prime}$. The import duties create a spread between the U.S. and Canadian price of hogs. The increase in the U.S. hog price shifts inward the U.S. supply of pork in the top-left diagram. The price of pork meat increases and so are imports of pork meat into the U.S. As a result, less hogs are slaughtered in the U.S. 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 than a tax on live hogs (causing a reduction in the demand of live hogs) and a subsidy to hog production. Even though, the U.S. 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 15 illustrates the shift in production across countries following import duties. Imports of live hogs decrease; but imports of pork meat into the U.S. should increase.

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. We argue that COOL has similar effects to import duties; but they differ in the potential response that these policy tools can bring. With respect to labeling, the U.S. is using potential vertical differentiation in meat products (according to the country of origin) to induce a price differential between U.S. 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 U.S. is that potential premiums in the meat market would be transferred back to U.S. hog producers through higher prices. Preliminary research results reported by Abdesselem, Bonroy and Gervais (2005) indicate that COOL could potentially raise the U.S. hog price by about one-half of a percent while raising pork meat prices in the U.S. by 6%. 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 consumers' attitude. As before, welfare implications of the COOL policy are unclear.[8]

What is the optimal response from the Canadian's perspective? First best policy in light of anti-dumping and CVD is *laissez-faire*. There are no market failures from the Canadian government's perspective. With respect to the COOL issue, one option for the Canadian industry is to use generic promotion for their product in certain geographical areas (such as the U.S. Northeast region). Larue, Gervais and Rancourt (2003) have shown that Canadian pork processors are not pure price takers in the U.S. market because export price margins do not adjust in a one-to-one proportion following variations in the exchange rate. 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 expansion of the Canadian hog/pork industry (Tamini and Gervais, 2005).

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 hog/pork operations are supply driven in that processing activities tend to occur where ready-to-market hogs are fed and feeding operations tend to locate in regions

[8] Abdesselem, Bonroy and Gervais (2005) 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 0.10 Can$ per kg and a premium of 0.25 Can$ per kg at the retail level for products with a U.S. label. These estimates were adapted from Sparks (2003) and Loureiro and Umberger (2003). Their model is calibrated using 2002 data. The welfare implications of a spatial equilibrium model with vertical differentiation have never been fully explored in the literature. It is difficult to use price and trade flow impacts derived under a linear approximation of North American hog/pork markets to figure out the full welfare effects in the context of a vertically differentiated trade model.

that have a comparative cost advantage in feeding activities. Before analyzing the potential localization impacts of CVDs and COOL, it is worth discussing further the assumptions behind figures 14 and 15 that are likely to impact on location. First, figures 14 and 15 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 (2000) showed that significant scale economies in the hog slaughtering activities do exist. There are major differences between plant sizes between Canada and the U.S. In Quebec, the biggest processing plant has a weekly capacity of 25,000 heads. In comparison, the average capacity of a plant in the U.S. was about 45,000 heads per week ten years ago. Some plants have weekly capacity of 70,000 head per week and some even reach 150,000 head (Pork Board, 2003). Another implicit assumption is there is perfect competition in the industry. The concentration ratio of the four biggest firms (CR-4) in the U.S. packing industry evolved from 32 in 1985 to 64 in 2004 (Hendrickson and Heffernan, 2005). 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% of the market in Quebec.

Concentration and economies of scale are not so important to understand the adjustments of the industry at the macro level (*i.e.*, national) but are rather determinant forces when understanding the regional impacts of COOL and CVD/AD duties. As alluded to in Figure 15, the CVD/AD and COOL policies will likely result in lower hog prices in Canada and more hogs slaughtered in Canada. There is no indication that there are packing capacity problems in Canada. In fact, the industry has deplored many times that there was not enough hogs to process domestically.[9] In Quebec, most if not all plants operate a single shift and so is the trend throughout Canada.

Yet there is no denying that if U.S. policies increase 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 (1994) changed the way academics (and to some extent practitioners)

[9] Klein *et al.*, (1995, p.57) write: "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 (1998) who represents a packing plant write: "… we have the sales; we don't have the hogs".

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, input costs, etc. 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 the beliefs about the intransience 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 capacities. Processing firms produce a homogenous product and are thus especially vulnerable financially to (bad) capacity decisions of others. The timing option (*i.e.,* the option to wait) has an interesting value given the relatively uncertain state of the industry. Hence, it is doubtful that CVDs or COOL would cause investment in additional capacities.

Hog marketing institutions can also have an important impact on capacity investment decisions. The hog marketing rules basically establish cost and supply certainty for Quebec processors in that a substantial share (currently 50%) of all available hogs is attributed to processors according to their historical market share. All hogs in the province need to be marketed through the Quebec marketing board. In 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.

A recent study also shed some doubts about whether Canadian hog producers would benefit from increased processing capacity. Hornung and Ward (2005) analyze whether the opening of the Maple Leaf Brandon plant in Manitoba had any positive bearing on Prairie hog prices. They identified a significant price differential between the Manitoba market and two different reference markets due to the opening of the Brandon plant. However, producers' perceptions ran contrary to their findings in some cases. A significant share of producers did not believe that the opening of the plant stimulated competition and ultimately raised hog prices in Manitoba.

Capacity is perhaps more problematic when analyzing hog finishing operations. Growth opportunities in hog finishing operations are rather severely constrained because of environmental concerns or simple profitability considerations. The former is perhaps the most apparent in Quebec. The hog industry is facing stringent environmental regulations and public pressure to regulate the industry does not show any sign that it will ease anytime soon. A two-year moratorium in Quebec was imposed on all new hog finishing operations in June 2002. The moratorium was lifted December 15, 2004 after strict new environmental regulations were issued. For all practical matters, the moratorium is still under 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 necessary delay in production is considered (licensing, investment, etc.). Many industry stakeholders doubt that vigorous growth in the industry observed between 1994 and 2002 will ever be able to resume.

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 the sufficient financial conditions 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 comparative cost advantage in feed grains. However, Manitoba is a net importer of corn (Charlebois and Wensley, 2003) and feed wheat would likely need to be shipped in from Saskatchewan (Kraft and Rude, 2002) if the province ever decide to expand hog production. The potential growth in livestock industries could likely offset any price reduction in feeder pigs due to bottlenecks at the border.

Cost increases for finishing operations could be less of a problem if income support programs could account for this increase. In Quebec, hog producers (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 the payment of the producers' own labor hours. The Canadian Agricultural Income Stabilization (CAIS) program available to other producers is less generous but could potentially shield producers from 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, 2005). Because of the moratorium on new hog production facilities, some hog producers in Quebec have converted their maternity permit into hog finishing operations. This has caused a movement in feeder pigs from Ontario to Quebec. Quebec producers could be shielded from price signals induced by temporary border restrictions. In the world trade arena, there are some pressures to reform domestic support and aggressive cuts in "*de minimis*" support could affect the efficiency of ASRA-like programs in raising hog producers' income.[10]

CONCLUDING REMARKS

There is no arguing that prior to 2003 BSE discoveries, the U.S. and Canada had a highly integrated beef industry. For all practical matters, the U.S. and Canadian hog/pork industries evolved in a fairly integrated market. Border trade restrictions, Countervailing (CVD) and Anti-Dumping (AD) duties, as well as Country of Origin Labeling (COOL) legislation threaten this market integration. Cattle and beef trade between the two countries has historically 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 U.S. Canada has invested sizeable amounts of public and private money into further development of their cattle slaughtering industry. The U.S. cattle slaughter industry lost substantial cattle numbers that are critical for plant utilization and operating at cost efficient levels. Losses have been especially acute in regions that are not in the heart of cattle feeding and in states near the border. Reduced cattle slaughter has resulted in significant income losses especially for local communities in the U.S. where beef packing plants have either reduced operations or closed down entirely.

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

[10] *De minimis support* is the trade distorting domestic support (product-and non-product specific) that is less than 5% of the value of production (10% for developing countries). There are currently some proposals in the Doha Round to cut the level of *de minimis* support in half.

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 U.S. trade policies (CVDs and ADs) and domestic policy (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 likely have implications on 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 currency with respect to the U.S. dollar has reached a 10-year high recently and further appreciation would negatively impact the profitability of pork processing operations; 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; 4) concentration and consolidation arguments to raise the competitiveness of Canadian pork packers could result in lower Canadian hog prices. We argue that the current business context in the hog/pork industry is not conducive of massive investment opportunities in processing and hog finishing capacities. 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. We are likely to see a contraction in the marketing of feeder pigs.

In summary, both U.S. and Canada stand to lose if special interests have their way in promoting bottlenecks at the border. 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 U.S. and Canada have reiterated their official position not to renegotiate NAFTA. There is no momentum in Western Canada to re-negotiate specific NAFTA provisions. There is even less interest in the U.S. to renegotiate a deal which some once considered as weakening U.S. domestic policies. The answer perhaps lies in stronger commitment and leadership to promote multilateral talks at the WTO. This would seem to us the most appropriate mean to address North American farmers concerns about development, market access and tariff reductions.

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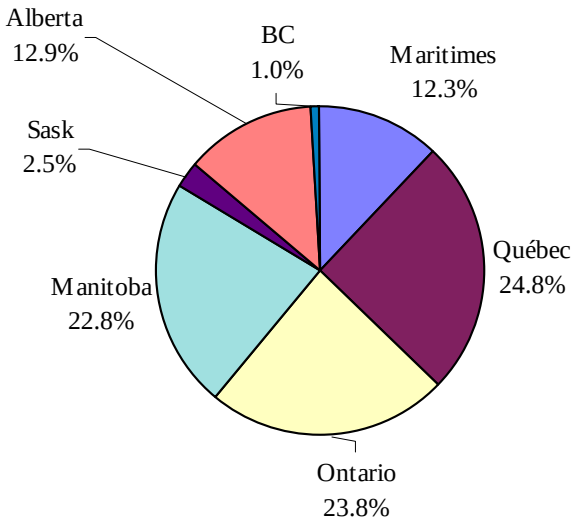


Figure 1. Provincial share of total Canadian hog marketings (as percentage of total number of head) in 2003.

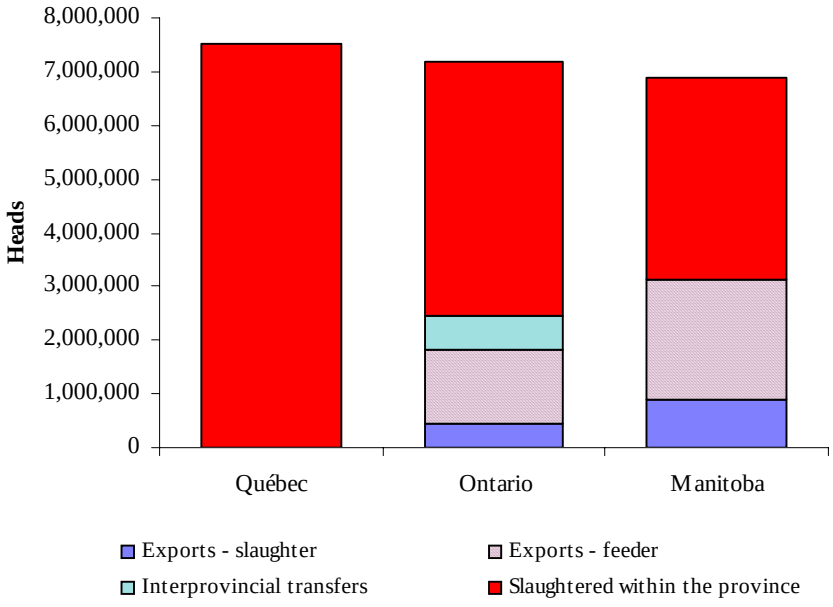


Figure 2. Market destination of all hogs marketed in Quebec, Ontario and Manitoba in 2003.

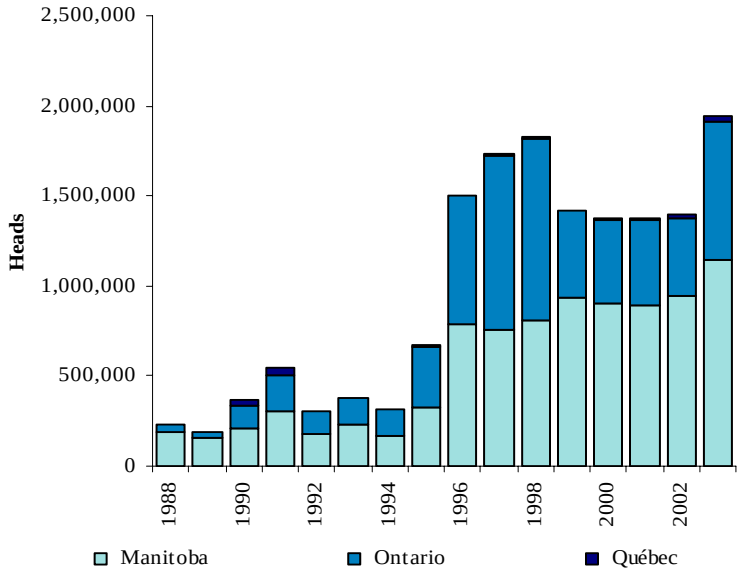


Figure 3. Exports of slaughter hogs from Quebec, Ontario and Manitoba to the U.S in 2003.

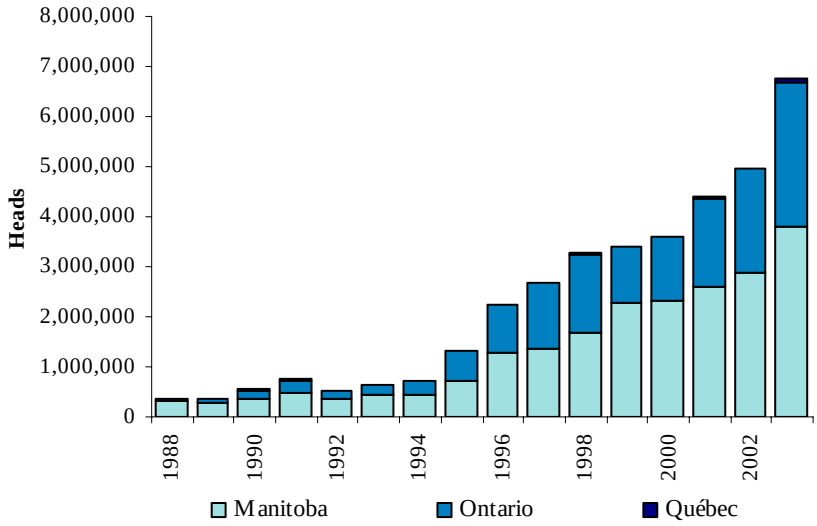


Figure 4. Exports of feeder pigs from Quebec, Ontario and Manitoba to the U.S in 2003.

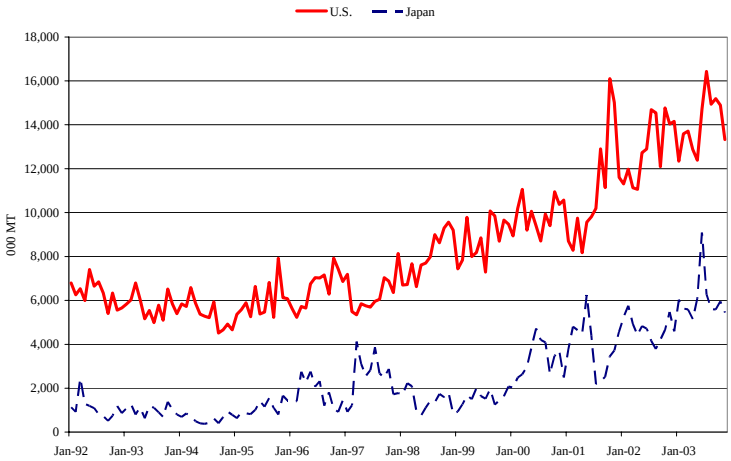


Figure 5a. Pork meat exports from Quebec to the U.S. and Japan from January 1992 to December 2003

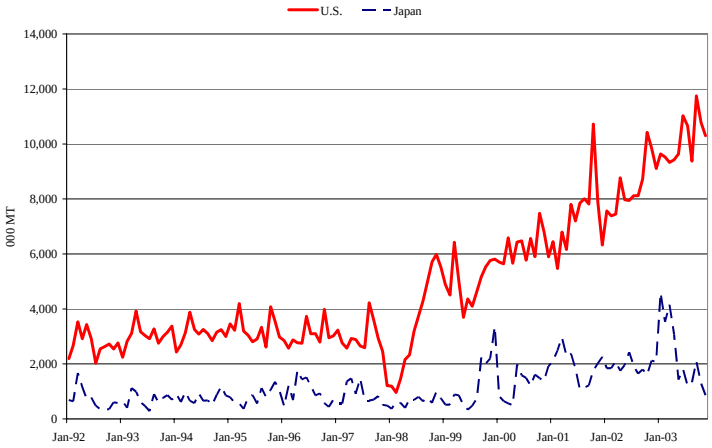


Figure 5b. Pork meat exports from Ontario to the U.S. and Japan from January 1992 to December 2003

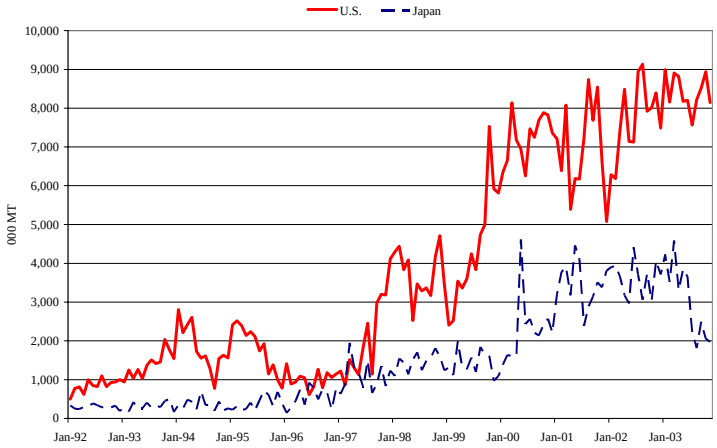
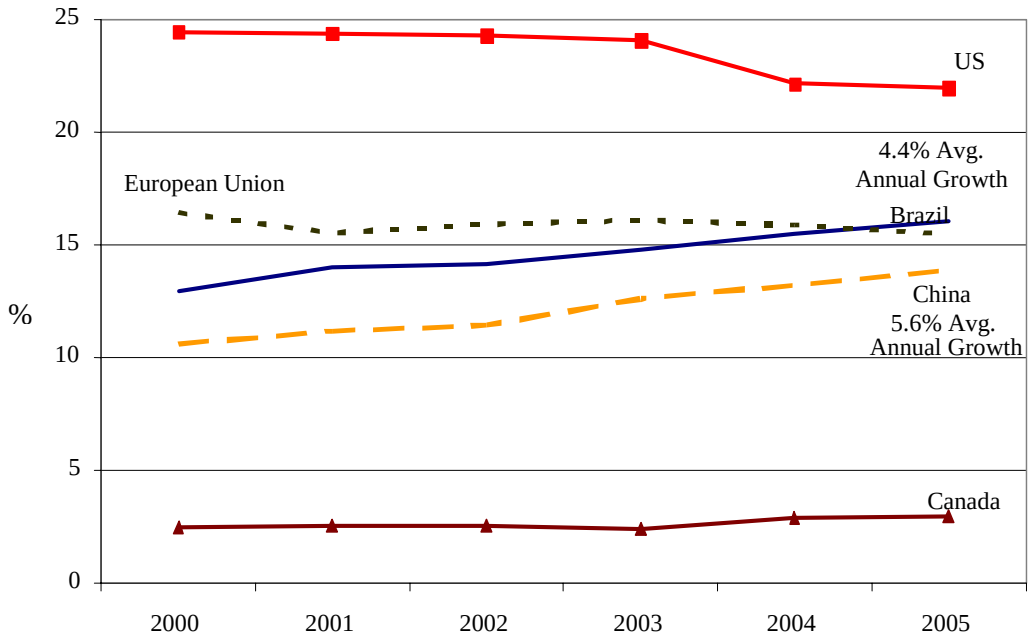


Figure 5c. Pork meat exports from Manitoba to the U.S. and Japan from January 1992 to December 2003.

Table 1. The U.S. hog/pork industry in comparison with the Canadian industry, 1994-2003.

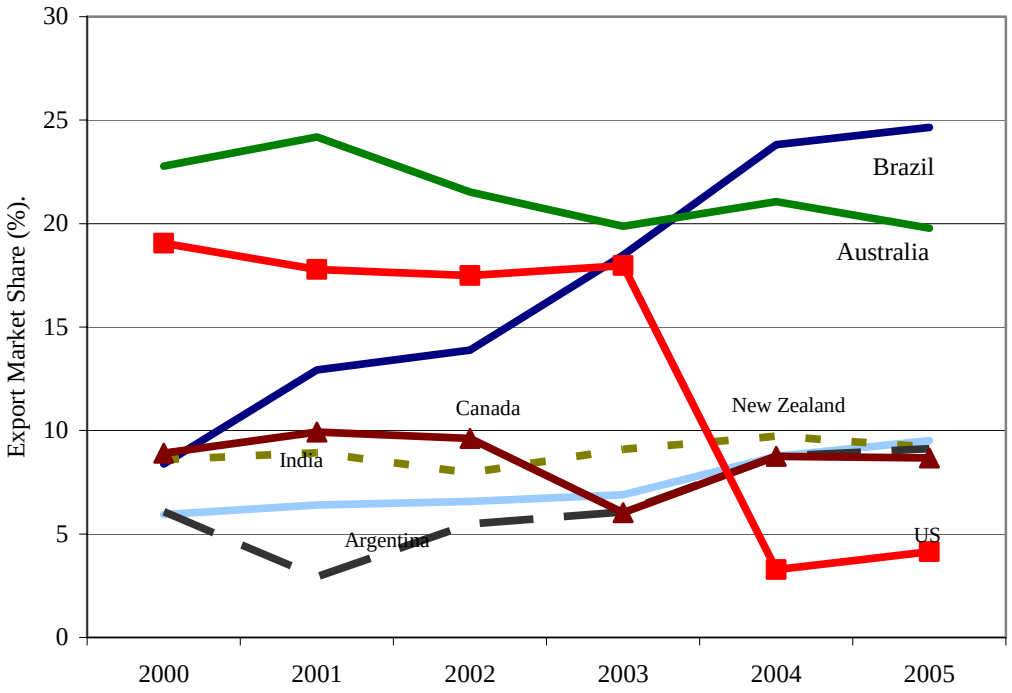
Year	Hog slaughter (head)	Pork imports (000 MT)	Pork exports (000 MT)
1994	95,905 (15.9)	338,077 (8.3)	284,114 (98.1)
1995	96,517 (16.1)	301,801 (8.9)	365,259 (98.5)
1996	92,394 (16.2)	281,311 (12.5)	413,166 (93.2)
1997	91,966 (16.5)	287,316 (18.0)	458,311 (91.8)
1998	101,028 (16.5)	320,302 (19.4)	528,939 (89.5)
1999	101,694 (18.6)	375,961 (15.4)	580,501 (89.5)
2000	97,977 (20.1)	439,359 (13.5)	584,846 (108.9)
2001	97,962 (21.0)	432,157 (15.8)	708,845 (101.4)
2002	100,263 (21.9)	486,694 (15.9)	732,831 (122.9)
2003	100,777 (22.1)	538,724 (20.2)	780,387(118.4)

Source: USDA and Agriculture and Agri-food Canada. Complied by Red meat market information website (www.agr.gc.ca/misb/aisd/redmeat/main.htm).



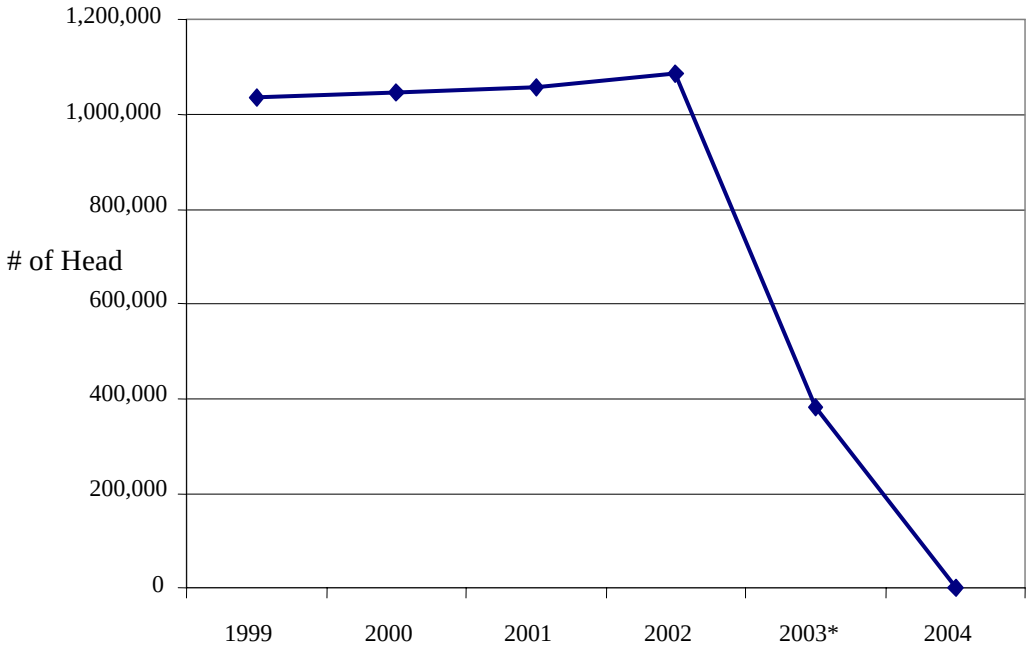
Source: Foreign Ag Service, USDA

Figure 6. Market shares of World Beef Production by Country for Four Largest Producers and Canada, 2000-2005 (’05 forecasted)



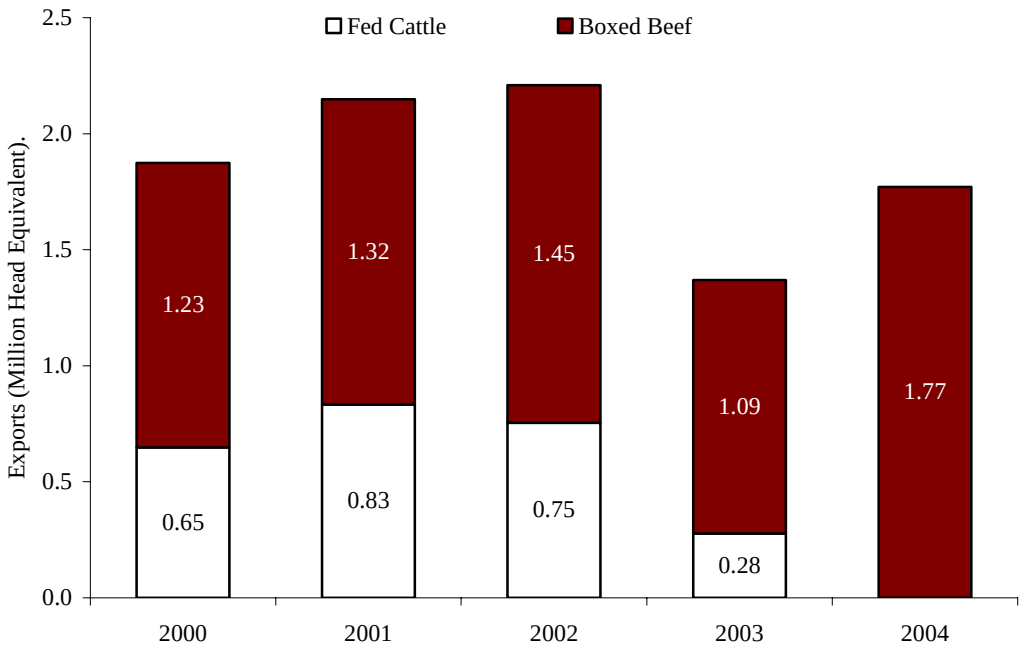
Source: Foreign Ag Service, USDA

Figure 7. Market Shares of Seven Largest World Beef Exporters by Country, 2000-2005 ('05 forecasted)



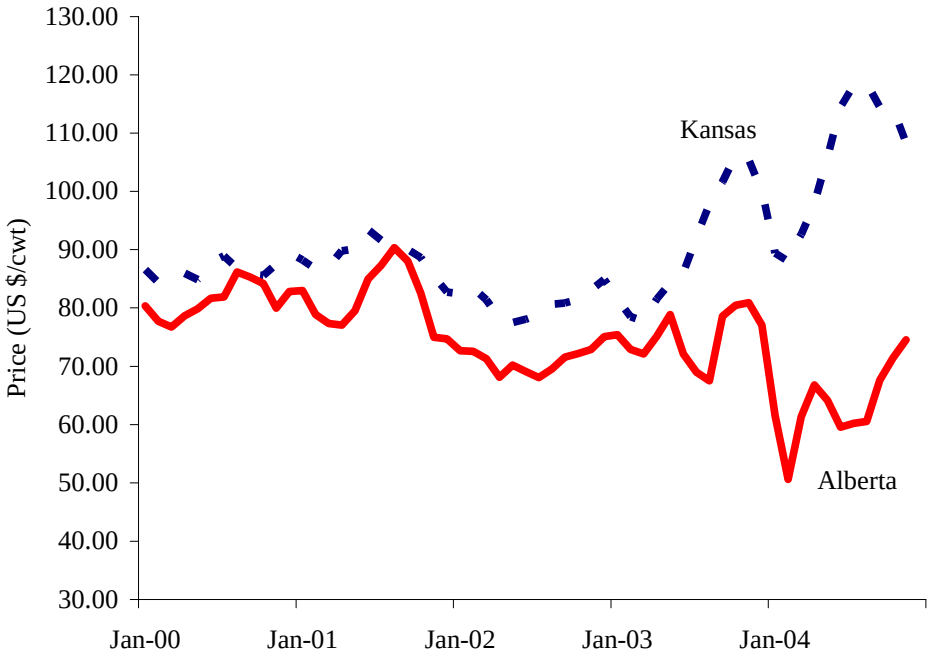
Source: USDA; *Import restrictions started in May 2003.

Figure 8. Annual Imports of Canadian Slaughter Cattle, 1999 – 2004.



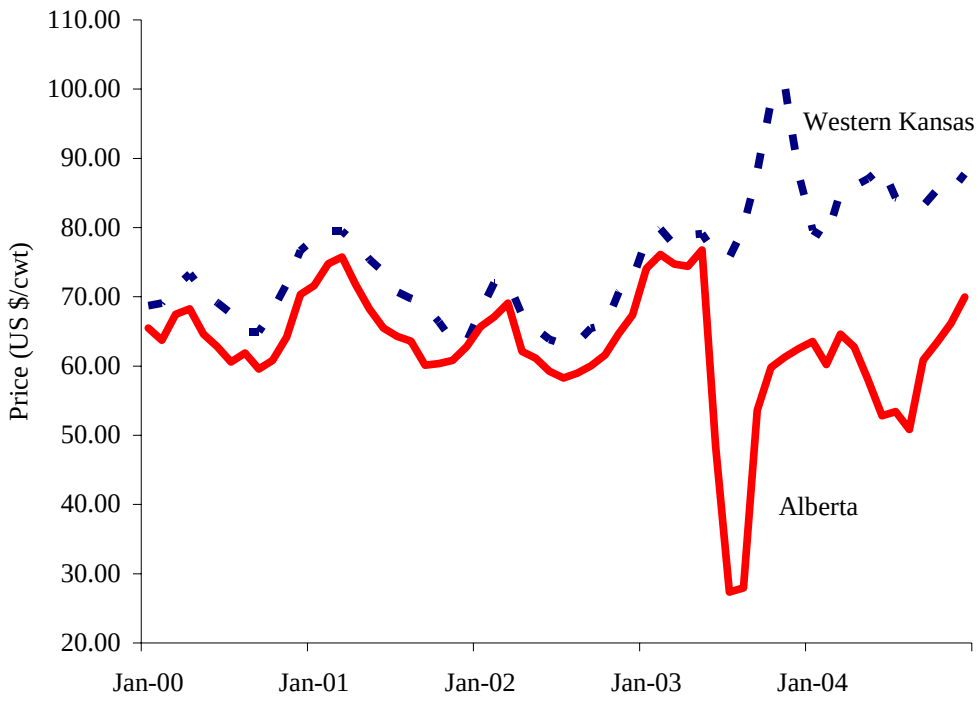
Source: Data from Livestock Marketing Information Center,
boxed beef converted to number of head by authors

Figure 9. Annual Canadian Boxed Beef (Converted to Approximate Head) and Fed Slaughter Cattle Exported to the US, 2000 – 2004.



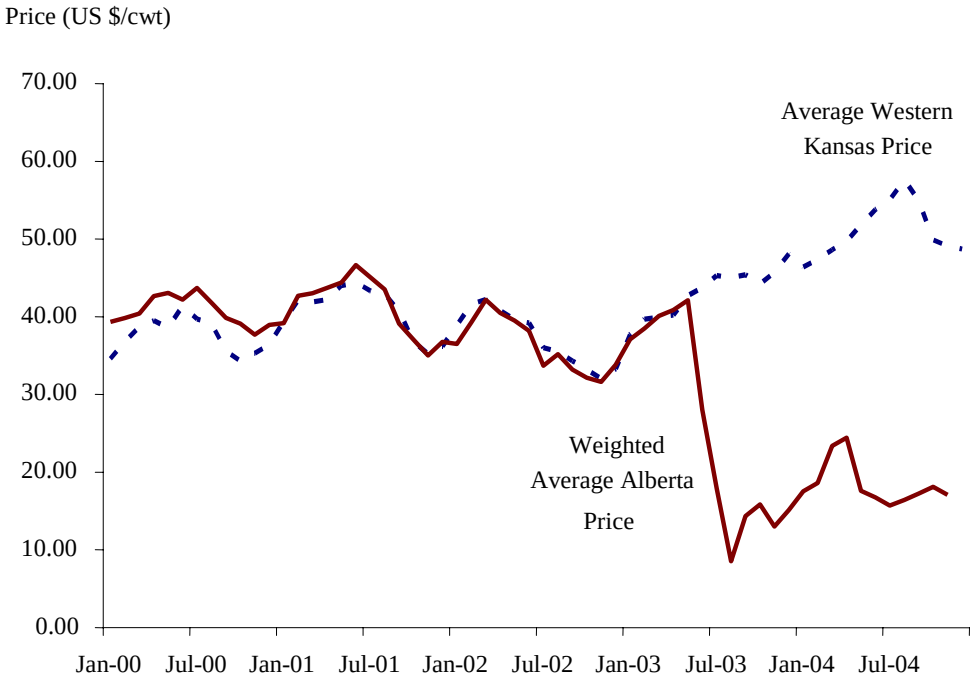
Source: USDA and CanFax

Figure 10. Monthly Average Prices for 700-800 Pound Steers in Kansas and Alberta, January 2000 – December 2004.



Source: USDA and CanFax

Figure 11. Monthly Average Prices for Fed Steers in Kansas and Alberta, January 2000 - December 2004



Source: Livestock Marketing Information Center

Figure 12. Average Monthly Prices for Slaughter Cows in Kansas and Alberta, January 2000 – December 2004.

Table 2. U.S. Imports of Canadian Slaughter Cattle, Total Cattle Slaughter, and U.S. Imports as a Percentage of Total Cattle Slaughter by State, 2002.

State of Slaughter	U.S. 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 3. Estimated Value of U.S. Imports of Canadian Slaughter Cattle and Boxed Beef and Byproduct Sales Value and Sales Value Less Purchase Cost of Canadian Slaughter Cattle by U.S. Slaughter Firms, by State, 2002.

State	Live Value of Imports[a] (U.S. $)	Estimated Beef & Byproduct Sales Value of Imports[b] (U.S $)	Estimated Beef & Byproduct Value Less Live Cost[c] (U.S.$)
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. Converted to U.S. Dollars using 2002 Exchange Rate of 1.57 Canadian to 1 U.S. 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 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.

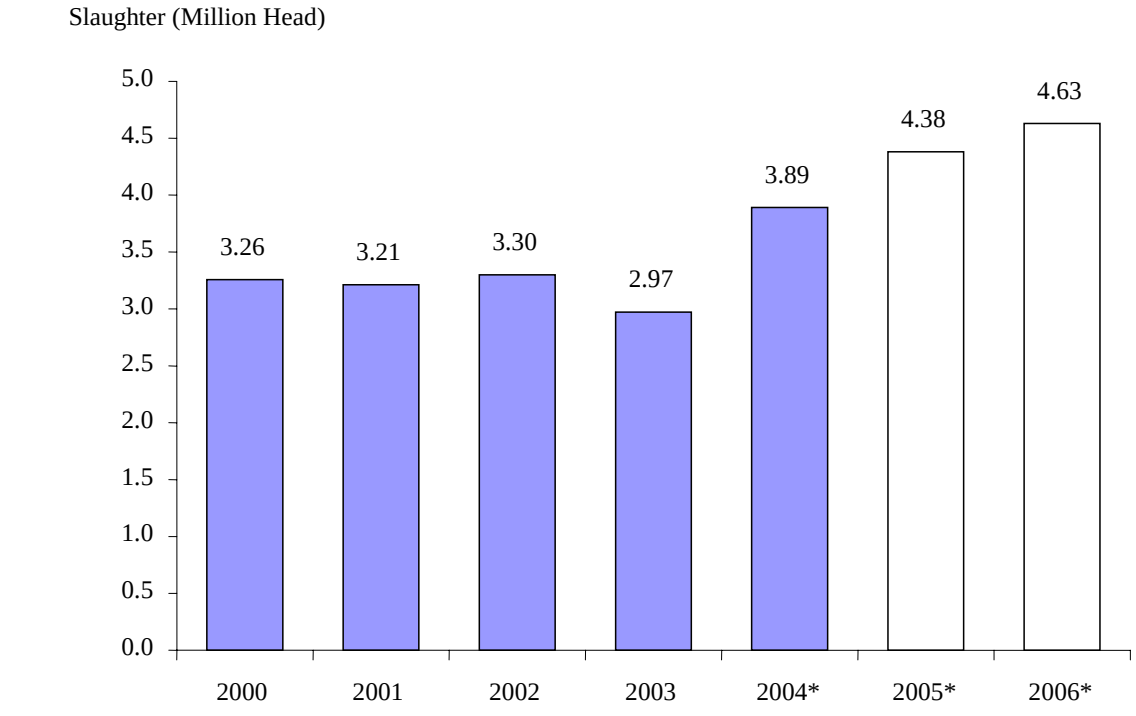
Table 4. Total Annual Employment Impact of Reduced Meat Processing Activity to the U.S. by Economic Sector, 2003 U.S. Dollars

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

Source: Schroeder, T. and J. Leatherman. *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, December 28, 2004



Source: Canfax; * as projected by CanFax

Figure 13. Annual Federally Inspected Canadian Cattle Slaughter 2000-2004 and Projections through 2006 assuming 90% Utilization planned expansion

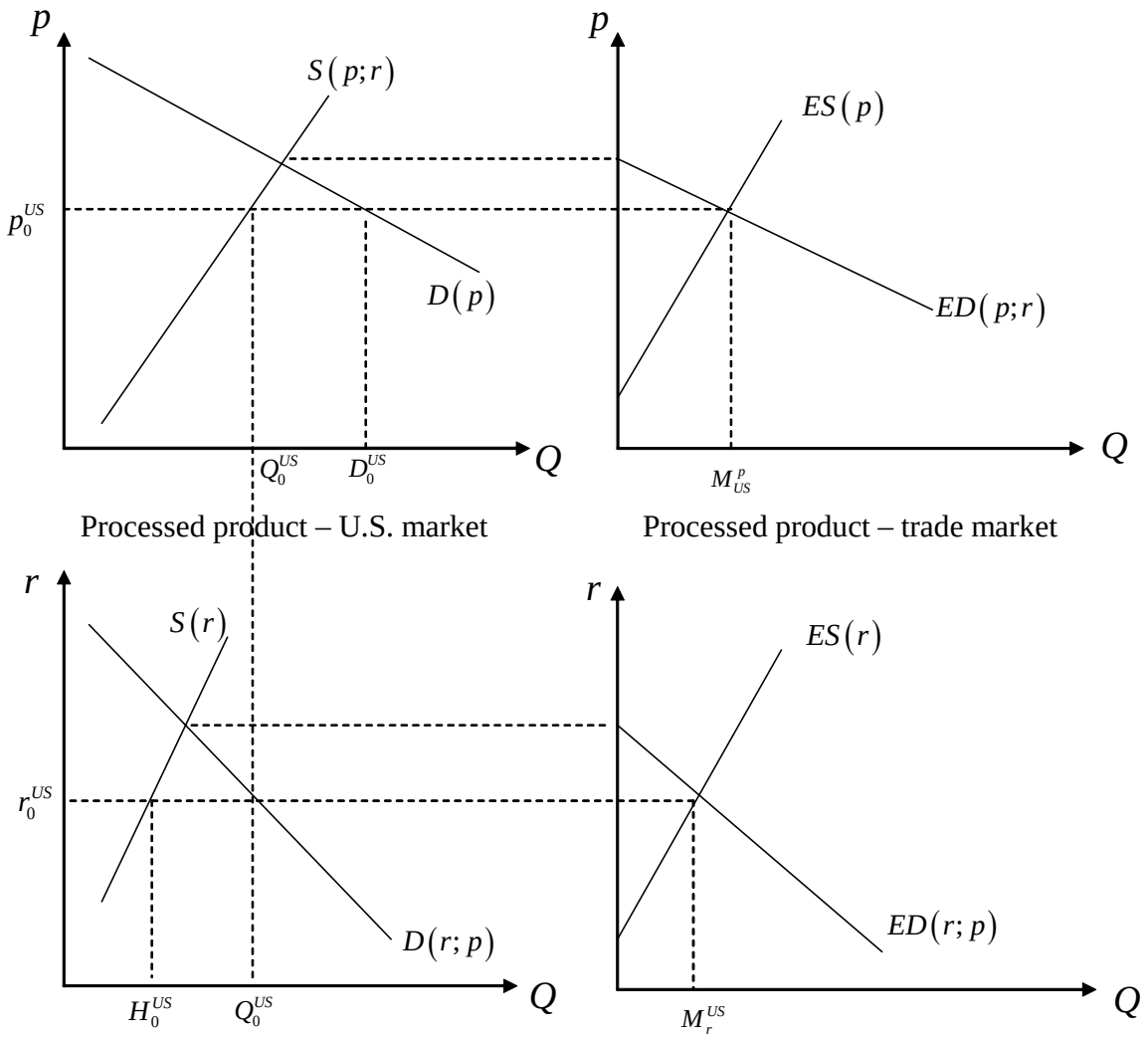
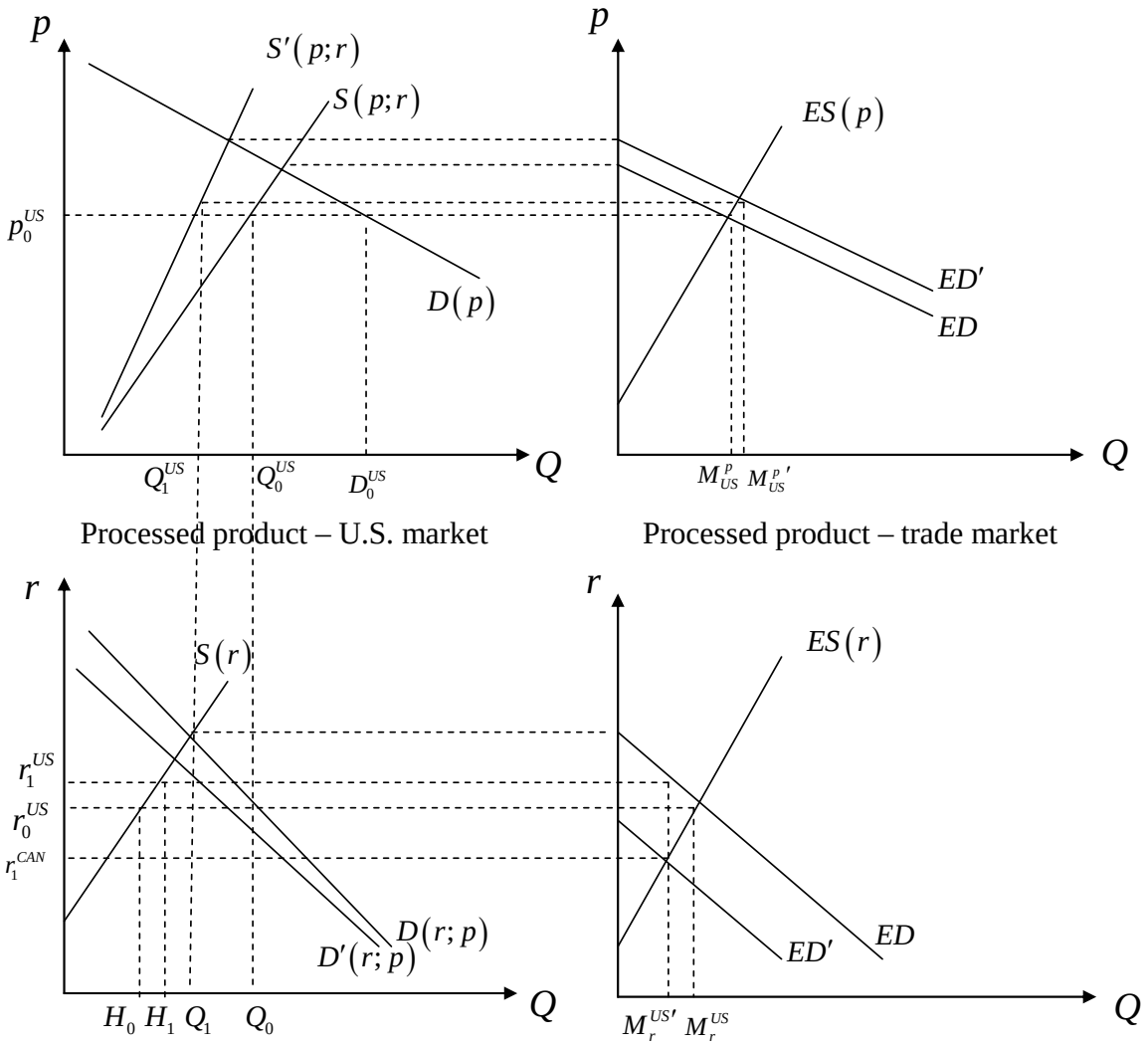

p
S(p;r)
p_0^US
D(p)
Q
Q_0^US
D_0^US
Processed product – U.S. market
p
ES(p)
ED(p;r)
Q
M_US^p
Processed product – trade market
r
S(r)
r_0^US
D(r;p)
Q
H_0^US
Q_0^US
Raw product – U.S. market
r
ES(r)
ED(r;p)
Q
M_r^US
Raw product – trade market

Figure 14.



Processed product – U.S. market

Processed product – trade market

Raw product – U.S. market

Raw product – trade market

Figure 15.